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Kasetsart University has rapidly expanded its education in response to public demand and has become orientated toward the social and economic development of the country as well as international academic communities. With staff members graduated from distinguished institutions all over the world, many areas of education have, hence, been developed at the master and doctoral levels.

Kasetsart University is a significant source of knowledge in several areas. It offers a host of educational programs leading to bachelor’s, master’s, and doctor’s degrees in several areas of sciences and arts in 7 campuses.

Faculties are the primary structural units of Kasetsart University that offer degree-bound educational programs at the undergraduate level. They are grouped on the basis of the academic areas of involvement into three clusters, namely,

- Agricultural science cluster,
- Science and technology cluster, and
- Social sciences and humanities cluster.

KU Academic Catalog was prepared and published by the Curriculum and Instruction Development Section of Education Services Division. It partly demonstrates educational development in the curriculum and provides information on the study programs at the undergraduate levels. It is also hoped that this catalog will represent means of communication assisting in strengthening and extending the future cooperation with the international academic institutions.

For graduate level has shown in Kasetsart University Bulletin was published by the Graduate School.

December 2006
# TABLE OF CONTENTS

## I. CURRICULUM

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kasetsart University in Brief</td>
<td>I-1</td>
</tr>
<tr>
<td>Faculty of Agriculture</td>
<td>I-17</td>
</tr>
<tr>
<td>Faculty of Business Administration</td>
<td>I-26</td>
</tr>
<tr>
<td>Faculty of Fisheries</td>
<td>I-33</td>
</tr>
<tr>
<td>Faculty of Humanities</td>
<td>I-40</td>
</tr>
<tr>
<td>Faculty of Forestry</td>
<td>I-57</td>
</tr>
<tr>
<td>Faculty of Sciences</td>
<td>I-63</td>
</tr>
<tr>
<td>Faculty of Engineering</td>
<td>I-85</td>
</tr>
<tr>
<td>Faculty of Education</td>
<td>I-102</td>
</tr>
<tr>
<td>Faculty of Economic</td>
<td>I-111</td>
</tr>
<tr>
<td>Faculty of Social Sciences</td>
<td>I-117</td>
</tr>
<tr>
<td>Faculty of Veterinary Medicine</td>
<td>I-126</td>
</tr>
<tr>
<td>Faculty of Architecture</td>
<td>I-131</td>
</tr>
<tr>
<td>Faculty of Agro-Industry</td>
<td>I-134</td>
</tr>
<tr>
<td>Faculty of Veterinary Technology</td>
<td>I-143</td>
</tr>
<tr>
<td>Kamphaeng saen Campus</td>
<td>I-145</td>
</tr>
<tr>
<td>Sri Racha Campus</td>
<td>I-165</td>
</tr>
<tr>
<td>Chalermphrakiat Sakon Nakhon Province Campus</td>
<td>I-174</td>
</tr>
<tr>
<td>Suphan Buri Campus</td>
<td>I-183</td>
</tr>
<tr>
<td>Affiliated Institute</td>
<td>I-189</td>
</tr>
</tbody>
</table>

## II. COURSE DESCRIPTION

### AGRICULTURE (001xxx - 049xxx)

<table>
<thead>
<tr>
<th>Course</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home Economics (006)</td>
<td>II-1</td>
</tr>
<tr>
<td>Pest Management (011)</td>
<td>II-9</td>
</tr>
<tr>
<td>Agricultural Chemistry (012)</td>
<td>II-10</td>
</tr>
<tr>
<td>Agricultural Science (015)</td>
<td>II-11</td>
</tr>
</tbody>
</table>

### AGRO-INDUSTRY (050xxx - 099xxx)

<table>
<thead>
<tr>
<th>Course</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biotechnology (051)</td>
<td>II-13</td>
</tr>
<tr>
<td>Food Science and Technology / Food Engineering (052)</td>
<td>II-15</td>
</tr>
<tr>
<td>Packaging Technology (053)</td>
<td>II-19</td>
</tr>
<tr>
<td>Agro-Industrial Product Development (054)</td>
<td>II-21</td>
</tr>
<tr>
<td>Textile Science and Technology (055)</td>
<td>II-26</td>
</tr>
<tr>
<td>Physico-Chemical Processing Technology (056)</td>
<td>II-31</td>
</tr>
</tbody>
</table>

### ECONOMICS (100xxx - 129xxx)

<table>
<thead>
<tr>
<th>Course</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic of Development and Planning (101)</td>
<td>II-34</td>
</tr>
</tbody>
</table>
Human Resource and Industrial Economics (103) II-36
International Economics (104) II-37
Monetary Economics and Public Finance (105) II-39
Natural Resources and Environmental Economics (106) II-40
Quantitative Economics (107) II-41
Economic theory (108) II-43
Transportation and Public Utilities Economics (109) II-44
Business Economics (110) II-46
Agricultural and Resources Economics (119) II-47
Cooperative Science (125) II-53

BUSINESS ADMINISTRATION (130xxx - 149xxx) II-58
Accounting (130) II-58
Finance (131) II-61
Management (132) II-64
Operations Management (133) II-68
Marketing (134) II-70

EDUCATION (150xxx - 199xxx) II-74
Education (151) II-74
Education Research and Evaluation (153) II-74
Teaching Mathematic (158) II-75
Teaching Sciences Teaching (159) II-76
Curriculum and Instruction (162) II-77
Education Psychology and Guidance (166) II-78
Education Technology (169) II-79
Computer Education (171) II-80
Physical Education (172) II-81
Health Education (173) II-89
Recreation (174) II-92
Physical Education Activities (175) II-93
Adult Education (177) II-96
Agricultural Education (178) II-96
Business Education (179) II-98
Home Economic Education (180) II-100

ENGINEERING (200xxx - 239xxx) II-102
Center Course (200) II-102
Chemical Engineering (202) II-102
Civil Engineering (203) II-105
Computer Engineering (204) II-112
Electrical Engineering (205) II-117
Industrial Engineering (206) II-128
Mechanical Engineering (208) II-133
Water Resource Engineering (209) II-139
Environmental Engineering (210) II-142
Electromechanic Manufacturing Engineering (211) II-145
Materials Engineering (213) II-147
Aerospace Engineering (215) II-152
Survey Engineering Geographic Information (218) II-156
Software and Knowledge Engineering (219) II-159
Aviation Technology Science (225) II-163
Aviation Management Science (226) II-166

ARCHITECTURE (240xxx - 241xxx) II-169
  Architecture (240) II-169
  Landscape Architecture (241) II-175

FISHERIES (250xxx - 299xxx) II-179
  Aquaculture (251) II-179
  Fishery Biology (252) II-180
  Fishery Management (253) II-182
  Fishery Products (254) II-183
  Marine Sciences (255) II-185
  Center Courses (299) II-187

FORESTRY (300xxx - 349xxx) II-189
  Conservation (301) II-189
  Forest Biology (302) II-190
  Forest engineering (303) II-194
  Forest Management (304) II-197
  Forest Products (305) II-199
  Silviculture (306) II-202
  Social Forestry (307) II-203
  Park and Recreation (308) II-204
  Pulp and Paper Technology (310) II-206
  Cooperative Education (349) II-208

HUMANITIES (350xxx - 399xxx) II-209
  Communication Art (352) II-209
  Drama (353) II-213
  Cambodian Language (354) II-213
  English Language (355) II-213
  French Language (356) II-219
  German Language (357) II-221
  Japanese Language (358) II-225
  Pali Language (359) II-228
  Sansakit Language (360) II-228
  Thai Language (361) II-229
  Chinese Language (362) II-231
  Laotian Language (366) II-234
  Myanmar Language (367) II-234
  Korean Language (368) II-235
  Vietnamese Language (369) II-235
  Library Science (371) II-235
  Linguistics (372) II-236
  English Literature (373) II-238
  French Literature (374) II-241
  Japanese Literature (375) II-241
  Thai Literature (376) II-241
  German Literature (377) II-243
  Chinese Literature (378) II-244
  Thai Music (385) II-244
  Western Music (386) II-248
<table>
<thead>
<tr>
<th>Subject</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Philosophy</td>
<td>II-253</td>
</tr>
<tr>
<td>Religion</td>
<td>II-255</td>
</tr>
<tr>
<td>Translation</td>
<td>II-257</td>
</tr>
<tr>
<td>Tourism</td>
<td>II-259</td>
</tr>
<tr>
<td>Hotel Studies</td>
<td>II-261</td>
</tr>
<tr>
<td>Secretarial</td>
<td>II-262</td>
</tr>
<tr>
<td><strong>SCIENCE (400xxx - 449xxx)</strong></td>
<td>II-264</td>
</tr>
<tr>
<td>Botany</td>
<td>II-264</td>
</tr>
<tr>
<td>Bio-Chemistry</td>
<td>II-266</td>
</tr>
<tr>
<td>Chemistry / Industrial Chemistry</td>
<td>II-268</td>
</tr>
<tr>
<td>General Science</td>
<td>II-274</td>
</tr>
<tr>
<td>Atmospheric Science</td>
<td>II-276</td>
</tr>
<tr>
<td>Space Science</td>
<td>II-276</td>
</tr>
<tr>
<td>Earth Technology</td>
<td>II-277</td>
</tr>
<tr>
<td>Genetics</td>
<td>II-278</td>
</tr>
<tr>
<td>Mathematics</td>
<td>II-281</td>
</tr>
<tr>
<td>Computer Science</td>
<td>II-285</td>
</tr>
<tr>
<td>Microbiology</td>
<td>II-291</td>
</tr>
<tr>
<td>Physics</td>
<td>II-295</td>
</tr>
<tr>
<td>Applied Radiation and Isotopes</td>
<td>II-302</td>
</tr>
<tr>
<td>Statistics</td>
<td>II-304</td>
</tr>
<tr>
<td>Zoology</td>
<td>II-310</td>
</tr>
<tr>
<td>Biology</td>
<td>II-313</td>
</tr>
<tr>
<td>Environmental Science</td>
<td>II-315</td>
</tr>
<tr>
<td><strong>SOCIAL SCIENCE (450xxx - 499xxx)</strong></td>
<td>II-318</td>
</tr>
<tr>
<td>Geography</td>
<td>II-318</td>
</tr>
<tr>
<td>History</td>
<td>II-322</td>
</tr>
<tr>
<td>Laws</td>
<td>II-327</td>
</tr>
<tr>
<td>Political Science</td>
<td>II-332</td>
</tr>
<tr>
<td>International Relationships</td>
<td>II-334</td>
</tr>
<tr>
<td>Justice and Security Administration</td>
<td>II-336</td>
</tr>
<tr>
<td>Local Government</td>
<td>II-338</td>
</tr>
<tr>
<td>Public Administration</td>
<td>II-339</td>
</tr>
<tr>
<td>Psychology</td>
<td>II-341</td>
</tr>
<tr>
<td>Sociology</td>
<td>II-349</td>
</tr>
<tr>
<td>Anthropology</td>
<td>II-352</td>
</tr>
<tr>
<td><strong>VETERINARY MEDICINE</strong></td>
<td>II-355</td>
</tr>
<tr>
<td>Veterinary Anatomy</td>
<td>II-355</td>
</tr>
<tr>
<td>Large Animal and Wildlife Clinical Sciences</td>
<td>II-356</td>
</tr>
<tr>
<td>Veterinary Obstetrics and Gynaecology</td>
<td>II-357</td>
</tr>
<tr>
<td>Veterinary Pathology</td>
<td>II-358</td>
</tr>
<tr>
<td>Veterinary Pharmacology</td>
<td>II-359</td>
</tr>
<tr>
<td>Veterinary Physiology</td>
<td>II-360</td>
</tr>
<tr>
<td>Componion Animal Clinical Sciences</td>
<td>II-361</td>
</tr>
<tr>
<td>Veterinary Microbiology and Immunology</td>
<td>II-363</td>
</tr>
<tr>
<td>Veterinary Parasitology</td>
<td>II-363</td>
</tr>
<tr>
<td>Veterinary Public Health and Diagnostic Service</td>
<td>II-364</td>
</tr>
<tr>
<td>Course</td>
<td>Page</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>VETERINARY TECHNOLOGY (520xxx)</td>
<td>II-366</td>
</tr>
<tr>
<td>Veterinary Technology (520)</td>
<td>II-366</td>
</tr>
<tr>
<td>KAMPHAENG SAEN CAMPUS</td>
<td></td>
</tr>
<tr>
<td>AGRICULTURE KAMPHAENG SAEN (026xxx – 049xxx)</td>
<td>II-369</td>
</tr>
<tr>
<td>Entomology (026)</td>
<td>II-369</td>
</tr>
<tr>
<td>Agricultural Mechanization (027)</td>
<td>II-372</td>
</tr>
<tr>
<td>Soil Science (028)</td>
<td>II-376</td>
</tr>
<tr>
<td>Agronomy (029)</td>
<td>II-379</td>
</tr>
<tr>
<td>Plant Pathology (031)</td>
<td>II-381</td>
</tr>
<tr>
<td>Agricultural Extension and Communication (032)</td>
<td>II-384</td>
</tr>
<tr>
<td>Animal Science (033)</td>
<td>II-388</td>
</tr>
<tr>
<td>Agricultural Biotechnology (034)</td>
<td>II-393</td>
</tr>
<tr>
<td>Center Course (036)</td>
<td>II-396</td>
</tr>
<tr>
<td>Horticulture (037)</td>
<td>II-398</td>
</tr>
<tr>
<td>EDUCATION KAMPHAENG SAEN</td>
<td>II-401</td>
</tr>
<tr>
<td>Agricultural (178)</td>
<td>II-401</td>
</tr>
<tr>
<td>Agricultural and Environmental Education (181)</td>
<td>II-403</td>
</tr>
<tr>
<td>Teaching Mathematic (158)</td>
<td>II-75</td>
</tr>
<tr>
<td>(See Courses from Education)</td>
<td>II-75</td>
</tr>
<tr>
<td>Physical Education (172)</td>
<td>II-81</td>
</tr>
<tr>
<td>(See Courses from Education)</td>
<td>II-81</td>
</tr>
<tr>
<td>SPORT SCIENCE (183xxx)</td>
<td>II-405</td>
</tr>
<tr>
<td>Sport Science (183)</td>
<td>II-405</td>
</tr>
<tr>
<td>ENGINEERING KAMPHAENG SAEN</td>
<td>II-409</td>
</tr>
<tr>
<td>Agricultural Engineering (201)</td>
<td>II-409</td>
</tr>
<tr>
<td>Irrigation Engineering (207)</td>
<td>II-415</td>
</tr>
<tr>
<td>Food Engineering (212)</td>
<td>II-418</td>
</tr>
<tr>
<td>Civil Engineering (203)</td>
<td>II-105</td>
</tr>
<tr>
<td>(See Courses from Engineering)</td>
<td>II-105</td>
</tr>
<tr>
<td>Mechanical Engineering (208)</td>
<td>II-133</td>
</tr>
<tr>
<td>(See Courses from Engineering)</td>
<td>II-133</td>
</tr>
<tr>
<td>LIBERAL ARTS AND SCIENCE(KAMPHAENG SAEN)</td>
<td>II-422</td>
</tr>
<tr>
<td>(700xxx - 749xxx)</td>
<td></td>
</tr>
<tr>
<td>English (721)</td>
<td>II-422</td>
</tr>
<tr>
<td>General Science (723)</td>
<td>II-422</td>
</tr>
<tr>
<td>Computer Science (729)</td>
<td>II-423</td>
</tr>
<tr>
<td>Economic Botany (736)</td>
<td>II-423</td>
</tr>
<tr>
<td>Biological Science (738)</td>
<td>II-424</td>
</tr>
<tr>
<td>Information Technology (739)</td>
<td>II-426</td>
</tr>
<tr>
<td>SRI RACHA CAMPUS(751xxx - 800xxx)</td>
<td></td>
</tr>
<tr>
<td>RESOURCES AND ENVIRONMENT</td>
<td>II-432</td>
</tr>
<tr>
<td>Chemical Analysis (114)</td>
<td>II-432</td>
</tr>
<tr>
<td>Cooperative Education (199)</td>
<td>II-432</td>
</tr>
<tr>
<td>Science Mathematics and Static (767)</td>
<td>II-433</td>
</tr>
<tr>
<td>Physical Activities (768)</td>
<td>II-433</td>
</tr>
<tr>
<td>Department</td>
<td>Code</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Computer Science</td>
<td>(418)</td>
</tr>
<tr>
<td>(See Courses from Engineering)</td>
<td></td>
</tr>
<tr>
<td>Environmental Science</td>
<td>(425)</td>
</tr>
<tr>
<td>(See Courses from Engineering)</td>
<td></td>
</tr>
<tr>
<td>MANAGEMENT SCIENCE</td>
<td></td>
</tr>
<tr>
<td>Hotel Studies</td>
<td>(391)</td>
</tr>
<tr>
<td>(See Courses from Humanities)</td>
<td></td>
</tr>
<tr>
<td>Social Sciences</td>
<td>(751)</td>
</tr>
<tr>
<td>Humanities</td>
<td>(752)</td>
</tr>
<tr>
<td>Economics</td>
<td>(753)</td>
</tr>
<tr>
<td>English</td>
<td>(754)</td>
</tr>
<tr>
<td>Business</td>
<td>(757)</td>
</tr>
<tr>
<td>Marketing</td>
<td>(758)</td>
</tr>
<tr>
<td>Finance</td>
<td>(759)</td>
</tr>
<tr>
<td>Accounting</td>
<td>(760)</td>
</tr>
<tr>
<td>Production and Operations</td>
<td>(761)</td>
</tr>
<tr>
<td>International Business</td>
<td>(762)</td>
</tr>
<tr>
<td>Hotel and Tourism Management</td>
<td>(763)</td>
</tr>
<tr>
<td>Logistic Management</td>
<td>(764)</td>
</tr>
<tr>
<td>SRI RACHA ENGINEERING</td>
<td></td>
</tr>
<tr>
<td>Naval Architecture and Marine Engineering</td>
<td>(03501)</td>
</tr>
<tr>
<td>Nautical Science</td>
<td>(03521)</td>
</tr>
<tr>
<td>CHALERMPRAKIAT SAKONNAKHON</td>
<td></td>
</tr>
<tr>
<td>PROVINCE CAMPUS</td>
<td>(801xxx – 850xxx)</td>
</tr>
<tr>
<td>NATURAL RESOURCES AND AGRO-INDUSTRY</td>
<td></td>
</tr>
<tr>
<td>Food Technology</td>
<td>(04801)</td>
</tr>
<tr>
<td>Agro-Bio resource</td>
<td>(04804)</td>
</tr>
<tr>
<td>SCIENCE AND ENGINEERING</td>
<td></td>
</tr>
<tr>
<td>Information Technology</td>
<td>(739)</td>
</tr>
<tr>
<td>(See Courses from Liberal Arts and Science)</td>
<td></td>
</tr>
<tr>
<td>Civil and Environmental Engineering</td>
<td>(04811)</td>
</tr>
<tr>
<td>Electrical and Computer Engineering</td>
<td>(04812)</td>
</tr>
<tr>
<td>Mechanical and Manufacturing Engineering</td>
<td>(04813)</td>
</tr>
<tr>
<td>Chemistry/Biochemistry</td>
<td>(04821)</td>
</tr>
<tr>
<td>Cooperative Education</td>
<td>(850)</td>
</tr>
<tr>
<td>LIBERAL ARTS AND MANAGEMENT SCIENCE</td>
<td></td>
</tr>
<tr>
<td>Accounting</td>
<td>(130)</td>
</tr>
<tr>
<td>(See Courses from Business Administration)</td>
<td></td>
</tr>
<tr>
<td>Management</td>
<td>(132)</td>
</tr>
<tr>
<td>(See Courses from Business Administration)</td>
<td></td>
</tr>
<tr>
<td>Marketing</td>
<td>(134)</td>
</tr>
<tr>
<td>(See Courses from Business Administration)</td>
<td></td>
</tr>
<tr>
<td>Hotel and Tourism Management</td>
<td>(763)</td>
</tr>
</tbody>
</table>
SUPHAN BURI CAMPUS (901xxx – 950xxx) II-470
Public Health (199) II-470
Anatomy (901) II-472
Physiology (902) II-473
Bio-Chemistry (903) II-473
Microbiology-Parasitology (904) II-474
Pharmacology (905) II-474
Phatology (906) II-474
Immunology (907) II-475
Center Course (910) II-475
Physical Therapy (941) II-476
Medical Technology (942) II-479
Radiological Technology (943) II-481

NOPPARAT VAJIRA BOROMARAJONANI NURSING COLLEGE II-487
Nursing Science (198) II-487

IGRIGATION COLLEGE
Irrigation Engineering (207)
(See Courses from Engineering) II-415

INTERDISPLINARY COURSES FOR GENERAL EDUCATION (999xxx) II-495
Science and Mathematics II-495
Social Sciences II-495
Humanities II-496
Language II-496
I. CURRICULUM

KASETSART UNIVERSITY PHILOSOPHY

“Kasetsart University is an institute with firm resolution to accumulate, seek for and develop knowledge for flourishing the intelligence of mankind so that each individual concerned shall be amply equipped, be it academically, ethically, or morality, and highly capable of properly guiding the upholding of the desirable intents of the society for the persistence, prosperity, and civilization of the nation.”

UNIVERSITY SYMBOL

University symbol is the statue of God of Rain riding on the back of Giant Serpent, surrounded by downward and upward lotus petals in the inner circle, with the words “Kasetsart University, 1943” circled on the outside. Color is dark green while Nonsri tree (Yellow Flame, Copper Pod Tree: *Peltophorum pterocarpum*) is the symbolic university plant.

THE SYMBOLIC COLOR OF EACH FACULTY

<table>
<thead>
<tr>
<th>Faculty of Agriculture</th>
<th>straw yellow</th>
</tr>
</thead>
<tbody>
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<td>lotus pink</td>
</tr>
<tr>
<td>Faculty of Architecture</td>
<td>earth gray</td>
</tr>
<tr>
<td>Faculty of Business Administration</td>
<td>light blue</td>
</tr>
<tr>
<td>Faculty of Economics</td>
<td>deep orange</td>
</tr>
<tr>
<td>Faculty of Education</td>
<td>purple</td>
</tr>
</tbody>
</table>
Faculty of Engineering     maroon  
Faculty of Fishery     sea blue  
Faculty of forestry     reddish brown  
Faculty of Humanities     white  
Faculty of Liberal Arts and Science     silver gray  
Faculty of Science     blue  
Faculty of Social Sciences     red  
Faculty of Veterinary Medicine     grayish blue  
The Graduate School     pale green  
Faculty of Natural Resource and Agricultural Industry     medium green  
Faculty of Science and Engineer     maroon  
Faculty of Arts and Management     light blue  
Faculty of Management Sciences     light blue  
Faculty of Resource and Environment     bluish green  
Faculty of Sports Sciences     orangey yellow  
The Irrigation College     maroon  
Faculty of Veterinary Technology     pink-purple  
College of environment     golden purple  
Baromrachachonnanee Nopparut Wachira Nursing College     golden shower yellow  

HISTORY  

Kasetsart is a state university of Thailand. Among the present 78 public universities and institutions and 61 private universities and 17 Community colleges in the country it ranks fourth chronologically and is the very first one to offer post-secondary degree-bound educational programs in agriculture. The three preceding it are also state universities, namely Chulalongkorn, Thammasat, and Mahidol, in that order.  

Kasetsart emerged initially in 1938 at the Maejo village in Chiangmai as a unit of division rank of the Department of Agriculture and Fisheries of the Ministry of Agriculture with the name of Kasetsart College, literally meaning College of Agricultural Science, and the primary responsibility of offering three-year post-secondary educational programs in response to the personnel requirements of the said ministry. In 1939, it was transferred to the present location at Bangkhen, Bangkok with the inclusion of the School of Forestry in Phrae Under is jurisdiction and the specification of Agriculture, Cooperative Science, and Forestry as the academic areas for its post-secondary education programs.  

On 2 February 1943, through the Kasetsart University 2486, the Kasetsart Act B.E. 2486, the Kasetsart College was detached from the Department of Agriculture and Fisheries of the Ministry of Agriculture and transformed into a unit equivalent to a department of the said ministry under the name of Kasetsart University (KU) with Faculty of Agriculture, Faculty of Forestry, Faculty of Cooperative Science, and Faculty of Fisheries as its primary structural units, and the authority to offer post-secondary degree-bound educational programs in Crop Production and Animal Husbandry, Forestry 1943 has been officially designated as the foundation day of Kasetsart University.  

In 1946 a duration of five years was officially prescribed for bachelor's degree programs of Kasetsart University and the corresponding courses of study and other academic requirements inclusive of thesis were specified for each of the four programs being offered then. For other universities in the country, the duration for a bachelor's degree program was four years and no thesis was required.
Kasetsart began to offer graduate education in 1954. The first program being offered was the Master of Crop Production and Animal Husbandry program with emphasis on Animal Husbandry.

Jurisdiction over Kasetsart University shifted from that of the Ministry of Agriculture to that of the Office of the Prime Minister effective 3 September 1959 as a result of the legislation designating the Office of the Prime Minister as the ministry-equivalent entity to oversee all matters pertaining to state universities.

In 1964, the shortening of the duration for bachelor's degree programs to four years together with the abolishment of the course pounding thesis requirement took effect. However, the Doctor of Veterinary Medicine program was excluded from such changes. A change in the entity with jurisdiction over Kasetsart University took place again on 29 September 1972 when a structural unit in the administrative set-up of the government under the name of Bureau of State Universities was created under the Office of the Prime Minister to oversee all matters pertaining to state universities. The Bureau of State Universities was abolished and the Ministry of University Affairs created on 13 April 1977 to assume the responsibility of overseeing matters pertaining to all institutions of higher learning, inclusive of private institution, in the country.

Kasetsart has growth steadily with numerous highly commendable accomplishments throughout the years. As a specialized university emphasizing on agricultural science and offering only four bachelor's degree programs to a total of 182 students initially, it is presently a nationally and internationally leading comprehensive university offering as many as 113 bachelor's degree programs to 77,059 students, 81 master's degree programs to 21,137 students and 36 doctorate programs to 234 students. Its teaching personnel has increased tremendously in number from less than 100 initially to 2,033 at present. Like wise, the number of degree-granting primary structural units has increased from four to 20 (inclusive of the Graduate School), while that of research institutes are 7 and that of service units from nil to four. Besides the main campus in Bangkok, it presently has three other campuses in the Central region and one campus each in the Northeastern region, the Western region, and the Southern region. Moreover, if maintains altogether 16 research stations, 5 field stations, 30 Centers, and three animal hospitals in all geographical regions of the country.

THE CAMPUSES

With due recognition of the great benefit to the nation of convenient access of the population to higher education, research, and technical services nationwide, The seven Kasetsart University campuses are:

- Bangkhen campus
- Kamphaengsaen campus
- Sriracha campus
- Chalermprakiat Sakon Nakhon Province campus
- Krabi Information Technology campus
- Lopburi campus
- Suphanburi campus

In addition to the offering curricular programs leading to degrees and diplomas, Kasetsart University also provides systematic and comprehensive services of several natures and extents to its students and the society in general. They are:
Kasetsart University Bangkhen Campus

This is the original and main campus of the University. It is situated on the area measuring 846 rai (135 hectares) in the lower part of the northern zone of Bangkok at the distance of approximately 6 kilometers to the south of Don Muang International Airport. At present, 13 faculties, 2 colleges, 10 offices, 1 institute and the Graduate School of the University operate at this campus with a total student population of approximately 32,776. The faculties are Agriculture, Agro-Industry, Architecture, Business Administration, Economics, Education, Engineering, Fisheries, Forestry, Humanities, Science, Social Sciences and Veterinary Medicine. The headquarters of all colleges, institutes, centers and offices of the University are also located in the campus.

### Office of the President
- General Affairs Division
- Student Affairs Division
- Education Services Division
- Vehicle, Building and Physical Plant Division
- Internal Audit Unit
- International Studies Center
- Personnel Division
- Finance Division
- Planning Division
- International Affairs Division
- KU Integrated General Education Center

### Faculty of Agriculture
- Off. of the Secretary
- Dept. of Farm Mechanics
- Dept. of Soils Science
- Dept. of Horticulture
- Dept. of Animal Science
- Dept. of Entomology
- Dept. of Home Economics
- Dept. of Agronomy
- Dept. of Plant Pathology
- Dept. of Agricultural Extension
- and Communication

### Faculty of Agro-Industry
- Off. of the Secretary
- Dept. of Biotechnology
- Dept. of Food Science and Technology
- Dept. of Packaging Technology
- Dept. of Products Development
- Dept. of Textile Science

### Faculty of Architecture
- Off. of the Secretary
- Dept. of Architecture Program
- Dept. of Urban and Environmental Planning Program
- Dept. of Landscape architecture Program
- Dept. of Building Technology Program

### Faculty of Business Administration
- Off. of the Secretary
- Dept. of Marketing
- Dept. of Operation Management
- Dept. of Accounting
- Dept. of Management
- Dept. of Finance

### Faculty of Fisheries
- Off. of the Secretary
- Dept. of Fishery Products
- Dept. of Aquaculture
- Dept. of Fishery Management
- Dept. of Fishery Biology
- Dept. of Marine Science

### Faculty of Humanities
- Off. of the Secretary
- Dept. of Philosophy and Religion
- Dept. of Foreign Language
- Dept. of Library Science
- Dept. of Career Science
- Dept. of Thai Language
- Dept. of Linguistics

Website: http://www.ku.ac.th
Dept. of Communication Arts

Faculty of Forestry
Off. of the Secretary  Dept. of Forest Management
Dept. of Forest Biology  Dept. of Forest Products
Dept. of Silviculture  Dept. of Forest Engineering
Dept. of Conservation

Faculty of Science
Off. of the Secretary  Dept. of Mathematics
Dept. of Chemistry  Dept. of Microbiology
Dept. of Biochemistry  Dept. of Botany
Dept. of Genetics  Dept. of Physics
Dept. of Applied Radiation and Isotope  Dept. of Statistics
Dept. of Zoology  Dept. of General Science
Dept. of Computer Science  Dept. of Environmental Science

Faculty of Engineering
Off. of the Secretary  Dept. of Agriculture Engineering
Dept. of Mechanical Engineering  Dept. of Irrigation Engineering
Dept. of Water Resource Engineering  Dept. of Electrical Engineering
Dept. of Civil Engineering  Dept. of Industrial Engineering
Dept. of Computer Engineering  Dept. of Chemical Engineering
Dept. of Food Engineering  Dept. of Aerospace Engineering
Dept. of Environmental Engineering

Faculty of Education
Off. of the Secretary  Dept. of Education
Dept. of Educational Technology  Dept. of Physical Education
Dept. of Vocational  Dept. of Educational Psychology and Guidance
Dept. of Sport Science  Kasetsart University Laboratory School

Faculty of Economics
Off. of the Secretary  Dept. of Economics
Dept. of Agricultural and Resource Economics  Dept. of Cooperative Science

Faculty of Social Sciences
Off. of the Secretary  Dept. of Psychology
Dept. of Law  Dept. of History
Dept. of Geography  Dept. of Political Science and Public Administration
Dept. of Sociology and Anthropology

Faculty of Veterinary Medicine
Off. of the Secretary  Dept. of Anatomy
Dept. of Pathology  Dept. of Pharmacology
Dept. of Surgery  Dept. of Physiology
Dept. of Microbiology and Immunology  Dept. of Medicine
Dept. of Veterinary Public Health  Dept. of Veterinary Parasitology
Dept. of Obstetrics Gynecology and Animal Reproduction

Graduate School
Off. of the Secretary
Other Offices and Institute of Kasetsart University

Office of Computer Service
Office of Extension and Training
Office of the Registrar
Office of Agricultural Museum and Culture
Office of University Library
Kasetsart University Research and Development Institute
Kasetsart University Archives
Quality Assurance Kasetsart University
Kasetsart University Sport Office
Cowboy Land
The Energy and Environmental Engineering Center
Central Laboratory and Greenhouse Complex
Research and Development Institute for Agricultural systems under Adverse Conditions
Kasetsart University Research and Development Institute
National Agricultural Extension and Training Center
Kasetsart Agro-Industrial Product Improvement Institute
Research and Development Institute of Industrial Production Technology : RDiPT
Institute of Food Research and Product Development

Affiliated Institute

Irrigation College
Veterinary Technology College
Baromrachachomnanee Nopparut Wachira Nursing College
Environment College

FACILITIES

Kasetsart University provides dormitories for overseas students as well as Computer Center, Medical and Dental Care, Libraries, Sports Center, Language Center, and Health Insurance. Bank and Currency Exchanged and Counseling Service are also available at the Office of International Programs.

ACADEMIC INFORMATION

ACADEMIC YEAR

All undergraduate study programs being offered at Kasetsart, exclusive of the Doctor of Veterinary Medicine (D.V.M.) the Bachelor of Architecture (B.Arch.) program and the Bachelor of Education (B.Ed.) program. The corresponding requirement for the D.V.M program is 6 years or 12 semesters, the B.Arch. program and the B.Ed. program are 5 years or 10 semester. The Bachelor of Science (B.S.), the Bachelor of Art (B.A.), the Bachelor of Accounting (B.Acct.), the Bachelor of Business Administration (B.B.A.), the Bachelor of Engineering (B.Eng.), the Bachelor of Economics (B.E.) require four years or eight of full-time study.

The academic year is divided into two semesters of sixteen weeks each, the first beginning in June and the second in November. A summer session of six weeks is also conducted from April to May.

ADMISSION

All applicants must have graduated from a high school or its equivalent as certified by the Ministry of Education. They have to pass the nationwide entrance examination and are required to undergo a medical examination. Details on admission to each faculty are available in the University Entrance Examination Bulletin, Commission on Higher Education (Ministry of Education). Foreign student can also be admitted in some major fields.

2 see International Studies Center, http://www.interprogram.ku.ac.th/
Admission of foreign undergraduate students is considered on a case-to-case basis. Besides the general qualifications for admission, other pertinent basic factors that must be carefully and thoroughly considered in each case are the willingness and readiness of the corresponding faculty members, especially those handing the required major courses, to teach or offer special tutoring in English, and the potential ability of the applicant to perform reasonably well in classes that are taught in Thai and obtain the necessary special assistance for attaining a desirable level of performance.

Transfer students will be accepted on the condition that the student has completed at least one year from other government university by case-to-case basis.

ENROLLMENT

Student are responsible for fulfilling all requirements of the curriculum in which they are enrolled. They should consult with their advisor about academic rules and requirements. The selection of major subjects in each faculty is based on the student’s interest, grade point average and other specific requirements of each department.
GRADUATION

To graduate with first or second class honors, students must have completed all subjects with the grade point average higher than 3.5 and 3.25 and have never failed in any subjects of examinations while study.

To complete the requirement in the undergraduate program, candidates must earn a grade point average (GPA) of at least 2.0 to be qualified for a Bachelor’s degree.

Kamphaeng Saen Campus

History

Kasetsart University, the first Higher Education Institute in Thailand to offer an academically strong program in agriculture, has been established since 1943. It was located in the area belonged to the Ministry of Agriculture and Cooperatives called Kaset Klang Bangkhen or Central Kaset Bangkhen.

In 1965, M.L. Choootchart Kampoo, the University President at that time, perceived that the existing area at Bangkhen was not adequate to support the educational expansion according to the National Social and Economics Development Plan. He then searched for a new site. The University Council considered that Kamphaeng Saen District was the most appropriate site for several reasons. Firstly it was only 80 kilometres from Bangkok and 30 kilometres from down town Nakhon Pathom Province. Secondly, the soil was fertile suitable for cultivation, the water can be channeled from the Meklong River through the irrigation canal dug from the Vajiralongkorn Dam in Kanchanaburi Province; Moreover, big plots of land were available. The Council, then, presented the University master plan to the Cabinet for the purchase and development of land. It was approved on December 6, 1966. Kasetsart University bought altogether 7,841 rai (or 1,270 hectares) of land and the first phase buildings were constructed in 1974 and finished in 1978.

On November 12, 1979 Kasetsart University Kamphaeng Saen Campus started teaching-learning activities by moving the third and fourth year students in Faculty of Agriculture and agriculture related programs from Bangkhen to Kamphaeng Saen. From 1990, Kamphaeng Saen Campus could offer classes to students from the first to the fourth year, including graduate students.

Teaching and Learning

Kamphaeng Saen Campus offers classes for the Bachelor Degree Program up to the Doctorate Degree Program in five faculties. They are:

The Faculty of Agriculture offers classes in eight departments: Departments of Entomology; Agricultural Mechanization; Soil Science; Agronomy; Horticulture; Agricultural Extension and Communication; Animal Science and Plant Pathology, and one interdisciplinary program on Agricultural Biotechnology.

The Faculty of Liberal Arts and Science has four division offering 5 Programs in the Bachelor of Science are General Science, Computer Science, Biological Science, and Information Technology; and the Bachelor of Art Program in English. And also offer the Master of Science Program in Economic Botany and the Master of Arts Program in Political Science.

The Faculty of Education offers classes in two departments: the Department of Vocational Education and the Department of Physical Education provide the Bachelor of Science and the Bachelor of Education’s degree program; Kasetsart University Laboratory School was incorporated in the Faculty of Education, Kamphaeng Saen Campus. Aiming at providing research and training facilities for Education student’s practicum and expanding educational opportunity to rural areas.

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3 see http://www.kps.ku.ac.th
The Faculty of Veterinary Medicine offers courses for the fourth to sixth year students in six departments: Departments of Parasitology; Veterinary Obstetrics; Gynaecology and Animal Reproduction Anatomy; Surgery; Science Medicine; and Veterinary Public Health. The Faculty of Veterinary Medicine set up Kamphaeng Saen Campus Animal Hospital to be used as a laboratory for students and treatment animals especially pets and economic animals.

The Faculty of Engineering offers classes in three departments: Departments of Agricultural Engineering; Irrigation Engineering and Food Engineering; and on special program on Civil Engineering.

The Faculty of Sports Science offers classes in three levels: the bachelor’s degree, the master’s degree and doctorate levels in sports science.

International Degree Programs, Kamphaeng Saen Campus currently offers International Degree Programs in Tropical Agriculture for the master’s degree and doctorate levels, in the fields of Agriculture Extension. Animal Science, Agronomy, Entomology, Farm Mechanics, Home Economics, Horticulture, Plant Pathology and Soil Science.

Academic Service
Kasetsart University Kamphaeng Saen Campus has supporting units to provide academic service as follows:
- The University Library Office provides and collects agricultural and agricultural related materials to support teaching-learning and research for teachers, personnel and students.
- The National Agricultural Extension and Training Center provides academic service, promotion of human resources, facilities for training, the production of media, documents, printing materials and texts.

Research
Kamphaeng Saen Campus has supporting units for research as follows:
1. Kasetsart University Research and Development Institute (KURDI) was set up to facilitate, disseminate and carry out research projects to rural areas. The Institute is divided into several centers as follows; The Central Laboratory and Greenhouse Complex; The National Agricultural Machinery Center; The Cane and Sugar Research and Development Center; The Industrial Entomology Research and Development Center; The Tropical and Subtropical Fruits Research and Development Center; The Agricultural Genetic Engineering and Biotechnology Center and The Tropical Vegetable Research Center.
2. Suwanvajokkasikit Animal Research and Development Institute (SARDI) carries out research on livestock and its products to the extent that they are right to the needs of both domestic and international markets. Its supporting units are: The National Swine Research and Training Center; The Buffalo and Beef Production Research and Development Center; The Dairy Research and Development Center; The Small Ruminant Animals Research and Development Center; The Animal Nutrition Research and Development Center; The Meat Science Research and Development Center; The Tap Kwang Research Station, and The Kamphaeng Saen Research Station.
3. The Energy and Environment Engineering Center has responsibilities in carrying out research and development in preservation and utilization of energy to the utmost and safe for the environments.
4. The National Biological Control Research Center (NBCRC) is a networking office among Kasetsart University and other agencies. NBCRC aims to educate and carry out research work concerning management of weed and pest by biological control measures.
5. The Plant Genetic Engineering Unit has been established by the collaboration of The National Center of Genetic Engineering and Biotechnology (BIOTEC). The unit serves as central research and service laboratory in plant molecular biology and plant genetic engineering.
Service and Welfare

The campus provides service and welfare as follows:
- Accommodation. Kamphaeng Saen Campus has 24 dormitories which can accommodate 4,000 students including staff housing and apartments.
- There are food centers on campus for students and personnel, for example; The Central Canteen, The Faculty Club, The Cowboy Corner and Nontri Food Shop.
- Kamphaeng Saen Campus Health Service. Health Center provides medical and health care for students and University staff with doctors and nurses available for consultation and treatment.
- Kamphaeng Saen Campus supports several kinds of sports facilities and service such as tennis lawns, football fields, a track field, a golf course and a swimming pool. Besides, Kamphaeng Saen Campus arranges a lot of facilities for convenience such as the Siam Commercial Bank (Kasetsart University KPS branch), a post office, The University Book Store, University Cooperatives Shop, and The Seven – Eleven.
- Moreover, a lot of recreation and rest areas are provided such as the Full Cycle Meat Production Center or in another name “The Cowboy Land”, The Insects Park with a collection of rare and endangered species of insects; the Fish and Bird Park where students and staff can enjoy seeing fishes and flocks of birds in the evening the Hundred Year Anniversary Garden in commemoration of H.R.H. the Princess Mother Somdet Phra Sirinarinndra Boromarajajonani. And the Botanical Garden.

Arts and Culture Promotion

Every year Kamphaeng Saen Campus organizes activities for Arts and Culture Promotion such as Paying Homage to Teacher Ceremony, Loykrathong Festival and Noppamas Beauty Pageant.

Kasetsart University Sri Racha Campus

A Brief History

Since 1989, Kasetsart University has a plan to use a plot of land located in Baan Namsub, Thungsukhla subdistrict, Sri Racha District, Chon Buri Province, where once used as a research station as well as for students’ practical training workshop. At first, the station was upgraded into a college and offered courses as to implement the government’s policy of expanding opportunity of education into regional area and the policy of developing workforce for the growing of the economy of the eastern seaboard region, which could be divided into 3 periods as follows:

Phase 1 (1990-1993)

The establishment of the “Community College” in order to offer courses to the community as well as providing useful information to the community. The college also has the community cultural relations center and the health and recreation center. The Continuing Education Center was set up in order to provide training courses needed by the community. The Research Center for Development of the Eastern Seaboard was also established to research in the field related to the Eastern Seaboard Development Project, particularly in the fields concern the environment and the ecology.

Phase 2 (1994-1999)

Kasetsart University agreed “Community College” to have the capacity in producing graduates. Thus, the establishment of Sri Racha Campus Project was set up to offer the undergraduate courses. The establishment of Sri Racha Campus Project composed of five divisions, which were:

4 see http://www.src.ku.ac.th/
1. The establishment of The Campus Administration Office, responsible for all administrative tasks.
2. The establishment of The Academic Services Office, responsible for providing services in teaching and laboratories, information services for the community and does the research.
3. The establishment of The Faculty of Management Sciences, to develop graduates in Business Management and Administration. It first admitted students in 1996.
5. The establishment of The Faculty of Industrial Technology, to develop graduates in Engineering and Industrial Technology. It first admitted students in 1997.

Phase 3 (1999-Present)
The Council of Kasetsart University at the 3rd meeting of 1999 on March 15th, 1999 agreed on granting a full status as a Campus to the establishment of Sri Racha Campus Project called “Sri Racha Campus”. In the 12th meeting of 1999 on December 20th, the organizational structure of the campus was set up, which comprised of the Faculty of Management Sciences, the Faculty of Resources and Environment, the Faculty of Industrial Technology (later changed to the Faculty of Engineering at Sri Racha), The Campus Administration Office, and The Academic Services Office.

Kasetsart University Chalermphrakiat Sakon Nakhon Province Campus

History
Chalermphrakiat Sakon Nakhon Province Campus was established in 1996 to celebrate the 50th anniversary of His Majesty accession to the throne, making it the fourth campus of Kasetsart University and supporting to government’s policy of expanding educational opportunities to meet the demand of the provinces as well.

The name “Chalermphrakiat” (which means upholding the honor of His majesty the King) and the golden jubilee sign was graciously granted by His Majesty on 15th August 1996.

The Campus aims for development in educational service, research work, academic services and promotion of traditional arts and culture.

Academic Subjects
Bachelor Degrees:
1. Faculty of Natural Resource and Agro-Industry
   - Bachelor of Science (Agro-Bioresource)
   - Bachelor of Science (Food Technology)
2. Faculty of Science and Engineering
   - Bachelor of Engineering (Civil Engineering)
   - Bachelor of Engineering (Electrical Engineering)
   - Bachelor of Engineering (Mechanical Engineering)
   - Bachelor of Science (Information Technology)
3. Faculty of Liberal Arts and Science Management
   - Bachelor of Accounting
   - Bachelor of Business Administration (Management), (Marketing), (Hotel and Tourism Management)

Learning and Teaching System
- “IT Campus” using UNINET and NontriNet network

5 see http://www.csc.ku.ac.th/
- Electronic Library
- Student Registration via Internet
- Practical Science Laboratories
- Modern computer laboratories and computer sound laboratories linked with multimedia system for earning languages
- Distance Education (Synchronous and Asynchronous Learning) by VDO conference and UNINET network
- Professional lecturers from Bangkhen, Kamphaeng Sean campus and qualified Chalermphrakiat Sakon Nakhon Province campus lecturers

Kasetsart University Lop Buri Campus

This campus occupies on area of 1,876 rai (300.16 hectares) in the Khok Samrong district of the Lop Buri Province at a distance of approximately 190 km north of Bangkok. The campus is being  founded according to the Cabinet approval on the Educational Opportunities Expansion Project to meet the needs of the people. Institutions and organizations of the region and the nation. Services encompass undergraduate and graduate education, basic and applied research and training to the benefit of people. These activities will be done with people participatory perspectives. Degree programs to be offered covering science, technology, and social science such as agricultural technology, agro-industry, economic, business administration, study for development, agricultural engineering, environmental management, sustainable tourism science, and wildlife studies. This campus is a national institution with international perspectives in that for the global regional cooperation. This campus aims to provide international degree program to the maximum sustainable extent through high quality teaching and research for students of the neighbouring countries such as Myanmar, Cambodia, Vietnam and Laos PDR.

Kasetsart University Suphan Buri Campus

Suphan Buri Campus is situated in the Muang and Bangplama Districts of Suphan Buri Province at a distance of 100 kilometers northwest of Bangkok. The establishment of this new Campus will provide opportunities for higher education in an agricultural area and a Center of Excellence for Farmers’ Health, strengthening the role of agriculture in Thai economy. The project for its initial development was approved in principle by the Cabinet in 1995 and the corresponding development was have been ongoing since then. Suphan Buri campus would comprise the following faculties : Allied Health Science, Sports Science, Laws and Human Resource Development. This campus would carry out manpower development programs to supplement its own lecturing staffs and provide a pool of skills for the country and in particular the western region. In addition, it would seek to offer quality and excellence in health related science education. It is intended that the local community will benefit from the establishment of the Suphan Buri campus by the usage of the university facilities.

Admission of students to the degree-bound educational programs of this campus began in the academic year 1999 by offering special master degree program on Sports Science, M.S. (Sport Science). In 2000, the second special master program on Business Administration, M.B.A. has been started. The third degree program was a top-up bachelor degree program on Public Health, B.P.H. which started from March 2001. And the bachelor degree program on Sports Science have been on going.

Kasetsart University Krabi Campus

Krabi Campus locates in Krabi Province, one of the six provinces along the Andaman seacoast, about 900 kms south of Bangkok. This seventh and the youngest campus of
Kasetsart University was established by the request of Southern people who has strongly recognized the roles of Kasetsart University in various disciplines.

During the pioneer period (1997-2009), the campus has completed the feasibility study and the Master Plan. Two ideal sites have been studied, the public land controlled by Krabi Agriculture and Technology College and Tung Kanoon Parn at Talingchan Subdistrict. The first site will be developed into the education center as well as the headquarter of the university campus. The second site is aimed in developing into the research station for transferring appropriate technologies on potential cash crop farming. Livestock, product development and handicraft center to promote tourism development in the area. Krabi Campus has set up the graduate program on Education Administration while the M.B.A. program is underway. Top up degree program on Sport Sciences has been developed in this campus. Moreover. Curriculum of top up degree program in Agricultural Development was completed for future action. Krabi Campus has signed the agreement with UPM (Malaysia) and BAIF (India) so as to promote the regional cooperation. Thai-Nordic Course was operated three times with the cooperation of the Tropical Unit, University of Helsinki. And in this connection, Krabi Campus has also established Andaman Institute to conduct research and development, technology transfer, as well as the establishing the Andaman Youth Leadership Network.

In the second phase (2002-2006), Krabi Campus will develop the infrastructure as well as the Information Technology System so as to provide the best opportunity to students in the region. More manpower development program is strengthening as well as the seeking more partnership to be involved in the regional development. The campus will concentrate research program on education. Sport science, natural resource and environment, coastal zone development, rubber, oil palm, fruit orchards, cut flowers, goat production, tourism development. And navigation.
Unseen in Bangkhen Campus
Unseen in Sri Racha Campus
FACULTY OF AGRICULTURE

GENERAL INFORMATION

The Faculty of Agriculture, one of the faculties of Kasetsart University established at its inception in 1943, currently carries out education and research activities at both Bangkhen and Kamphaengsaen campuses. The faculty consists of nine departments; namely: Agricultural Extension and Communication, Agronomy, Animal Husbandry, Entomology, Farm Mechanics, Home Economics, Horticulture, Plant Pathology and Soil Science. Through these exiting departments the faculty offers various undergraduate and graduate study programs to a total number of approximately 3,000 students. For the undergraduate program, for four-year curricula are being offered. There are Bachelor of Science in Home Economics, Agricultural Chemistry, Agricultural Science, and Pest Management. In addition, through the Graduate School, the faculty is responsible for various graduate programs leading to Master of Science and Doctor of Philosophy degrees.

DEGREES OFFERED
UNDERGRADUATE DEGREES

BANGKHEN CAMPUS
BACHELOR OF SCIENCE (Agricultural Chemistry)
BACHELOR OF SCIENCE (Agricultural Science)
BACHELOR OF SCIENCE (Home Economics)
BACHELOR OF SCIENCE (Pest Management)
BACHELOR OF SCIENCE  (Tropical Agricultural)

KAMPHAENGSAEN CAMPUS
BACHELOR OF SCIENCE  (Agriculture) Field of Study:
- Agricultural Extension and Communication
- Agronomy
- Animal Husbandry
- Entomology
- Horticulture
- Plant Pathology
- Soil Science

BACHELOR OF SCIENCE  (Animal Science)
BACHELOR OF SCIENCE  (Agricultural Mechanization)
BACHELOR OF SCIENCE  (Agricultural Biotechnology)

STRUCTURE OF THE CURRICULA

BACHELOR OF SCIENCE  (Agricultural Chemistry)

Total Minimum Requirements  140  Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics  3  Credits  
   999211(3)

2. Language  12  Credits  
   355xxx(9), 999021(3)

3. Social Sciences  7  Credits  
   102181(3), 999141(3), 371111(1)

4. Humanities  6  Credits  
   351213(3), 999033(3)

5. Physical Education Activities  2  Credits  
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS  104 Credits

1. Core Courses  53  Credits
   - Sciences  33  Credits
      401114(3), 401351(3), 403113(3), 403114(1), 403115(3), 403116(1), 417116(4),
      419211(3), 419214(1), 420119(4), 422111(3), 424111(3), 424112(1)

I-18
2. Major Requirements 39 Credits
011411(3), 011471(4), 012399(2), 012431(4), 012481(3), 012497(1), 012498(2),
012499(2), 402311(2), 402312(1), 402313(3), 402342(3) or 402482(3), 403221(4),
403222(1), 403231(2), 403232(2)

3. Major Electives 12 Credits
choose 12 credits from the following courses:
003211(2), 003212(1), 003413(3), 003419(2), 004312(3), 004334(3), 007454(3),
008481(3), 008482(3), 009321(3), 009421(3), 009423(3), 009431(3), 009481(3),
012432(4), 012482(3), 012491(3), 012496(1-3), 119111(3), 119331(3), 119371(3),
403325(3), 403451(3), 403452(3), 403455(3), 451222(3), 453111(3)

FREE ELECTIVES 6 Credits

BACHELOR OF SCIENCE
(Agricultural Science)

Total Minimum Requirements 137 Credits

GENERAL EDUCATION 31 Credits

1. Science and Mathematics 7 Credits
417116(4), 999211(3)

2. Language 12 Credits
355xxx(9), 999021(3)

3. Social Sciences 7 Credits
102181(3), 371111(3), 999141(3)

4. Humanities 3 Credits
999033(3)

5. Physical Education Activities 2 Credits
175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 100 Credits

1. Core Courses 58 Credits
005201(3), 015211(3), 015221(3), 015231(2), 015241(3), 015261(3), 015271(2),
015281(3), 015299(2), 403111(4), 403112(1), 403221(4), 403222(1), 416311(3),
416312(1), 419211(3), 419214(1), 422111(3), 424111(3), 424112(1), 401114(3)
or 423113(3), 002341(3) or 401351(3), 420119(3) or 422311(3)

2. Major Requirements  30 Credits
choose one program  from below :
Agriculture Resource and Environment  not less than 30 credits
  001466(3), 002302(3), 003421(3), 004324(3), 005333(3), 007311(3), 008371(3),
  009421(3), 009442(3), 009472(3)
General Agricultural Science  not less than 30 credits
  001466(3), 002302(3), 003211(2), 003212(1), 003417(3), 004372(3), 005333(3),
  007311(3), 007371(3), 008469(3), 009421(3)
Plant Science  not less than 30 credits
  015471(3), 015497(1), 015499  (3), 402311(2), 402312(1),  422462(3)
and choose courses from below not less than 17 credits:
  003211(2), 003212(1), 003417(3), 003421(3), 003451(3), 003461(3), 005449(3),
  007311(3), 007371(3), 007422(3), 007431(3), 007444(3), 007491(1), 007498(2),
  009421(3), 015472(3)
Animal Science  not less than 30 credits
  002321(3), 002322(2), 002331(3), 002411(3), 002412(3), 002413(3), 002414(3),
  002497(1), 402311(2), 402312(1)
and choose courses from below not less than 6 credits:
  002499(3), 004336(3), 005424(3)

3. Major Electives  not less than 12  Credits
and choose courses from any department in Faculty of Agriculture and/or choose from
the following courses :
  015390(1), 015490(6), 119111(3), 119221(3), 119331(3), 119371(3), 130101(3),
  130111(3), 131211(3), 131313(3), 132111(3), 134111(3)

FREE ELECTIVES   6   Credits

BACHELOR OF SCIENCE
(Home Economics)
Minimum Requirements   137   Credits

GENERAL EDUCATION 30 Credits

1. Sciences and Mathematics  3  Credits
   999211(3)

2. Language  12 Credits
   355xxx(9), 999021(3)

3. Humanities  4 Credits
   371111(1), 999031(3)
4. Social Sciences  9 Credits
   459111(3), 999141(3)
and choose 3 credits from below :
   102181(3), 999041(3)

5. Physical Education Activities  2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS  101 Credits

1. Major Requirements  60 Credits
   - Sciences and Mathematics  28 Credits
     403111(4), 403112(1), 403221(4), 403222(1), 419211(3), 419214(1), 420119(4),
     422111(3), 423251(3), 424111(3), 424112(1),
   - Home Economics  32 Credits
     006121(3), 006151(3), 006171(3), 006231(4), 006241(3), 006244(3), 006282(3),
     006311(3), 006399(2), 006497(1), 006498(2), 006499(2)

2. Major Electives  41 Credits
   choose one program from below :
   - Related Arts
     choose 18 credits from the following courses :
       006221(3), 006222(3), 006224(3), 006321(3), 006325(3), 006327(3)
     and choose one program from below :
       1) Interior Decoration  23 credits
       choose 18 credits from the following courses :
         006324(3), 006421(3), 006422(3), 006424(3), 006425(3), 006427(3)
       and choose 5 credits from the following courses :
         001351(3), 006243(3), 006326(3), 006496(1-3), 240112(2), 459471(3)
       2) Handicraft Design  23 credits
       choose 18 credits from the following courses :
         006223(3), 006322(3), 006323(3), 006326(3), 006347(3), 006423(3)
       and choose 5 credits from the following courses :
         001351(3), 006421(3), 006426(3), 459471(3), 459472(3)
   - Clothing and Textiles
     choose 11 credits from the following courses:
       006242(1), 006243(3), 006245(1), 006246(3), 006345(3)
     and choose one program from below :
       1) Clothing  30 credits
       choose 18 credits from the following courses :
         006344(3), 006346(3), 006348(3), 006444(3), 006448(3), 006449(3)
       and choose 9 credits from the following courses :
         006326(3), 006349(3), 006442(3), 006443(3), 006445(3), 006446(3), 006496(1-3)
       and choose 3 credits from the following courses :
         006322(3), 006471(3), 130101(3), 459471(3)
       2) Textiles  30 credits
       choose 18 credits from the following courses :
         006341(3), 006342(3), 006343(3), 006347(3), 006441(3), 006443(3)
       and choose 9 credits from the following courses :
and choose 3 credits from the following courses:
- Family and Child Development
choose 18 credits from the following courses:
- Food and Nutrition
choose 19 credits from the following courses:
- BACHELOR OF SCIENCE
(Pest Management)
Minimum Requirements  139  Credits

GENERAL EDUCATION   31 Credits

1. Science and Mathematics   7 Credits
   420119(4)
and choose 3 credits from interdisciplinary course for general education in Science and Mathematics

2. Language   12 Credits
   355xxx(9), 999021(3)

3. Social Sciences   7 Credits
   102181(3), 371111(1)
and choose 3 credits from interdisciplinary course for general education in Social Sciences

4. Humanities   3 Credits
choose 3 credits from interdisciplinary course for general education in Humanities

5. Physical Education Activities   2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS   102 Credits

1. Core Course   56 Credits
   - Sciences 31 Credits
     401114(3), 403111(4), 403112(1), 403221(4), 403222(1), 416311(3), 417116(4), 419211(3), 419214(1), 422111(3), 424111(3), 424112(1),
   - Agriculture 25 Credits
     005201(3) or 015251(3), 015111(1), 015151(2), 015211(3), 015221(3), 015231(2), 015241(3), 015261(3), 015271(2), 015281(3)

2. Major Requirements   37 Credits
   003419(2), 004312(3), 008481(3), 011399(2), 011411(3), 011451(3), 011471(4),
   011497(1), 011498(2), 011499(2), 119111(3)
and choose 9 credits from the following course:
   011431(3), 011432(3), 011433(2),
   011441(4), 011443(3), 011452(3), 011472(3), 011491(3), 011496(1-3)

3. Major Electives
and choose 9 credits from one program below:
   1) Agri-Business   9 credits
      119221(3), 119331(3), 119371(3), 119372(3), 131211(3), 132111(3), 132141(3),
      134111(3), 355233(3)
   2) Research in Pest Management   9 credits
      011491(3), 355224(3), 401351(3), 402311(2), 402312(1), 402313(3), 402314(1),
      422413(3), 422427(3)
   3) Agricultural Environment   9 credits
      003421(3), 004461(3), 009422(3), 009472(3), 009481(3), 119405(3), 301201(3).
4) Individual 9 credits
choose 9 credits from courses in the university that have been approved by the adviser
and head of department.
Remarks: courses cannot be duplicated with that in core course and major
requirements.

FREE ELECTIVES 6 Credits

BACHELOR OF SCIENCE
(Tropical Agriculture)

Total Minimum Requirements 125 Credits

GENERAL EDUCATION 3 Credits

1. Science and Mathematics 8 Credits
   417116(4), 420115(1), 420119(3)

2. Language 12 Credits
   355xxx(9), 999021(3)

3. Social Sciences 7 Credits
   102181(3), 371111(1), 999141(3)

4. Humanities 3 Credits
   999033(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 100 Credits

1. Core Courses 37 Credits
   005201(3), 015211(3), 015221(3), 015231(2), 015241(3), 015261(3), 015271(2),
   015281(3), 401114(3), 401351(3), 403111(4), 403112(1), 424111(3), 424112(1)

2. Major Requirements 33 Credits
   001466(3), 002302(3), 003211(2), 003212(1), 003417(3), 004372(3), 005474(3),
   006151(3), 007311(3), 007371(3), 008469(3), 009421(3)

3. Major Electives 17 Credits
   choose one program from two programs below

   1. Practicum
015299(2), 015399(3)

2. Co-operative Education
   015390(1), 015490(6)

and choose 12 credits from the others courses or from the following courses:
   119221(3), 119331(3), 119371(3), 132111(3)

**FREE ELECTIVES 6 Credits**
GENERAL INFORMATION

Although the university is still highly recognized for agricultural science, its business education has gained more and more reputation. During the recent years, the faculty of Business Administration has developed well-known academic programs. The school’s modern history has begun in December 1992 when the Faculty of Economics and Business Administration was divided into two independent schools. That allows the faculty to focus its resources to strengthen instruction and research activities in business disciplines. The faculty offers five undergraduate programs and seven graduate programs. Besides, various short training programs including the acclaimed Kaset Mini MBA Program are offered here.

DEGREES OFFERED

UNDERGRADUATE DEGREES

1. BACHELOR OF ACCOUNTANCY
2. BACHELOR OF BUSINESS ADMINISTRATION (Finance)
3. BACHELOR OF BUSINESS ADMINISTRATION (Management)
4. BACHELOR OF BUSINESS ADMINISTRATION (Operation Management)
5. BACHELOR OF BUSINESS ADMINISTRATION (Marketing)

STRUCTURE OF THE CURRICULA

BACHELOR OF ACCOUNTANCY

Total Minimum Requirements 135 Credits

GENERAL EDUCATION  32  Credits
1. Science and Mathematics  6 Credits
   418112(3) or 418113(3)
   and choose 3 credits from interdisciplinary course for general education in Science and Mathematics
   999011(3), 999012(3), 999213(3)

2. Social Sciences  6 Credits
   999141(3)
   and choose 3 credits from the following courses:
   452111(3), 452112(3), 453111(3), 453112(3), 459111(3)

3. Humanities  3 Credits
   choose 3 credits from interdisciplinary courses for general education in Humanities
   999031(3), 999032(3), 999033(3)

4. Language  15 Credits
   355xxx(9), 999021(3), xxxxxx(3)

5. Physical Education Activities  2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS  97 Credits

1. Core Course  42 Credits
   108111(3), 108112(3), 130111(3), 131211(3), 132111(3), 132142(3),
   132242(3), 132338(3), 132413(3), 133211(3), 133242(3), 134111(3),
   417111(3), 422111(3)

2. Major Requirement  40 Credits
   130121(3), 130211(3), 130221(3), 130311(3), 130312(3), 130321(3),
   130331(3), 133341(3), 130351(3), 130352(3), 130361(3), 130413(3),
   130441(3), 130497(1)

3. Major Electives  15 Credits
   choose in Accounting at least 9 Credits and other 6 credits from the following courses :
   130251(3), 130353(3), 130421(3), 130431(3), 130432(3), 130433(3),
   130442(3), 130451(3), 130452(3), 130453(3), 130461(3), 130462(3),
   130463(3), 130464(3), 130498(3), 131311(3), 131317(3), 131321(3),
   132221(3), 132451(3), 132491(3), 133315(3), 134311(3), 134421(3),
   418211(3), 418321(3), 418322(3), 418443(3), 422427(3), 422454(3)

FREE ELECTIVES  6 Credits
BACHELOR OF BUSINESS ADMINISTRATION
(Finance)

Total Minimum Requirements 132 Credits

GENERAL EDUCATION 32 Credits

1. Science and Mathematics 6 Credits
   418112(3) or 418113(3)
   and choose 3 credits from interdisciplinary courses for general education in
   Science and Mathematics
   999012(3), 999211(3), 999213(3)

2. Social Sciences 6 Credits
   459111(3), 999141(3)

3. Humanities 3 Credits
   choose 3 credits from interdisciplinary courses for general education in
   Humanities
   999031(3), 999032(3), 999033(3)

4. Language 15 Credits
   355xxx(9), 999021(3), xxxxxx(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 94 Credits

1. Core Courses 45 Credits
   108111(3), 108112(3), 130171(3), 130172(3), 131211(3), 132111(3),
   132142(3), 132242(3), 132338(3), 132413(3), 133211(3), 133242(3),
   134111(3), 417111(3), 422111(3)

2. Major Requirements 31 Credits
   131311(3), 131312(3), 131317(3), 131321(3), 131331(3), 131332(3),
   131335(3), 131413(3), 131491(3), 131497(1), 131498(3)

3. Major Electives 18 Credits
   131313(3), 131314(3), 131315(3), 131316(3), 131322(3), 131333(3),
   131334(3), 131411(3), 131412(3), 131431(3), 131432(3), 132333(3)

FREE ELECTIVES 6 Credits
BACHELOR OF BUSINESS ADMINISTRATION
(Management)

Total Minimum Requirements  132  Credits

GENERAL EDUCATION  32  Credits

1. Science and Mathematics  6  Credits  
   418112(3) or 418113(3)  
   and choose  3  credits from Interdisciplinary courses for general education in  
   Science and Mathematics  
   999012(3), 999211(3), 999213(3)

2. Social Sciences  6  Credits  
   459111(3), 999141(3)

3. Humanities  3  Credits  
   choose  3  credits from Interdisciplinary courses for general education in  
   Humanities  
   999031(3), 999032(3), 999033(3)

4. Language  15  Credits  
   355xxx(9), 999021(3), xxxxxx(3)

5. Physical Education  2  Credits  
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS  94  Credits

1. Core Courses  45  Credits  
   134111(3), 417111(3), 422111(3)

2. Major Requirements  34  Credits  
   132211(3), 132221(3), 132311(3), 132314(3), 132323(3), 132333(3), 132336(3), 132412(3), 132451(3), 132491(3), 132497(1), 132498(3)

3. Major Electives  15  Credits  
   choose from the following courses :  

**FREE ELECTIVES  6  Credits**

**BACHELOR OF BUSINESS ADMINISTRATION**
*(Operations Management)*

Total Minimum Requirements  132  Credits

**GENERAL EDUCATION  32  Credits**

1. Science and Mathematics  6  Credits
   418112(3)
   and choose  3  credits from interdisciplinary courses for general education in Science and Mathematics
   999012(3), 999211(3), 999213(3)

2. Social Sciences  6  Credits
   459111(3), 999141(3)

3. Humanities  3  Credits
   choose  3  credits from interdisciplinary courses for general education in Humanities
   999031(3), 999032(3), 999033(3)

4. Language  15  Credits
   355xxx(9), 999021(3), xxxxxx(3)

5. Physical Education  2  Credits
   175xxx(1), 175xxx(1)

**SPECIFIC REQUIREMENTS  94  Credits**

1. Core Courses  45  Credits

2. Major Requirements  31  Credits
   132491(3), 133312(3), 133313(3), 133314(3), 133315(3), 133317(3), 133415(3), 133418(3), 133419(3), 133497(1), 133498(1-3)

3. Major Electives  18  Credits
choose from the following courses:

FREE ELECTIVES  6  Credits

BACHELOR OF BUSINESS ADMINISTRATION  
(Marketing)

Total Minimum Requirements  132  Credits

GENERAL EDUCATION  32  Credits

1. Science and Mathematics  6  Credits
418112(3)  or 418113(3)
and choose  3  credits from interdisciplinary courses for general education in Science and Mathematics
999012(3), 999211(3), 999213(3)

2. Social Sciences  6  Credits
459111(3), 999141(3)

3. Humanities  3  Credits
choose  3  credits from interdisciplinary courses for general education in Humanities
999031(3), 999032(3), 999033(3)

4. Language  15  Credits
355xxx(9), 999021(3), xxxxxx(3)

5. Physical Education Activities  2  Credits
175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS  94  Credits

1. Core Courses  45  Credits
108111(3), 108112(3), 130171(3), 130172(3), 131211(3), 132111(3),
132142(3), 132242(3), 132338(3), 132413(3), 133211(3), 133242(3),
134111(3), 417111(3), 422111(3)

2. Major Requirements   34 Credits
134211(3), 134311(3), 134312(3), 134313(3), 134321(3), 134331(3),
134411(3), 134421(3), 134491(3), 134492(3), 134497(1), 134498(1-3)

3. Major Electives   15 Credits
choose in Marketing at least 9 Credits from the following courses :
131317(3), 131335(3), 132211(3), 132221(3), 132311(3), 132321(3),
132333(3), 132335(3), 132337(3), 132344(3), 132412(3), 133321(3),
133322(3), 133323(3), 133324(3), 133418(3), 133425(3), 134314(3),
134315(3), 134322(3), 134332(3), 134333(3), 134412(3), 134413(3),
134414(3), 134415(3), 134422(3), 134423(3), 134431(3), 134432(3)

FREE ELECTIVES   6 Credits
FACULTY OF FISHERIES

Faculty of Fisheries was established as one of the first four faculties of Kasetsart University in February 1943. The first faculty’s office was in the first floor of the building south to the Faculty of Forestry building which is the Field Crop Research Institute at present. In 1959, Faculty of Fisheries moved into its own faculty’s building on Paholyothin Road. This building was named "Pholathep" after Phraya Pholathep, Secretary of the Ministry of Agriculture in the government of King Rama VI. In 1979, Faculty of Fisheries moved to new building on Xujati Kambhu Road. Other buildings for the Department of Aquaculture, the Department of Fishery Management, and the Department of Marine Science, were built in 1990, on Inkaasuwon Road. Faculty of Fisheries consists of 5 departments, one research center, library, museum, computer center, and the office of secretariat, namely:

- Department of Fishery Management
- Department of Fishery Biology
- Department of Fishery Products
- Department of Aquaculture
- Department of Marine Science
- Office of Secretariat
- Fish Feed Technology Development Center
- Faculty’s Library
- Kasetsart University Museum of Fisheries (Natural History)
DEGREE OFFERED
UNDERGRADUATE DEGREES
BACHELOR OF SCIENCE (FISHERIES)
- Aquaculture
- Fishery Biology
- Fishery Management
- Fishery Products
- Marine Sciences

STRUCTURE OF THE CURRICULA

BACHELOR OF SCIENCE (FISHERIES)
Aquaculture

Total Minimum Requirements 139 Credits

GENERAL EDUCATION  30 Credits

1. Science and Mathematics 6 Credits
   999012(3), 999211(3)

2. Language 12 Credits
   355xxx(9), 999021(3)

3. Social Sciences 7 Credits
   371111(1), 999141(3)
   and choose 3 credits from the following courses:
   102181(3), 999041(3)

4. Humanities 3 Credits
   999033(3)

5. Physical Education Activities 2 Credits
   175131(1), 175xxx(1)

SPECIFIC REQUIREMENTS  103 Credits

1. Core Course 16 Credits
   299111(3), 299112(3), 299211(2), 299212(1), 299213(2), 299214(1), 299215(3),
   299216(1)

2. Major Requirements 75 Credits
   - Professional Basic Courses 36 Credits
     403111(4), 403112(1), 403221(4), 403222(1), 416311(3), 416312(1), 417116(4),
I-35

- Major Courses 39 Credits
  251211(3), 251321(3), 251322(3), 251323(3), 251324(3), 251351(3), 251371(2), 251372(1), 251441(2), 251442(1), 251462(3), 251491(3), 251497(1), 251499(2), 252371(3), 252431(3)

3. Major Electives 12 Credits
   choose from the following courses:

FREE ELECTIVES 6 Credits

BACHELOR OF SCIENCE (FISHERIES)
Fishery Biology

Total Minimum Requirements 137 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 6 Credits
   999012(3), 999211(3)

2. Language 12 Credits
   355xxx(9), 999021(3)

3. Social Sciences 7 Credits
   371111(1), 999141(3)
   and choose 3 credits from the following courses:
   102181(3), 999041(3)

4. Humanities 3 Credits
   999033(3)

5. Physical Education Activities 2 Credits
   175131(1), 175xxx(1)

SPECIFIC REQUIREMENTS 101 Credits

1. Core Course 16 Credits
   299111(3), 299112(3), 299211(2), 299212(1), 299213(2), 299214(1), 299215(3), 299216(1)
2. Major Requirements 79 Credits
   - Science and Mathematics 36 Credits
     403111(4), 403112(1), 403221(4), 403222(1), 416311(3), 416312(1), 417116(4),
     419211(3), 419214(1), 420115(1), 420119(3), 422111(3), 424111(3), 424112(1)
   - Fishery Biology
     252331(4), 252351(3), 252352(3), 252371(3), 252421(3), 252431(3), 252441(3),
     252442(3), 252451(3), 252452(3), 252491(3), 252497(1), 252498(3), 252499(1,1),
     255352(3)

3. Major Electives 6 Credits
   251211(3), 251321(3), 251322(3), 251323(3), 251324(3), 251371(2), 251372(1),
   251441(2), 251442(1), 252496(1-3), 253211(3), 253381(3), 253383(3), 253411(3),
   253412(3), 253482(3), 254211(3), 254311(3), 254371(2), 254471(3), 255341(3),
   255361(3), 255431(3), 255432(3), 255433(3), 255434(3), 255447(3), 255451(3),
   255452(3), 255453(3), 299390(1), 299490(6), 402311(2), 402312(1), 402313(3),
   403456(3), 416422(3), 416441(3), 416453(3), 416456(3), 416471(3), 422427(3),
   422432(3), 422451(3), 422453(3), 422462(3), 422465(3), 424351(3), 424473(3),
   424482(3), 424483(3), 424484(3), 425423(3)

FREE ELECTIVES 6 Credits

BACHELOR OF SCIENCE (FISHERIES)
Fishery Management

Total Minimum Requirements 140 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 6 Credits
   999012(3), 999211(3)

2. Language 12 Credits
   355xxx(9), 999021(3)

3. Social Sciences 7 Credits
   371111(1), 999141(3)
   and choose 3 credits from the following courses:
   102181(3), 999041(3)

4. Humanities 3 Credits
   999033(3)

5. Physical Education Activities 2 Credits
   175131(1), 175xxx(1)
SPECIFIC REQUIREMENTS 104 Credits

1. Core Course 16 Credits
   299111(3), 299112(3), 299211(2), 299212(1), 299213(2), 299214(1), 299215(3), 299216(1)

2. Major Requirements 79 Credits
   - Professional Basic Courses 34 Credits
     403111(4), 403112(1), 403221(4), 403222(1), 416311(3), 416312(1), 417116(4), 419211(3), 419214(1), 420115(1), 420119(3), 422111(3), 422311(3), 424111(3), 424112(1)
   - Major Courses 45 Credits

3. Major Electives 9 Credits

FREE ELECTIVES 6 Credits

BACHELOR OF SCIENCE (FISHERIES)  
Fishery Products

Total Minimum Requirements 138 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 6 Credits
   999012(3), 999211(3)

2. Language 12 Credits
   355xxx(9), 999021(3)

3. Social Sciences 7 Credits
   371111(1), 999141(3)
   and choose 3 credits from the following courses:
   102181(3), 999041(3)
4. Humanities 3 Credits  
   999033(3)

5. Physical Education Activities 2 Credits  
   175131(1), 175xxx(1)

SPECIFIC REQUIREMENTS 102 Credits

1. Core Course 16 Credits  
   299111(3), 299112(3), 299211(2), 299212(1), 299213(2), 299214(1), 299215(3), 299216(1)

2. Major Requirements 77 Credits  
   - Professional Basic Courses 42 Credits  
   - Major Courses 35 Credits  
     254211(3), 254311(3), 254371(2), 254411(3), 254421(3), 254422(3), 254423(3), 254461(3), 254471(3), 254472(3), 254473(3), 254497(1), 254499(1,1)

3. Major Electives 9 Credits  
   choose the following courses:  

FREE ELECTIVES 6 Credits

BACHELOR OF SCIENCE (FISHERIES)  
Marine Sciences

Total Minimum Requirements 138 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 6 Credits  
   999012(3), 999211(3)

2. Language 12 Credits  
   355xxx(9), 999021(3)
3. Social Sciences 7 Credits
371111(1), 999141(3)
and choose 3 credits from the following courses:
102181(3), 999041(3)

4. Humanities 3 Credits
999033(3)

5. Physical Education Activities 2 Credits
175131(1), 175xxx(1)

**SPECIFIC REQUIREMENTS 102 Credits**

1. Core Course 16 Credits
299111(3), 299112(3), 299211(2), 299212(1), 299213(2), 299214(1), 299215(3),
299216(1)

2. Major Requirements 74 Credits
- Professional Basic Courses 38 Credits
401114(3), 403111(4), 403112(1), 403221(4), 403222(1), 417116(4), 419211(3),
419214(1), 420115(1), 420119(3), 422111(3), 423113(3), 424111(3),
424112(1)
- Marine Sciences 36 Credits
251211(3), 251322(3), 252331(4), 255341(3), 255351(2), 255352(3), 255361(3),
255447(3), 255451(3), 255453(3), 255462(3), 255497(1), 255499(1,1)

3. Major Electives 12 Credits
204111(3), 209331(3), 210424(3), 251324(3), 251351(3), 251371(2), 251372(1),
251441(2), 251442(1), 252371(3), 252421(3), 252431(3), 252441(3), 252442(3),
252451(3), 253211(3), 253381(3), 253412(3), 253481(3), 254211(3), 254471(3),
255353(2), 255411(3), 255421(3)255431(3), 255432(3), 255433(3), 255434(3),
255441(3), 255442(3), 255443(3), 255445(3), 255446(3), 255448(3), 255452(3),
255461(3), 255491(3), 255496(1-3), 255498(1-3), 299390(1), 299490(6), 402311(2),
402312(1), 403455(3), 403456(3), 404483(3), 411241(3), 416311(3), 416312(1),
416453(3), 416481(3), 419482(3), 419484(3), 421431(3), 422427(3), 422432(3),
422451(3), 422453(3), 422462(3), 422465(3), 423413(3), 423414(4), 424483(3)

**FREE ELECTIVES 6 Credits**
FACULTY OF HUMANITIES

GENERAL INFORMATION

The Faculty of Humanities endeavors to produce graduates of high quality who possess up-to-date knowledge and career skills, who are thoroughly grounded in their field, and have the ability and desire to apply and expand their knowledge, who are creative and critical thinkers, who are of high moral character, and who will serve and models and live happily in society.

The Faculty of Humanities was established as the eleventh faculty of Kasetsart University on 17 June 1981. It currently consists of eight departments, namely;
1. Department of Career Sciences
2. Department of Communication Arts
3. Department of Foreign Languages
4. Department of Library Science
5. Department of Linguistics
6. Department of Literature
7. Department of Philosophy and Religion
8. Department of the Thai Language

DEGREE OFFERED

UNDERGRADUATE DEGREES

1. BACHELOR OF ARTS (Philosophy and Religion)
2. BACHELOR OF ARTS (Thai)
3. BACHELOR OF ARTS (English)
4. BACHELOR OF ARTS (French)
5. BACHELOR OF ARTS (German)
6. BACHELOR OF ARTS (Japanese)
7. BACHELOR OF ARTS (Translation)
8. BACHELOR OF ARTS (Thai Literature)
9. BACHELOR OF ARTS (English Literature)
10. BACHELOR OF ARTS (Tourism)
11. BACHELOR OF ARTS (Hotel Studies)
12. BACHELOR OF ARTS  (Secretarial Science)
13. BACHELOR OF ARTS  (Thai Music)
14. BACHELOR OF ARTS  (Western Music)
15. BACHELOR OF ARTS  (Mass Communication)
16. BACHELOR OF ARTS  (Chinese)

STRUCTURE OF THE CURRICULA

BACHELOR OF ARTS  
(Philosophy and Religion)

Total Minimum Requirements  136  Credits

GENERAL EDUCATION   30  Credits

1. Science and Mathematics   6  Credits
choose 3 credits from the following courses:
999012(3), 999211(3), 999213(3)
and choose 3 credits from the following courses:
404101(3), 420102(3), 417102(3), 418112(3), 422101(3), 424101(3), 424201(3),
999012(3), 999213(3)

2. Language  15  Credits
361131(3), 999021(3)
and choose a foreign language  9  credits
xxxxxx(9)

3. Social Sciences   4  Credits
371111(1), 999141(3)

4. Humanities   3  Credits
999032(3)

5. Physical Education Activities   2  Credits
175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS  100  Credits

1. Major Requirements   73  Credits
355221(3), 355231(3), 387111(3), 387121(3), 387211(3), 387212(3), 387221(3),
387222(3), 387321(3), 387322(3), 387323(3), 387331(3), 387442(3),
388111(3), 388221(3), 388222(3), 388231(3), 388241(3), 388251(3), 388321(3),
388322(3), 388323(3), 388411(3), 387497(1) or 388497(1)

2. Major Electives  27  Credits
choose 6 credits in Philosophy from the following courses
387223(3), 387332(3), 387333(3), 387341(3), 387432(3), 387441(3)
choose 6 credits in Religion from the following courses
388211(3), 388311(3), 388331(3), 388441(3)
choose 15 credits in Humanities or others that approved by the department

FREE ELECTIVES  6  Credits

BACHELOR OF ARTS  
(Thai)

Total Minimum Requirements  129  Credits

GENERAL EDUCATION  30  Credits

1. Science and Mathematics  3  Credits
   choose  3  credits from the following courses :
   404101(3), 420102(3), 999012(3), 999211(3), 999213(3)

2. Social Sciences  7  Credits
   371111(1),
   and choose  6  credits from the following courses :
   453111(3), 459111(3), 460111(3), 461111(3), 999xxx(3)

3. Humanities  6  Credits
   choose  6  credits from the following courses :
   351111(3), 386121(3), 387102(3), 387121(3), 388111(3), 999031(3), 999032(3), 999033(3)

4. Language  12  Credits
   A foreign language  9  credits and other language  3  credits

5. Physical Education Activities  2  Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS  93  Credits

1. Core Course  48  Credits
   361111(3), 361131(3), 361211(3), 361212(3), 361213(3), 361221(3), 361222(3), 361231(3), 361412(3), 361415(3)

2. Major Requirements  9  Credits
   choose 1 major from the following courses:
   1. Thai Language for Linguistic
      361322(3), 361411(3), 361414(3), 361414(3)
   2. Thai Language for Career
      361232(3), 361315(3), 361434(3)

3. Major Electives  36  Credits
   1. Thai Language for Linguistic
      choose at least  21  credits from the following courses :
and choose 15 credits in Humanities or others that approved by the department

2. Thai Language for Career
   choose at least 21 credits from the following courses:

   and choose 15 credits in Humanities or others that approved by the department

FREE ELECTIVES  6 Credits

BACHELOR OF ARTS
(English)

Total Minimum Requirements 138 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 6 Credits
   choose 6 credits from Science and Mathematics courses

2. Language 15 Credits
   361111(3), 361131(3), 355112(3), 355113(3), 355xxx(3)

3. Social Sciences 4 Credits
   371111(1)
   and choose 3 credits from Social Sciences courses:

4. Humanities 3 Credits
   choose 3 credits from Humanities courses:

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 102 Credits

1. Major Requirements 66 Credits
   - Linguistics and Literature 18 credits
     372212(3), 372213(3), 372411(3), 373111(3), 373211(3), 389211(3)
   - Language 6 credits
     choose 6 credits in Language from the following courses:
     356xxx(6), 357xxx(6), 358xxx(6), 361xxx(6), 362xxx(6)
   - Language Skill 42 Credits

2. Major Electives 36 Credits
   choose 36 credits in Humanities or Social Sciences or others that approved by the department
   - Translation
     389311(3), 389312(3), 389333(3), 389343(3), 389353(3), 389363(3), 389373(3), 389412(3)
- English for Tourism
  355254(3), 355262(3), 355361(3), 355362(3), 355461(3), 355371(3), 355372(3), 355471(3)
- English for Business
  355251(3), 355253(3), 355351(3), 355381(3), 355382(3), 355451(3)
- English for Mass Communication
  355256(3), 355352(3), 355353(3), 355354(3), 355452(3)
- Literature
- Language
  372201(3), 372222(3), 372311(3), 372313(3), 372324(3)
- Language Skill
- Cooperative Education
  355390(1), 355490(6)

FREE ELECTIVES  6  Credits

BACHELOR OF ARTS
(French)

Total Minimum Requirements  142  Credits

GENERAL EDUCATION  30 Credits

1. Science and Mathematics  6 Credits
   choose  6  credits from the following courses :
   999012(3), 999211(3), 999213(3)

2. Language  15 Credits
   361131(3), 999021(3), xxxxxx(9)

3. Social Sciences  4 Credits
   371111(1)
   and choose  3  credits from the following courses :
   999041(3), 999141(3)

4. Humanities  3 Credits
   choose  3  credits from the following courses :
   999031(3), 999032(3), 999033(3)

5. Physical Education Activities  2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS  106 Credits

1. Major Requirements  91 Credits
   - Linguistics, Literature and Culture 24 credits
     356231(3), 372212(3), 372441(3), 374211(3), 374311(3), 374321(3), 374422(3), 374423(3)
   - Thai Language  6 credits
General Education 30 Credits

1. Science and Mathematics 6 Credits
   choose 6 credits from Science and Mathematics

2. Language 15 Credits
   361131(3), 361xxx(3), 355xxx(9)

3. Social Sciences 4 Credits
   371111(1)
   and choose 3 credits from Social Sciences

4. Humanities 3 Credits
   choose 3 credits from the Humanities

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

Specific Requirements 104 Credits

1. Major Requirements 77 Credits
   - Linguistics and Literature 15 credits
     372213(3), 377211(3), 377311(3), 377312(3), 377413(3)
   - Language 6 credits
     choose from the following courses:
     355xxx(6), 356xxx(6), 358xxx(6), 361xxx(6), 362xxx(6)
   - German Language Skill 56 credits
     357115(3), 357116(3), 357211(3), 357212(3), 357217(3), 357221(3), 357222(3),
     357241(3), 357242(3), 357322(3), 357331(3), 357332(3), 357341(3), 357342(3),
     357351(3), 357352(3), 357432(3), 357441(3), 357498(2)

2. Major Electives 27 Credits
   choose 12 credits from the following courses

Free Electives 6 Credits
- Without cooperative: choose 12 credits from
  357231(3), 357232(3), 357251(3), 357362(3), 357461(3), 357471(3), 357481(3)
- With cooperative: 357490(6) and choose 6 credits from
  357231(3), 357232(3), 357251(3), 357362(3), 357490(6)
and choose 15 credits from others

FREE ELECTIVES  6 Credits

BACHELOR OF ARTS
(Japanese)

Total Minimum Requirements  138 Credits

GENERAL EDUCATION  30 Credits

1. Science and Mathematics  6 Credits
   choose 6 credits from the following courses:
   999012(3), 999211(3), 999213(3)

2. Language  15 Credits
   361131(3), 999021(3), 355xxx(9)

3. Social Sciences  4 Credits
   371111(1), 999141(3)

4. Humanities  3 Credits
   choose from the following courses:
   999031(3), 999032(3), 999033(3)

5. Physical Education Activities  2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS  105 Credits

1. Major Requirements  75 Credits
   - Linguistics and Literature  15 credits
     372212(3), 375411(3), 375412(3)
     choose 6 credits from the following courses:
     358423(3), 358424(3), 375413(3), 375414(3)
   - Language Skill  54 credits
     358111(3), 358112(3), 358113(3), 358211(3), 358212(3), 358221(3), 358222(3),
     358231(3), 358232(3), 358241(2), 358242(2), 358311(3), 358312(3), 358321(3),
     358322(3), 358331(3), 358332(3), 358341(2), 358342(3)
   - Thai Language  6 credits

2. Major Electives  30 Credits
   choose 15 credits from the following courses:
   358313(3), 358323(3), 358421(3), 358422(3), 358431(3), 358432(3), 358433(3),
   358434(3), 358441(3), 358442(3), 358443(3), 358444(3), 358451(3), 358452(3),
   358461(3), 358471(3), 358481(3)
   choose 15 credits in Humanities or Social Sciences or others that approved by the
department

FREE ELECTIVES  3 Credits
# BACHELOR OF ARTS
* (Translation)

Total Minimum Requirements 138 Credits

## GENERAL EDUCATION 30 Credits

1. Science and Mathematics 6 Credits
   choose 6 credits from the following courses:
   - 999012(3), 999211(3), 999213(3)

2. Language 15 Credits
   - 361131(3), 999021(3), 355xxx(9)

3. Social Sciences 4 Credits
   - 371111(1), 999xxx(3)

4. Humanities 3 Credits
   choose 3 credits from the following courses:
   - 999031(3), 999032(3), 999033(3)

5. Physical Education Activities 2 Credits
   - 175xxx(1), 175xxx(1)

## SPECIFIC REQUIREMENTS 102 Credits

1. Major Requirements 72 Credits
   - English 33 credits
     - 355211(3), 355212(3), 355231(3), 355232(3), 355241(3), 355242(3), 355311(3),
       355331(3), 355332(3), 355431(3), 355432(3)
   - Thai and Linguistics 12 credits
     - 361231(3), 361232(3), 372221(3), 372321(3)
   - Translation 27 credits
     - 389211(3), 389311(3), 389321(3), 389331(3), 389341(3), 389351(3), 389361(3),
       389412(3), 389491(3)

2. Major Electives 30 Credits
   choose 30 credits from the following courses:
   - 355224(3), 355234(3), 355251(3), 355261(3), 355351(3), 361241(3), 361411(3),
     372222(3), 372324(3), 372423(3), 373211(3), 389312(3), 389431(3), 389441(3),
     389451(3), 389461(3), 389422(3)

## FREE ELECTIVES 6 Credits
BACHELOR OF ARTS  
(English Literature) 

Total Minimum Requirements  135  Credits

GENERAL EDUCATION  30  Credits

1. Science and Mathematics 6 Credits
   choose 6 credits from the following courses:
   999011(3), 999012(3), 999211(3), 999213(3)

2. Language  15  Credits
   361131(3), 999021(3)
   and choose a foreign language  9  credits

3. Social Science   4   Credits
   choose 4 credits from the following courses:
   371111(1), 999041(3), 999141(3)

4. Humanities    3     Credits
   choose 3 credits from the following courses:
   999031(3), 999032(3), 999033(3)

5. Physical Education Activities    2    Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS  99  Credits

1. Core Course  33  Credits
   - Language Skill  30 credits
     355211(3), 355212(3), 355221(3), 355222(3), 355231(3), 355232(3), 355241(3),
     355242(3), 355331(3), 355332(3)
   - Linguistics  3  credits
     372212(3)

2. Major Requirements 39  Credits
   373111(3), 373211(3), 373221(3), 373311(3), 373312(3), 373313(3), 373326(3),
   373331(3), 373342(3), 373422(3), 373424(3), 373425(3), 373445(3)

3. Major Electives 27 Credits
   choose 3 credits from the following courses
   373314(3), 373321(3), 373322(3), 373323(3), 373324(3), 373325(3), 373332(3),
   373333(3), 373341(3)
   and choose 9 credits from the following courses
   373421(3), 373431(3), 373432(3), 373433(3), 373441(3), 373442(3), 373443(3),
   373444(3), 373446(3), 373447(3), 373448(3), 373497(1), 373498(1-2)
   choose  15  credits from Humanities, Education, Social Sciences, Economics and
   Business Administration or other groups by department approving.

FREE ELECTIVES    6    Credits
BACHELOR OF ARTS
(Thai Literature)

Total Minimum Requirements 135 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 6 Credits
   choose 6 credits from the following courses:
   999011(3), 999012(3), 999211(3), 999213(3)

2. Language 15 Credits
   361131(3), 999021(3)
   and choose a foreign language 9 credits

3. Social Science 4 Credits
   choose 4 credits from the following courses:
   371111(1), 999041(3), 999141(3)

4. Humanities 3 Credits
   choose 3 credits from the following courses:
   999031(3), 999032(3), 999033(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 99 Credits

1. Core course 30 Credits
   - Language skill 24 credits
     361221(3), 361231(3), 361232(3), 361241(3), 361311(3), 361312(3), 361313(3),
     361451(3)
   - Linguistics 6 credits
     372212(3), 372411(3)

2. Major Requirements 33 Credits
   376211(3), 376212(3), 376221(3), 376222(3), 376223(3), 376311(3), 376321(3),
   376347(3), 376411(3), 376412(3), 376442(3)

3. Major Electives 36 Credits
   choose 9 credits from the following courses
   376312(3), 376313(3), 376331(3), 376341(3), 376342(3), 376343(3), 376344(3),
   376345(3), 376346(3)
   and choose 12 credits from the following courses
   376413(3), 376414(3), 376415(3), 376431(3), 376432(3), 373433(3), 376434(3),
   376435(3), 376436(3), 376441(3), 376443(3), 376444(3), 376449(1), 376497(1-2)
   choose 15 credits from Humanities, Education, Social Science, Economics and
   Business Administration or other groups by department approving.

FREE ELECTIVES 6 Credits
BACHELOR OF ARTS
(Tourism)

Total Minimum Requirements 138 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 6 Credits
   422101(3)
   and choose 3 credits from the following courses:
   999012(3), 999211(3), 999213(3)

2. Language 15 Credits
   999021(3), 361131(3)
   and choose a foreign language 9 credits

3. Social Sciences 4 Credits
   371111(1)
   and choose 3 credits from the following courses:
   999041(3), 999141(3)

4. Humanities 3 Credits
   choose 3 credits from the following courses:
   999031(3), 999033(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 102 Credits

1. Core Courses 24 Credits
   130101(3), 132111(3), 134111(3), 390111(3), 390311(3), 391111(3), 391211(3),
   418113(3)

2. Major Requirements 24 Credits
   390221(3), 390261(3), 390321(3), 390331(3), 390341(3), 390342(3), 390451(3),
   390491(3)

3. Major Electives 54 Credits
   choose 12 Credits according to major requirement
   301201(3), 301341(2), 301441(1), 301444(3), 390231(3), 390232(3), 390233(3),
   390343(3), 390351(3), 390352(3), 390452(3), 390453(3), 390497(1), 390498(1-3),
   391221(3), 391222(3), 391331(3), 391351(3), 425211(3), 452221(3), 453445(3)
   choose 42 Credits in language
   Study one language for 42 credits or study the two foreign languages by studying the
   first foreign language for 27 credits and the second foreign language 15 credits
   which 9 credits must be the same language as chosen in the general education.

FREE ELECTIVES 6 Credits

TRAINING not less than 400 Hrs.
BACHELOR OF ARTS
(Hotel studies)

Total Minimum Requirements 138 Credits

GENERAL EDUCATION  30 Credits

1. Science and Mathematics  6 credits
   422101(3)
   and choose 3 credits from the following courses:
   999011(3), 999012(3), 999211(3), 999213(3)

2. Language  15 Credits
   999021(3), 361131(3)
   and choose a foreign language 9 credits

3. Social Science  4 Credits
   371111(1)
   and choose 3 credits from the following courses:
   999041(3), 999141(3)

4. Humanities  3 Credits
   choose 3 credits from the following courses:
   999031(3), 999033(3)

5. Physical Education Activities  2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS  102 Credits

1. Core Course  24 Credits
   130101(3), 132111(3), 134111(3), 390111(3), 390311(3), 391111(3), 391211(3),
   418113(3)

2. Major Requirements  21 Credits
   390451(3), 391221(3), 391222(3), 391331(3), 391341(3), 391342(3), 391491(3)

3. Major electives 57 Credits
   choose 15 Credits according to major requirement
   006151(3), 006454(3), 132412(3), 133324(3), 133428(3), 390221(3), 390231(3),
   390232(3), 390233(3), 390261(3), 390321(3), 390331(3), 390341(3), 390342(3),
   390343(3), 390351(3), 390352(3), 390452(3), 390453(3), 391351(3), 391497(1),
   391498(1-3), 452221(3)
   choose 42 Credits in language
   Study one language for 42 credits or study the two foreign languages by studying the
   first foreign language for 27 credits and the second foreign 15 credits which 9 credits
   must be the same language as chosen in the general education.

FREE ELECTIVES  6 Credits

TRAINING  not less than 400 Hrs.
BACHELOR OF ARTS  
(Secretarial Science)

Total minimum Requirements  138  Credits

GENERAL EDUCATION  30  Credits

1. Science and Mathematics  6  Credits
   422101(3)
   and choose 3 credits from the following courses:
   999011(3), 999012(3), 999211(3), 999213(3)

2. Language  15  Credits
   999021(3), 361131(3)
   and choose a foreign language  9 credits

3. Social Science    4  Credits
   371111(1)
   and choose 3 credits from the following courses:
   999041(3), 999141(3)

4. Humanities    3  Credits
   choose 3 credits from the following courses:
   999031(3), 999033(3)

5. Physical Education Activities   2  Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS  102  Credits

1. Major Requirements  45  Credits
   130101(3), 132111(3), 134111(3), 132141(3), 355481(3), 355482(3), 392223(3),
   392241(3), 392242(3), 392321(3), 392332(3), 392431(3), 392491(3),
   418113(3)

2. Major Requirement  57  Credits
   choose 15 Credits according to major requirement
   132311(3), 132333(3), 132337(3), 132412(3), 389211(3), 389411(3), 390261(3),
   391111(3), 391222(3), 391331(3), 392221(3), 392222(3), 392224(3), 392341(3),
   392421(3), 459272(3), 459454(3)
   choose 42 Credits in language
   Study one language for 42 credits or study the two foreign languages by studying the
   first foreign language for 27 credits and the second foreign language 15 credits which 9
   credits must be the same language as chosen in the general education.

FREE ELECTIVES  6  Credits

TRAINING  not less than  400  Hrs.
BACHELOR OF ARTS
(Thai Music)

Total Minimum Requirements 135 Credits

GENERAL EDUCATION 33 Credits

1. Science and Mathematics 6 Credits
   and choose 3 credits from the following courses:
   999012(3), 999211(3), 999213(3)
   choose 3 credits from the following courses:
   420102(3), 424201(3), 418112(3), 422101(3)

2. Language 15 Credits
   999021(3), 361131(3)
   and choose a foreign language 9 credits

3. Social Sciences 7 Credits
   371111(1), 999141(3)
   and choose 3 credits from the following courses:
   102181(3), 351111(3), 451122(3), 453111(3), 453112(3), 454112(3), 459111(3),
   460111(3), 461111(3)

4. Humanities 3 Credits
   choose 3 credits from Interdisciplinary Courses for General Education in Humanities
   999031(3), 999032(3), 999033(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 96 Credits

1. Core Course 14 Credits
   353111(3), 361231(3), 386111(3), 386121(3), 386221(2)

2. Major Requirements 42 Credits
   385112(1), 385113(1), 385114(1), 385115(1), 385131(3), 385132(3), 385213(2),
   385223(2), 385231(3), 385232(3), 385331(3), 385332(3), 385431(3), 385433(3),
   385491(1), 385497(1), 385498(1), 386381(3), 386382(3)

3. Major Electives 40 Credits
   - choose 25 credits from the following courses:
     385116(1), 385117(1), 385121(3), 385212(3), 385214(3), 385224(3), 385225(3),
     385233(1), 385234(1), 385263(2), 385264(2), 385265(2), 385315(3), 385321(3),
     385322(3), 385323(3), 385333(1), 385334(1), 385381(2), 385382(3), 385383(2),
     385384(3), 385385(3), 385386(3), 385432(3), 385434(3), 385481(3), 385492(2),
     385494(3), 385495(3)
   - choose 15 credits in Humanities or others that approved by the department

FREE ELECTIVES 6 Credits

TRAINING 130 Hrs.
BACHELOR OF ARTS
(Western Music)

Total Minimum Requirements 135 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 6 Credits
   choose 6 credits from the following courses:
   999012(3), 999012(3), 999213(3)

2. Language 15 Credits
   355112(3), 355113(3), 355xxx(3), 999021(3), 361131(3)

3. Social Sciences 4 Credits
   371111(1), 999141(3)

4. Humanities 3 Credits
   choose 3 credits from the following courses:
   999031(3), 999032(3), 999033(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 99 Credits

1. Core Course 13 Credits
   353111(3), 361231(3), 385223(2), 386111(3), 386221(2)

2. Major Requirements 61 Credits
   386141(1), 386142(1), 386112(3), 386151(1), 386161(1), 386162(1), 386171(3),
   386172(3), 386211(3), 386212(3), 386222(2), 386271(3), 386272(3), 386281(1),
   386282(1), 386321(2), 386322(2), 386361(1), 386371(3), 386372(3), 386381(3),
   386382(3), 386461(2), 386471(3), 386484(2), 386485(2), 386486(2), 386487(2),
   386497(1), 386499(3)

3. Major Electives 25 Credits
   choose 10 credits in Western Music from the following courses:
   386152(1), 386181(1), 386182(1), 386183(1), 386184(1), 386241(1), 386242(1),
   386251(1), 386252(1), 386311(3), 386341(1), 386342(1), 386351(1), 386352(1),
   386362(1), 386363(1), 386364(1), 386365(2), 386366(2), 386383(3), 386384(1),
   386385(1), 386386(1), 386387(1), 386388(1), 386462(2), 386481(2), 386482(2),
   386483(2), 386488(2), 386491(3), 386498(2), 386489(2)
   choose 15 credits in Humanities or others that approved by the department

FREE ELECTIVES 6 Credits
GENERAL EDUCATION  33 Credits

1. Science and Mathematics    6 Credits
   999211(3), 999213(3)

2. Language    15 Credits
   361131(3), 999021(3)
   and choose a foreign language    9 credits

3. Social Sciences    4 Credits
   371111(1)
   and choose    3    credits from the following courses:
   999041(3), 999141(3)

4. Humanities    6 Credits
   999031(3)
   and choose    3    credits the following courses:
   376101(3), 376111(3), 386121(3), 387102(3), 387121(3), 388111(3), 452112(3),
   452211(3), 452221(3), 999032(3), 999033(3)

5. Physical Education Activities    2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS  96 Credits

1. Core Course    24 Credits
   352111(3), 352141(3), 352221(3), 352231(3), 352242(3), 352251(3),
   352261(3)

2. Major Requirements    33 Credits
   102181(3), 454111(3), 459111(3), 352241(3), 352243(3), 352311(3), 352351(3),
   352354(3), 352412(2), 352441(3), 352491(3), 352498(1) or 352499(1)

3. Major Electives    39 Credits
   - choose    24    credits from the following courses
   352213(3), 352214(3), 352312(3), 352313(3), 352314(3), 352315(2), 352316(3),
   352321(3), 352322(3), 352323(3), 352331(3), 352332(3), 352341(3), 352352(3),
   352353(3), 352411(3), 352413(3), 352421(3), 352431(3), 352434(3), 352442(3),
   352451(3), 352452(3), 352454(3), 352497(1), 353111(3), 353131(3), 353214(3),
   353231(3)
   - choose    15    credits in Humanities or others that approved by the department

FREE ELECTIVES    6 Credits
BACHELOR OF ARTS
(Chinese)

Total Minimum Requirements 141 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 6 Credits
   choose 6 credits from the following courses:
   999011(3), 999012(3), 999211(3), 999212(3), 999213(3)

2. Language 15 Credits
   361131(3), 999021(3), xxxxxx(9)

3. Social Sciences 4 Credits
   371111(1)
   and choose 3 credits from the following courses:
   999041(3), 999141(3)

4. Humanities 3 Credits
   choose 3 credits from the following courses:
   999031(3), 999032(3), 999033(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 105 Credits

1. Major Requirements 57 Credits
   - Linguistics and Literature 12 credits
     362281(3), 372212(3), 378311(3), 378312(3)
   - Thai Language 6 credits
     Thai Language 6 credits
   - Language Skill 39 Credits
     362114(3), 362115(3), 362116(3), 362221(3), 362222(3), 362231(3), 362232(3),
     362241(3), 362242(3), 362311(3), 362312(3), 362451(3), 362452(3)

2. Major Electives 48 Credits
   - choose 33 credits from the following courses:
     362213(3), 362233(3), 362313(3), 362321(3), 362322(3), 362323(3), 362324(3),
     362325(3), 362326(3), 362331(3), 362341(3), 362342(3), 362413(3), 362421(3),
     362461(3), 362462(3), 362463(3), 362464(3), 362471(3), 362472(3), 362481(3),
     362496(3), 362497(1), 362498(3)
   - choose 15 credits that approved by the department

FREE ELECTIVES 6 Credits
FACULTY OF FORESTRY

GENERAL INFORMATION

On May 1st, 1936 Faculty of Forestry emerged initially as Forestry School offering a 2-year curriculum under Royal Forestry Department, Ministry of Agriculture (now Ministry of Agriculture and Cooperatives). There were 25 forestry students at the beginning. The 2-year program was operated until 1939 when the Forestry School was transferred to Kasetsart College and extended the curriculum to be a 3 year program under the College of Forestry.

On February 2, 1943 the Kasetsart College was conferred as a university status through amalgamation of the College of Agriculture and College of Forestry with the two additional Faculties of Fisheries and Cooperative Sciences. The program for Bachelor degree in Forestry was then first offered under a 5-year curriculum.

In 1964 the program was changed to 4 years with 3 undergraduate study fields namely: General Forestry, Conservation, and Wood Technology. Since then the curriculum has been updated several times until recently in year 2000.

The first graduate program for Master of Science in Forestry was offered in 1967 and Doctorate degree in 1992. The Faculty of forestry contains an Administrative Service Unit, Forestry Library, Forest Research Center, and 6 academic Departments namely: Forest Product, Conservation, Silviculture, Forest Engineering, Forest Management, and Forest Biology.

The Faculty of Forestry at Kasetsart University was the only one academic institution in Thailand offering higher education in forestry for Bachelor and Master of Science, and Doctor of Philosophy degrees.
DEGREE OFFERED
UNDERGRADUATE DEGREES
1. BACHELOR OF SCIENCE (FORESTRY)
2. BACHELOR OF SCIENCE (WOOD SCIENCES AND TECHNOLOGY)
3. BACHELOR OF SCIENCE (PULP AND PAPER TECHNOLOGY)

STRUCTURE OF THE CURRICULA

BACHELOR OF SCIENCE
(Forestry)

Total Minimum Requirements 146 Credits

GENERAL EDUCATION 31 Credits

1. Science and Mathematics 7 Credits
   417116(4), 999211(3)

2. Language 12 Credits
   999021(3), 355xxx(9)

3. Social Sciences 7 Credits
   102181(3) or 999041(3), 371111(1), 999141(3)

4. Humanities 3 Credits
   999033(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 109 Credits

1. Core Course 57 Credits
   015261(3), 301111(2), 302111(2), 302112(1), 302221(2), 302222(1), 303111(2),
   303221(3), 303222(1), 304111(2), 304112(1), 304221(1), 304321(2), 304352(1),
   305111(3), 305321(2), 306111(2), 306221(2), 306222(1), 401114(3), 403111(4),
   403112(1), 403221(4), 403222(1), 420119(4), 422111(3), 423113(3)

2. Major Courses 52 Credits
   choose courses according to each major from the following below:
   3.1 Forest Resource Management
   - Major Requirements 26 Credits
     015261(3), 301421(3), 301471(2), 302313(1), 302342(2), 304331(3),
     304351(2), 304411(2), 304441(2), 306311(2), 306431(2), 308311(2)
   - Major Electives 26 Credits
     choose one program from below:
     1) Watershed Management 22 Credits
and choose at least 4 credits from the following courses:
009442(3), 301411(2), 301462(3), 301481(3), 301483(3), 301496(1-3), 301497(1), 301498(1-3), 302482(3), 302485(3), 303341(3), 304414(3), 306432(2), 307311(3), 307421(2)

2) Forest Management 20 credits
304353(1), 304412(2), 304413(2), 304421(3), 304431(3), 304432(2), 304433(2), 304445(3), 304491(2).
and choose at least 6 credits from the following courses:
302482(2), 302485(3), 303341(3), 304414(3), 304442(2), 304446(3), 304461(3), 304496(1-3), 304497(1), 304498(1-3), 306432(2)

3) Parks and Recreation 20 credits
303312(2), 308312(3), 308321(3), 308411(1), 308421(3), 308431(3), 308441(3), 308491(2)
and choose at least 6 credits from the following courses:
302421(2), 302422(2), 302441(3), 302482(2), 304414(3), 306426(2), 308423(3), 308432(3), 308496(1-3), 308497(1), 308498(1-3), 459426(3)

3.2 Forest Engineering
- Major Requirements 44 credits
303321(2), 303331(3), 303332(2), 303333(1), 303341(3), 303342(1), 303361(3), 303421(3), 303422(3), 303441(2), 303442(1), 303443(3), 303444(2), 303451(3), 303491(2), 303498(1-3), 304331(3), 304441(2), 306331(2)
- Major Electives 8 credits
choose from the following courses:
010111(3), 301421(3), 303431(3), 303445(3), 303446(3), 303447(3), 303461(3), 303496(1-3), 303497(1), 304351(2), 304411(2), 304414(3), 304431(3), 305351(3), 305352(3)

3.3 Social Forestry
- Major Requirements 46 credits
301421(3), 301471(2), 302313(1), 304331(3), 304411(2), 306431(2), 307311(3), 307312(1), 307313(1), 307421(2), 307422(3), 307424(3), 307431(3), 307441(3), 307491(2), 459231(3), 459423(3), 460231(3), 460442(3)
- Major Electives 6 credits
choose from the following courses:

3.4 Forest Biological Sciences
- Major Requirements 28 credits
301421(3), 302313(1), 302331(2), 302332(2), 302341(3), 302482(2), 304331(3), 304351(2), 304411(2), 304441(2), 306311(2), 306432(2), 308311(2)
- Major Electives 24 credits
  choose one program according to courses of each program from below:
  1) Forest Biology 19 credits
     302411(1), 302412(3), 302421(2), 302422(2), 302451(3) or 401411(3),
     302452(3), 302471(3) or 416311(3), 302491(2)
     and choose at least 5 credits from the following courses:
     302413(3), 302431(3), 302432(3), 302433(3), 302434(3), 302472(3),
     302453(3), 302496(1-3), 302497(1), 302498(1-3), 304414(3),
     306422(2), 307421(2), 401441(2)
  2) Forest Wildlife and Range Sciences 18 Credits
     302440(1), 302441(3), 302442(3), 302443(3), 302447(3), 302483(3),
     302491(2)
     and choose at least 6 credits from the following courses:
     002111(3), 003412(3), 302444(2), 302445(3), 302446(3), 302448(3),
     302485(3), 302486(3), 302497(1), 302498(1-3), 304414(3), 401441(2),
     423428(4)
  3) Silviculture 20 Credits
     302452(3), 302471(3), 303311(2), 306421(1), 306422(2), 306441(3),
     306442(2), 306491(2), 307421(2)
     and choose at least 4 credits from the following courses:
     302421(2), 302432(2), 303341(3), 304414(3), 306423(2), 306431(2),
     306496(1-3), 306497(1), 306498(1-3), 307311(3), 307423(3)

FREE ELECTIVES 6 Credits

BACHELOR OF SCIENCE
(Wood Sciences And Technology)

Total Minimum Requirements 145 Credits

GENERAL EDUCATION 34 Credits

1. Science and Mathematics 11 Credits
   401114(3), 403111(4), 403112(1), 999211(3)

2. Language 12 Credits
   999021(3), 355xxx(9)

3. Social Sciences 6 Credits
   102181(3), 999141(3)

4. Humanities 3 Credits
   999033(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)
SPECIFIC REQUIREMENTS  105  Credits

1. Core Course  38  Credits
   206221(3), 301111(2), 302112(1), 302112(1), 304111(2), 304112(1), 305111(3),
   306111(2), 306221(2), 403221(4), 403222(1), 417167(4), 417168(3), 420111(3),
   420112(3), 420113(1), 420114(1)

2. Major Requirements  58  Credits
   203221(3), 206341(3), 208221(3), 303451(3), 305112(2), 305323(3),
   305331(3), 305333(3), 305351(3), 305352(3), 305371(3), 305372(3), 305422(2),
   305441(3), 305444(3), 305451(3), 305472(3), 305473(3), 305474(3)

3. Major Electives  9  Credits
   choose 6 credits from the following courses and choose related courses from the
   Faculty of Engineering and/or Faculty of Business Administration
   205201(3), 205202(1), 206422(3), 206451(2), 208222(3), 208241(3), 305353(3),
   305373(3), 305422(3), 305443(3), 305445(3), 305446(3), 305452(3), 305461(2),
   305481(3), 305491(2), 305496(1-3), 305497(1), 305498(1-3)

FREE ELECTIVES  6  Credits

BACHELOR OF SCIENCE
(Pulp and Paper Technology)

Total Minimum Requirements  142  Credits

GENERAL EDUCATION  30  Credits

1. Science and Mathematics  6  Credits
   204111(3) 999012(3)

2. Language  12  Credits
   355xxx(9), 999021(3)

3. Social Sciences  6  Credits
   102181(3), 999141(3) or 999041(3)

4. Humanities  4  Credits
   371111(1), 999033(3)

5. Physical Education Activities  2  Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS  103  Credits

1. Core Course  44  Credits
202211(3), 202221(3), 208111(3), 403113(3), 403114(1), 403115(3), 403116(1),
403221(4), 403222(1), 403244(4), 417167(4), 417168(3), 420111(3), 420112(3),
420113(1), 420114(1), 422111(3)

2. Major Requirements  50  Credits
202311(3), 301111(2), 302111(2), 302112(1), 304111(2), 304112(1), 305111(3),
306111(2), 306221(2), 310211(3), 310231(3), 310341(4), 310351(4), 310411(3),
310421(3), 310461(3), 310472(3), 310481(3), 310499(3)

3. Major Electives  12  Credits
202222(3), 202484(3), 202487(3), 205201(3), 206221(3), 206323(3), 206351(3),
206401(1), 206451(2), 206452(3), 301481(3), 305333(3), 305491(2), 310412(3),
310451(3), 310462(3), 310463(3), 310471(3), 310482(3), 310496(1-3), 310497(1),
310498(1-3), 403231(4), 403331(4), 403332(3), 403455(3), 403456(3), 417267(3),
417268(3)

FREE ELECTIVES     6     Credits

TRAINING     150     Hrs.
The Faculty of Science was initially established on 9th March 1966. The 7th faculty in Kasetsart University, formerly named Faculty of Science and Arts. At that time, the faculty of Science and Arts consisted of 6 departments and one program which were Department of Biology, Chemistry, Languages, Mathematics, Physics, Social Sciences-Humanities, and Nuclear Energy Program.

The Faculty of Science and Arts was renamed Faculty of science on 17th June 1981. The faculty has a firm determination to promote and develop science and technology as well as generate high quality scientists. The faculty will support researches as a mean for social and national development, according to the University’s philosophy.

The faculty consists of the Faculty’s secretary office and 12 academic departments:
- Department of Applied Radiation and Isotopes
- Department of Biochemistry
- Department of Botany
- Department of Chemistry
- Department of Computer Science
- Department of General Science
- Department of Genetics
- Department of Mathematics
- Department of Microbiology
- Department of Physics
- Department of Statistics
- Department of Zoology

DEGREE OFFERED

UNDERGRADUATE DEGREE

1. BACHELOR OF SCIENCE (BIO-CHEMISTRY)
2. BACHELOR OF SCIENCE (BIOLOGY) Applied Radiation and Isotopes
3. BACHELOR OF SCIENCE (BIOLOGY) Biology
4. BACHELOR OF SCIENCE (BIOLOGY) Botany
5. BACHELOR OF SCIENCE (BIOLOGY) Genetics
6. BACHELOR OF SCIENCE (BIOLOGY) Microbiology
7. BACHELOR OF SCIENCE (BIOLOGY) Zoology
8. BACHELOR OF SCIENCE (CHEMISTRY)
9. BACHELOR OF SCIENCE (COMPUTER SCIENCE)
10. BACHELOR OF SCIENCE (EARTH SCIENCE)
11. BACHELOR OF SCIENCE (ENVIRONMENTAL SCIENCE)
12. BACHELOR OF SCIENCE (GENERAL SCIENCE)
13. BACHELOR OF SCIENCE (INDUSTRIAL CHEMISTRY)
14. BACHELOR OF SCIENCE (MATHEMATICS)
15. BACHELOR OF SCIENCE (PHYSICS)
16. BACHELOR OF SCIENCE (STATISTICS)

STRUCTURE OF THE CURRICULA
BACHELOR OF SCIENCE
(Bio-Chemistry)

Total Minimum Requirements 133 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 6 Credits
   999212(3), 418xxx(3)

2. Language 12 Credits
   999021(3), xxxxxx(9)

3. Social Sciences 6 Credits
   999141(3), 999xxx(3)

4. Humanities 4 Credits
   371111(1), 999033(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 97 Credits

1. Core Course 28 Credits
   403113(3), 403115(3), 417111(3), 417112(3), 420111(3), 420112(3),
   420113(1), 420114(1), 422111(3), 424111(3), 424112(1)

2. Major Requirements 54 Credits
   401114(3), 402311(1), 402312(1), 402313(3), 402314(1), 402321(3), 402322(3),
   402411(3), 402421(3), 402422(2), 402451(3), 402461(3), 402497(1), 402498(3),
   402523(4), 402623(4), 402644(4), 416311(3), 419211(3), 419213(2), 423113(3)

3. Major Electives 15 Credits
   - choose courses as the following requirement of major course 9 credits
     402423(3), 402441(3), 402471(3), 402481(3), 402496(3)
   - and/or choose related courses in biochemistry
     or the following courses: 449390(1), 449490(6)

FREE ELECTIVES 6 Credits
BACHELOR OF SCIENCE (BIOLOGY) 
Applied Radiation and Isotopes

Total Minimum Requirements 132 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 6 Credits
   999212(3), 418112(3)

2. Language 12 Credits
   999021(3), 355xxx(9)

3. Social Sciences 6 Credits
   999041(3), 999141(3)

4. Humanities 4 Credits
   371111(1), 999033(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 96 Credits

1. Core Course 28 Credits
   403113(3), 403115(3), 403118(1), 417111(3), 417112(3), 420111(3), 420112(3),
   420113(1), 420114(1), 422111(3), 424111(3), 424112(1)

2. Major Requirements 53 Credits
   401114(3) or 423113(3), 402311(2), 402312(1), 403221(4), 403222(1), 403231(2),
   403232(2), 416311(3), 416312(1), 419211(3), 421422(3), 421497(1), 421498(3)

3. Major Electives 15 Credits
   - choose courses from the department (421xxx) not less than 9 credits
   - choose courses from other department in related field not less than 6 credits below:
     421322(3), 421412(3), 421413(3), 421414(3), 421423(3), 421431(3), 421496(1-3),
     449390(1), 449490(6)

FREE ELECTIVES 6 Credits
# BACHELOR OF SCIENCE (BIOLOGY)

**Biology**

Total Minimum Requirements 135 Credits

## GENERAL EDUCATION 30 Credits

1. Science and Mathematics 6 Credits
   - 999212(3), 418112(3)

2. Language 12 Credits
   - 999021(3), xxxxxx(9)

3. Social Sciences 6 Credits
   - 999141(3), xxxxxx(3)

4. Humanities 4 Credits
   - 371111(1), 999033(3)

5. Physical Education Activities 2 Credits
   - 175xxx(1), 175xxx(1)

## SPECIFIC REQUIREMENTS 99 Credits

1. Core Course 28 Credits
   - 403113(3), 403115(3), 417111(3), 417112(3), 420111(3), 420112(3), 420113(1), 420114(1), 422111(3), 424111(3), 424112(1)

2. Major Requirements 56 Credits

3. Major Electives 15 Credits
   - choose courses as the following requirement of major course 15 credits by choosing from the department (424xx) not less than 9 credits and related courses, including:
     - 449390(1), 449490(6)

## FREE ELECTIVES 6 Credits

## TRAINING 60 Hrs.
BACHELOR OF SCIENCE (BIOLOGY)
Botany

Total Minimum Requirements 135 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 6 Credits
   999212(3), 418xxx(3) or other computer science in general education

2. Language 12 Credits
   999021(3), xxxxxx(9)

3. Social Sciences 6 Credits
   999141(3), xxxxxx(3)

4. Humanities 4 Credits
   371111(1), 999033(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 98 Credits

1. Core Course 28 Credits
   403113(3), 403115(3), 403118(1), 417111(3), 417112(3), 420111(3), 420112(3),
   420113(1), 420114(1), 422111(3), 424111(3), 424112(1)

2. Major Requirements 43 Credits
   401114(3), 401341(3), 401351(3), 401411(3), 401481(3), 401497(1), 401498(3),
   402311(2), 402312(1), 403221(4), 403222(1), 403231(2), 403232(2), 416311(3),
   416312(1), 419211(3), 419212(2), 422311(3)

3. Major Electives 27 Credits
   - choose courses from the department (401xxx) not less than 18 credits such as
     401412(3), 401413(3), 401414(3), 401424(3), 401425(3), 401431(3), 401451(3),
     401452(3), 401461(3), 401462(3), 401473(3)
   - choose courses from physical science or others in related field not less than 9 credits
     such as statistics, environment, business administration, economics, education,
     agro-industry and the following courses :
     449390(1), 449490(6)

FREE ELECTIVES 6 Credits
TRAINING 1 Credits (not less than 100 hrs.):
401499(1)
BACHELOR OF SCIENCE (BIOLOGY)
Genetics

Total Minimum Requirements 134 Credits

GENERAL EDUCATION  30 Credits

1. Science and Mathematics  6 Credits
   418112(3), 999212(3)

2. Language  12 Credits
   999021(3), xxxxxx(9)

3. Social Sciences  6 Credits
   459111(3), 999141(3)

4. Humanities  4 Credits
   371111(1), 999033(3)

5. Physical Education Activities  2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS  98 Credits

1. Core Course  28 Credits
   403113(3), 403115(3), 417111(3), 417112(3), 420111(3), 420112(3),
   420113(1), 420114(1), 422111(3), 424111(3), 424112(1)

2. Major Requirements  52 Credits
   401114(3), 402311(2), 402312(1), 416311(3), 416312(1), 416441(3), 416453(3), 416471(3), 416497(1),
   416498(3), 419211(3), 419213(2), 422424(3), 422425(3), 423113(3), 423811(3)

3. Major Electives  18 Credits
   - choose courses from the department (416xxx) not less than 9 credits
   - choose courses from other department in related field not less than 6 credits
   and the following courses : 449390(1), 449490(6)
   - choose 3 credits from the following courses
     422422(3) or 422424(3)

FREE ELECTIVES  6 Credits
BACHELOR OF SCIENCE PROGRAM (BIOLOGY)
Microbiology

Total Minimum Requirements  135  Credits

GENERAL EDUCATION    30  Credits

1. Science and Mathematics    6  Credits
   999212(3), 418xxx(3)

2. Language    12  Credits
   999021(3), xxxxxx(9)

3. Social Sciences    6  Credits
   999141(3), xxxxxx(3)

4. Humanities    4  Credits
   371111(1), 999033(3)

5. Physical Education Activities    2  Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS    99  Credits

1. Core Course    28  Credits
   403113(3), 403115(3), 417111(3), 417112(3), 420111(3), 420112(3),
   420113(1), 420114(1), 422111(3), 424111(3), 424112(1)

2. Major Requirements    50-51 Credits
   401114(3), 402311(2), 402312(1), 402313(3), 403221(4), 403222(1), 403231(2),
   403232(2), 416311(3), 416312(1), 419211(3), 419213(2), 419325(3), 419341(3),
   419371(3), 419391(1), 419451(4), 419497(1), 419498(2-3), 422415(3), 423113(3)

3. Major Electives    20-21 Credits
   choose courses from the department and other department in related field
   and the following courses : 449390(1), 449490(6)

FREE ELECTIVES    6  Credits

TRAINING    80  Hrs.
BACHELOR OF SCIENCE (BIOLOGY)
Zoology

Total Minimum Requirements 135 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 6 Credits
   418112(3), 999212(3)

2. Language 12 Credits
   999021(3), xxxxxx(9)

3. Social Sciences 6 Credits
   999141(3), xxxxxx(3)

4. Humanities 4 Credits
   371111(1), 999033(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 99 Credits

1. Core Course 28 Credits
   403113(3), 403115(3), 417112(3), 420111(3), 420112(3),
   420113(1), 420114(1), 422111(3), 424111(3), 424112(1)

2. Major Requirements 56 Credits
   401114(3), 402311(2), 402312(1), 402313(3), 403221(4),
   403222(1), 416311(3), 416312(1), 419211(3), 419213(2),
   422465(3), 423113(3), 423311(5), 423351(3),
   423352(1), 423414(4), 423421(3), 423441(4), 423481(3),
   423497(1), 423498(3)

3. Major Electives 15 Credits
   - choose courses from the department (423xxx) not less than 9 credits and related
     courses and the following courses :
   449390(1), 449490(6)

FREE ELECTIVES 6 Credits

TRAINING 60 Hrs.
BACHELOR OF SCIENCE
(Chemistry)

Total Minimum Requirements 140 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 3 Credits
   418112(3)

2. Language 12 Credits
   999021(3), xxxxxx(9) (elective courses in one foreign language)

3. Social Sciences 7 Credits
   108101(3), 132111(3), 371111(1)

4. Humanities 6 Credits
   387101(3), 391111(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 104 Credits

1. Core Course 28 Credits
   403113(3), 403115(3), 417111(3), 417112(3), 420111(3), 420112(3),
   420113(1), 420114(1), 422111(3), 424111(3), 424112(1)

2. Major Requirements 67 Credits
   402311(2), 402312(1), 402313(3), 403223(4), 403224(4), 403231(2), 403232(2),
   403242(4), 403243(4), 403291(1), 403312(4), 403313(3), 403314(3), 403315(3),
   403323(2), 403331(4), 403332(2), 403333(2), 403342(3), 403343(3), 403412(3),
   403497(1), 403498(1), 417241(3), 420221(4)

3. Major Electives 9 Credits
   choose 9 credits from the following courses:
   403325(3), 403326(4), 403344(2), 403345(3), 403354(3), 403355(3), 403364(3),
   403382(3), 403385(3), 403411(3), 403413(3), 403414(2), 403421(3), 403422(3),
   403423(3), 403424(3), 403425(3), 403426(3), 403431(3), 403443(3), 403451(2),
   403452(2), 403453(3), 403455(3), 403456(3), 403461(1), 403462(3), 403464(3),
   403471(3), 403496(3), 449390(1), 449490(6)

FREE ELECTIVES 6 Credits
BACHELOR OF SCIENCE  
(Computer Science)

Total Minimum Requirements 134 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 6 Credits
   999212(3) and choose 3 credits from below
   999011(3), 999012(3), 999213(3)

2. Language 12 Credits
   999021(3), xxxxxx(9) (elective courses in one foreign language)

3. Social Sciences 3 Credits
   999141(3)

4. Humanities 7 Credits
   371111(1), 999033(3), xxxxxx(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 98 Credits

1. Core Course 28 Credits
   403113(3), 403115(3), 403118(1), 417111(3), 417112(3), 420111(3), 420112(1),
   420113(1), 420114(1), 422111(3), 424111(3), 424112(1)

2. Major Requirements 52 Credits
   417231(3), 417241(3), 417271(3), 418112(3), 418261(3), 418262(3),
   418231(3), 418241(3), 418311(3), 418322(3), 418323(3), 418421(3), 418431(3),
   418432(3), 418433(3), 418497(1), 418498(3)

3. Major Electives 18 Credits
   - choose courses from the department on code-200 not more than 3 credits and
   code-300 up not less than 9 credits and choose related courses
   and the following courses : 449390(1), 449490(6)

FREE ELECTIVES 6 Credits
BACHELOR OF SCIENCE
(Earth Science)

Total Minimum Requirements  136   Credits

GENERAL EDUCATION   30 Credits

1. Science and Mathematics   6 Credits
   999212(3), 418xxx(3)

2. Language   12 Credits
   999021(3), xxxxxx(9) (elective courses in one foreign language)

3. Social Sciences   6 Credits
   999141(3), xxxxxx(3) (elective course in Social Sciences)

4. Humanities   4 Credits
   371111(1), 999033(3)

5. Physical Education Activities   2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS   100 Credits

1. Core Course   28 Credits
   403113(3), 403115(3), 403118(1), 417111(3), 417112(3), 420111(3), 420112(3),
   420113(1), 420114(1), 422111(3), 424111(3), 424112(1)

2. Major Requirements   54 Credits
   009111(4), 301461(3), 304431(3), 403221(4), 403222(1), 403231(2), 403232(2),
   404491(3), 404492(3), 405311(3), 405431(3), 411231(3), 411241(3), 411331(3),
   411351(3), 411361(3), 411497(1,1), 411498(1-3), 420361(3)

3. Major Electives   18 Credits
   choose courses from the following courses
   009431(3), 009442(3), 009463(3), 009472(3), 255211(3), 255352(3), 255451(3),
   255452(3), 255453(3), 301462(3), 404383(4), 404481(3), 404482(4), 405481(3),
   411431(3), 411441(3), 411442(3), 411451(3), 411461(3), 411472(3), 411496(3),
   420362(3), 449390(1), 449490(6)

FREE ELECTIVES   6 Credits
BACHELOR OF SCIENCE
(Environmental Science)

Total Minimum Requirements 135 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 6 Credits
   999212(3), 418xxx(3) or other computer science in general education

2. Language 12 Credits
   999021(3), xxxxxx(9) (elective courses in one foreign language)

3. Social Sciences 6 Credits
   999141(3), xxxxxx(3) (elective course in Social Sciences)

4. Humanities 4 Credits
   371111(1), 999033(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 99 Credits

1. Core Course 28 Credits
   403113(3), 403115(3), 403118(1), 417111(3), 417112(3), 420111(3), 420112(3),
   420113(1), 420114(1), 422111(3), 424111(3), 424112(1)

2. Major Requirements 56 Credits
   402311(2), 402312(1), 403221(4), 403222(1), 403231(2), 403232(2), 419211(3),
   419213(2), 424381(3), 425211(3), 425321(3), 425322(3), 425324(3), 425325(3),
   425326(3), 425421(2), 425422(3), 425431(3), 425432(3), 425453(1), 425497(1),
   425498(2)
   and choose 3 credits from the following course
   401114(3), 416311(3), 423113(3)

3. Major Electives 15 Credits
   choose courses from the environmental science department and related field such as
   425312(3), 425323(3), 425433(3), 425451(3), 425452(3), 425461(3), 425471(3),
   425481(3), 425496(3), 449390(1), 449490(6)

FREE ELECTIVES 6 Credits
TRAINING not less than 100 Hrs.
BACHELOR OF SCIENCE
(General Science)

Total Minimum Requirements 135 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 6 Credits
   999212(3), 418xxx(3) or (one course in Computer Science)

2. Language 12 Credits
   999021(3), xxxxxx(9) (elective courses in one foreign language)

3. Social Sciences 6 Credits
   999141(3), xxxxxx(3) (elective course in Social Sciences)

4. Humanities 4 Credits
   371111(1), 999033(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 99 Credits

1. Core Course 28 Credits
   403113(3), 403115(3), 403118(1), 417111(3), 417112(3), 420111(3), 420112(3),
   420113(1), 420114(1), 422111(3), 424111(3), 424112(1)

2. Major Requirements 47 Credits
   401114(3), 403221(4), 403222(1), 403231(2), 403232(2), 404311(3), 404484(3),
   404491(3), 404492(3), 404497(1,1), 404498(3), 405311(3), 411231(3), 416311(3),
   416312(1), 419211(3), 419213(2), 423113(3)

3. Major Electives 24 Credits
   404454(3)
   - choose courses as the following requirement of major course by selecting from
     physical science or biology science and related courses and following courses :
     449390(1), 449490(6)

FREE ELECTIVES 6 Credits
BACHELOR OF SCIENCE
(Industrial Chemistry)

Total Minimum Requirements 140 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 3 Credits
   418112(3)

2. Language 12 Credits
   999021(3), xxxxxx(9) (elective courses in one foreign language)

3. Social Sciences 7 Credits
   108101(3), 132111(3), 371111(1)

4. Humanities 6 Credits
   387101(1), 391111(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 104 Credits

1. Core Course 28 Credits
   403113(3), 403115(3), 403118(1), 417111(3), 417112(3), 420111(3), 420112(3),
   420113(1), 420114(1), 422111(3), 424111(3), 424112(1)

2. Major Requirements 55 Credits
   202211(3), 202218(3), 202313(1), 202314(1), 202318(3), 403223(4), 403224(4),
   403231(2), 403232(2), 403242(4), 403243(4), 403251(3), 403291(1), 403312(4),
   403313(3), 403311(3), 403351(4), 403352(3), 403353(2), 403497(1)

3. Major Electives 21 Credits
   choose from the following courses :
   202317(3), 202412(3), 202462(3), 206431(3), 403326(4), 403354(3), 403355(3),
   403361(3), 403362(3), 403363(3), 403364(3), 403365(3), 403366(3), 403367(3),
   403368(3), 403375(3), 403376(3), 403381(3), 403382(3), 403383(3), 403385(3),
   403451(2), 403452(2), 403543(3), 403455(3), 403456(3), 403461(2), 403462(2),
   403464(3), 403465(3), 403466(3), 403467(3), 403468(3), 403471(3), 403476(3),
   403481(3), 403482(2), 403483(2), 403484(3), 403496(3), 403498(1), 417241(3),
   417242(3), 449390(1), 449490(6)
FREE ELECTIVES  6  Credits
BACHELOR OF SCIENCE
(Mathematics)

Total Minimum Requirements    134 Credits

GENERAL EDUCATION     30 Credits

1. Science and Mathematics   6 Credits
   999212(3)
   and choose   3 credits from below
   999011(3), 999012(3), 999213(3)

2. Language    12 Credits
   999021(3), xxxxxx(9) (elective courses in one foreign language)

3. Social Sciences    6 Credits
   999141(3), 453111(3)

4. Humanities    4 Credits
   371111(1), 999033(3)

5. Physical Education Activities   2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS     98 Credits

1. Core Course    28 Credits
   403113(3), 403115(3), 403118(1), 417111(3), 417112(3), 420111(3), 420112(3),
   420113(1), 420114(1), 422111(3), 424111(3), 424112(1)

2. Major Requirements    43 Credits
   417231(3), 417241(3), 417242(3), 417271(3), 417311(3), 417312(3), 417321(3),
   417322(3), 417341(3), 417342(3), 417343(3), 417425(3), 417497(1), 418112(3),
   422343(3)

3. Major Electives    27 Credits
   choose courses from pure mathematics 6 credits
   417232(3), 417331(3), 417332(3), 417411(3), 417412(3), 417421(3), 417422(3),
   417423(3), 417424(3), 417426(3), 417432(3), 417433(3)
   choose courses from applied mathematics 6 credits
   417371(3), 417381(3), 417443(3), 417451(3), 417461(3), 417471(3), 417472(3)
   choose 15 credits from courses in mathematics, physics, statistics, computer sciences,
   economics, administration business, education or other that approved by the
department on code-300 up and the following courses : 449390(1), 449490(6)
FREE ELECTIVES 6 Credits
BACHELOR OF SCIENCE
(Physics)

Total Minimum Requirements 135 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 6 Credits
   999212(3), 418xxx(3)

2. Language 12 Credits
   999021(3), xxxxxx(9) (elective courses in one foreign language)

3. Social Sciences 6 Credits
   999141(3), xxxxxx(3) (elective course in Social Science)

4. Humanities 4 Credits
   371111(1), 999033(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 96 Credits

1. Core Course 28 Credits
   403113(3), 403115(3), 403118(1), 417111(3), 417112(3), 420111(3), 420112(3),
   420113(1), 420114(1), 422111(3), 424111(3), 424112(1)

2. Major Requirements 47 Credits (Physical Science)
   xxxxxx(3), 417241(3), 417262(3), 417361(3), 417362(3), 420211(3), 420212(3),
   420221(3), 420222(1), 420241(3), 420242(1), 420243(2), 420244(1), 420321(3),
   420331(3), 420332(3), 420334(1), 420341(3), 420497(1), 420498(1)

3. Major Electives 21 Credits
   choose courses from Physics, Mathematics, Computer Science, Statistics or
   Chemistry Department and the following courses: 449390(1), 449490(6)

FREE ELECTIVES 9 Credits
BACHELOR OF SCIENCE
(Statistics)

Total Minimum Requirements 135 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 6 Credits
   999212(3)
   and choose 3 credits from below
   999011(3), 999012(3), 999213(3)

2. Language 12 Credits
   999021(3), xxxxxx(9) (elective courses in one foreign language)

3. Social Sciences 6 Credits
   999041(3), 999141(3)

4. Humanities 4 Credits
   371111(1), 999033(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 96 Credits

1. Core Course 28 Credits
   403113(3), 403115(3), 403118(1), 417111(3), 417112(3), 420111(3), 420112(3),
   420113(1), 420114(1), 422111(3), 424111(3), 424112(1)

2. Major Requirements 46 Credits
   417241(3), 417322(3), 417343(3), 418112(3), 418211(3), 422211(3), 422221(3),
   422341(3), 422342(3), 422361(3), 422433(3), 422441(3), 422452(3), 422461(3),
   422491(3), 422497(1)

3. Major Electives 22 Credits
   choose courses from statistics, mathematics, computer sciences, industry engineering,
   and computer engineering and the following courses: 449390(1), 449490(6)

FREE ELECTIVES 9 Credits
FACULTY OF ENGINEERING

GENERAL INFORMATION

The Faculty of Engineering was founded in 1938 within the Royal Irrigation Department under the name “Irrigation Engineering School”. The School became affiliated with Kasetsart University In 1951. The School became the Faculty of Engineering in 1967. The Faculty consists of 10 departments; namely: Aerospace Engineering, Chemical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, Environmental Engineering, Industrial Engineering, Material Engineering, Mechanical Engineering, Water Resource Engineering.

The goal to the Faculty is to education quality engineers, we shall strengthen our graduate programs and encourage our staffs to do more research. We also expand our cooperations with private and public sectors as partners in education and research projects. Our new international programs with the collaboration of our well-know partner institutes from many parts of the world will open our international frontiers. Many new Ph.D.research programs have been launched.

DEGREE OFFERED

UNDERGRADUATE DEGREES

1. BACHELOR OF ENGINEERING (Aerospace Engineering)
2. BACHELOR OF ENGINEERING (Chemical Engineering)
3. BACHELOR OF ENGINEERING (Computer Engineering)
4. BACHELOR OF ENGINEERING (Electrical Engineering)
5. BACHELOR OF ENGINEERING (Electromechanic Manufacturing Engineering)
6. BACHELOR OF ENGINEERING (Environmental Engineering)
7. BACHELOR OF ENGINEERING (Industrial Engineering)
8. BACHELOR OF ENGINEERING (Material Engineering)
9. BACHELOR OF ENGINEERING (Mechanical Engineering)
10. BACHELOR OF ENGINEERING (Software and Knowledge Engineering)
11. BACHELOR OF ENGINEERING (Survey Engineering and Geographic Information)
12. BACHELOR OF ENGINEERING (Water Resources Engineering)
13. BACHELOR OF SCIENCE (Aviation Management)
14. BACHELOR OF SCIENCE (Aviation Technology)

STRUCTURE OF THE CURRICULA

BACHELOR OF ENGINEERING
(Aerospace Engineering)

Total Minimum Requirements 150 Credits

GENERAL EDUCATION 31 Credits

1. Science and Mathematics 11 Credits
   204111(3), 403111(4), 403112(1)
   and choose 3 credits from Interdisciplinary course for General Education in Science and Mathematics
   999012(3), 999213(3)

2. Language 12 Credits
   355xxx(9), 999021(3)

3. Social Sciences 3 Credits
   choose 3 credits from Interdisciplinary Course for General Education in Social Sciences
   999041(3), 999141(3)

4. Humanities 3 Credits
   choose 3 credits from Interdisciplinary Course for General Education in Humanities
   999031(3), 999032(3), 999033(3)

5. Physical Education 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC COURSES 113 Credits

1. Core Course 25 Credits
   204112(1), 208111(3), 213211(3), 417167(4), 417168(3), 417267(3), 420111(3),
   420112(3), 420113(1), 420114(1)

2. Major Requirements 76 Credits
   205201(3), 208211(3), 208222(3), 208281(1), 208321(3), 208351(3), 208381(1),
   215211(3), 215212(3), 215213(3), 215221(3), 215231(3), 215232(3), 215241(3),
   215242(3), 215261(1), 215311(1), 215321(3), 215323(3), 215331(3), 215341(3),
   215351(3), 215352(3), 215353(3), 215354(3), 215361(3), 215362(3), 215381(3),
   215495(1), 215499(2)
3. Major Electives    12 Credits
   choose 12 credits from the following courses :
   1. Aerospace Engineering
      215421(3), 215422(3), 215441(3), 215451(2), 215452(2), 215461(3), 215462(3),
      215463(3), 215464(3), 215465(3), 215481(3), 215496(1-3), 215497(1), 215498(1-3)
   2. Aerospace Industry Management
      215371(3), 215372(3), 215373(3), 215471(3), 215472(3), 215473(3), 215474(3),
      215475(3), 215476(3)
   3. Co-operative Education
      200490(6-9)

FREE ELECTIVES    6 Credits

TRAINING    240 Hrs. (except who take course : 200490)

BACHELOR OF ENGINEERING
(Chemical Engineering)

Total Minimum Requirements    143 Credits

GENERAL EDUCATION    31 Credits

1. Science and Mathematics    11 Credits
   204111(3), 403111(4), 403112(1)
   and choose    3 credits from Interdisciplinary Course for General Education in
   Science and Mathematics
   999011(3), 999012(3), 999213(3)

2. Language    12 Credits
   355xxx(9), 999021(3)

3. Social Sciences    3 Credits
   choose    3 credits from Interdisciplinary Course for General Education in Social
   Sciences
   999041(3), 999141(3)

4. Humanities    3 Credits
   choose    3 credits from Interdisciplinary Course for General Education in
   Humanities
   999031(3), 999032(3), 999033(3)

5. Physical Education    2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC COURSES    106 Credits

1. Core Course    25 Credits
   204112(1), 208111(3), 213211(3), 417167(4), 417168(3), 417267(3), 420111(3),
   420112(3), 420113(1), 420114(1)

2. Major Requirements    78 Credits
   202211(3), 202212(3), 202213(3), 202215(3), 202222(3), 202311(3), 202312(3),
   202313(1), 202314(1), 202316(3), 202321(3), 202322(1), 202341(3), 202361(3),
3. Major Electives  3 Credits
choose 3 credits from the following courses:
202422(3), 202423(3), 202432(3), 202441(3), 202443(3), 202451(3), 202462(3),
202471(3), 202481(3), 202496(1-3), 202498(1-3)

FREE ELECTIVES     6    Credits

TRAINING     240 Hrs.

BACHELOR OF ENGINEERING
       (Computer Engineering)

Total Minimum Requirements    139   Credits

GENERAL EDUCATION     31 Credits

1. Science and Mathematics     11 Credits
   204111(3), 403111(4), 403112(1)
   and choose 3 credits from Interdisciplinary Course for General Education in
   Science and Mathematics
   999011(3), 999012(3), 999213(3)

2. Language     12 Credits
   355xxx(9), 999021(3)

3. Social Sciences     3 Credits
choose 3 credits from Interdisciplinary Course for General Education in Social
Sciences
   999041(3), 999141(3)

4. Humanities     3 Credits
choose 3 credits from Interdisciplinary Course for General Education in
Humanities
   999031(3), 999032(3), 999033(3)

5. Physical Education     2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC COURSES     102 Credits

1. Core Course     25 Credits
   204111(3), 204112(1), 213211(3), 417167(4), 417168(3), 417267(3), 420111(3),
   420112(1), 420113(1), 420114(1)

2. Major Requirements     62 Credits
   204211(3), 204212(3), 204213(3), 204214(1), 204221(3), 204222(3), 204223(1),
   204224(1), 204313(3), 204321(3), 204325(3), 204331(3), 204332(3), 204341(3),
   204351(3), 204352(3), 204421(3), 204422(1), 204495(2), 204497(1), 204499(2),
   205201(3), 205202(1), 205203(3), 205303(1), 208201(3)
3. Major Electives  15  Credits
choose 15 credits from the following courses :
204312(3), 204323(3), 204324(1), 204371(3), 204411(3), 204424(3),
204425(3), 204426(3), 204432(3), 204433(3), 204434(3), 204435(3), 204451(3),
204452(3), 204461(3), 204462(3), 204463(3), 204464(3), 204471(3), 204472(3),
204481(3), 204482(3), 204496(1-3), 204498(1-3), 205314(3), 205338(3),
205415(3), 206321(3), 206425(3), 219211(1)

FREE ELECTIVES     6    Credits

TRAINING               240    Hrs.

BACHELOR OF ENGINEERING
(Electrical Engineering)

Total Minimum Requirements    150    Credits

GENERAL EDUCATION     31    Credits

1. Science and Mathematics     11    Credits
204111(3), 403111(4), 403112(1)
and choose   3   credits from Interdisciplinary Course for General Education in
Science and Mathematics
999011(3), 999012(3), 999213(3)

2. Language    12    Credits
355xxx(9), 999021(3)

3. Social Sciences    3    Credits
choose   3   credits from Interdisciplinary Course for General Education in Social
Sciences
999041(3), 999141(3)

4. Humanities     3    Credits
choose   3   credits from Interdisciplinary Course for General Education in
Humanities
999031(3), 999032(3), 999033(3)

5. Physical Education    2    Credits
175xxx(1), 175xxx(1)

SPECIFIC COURSES     113    Credits

1. Core Course     25    Credits
204112(1), 208111(3), 213211(3), 417167(4), 417168(3), 417267(3), 420111(3),
420112(3), 420113(1), 420114(1)

2. Major Requirements    56    Credits
205211(3), 205212(3), 205213(1), 205214(3), 205215(3), 205216(3), 205231(1),
205232(3), 205251(3), 205291(1), 205332(3), 205335(3), 205336(1), 205341(3),
205352(1), 205361(3), 205362(3), 205411(3), 205491(1), 205497(1), 205499(2),
206401(1), 208201(3), 208241(3), 208281(1)
3. Major Electives 32 Credits

choose one group from Four groups below:

1. Power
Choose 14 credits from the following courses:
205351(3), 205353(1), 205354(3), 205355(3), 205356(3), 205456(1)
and choose 18 credits from the following course:
205451(3), 205452(3), 205453(3), 205454(3), 205455(1), 205457(3), 205458(3),
205459(3), 205482(3), 205484(3), 205485(3), 205492(3), 205498(1-3)

2. Control and Measurement
Choose 10 credits from the following courses:
205363(1), 205364(3), 205412(3), 205462(3)
and choose 22 credits from the following courses:
205311(3), 205312(3), 205461(3), 205463(1), 205464(3), 205465(3), 205466(3),
205493(3)

3. Communication
Choose 7 credits from the following courses:
205321(3), 205322(3), 205323(1)
and choose 25 credits from the following courses:
205314(3), 205315(1), 205324(3), 205327(3), 205328(3), 205342(3), 205413(3),
205414(3), 205415(3), 205416(3), 205421(3), 205422(3), 205423(3), 205424(3),
205425(3), 205427(3), 205428(3), 205429(3), 205441(3), 205442(3), 205443(1),
205444(3), 205445(1), 205446(3), 205447(3), 205483(3), 205494(3)

4. Electronics
Choose 16 credits from the following courses:
205319(3), 205331(3), 205333(1), 205334(3), 205337(3), 205338(3)
and choose 16 credits from the following courses:
205431(3), 205432(1), 205433(3), 205434(3), 205435(3), 205436(3), 205481(3),
205486(3), 205487(1), 205495(3)

FREE ELECTIVES 6 Credits

TRAINING 240 Hrs.

BACHELOR OF ENGINEERING
(Electromechanic Manufacturing Engineering)

Total Minimum Requirements 147 Credits

GENERAL EDUCATION 31 Credits

1. Science and Mathematics 11 Credits
204111(3), 403111(4), 403112(1)
and choose 3 credits from Interdisciplinary course for General Education in
Science and Mathematics
999011(3), 999012(3), 999213(3)

2. Language 12 Credits
355xxx(9), 999021(3)
3. Social Sciences 3 Credits  
choose 3 credits from Interdisciplinary Course for General Education in Social Sciences  
999041(3), 999141(3)

4. Humanities 3 Credits  
choose 3 credits from Interdisciplinary Course for General Education in Humanities  
999031(3), 999032(3), 999033(3)

5. Physical Education 2 Credits  
175xxx(1), 175xxx(1)

SPECIFIC COURSES 110 Credits

1. Core Course 25 Credits  
204112(1), 208111(3), 213211(3), 417167(4), 417168(3), 417267(3), 420111(3),  
420112(3), 420113(3) 420114(1)

2. Major Requirements 73 Credits  
205211(3), 205231(3), 205251(3), 205331(3), 203332(1), 205351(3),  
205352(1), 205353(1), 206311(3), 208221(3), 208222(3), 208241(3), 208261(3),  
208281(1), 208321(3), 208342(3), 208361(3), 208371(3), 211231(3), 211311(3),  
211322(3), 211323(1), 211331(3), 211361(3), 211431(3), 211442(3), 211497(1),  
211499(3),  
206221(3), 206321(3), 206322(3), 206341(3), 206351(3), 206351(3), 206371(3),  
206413(3), 206425(3), 206441(3), 206442(3), 206451(2), 206452(3), 206453(3),  
206471(1)  

3. Major Electives 12 Credits  
choose 12 credits from the following courses:

1. Electrical Engineering
205212(3), 205214(3), 205215(3), 205319(3), 205321(3), 205323(1), 205335(3),  
205336(1), 205341(3), 205345(3), 205355(3), 205362(3), 205486(3)

2. Industrial Engineering
206221(3), 206321(3), 206322(3), 206341(3), 206351(3), 206351(3), 206371(3),  
206413(3), 206425(3), 206441(3), 206442(3), 206451(2), 206452(3), 206453(3),  
206471(1)

3. Mechanics Engineering
208381(3), 208382(1), 208474(3)

4. Electromechanic Engineering
211411(3), 211412(3), 211432(3), 211433(3), 211434(3), 211441(3), 211457(3),  
211471(3), 211496(1-3), 211498(1-3)

FREE ELECTIVES 6 Credits

TRAINING 240 Hrs.
BACHELOR OF ENGINEERING  
(Environmental Engineering)

Total Minimum Requirements  148  Credits

GENERAL EDUCATION  31  Credits

1. Science and Mathematics  11  Credits
204111(3), 403111(4), 403112(1)  
and choose 3 credits from Interdisciplinary course for General Education in Science and Mathematics  
999011(3), 999012(3), 999213(3)

2. Language  12  Credits  
355xxx(9), 999021(3)

3. Social Sciences  3  Credits  
choose 3 credits from Interdisciplinary Course for General Education in Social Sciences  
999041(3), 999141(3)

4. Humanities  3  Credits  
choose 3 credits from Interdisciplinary Course for General Education in Humanities  
999031(3), 999032(3), 999033(3)

5. Physical Education  2  Credits  
175xxx(1), 175xxx(1)

SPECIFIC COURSES  111  Credits

1. Core Course  25  Credits  
204112(1), 208111(3), 213211(3), 417167(4), 417168(3), 417267(3), 420111(3),  
420112(3), 420113(1), 420114(1)

2. Major Requirements  80  Credits  
203211(3), 203212(1), 203221(3), 203222(3), 203331(3), 203352(3), 203353(1),  
203354(3), 205201(3), 206221(3), 209211(3), 209212(1), 209241(3), 210211(4),  
210212(3), 210311(3), 210312(3), 210313(3), 210314(3), 210315(3), 210316(3),  
210411(3), 210412(3), 210421(3), 210422(3), 210431(3), 210495(1), 210497(1),  
210499(2)

3. Major Electives  6  Credits  
choose 6 credits from the following courses :  
203321(3), 203323(3), 203332(2), 203333(3), 203351(3), 203361(3), 203456(3),  
203464(3), 209321(3), 209342(3), 209343(3), 209344(3), 209423(3), 209446(3),  
210423(3), 210432(3), 210433(3), 210434(3), 210435(3), 210496(1-3), 210498(1-3)

FREE ELECTIVES  6  Credits

TRAINING  240  Hrs.
BACHELOR OF ENGINEERING
(Industrial Engineering)

Total Minimum Requirements 144 Credits

GENERAL EDUCATION  31 Credits

1. Science and Mathematics  11 Credits
   204111(3), 403111(4), 403112(1)
   and choose  3  credits from Interdisciplinary Course for General Education in
   Science and Mathematics
   999011(3), 999012(3), 999213(3)

2. Language  12 Credits
   355xxx(9), 999021(3)

3. Social Sciences  3 Credits
   choose  3  credits from Interdisciplinary Course for General Education in Social
   Sciences
   999041(3), 999141(3)

4. Humanities  3 Credits
   choose  3  credits from Interdisciplinary Course for General Education in
   Humanities
   999031(3), 999032(3), 999033(3)

5. Physical Education  2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC COURSES  107 Credits

1. Core Course  25 Credits
   204112(1), 208111(3), 213211(3), 417167(4), 417168(3), 417267(3), 420111(3),
   420112(3), 420113(1), 420114(1)

2. Major Requirements  73 Credits
   205201(3), 205202(1), 205301(4), 205302(1), 206211(3), 206222(3), 206223(3),
   206311(3), 206321(3), 206322(3), 206341(3), 206351(3), 206361(3), 206371(3),
   206381(1), 206441(3), 206442(3), 206471(3), 206481(1), 206497(1), 206499(2),
   208211(3), 208221(3), 208222(3), 208241(3), 208261(3), 208281(1), 208342(3),
   208381(1)

3. Major Electives  9 Credits
   choose  9  credits from the following courses : and/or from another groups
   1. Operation Research and Production Planning and Control
      206421(3), 206425(3), 206444(3), 206445(3), 206448(3), 206496(1-3),
      206498(1-3)
   2. Engineering Management
      206413(3), 205431(3), 206432(3), 206451(3), 206452(3), 206453(3), 206496(1-3),
      206498(1-3)
   3. Quality and Manufacturing Engineering
      206411(3), 206412(3), 206414(3), 206415(3), 206422(3), 206423(3), 206424(3),
      206496(1-3), 206498(1-3)
4. Productivity Improvement
206443(3), 206446(3), 206447(3), 206461(3), 206462(3), 206496(1-3), 206498(1-3)

FREE ELECTIVES 6 Credits

TRAINING 240 Hrs.

BACHELOR OF ENGINEERING
(Material Engineering)

Total Minimum Requirements 148 Credits

GENERAL EDUCATION 31 Credits

1. Science and Mathematics 11 Credits
204111(3), 403111(4), 403112(1)
and choose 3 credits from Interdisciplinary course for General Education in Science and Mathematics 999011(3), 999012(3), 999213(3)

2. Language 12 Credits
355xxx(9), 999021(3)

3. Social Sciences 3 Credits
choose 3 credits from Interdisciplinary Course for General Education in Social Sciences 999041(3), 999141(3)

4. Humanities 3 Credits
choose 3 credits from Interdisciplinary Course for General Education in Humanities 999031(3), 999032(3), 999033(3)

5. Physical Education 2 Credits
175xxx(1), 175xxx(1)

SPECIFIC COURSES 111 Credits

1. Core Course 25 Credits
204112(1), 208111(3), 208211(3), 417167(4), 417168(3), 417267(3), 420111(3), 420112(4), 420113(1) 420114(1)

2. Major Requirements 68 Credits

3. Major Electives 18 Credits
choose 18 credits from the following courses :
1. Metals
213325(3), 213333(3), 213352(3), 213353(3), 213354(3), 213421(3), 213422(3), 213434(3), 213451(3), 213496(1-3), 213498(1-3)
2. Polymers
213327(3), 213335(3), 213496(1-3), 213498(1-3)
3. ceramics
213326(3), 213431(3), 213496(1-3), 213498(1-3)
4. Composite Materials and Semiconductor Materials
213323(4), 213328(3), 213336(3), 213433(3), 213496(1-3), 213498(1-3)
5. Production Planning and Quality Control
206341(3), 206351(3), 206371(3), 206442

FREE ELECTIVES  6  Credits

TRAINING  240  Hrs.

BACHELOR OF ENGINEERING
(Mechanical Engineering)

Total Minimum Requirements  150  Credits

GENERAL EDUCATION  31  Credits

1. Science and Mathematics  11  Credits
204111(3), 403111(4), 403112(1)
and choose 3 credits from Interdisciplinary course for General Education in
Science and Mathematics
999011(3), 999012(3), 999213(3)

2. Language  12  Credits
355xxx(9), 999021(3)

3. Social Sciences  3  Credits
choose 3 credits from Interdisciplinary Course for General Education in Social
Sciences
999041(3), 999141(3)

4. Humanities  3  Credits
choose 3 credits from Interdisciplinary Course for General Education in
Humanities
999031(3), 999032(3), 999033(3)

5. Physical Education  2  Credits
175xxx(1), 175xxx(1)

SPECIFIC COURSES 113  Credits

1. Core Course  25  Credits
204112(1), 208111(3), 208211(3), 417167(4), 417168(3), 417267(3), 420111(3),
420112(4), 420113(1), 420114(1)

2. Major Requirements  76  Credits
205201(3), 205202(1), 205301(4), 205302(1), 206311(3), 208211(3), 208221(3),
208222(3), 208241(3), 208261(3), 208271(3), 208281(1), 208321(3), 208322(3),
3. Major Electives  12 Credits
choose 12 credits from the following courses:

1. Metals
208432(3), 208433(3), 208434(3), 208435(3), 208436(3), 208437(3), 208438(3), 208496(1-3), 208498(1-3)

2. Polymers
208441(3), 208452(3), 208453(3), 208454(3), 208455(3), 208456(3), 208457(3), 208458(3), 208496(1-3), 208498(1-3)

3. Ceramics
206221(3), 206351(3), 208442(3), 208443(3), 208444(3), 208445(3), 208446(3), 208447(3), 208496(1-3), 208498(1-3)

4. Composite Materials and Semiconductor Materials
208411(3), 208412(3), 208413(3), 208414(3), 208415(3), 208416(3), 208472(3), 20873(3), 208474(3), 208496(1-3), 208498(1-3)

5. Production Planning and Quality Control
208462(3), 208463(3), 208464(3), 208465(3), 208466(3), 208496(1-3), 208498(1-3)

6. Dynamics System Engineering
208421(3), 208422(3), 208471(3), 208496(1-3), 208498(1-3)

7. Co-operative Education
200490(6-9)

FREE ELECTIVES  6 Credits

TRAINING  240 Hrs.

BACHELOR OF ENGINEERING
(Software and Knowledge Engineering)

Total Minimum Requirements  143 Credits

GENERAL EDUCATION  31 Credits

1. Science and Mathematics  11 Credits
204111(3), 203111(4), 403112(1)
and choose 3 credits from Interdisciplinary course for General Education in Science and Mathematics
999011(3), 999012(3), 999213(3)

2. Language  12 Credits
355xxx(9), 999021(3)

3. Social Sciences  3 Credits
choose 3 credits from Interdisciplinary Course for General Education in Social Sciences
999041(3), 999141(3)

4. Humanities  3 Credits
choose 3 credits from Interdisciplinary Course for General Education in Humanities
 999031(3), 999032(3), 999033(3)

5. Physical Education 2 Credits
  175xxx(1), 175xxx(1)

SPECIFIC COURSES 106 Credits

1. Core Course 25 Credits
  204111(3), 204112(1), 213211(3), 417167(4), 417168(3), 417267(3), 420111(3),
  420112(4), 420113(1) 420114(1)

2. Major Requirements 39 Credits
  204211(3), 204212(3), 204214(3), 204313(3), 204351(3), 204352(3), 208201(3),
  219211(3), 219221(3), 219241(3), 219311(3), 219324(3), 219342(3), 219497(1),
  219499(3)

3. Major Electives 42 Credits

Choose 42 credits from only one group:

1. Software Engineering choose 27 credits from the following courses:
   219212(3), 2193331(3), 219341(2), 219343(3), 219344(3), 219345(3), 219490(9)
   choose 15 credits from the following courses:
   130111(3), 132111(3), 132211(3), 134111(3), 204213(3), 204222(3), 204312(3),
   204325(3), 204371(3), 204421(3), 204425(3), 204426(3), 204433(3), 204461(3),
   204462(3), 204463(3), 204464(3), 204481(3), 204482(3), 219321(3), 219322(3),
   219323(3), 219332(3), 219333(3), 219334(3), 219361(3), 219362(3), 219363(3),
   219364(3), 219365(3), 219371(3), 219372(3), 219381(3), 219411(3), 219412(3),
   219451(3), 219481(3), 219482(3), 219483(3), 219491(3), 219495(3), 219496(3),
   219498(1-3)

2. Knowledge Engineering choose 27 credits from the following courses:
   204213(3), 204461(3), 219323(3), 219331(3), 219361(3), 219362(3), 219364(3),
   219365(3), 219366(3), 219371(3), 219372(3), 219381(3), 219411(3), 219412(3),
   219451(3), 219481(3), 219482(3), 219483(3), 219491(3), 219495(3), 219496(3),
   219498(1-3)

FREE ELECTIVES 6 Credits

TRAINING 240 Hrs.
BACHELOR OF ENGINEERING
(Survey Engineering and Geographic Information)

Total Minimum Requirements 142 Credits

GENERAL EDUCATION 31 Credits

1. Science and Mathematics 11 Credits
204111(3), 203111(4), 403112(1)
and choose 3 credits from Interdisciplinary course for General Education in Science and Mathematics
999011(3), 999012(3), 999213(3)

2. Language 12 Credits
355xxx(9), 999021(3)

3. Social Sciences 3 Credits
choose 3 credits from Interdisciplinary Course for General Education in Social Sciences
999041(3), 999141(3)

4. Humanities 3 Credits
choose 3 credits from Interdisciplinary Course for General Education in Humanities
999031(3), 999032(3), 999033(3)

5. Physical Education 2 Credits
175xxx(1), 175xxx(1)

SPECIFIC COURSES 105 Credits

1. Core Course 25 Credits
204112(1), 208111(3), 208211(3), 417167(4), 417168(3), 417267(3), 420111(3),
420112(4), 420113(1) 420114(1)

2. Major Requirements 71 Credits
203221(3), 203222(3), 203321(3), 203323(3), 203331(3), 203333(3), 203352(3),
203353(1), 206221(3), 208221(3), 209211(3), 209212(3), 218211(3), 218212(3),
218213(3), 218312(3), 218321(3), 218331(1), 218332(3), 218341(3), 218411(3),
218412(3), 218422(3), 218423(3), 218495(1), 218497(1), 218499(3), 417268(3)

3. Major Electives 9 Credits
choose 6 credits from the following courses :
218311(3), 218333(3), 218413(2), 218421(3), 218431(3), 218441(3), 218496(3),
218498(3)
and choose 3 credits from Survey Engineering and Geographic Information
203341(3), 203354(3), 203361(3), 203371(3), 203471(3), 204212(3), 204351(3),
204452(3), 209423(3), 210431(3), 411351(3), 453111(3), 453451(2)

FREE ELECTIVES 6 Credits

TRAINING 240 Hrs.
# BACHELOR OF ENGINEERING
## (Water Resource Engineering)

**Total Minimum Requirements**  150  Credits

## GENERAL EDUCATION  31 Credits

1. Science and Mathematics  11 Credits  
   204111(3), 403111(4), 403112(1)  
   and choose 3 credits from the following courses:  
   999011(3), 999012(3), 999213(3)

2. Language  12 Credits  
   355xxx(9), 999021(3)

3. Social Sciences  3 Credits  
   choose 3 credits from Interdisciplinary Course for General Education in Social Sciences  
   999041(3), 999141(3)

4. Humanities  3 Credits  
   choose 3 credits from Interdisciplinary Course for General Education in Humanities  
   999031(3), 999032(3), 999033(3)

5. Physical Education  2 Credits  
   175xxx(1), 175xxx(1)

## SPECIFIC COURSES  113 Credits

1. Core Course  25 Credits  
   204112(1), 208111(3), 213211(3), 417167(4), 417168(3), 417267(3), 420111(3),  
   420112(3), 420113(1), 420114(1)

2. Major Requirements  80 Credits  
   203211(3), 203212(1), 203221(3), 203222(3), 203321(3), 203322(3), 203323(3),  
   203331(3), 203333(3), 203352(3), 203353(1), 208221(3), 209211(3), 209212(1),  
   209241(3), 209321(3), 209322(3), 209342(3), 209343(3), 209344(3), 209361(3),  
   209423(3), 209424(3), 209462(3), 209463(3), 209464(3), 209494(1), 209495(1),  
   209497(1), 209499(2)

3. Major Electives  8 Credits  
   choose 8 credits from the following courses with at least 6 credits of 209xxx  
   203312(3), 203354(3), 203361(3), 203431(3), 203471(3), 209425(3), 209426(3),  
   209427(3), 209428(3), 209429(3), 209445(3), 209446(3), 209429(3), 209447(3),  
   209448(3), 209465(3), 209466(3), 209467(3), 209468(3), 209496(1-3), 209498(1-3)

## FREE ELECTIVES  6 Credits

## TRAINING  240 Hrs.
BACHELOR OF SCIENCE  
(Aviation Management)

Total Minimum Requirements 150 Credits

GENERAL EDUCATION  31 Credits

1. Science and Mathematics   11 Credits
   204111(3), 417116(4), 420115(1), 420119(3)

2. Language   12 Credits
   355xxx(6)
   choose from general education, Language 2 subject 6 credits.

3. Social Sciences   3 Credits
   choose   3 credits from Interdisciplinary Course for General Education in Social Sciences
   999041(3), 999141(3)

4. Humanities   3 Credits
   choose   3 credits from Interdisciplinary Course for General Education in Humanities
   999031(3), 999032(3), 999033(3)

5. Physical Education   2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC COURSES  106 Credits

1. Core Course   24 Credits
   225111(3), 225141(3), 225142(3), 225231(3), 226111(3), 226112(3), 226113(3),
   226151(1), 226152(1), 226153(1)

2. Major Requirements   70 Credits
   130101(3), 132211(3), 225143(2), 225144(2), 225211(3), 225212(3), 225232(3),
   225271(3), 225231(3), 225341(3), 226211(3), 226212(3), 226221(3), 226231(3),
   226251(1), 226311(3), 226312(3), 226341(3), 226342(3), 226343(3), 226351(3),
   226352(1), 226353(1), 226361(3), 226371(3), 226499(3)

3. Major Electives   12 Credits
   choose   12 credits from the following courses
   1. Air Transportation Management
      226362(3), 226363(3), 226365(3), 226461(3), 226462(3), 226496(1-3),
      226497(1), 226498(1-3)
   2. Airport Management
      226372(3), 226471(3), 226472(3), 226496(1-3), 226497(1), 226498(1-3)
   3. Aviation Management
      132432(3), 132451(3), 132452(3), 226441(3), 226496(1-3), 226497(1), 226498(1-3)
   4. Co-operative Education
      200490(6-9)

FREE ELECTIVES   6 Credits

TRAINING    240 Hrs.
BACHELOR OF SCIENCE
(Aviation Technology)

Total Minimum Requirements 144 Credits

GENERAL EDUCATION  31 Credits

1. Science and Mathematics  11 Credits
   204111(3), 417116(4), 420115(1), 420119(3)

2. Language  12 Credits
   355xxx(6)
   choose from general education, Language 2 subject 6 credits.

3. Social Sciences  3 Credits
   choose 3 credits from Interdisciplinary Course for General Education in Social Sciences
   999041(3), 999141(3)

4. Humanities  3 Credits
   choose 3 credits from Interdisciplinary Course for General Education in Humanities
   999031(3), 999032(3), 999033(3)

5. Physical Education  2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC COURSES  107 Credits

1. Core Course  24 Credits
   225111(3), 225141(3), 225142(3), 225231(3), 226111(3), 226112(3), 226113(3),
   226151(1), 226152(1), 226153(1)

2. Major Requirements  59 Credits
   225143(2), 225144(2), 225151(1), 225152(1), 225153(3), 225154(3), 225232(3), 225251(3),
   225252(3), 225253(3), 225254(3), 225271(3), 225321(3), 225322(3), 225351(3),
   225352(3), 225499(3), 226211(3), 226221(3), 226251(1), 226341(3), 226342(3),
   226352(1), 226353(1)

3. Major Electives  24 Credits
   choose 24 credits from the following courses
   1. Civil Aviation Training
      225381(3), 225481(3), 225482(3), 225483(3), 225496(1-3), 225497(1), 225498(1-3)
   2. Airport
      215476(3), 225496(1-3), 225497(1), 226371(3), 226372(3), 226471(3)
   3. Air Transportation Technology Management
      225323(3), 225341(3), 225353(3), 225421(3), 225496(1-3), 225497(1), 225498(1-3),
      226351(3), 226361(3), 226365(3), 226441(3), 226461(3)
   4. Co-operative Education
      200490(6-9)

FREE ELECTIVES  6 Credits

TRAINING  240 Hrs.
Faculty of Education was established on November 28th, 1969. At the beginning, there were 3 departments, i.e. Department of Education, Department of Vocational Education and Department of Physical Education and an Office of Secretary. Its main function was to provide pre-service training for teachers in Agriculture, Home-Economics, and Physical Education at Bachelor’s degree level. These were the fields urgently needed at that time because Ministry of Education had initiated school-to-work program for the first time.

The program objective was to provide some vocational training for students who planned not to pursue their education at higher level. Faculty of Education decided from the beginning that besides the above mentioned undergraduate programs, it would concentrate on Master and Doctoral levels because many universities and teacher colleges had already offered programs in education at undergraduate level.

For over 30 years, Faculty of Education has gradually developed and many more working units were added as shown below.

1969 Establishment of Faculty of Education: Department of Education, Department of Vocational Education, Department of Physical Education, and, an Office of Secretary
1971 Kasetsart University Laboratory School
1980 Department of Vocational Education at Kampangsaen Campus
1980 Laboratory School at Kampangsaen Campus
1985 Department of Educational Technology
1989 Department of Educational Psychology and Guidance
1992 Department of Sports Science
2004 Bachelor of Education (B.Ed.) programs offered 5 years.

DEGREE OFFERED

UNDERGRADUATE DEGREES
1. BACHELOR OF EDUCATION (Business Education)
2. BACHELOR OF EDUCATION (Health Education)
3. BACHELOR OF EDUCATION (Home Economics Education)
4. BACHELOR OF EDUCATION (Teaching Mathematics)
5. BACHELOR OF EDUCATION (Physical Education)
6. BACHELOR OF EDUCATION (Teaching Science)

STRUCTURE OF THE CURRICULA

BACHELOR OF EDUCATION
(Business Education)

Total Minimum Requirements 162 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 6 Credits
   999012(3), 999213(3)

2. Language 15 Credits
   999021(3), 355xxx (12)

3. Social Sciences 3 Credits
   999141(3)

4. Humanities 4 Credits
   999033(3), 371111(1)

5. Physical Education 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 126 Credits

1. Major Requirements 86 Credits
   - Professional Education 51 credits
     151111(2), 151223(1), 151311(2), 151323(1), 151423(1), 151428(6),
     151429(6), 153351(3), 153492(3), 162221(3), 166211(3), 166312(2),
     167311(2), 169311(2), 171111(3), 176241(3), 176421(3), 179231(3),
     179326(2)
   - Business Education 35 Credits
     108101(3), 130101(3), 131211(3), 132111(3), 132142(3), 134111(3),
     176111(2), 179111(2), 179221(3), 179322 (3), 179441(3), 179461(1),
     179462(2), 179497(1)

2. Major Electives 40 Credits
   - Business Education 10 Credits
     choose from the following courses :
     179212(2), 179322(2), 179332(3), 179351(3), 179424(2), 179433(3),
     179434(3), 179435(3), 179495(1-3), 179496(1-3), 179498(1-3)
- General Business 30 Credits

FREE ELECTIVES 6 Credits

BACHELOR OF EDUCATION
(Health Education)

Total Minimum Requirements 162 Credits

GENERAL EDUCATION 32 Credits

1. Science and Mathematics 6 Credits
   999211(3), 999213(3)

2. Language 12 Credits
   999021(3), 355xxx (9)

3. Social Sciences 4 Credits
   371111(1), 999141(3)

4. Humanities 4 Credits
   999032(3), 999033(3)

5. Physical Education 4 Credits
   175xxx(1), 175xxx(1), 175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 124 Credits

1. Major Requirements 102 Credits
   - Professional Education 42 Credits
     151111(2), 151223(1), 151311(2), 151323(1), 151423(1), 151428(6),
     151429(6), 153351(3), 153492(3), 166211(3), 166312(2), 167311(2),
     169311(2), 171111(3), 173462(2), 173463(3)
   - Major Course 60 Credits
     173112(2), 173123(3), 173124(3), 173141(2), 173142(2), 173161(3),
     173253(3), 173254(3), 173255(3), 173256(3), 173321(2), 173322(3),
     173341(2), 173342(3), 173343(3), 173351(3), 173352(3), 173441(2),
     173447(2), 173461(3), 173492(3), 173496(1), 173497(1), 173498(2)

2. Major Electives 40 Credits
   - Professional Education 8 Credits
     choose from the following courses
     162211(2), 162221(2), 162426(2), 162427(2), 166212(2)
   - Major Course 30 Credits
     choose from the following courses
BACHELOR OF EDUCATION  
(Home Economics Education)

Total Minimum Requirements 162 Credits

GENERAL EDUCATION  35 Credits

1. Science and Mathematics  6 Credits  
   422101(3), 999213(3)

2. Language  18 Credits  
   361111(3), 355xxx(12)  
   choose a Language  3 credits

3. Social Sciences  6 Credits  
   459111(3), 999141(3)

4. Humanities  3 Credits  
   387102(3)

5. Physical Education  2 Credits  
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS  126 Credits

1. Major Requirements  102 Credits  
   - Professional Education  52 Credits  
     151111(2), 151311(2), 151223(1), 151323(1), 151423(1), 151428(6),  
     151429(6), 153351(3), 153492(3), 162221(3), 166211(3), 166312(2),  
     167311(2), 171111(3), 176111(2), 176241(3), 176421(3), 180321(3),  
     180331(3)
     - Major Course  50 Credits  
       006121(3), 006141(3), 006151(3), 006171(3), 006224(3), 006231(4),  
       006244(3), 006246(3), 006251(3), 006281(3), 006351(3), 105401(3),  
       108101(3), 180111(3), 180322(3), 180473(3), 180497(1)

2. Major Electives  24 Credits

FREE ELECTIVES  AT LEAST  6 Credits
BACHELOR OF EDUCATION
(Teaching Mathematics)

Total Minimum Requirements   168   Credits

GENERAL EDUCATION   33   Credits

1. Science and Mathematics   6   Credits
   999012(3), 999213(3)

2. Language   12   Credits
   999021(3), 355xxx (9)

3. Social Sciences   6   Credits
   459xxx(3), 999141(3)

4. Humanities   7   Credits
   371111 (1), 999033(3), 388xxx or 387xxx

5. Physical Education   2   Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS AT LEAST   129   Credits

1. Major Requirements   91   Credits
   - Professiona Education   43   Credits
     151111(2), 151311(2), 151223(1), 151323(1), 151423(1), 151428(6),
     151429(6), 153351(3), 153492(3), 158211(3), 1583219(3), 166211(3),
     166312(2), 167311(2), 169311(2), 171111(3)
   - Major Course   48   Credits
     158222(3), 158322(3), 158331(3), 158531(3), 158421(3), 158422(3),
     158341(3), 158496(3), 158498(3), 417111(3), 417112(3), 417231(3),
     417241(3), 417271(3), 417321(3), 417332(3)

2. Major Electives at least   38   Credits
   - Professiona Education   8   Credits
     choose from the following courses
     161211(2), 162426(2), 162427(2), 166212(2), 166321(2), 166322(2),
     166421(2), 166422(2)
   - Major Course   30   Credits

FREE ELECTIVES AT LEAST   6   Credits
BACHELOR OF EDUCATION
(Physical Education)

Total Minimum Requirements 173 Credits

GENERAL EDUCATION 33 Credits

1. Science and Mathematics 9 Credits
   999012(3), 422101(3), 417101(3)

2. Language 12 Credits
   999021(3), 355xxx(9)

3. Social Sciences 3 Credits
   999041(3)

4. Humanities 7 Credits
   371111(1), 999031(3), 999032(3)

5. Health Education 2 Credits
   173112(2)

SPECIFIC REQUIREMENTS AT LEAST 125 Credits

1. Major Requirements 105 Credits
   - Professiona Education 44 Credits
     151111(2), 151311(2), 151223(1), 151323(1), 151423(1), 151428(6),
     151429(6), 153351(3), 153492(3), 166211(3), 162221(3), 162426(2),
     162427(2), 166312(2), 167311(2), 169311(2), 171111(3)
   - Major Course 61 Credits
     172111(3), 172112(2), 172113(2), 172114(2), 172151(2), 172161(2),
     172171(2), 172172(2), 172173(2), 172231(2), 172241(2), 172261(2),
     172262(2), 172263(2), 172271(2), 172311(2), 172312(2), 172313(2),
     172314(2), 172315(3), 172316(2), 172317(2), 172333(2), 172411(2),
     172412(2), 172491(3), 173361(2), 174121(2), 174231(2)

2. Major Electives at least 20 Credits
   - Professiona Education 6 Credits
     choose from the following courses
     161211(2), 166212(2), 166312(2), 166322(2), 166421(2), 166422(2)
   - Major Course 14 Credits
     choose from the following courses
     172162(2), 172232(2), 172233(2), 172234(2), 172242(2), 172264(2),
     172265(2), 172266(2), 172267(2), 172269(2), 172272(2), 172318(2),
     172319(2), 172331(2), 172332(2), 172334(2), 172335(2), 172341(2),
     172342(2), 172351(2), 172352(2), 172361(2), 172362(2), 172363(2),
172364(2), 172371(2), 172372(2), 172373(2), 172374(2), 172375(2),
172413(2), 172414(2), 172415(2), 172416(2), 172417(2), 172431(2),
172432(2), 172451(2), 172452(2), 172453(2), 172454(2), 172455(2),
172461(2), 172462(2), 172463(2), 172463(2), 172471(2), 172472(2),
172473(2), 172497(1), 172498(1-3)

FREE ELECTIVES AT LEAST 6 Credits

TRAINING 150 Hrs.

BACHELOR OF EDUCATION
( Teaching Science)

Total Minimum Requirements  164-166 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 9 Credits
   999012(3), 999212(3), 999213(3)

2. Language 12 Credits
   999021(3), 355xxx(9)

3. Social Sciences 3 Credits
   choose from the following courses
   999041(3), 999141(3)

4. Humanities 4 Credits
   371111(1)
   choose from the following courses
   999031(3), 999032(3), 999033(3)

5. Physical Education 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS AT LEAST 138-140 Credits

1. Major Requirements 122-123 Credits
   - Professiona Education 49 Credits
     151111(2), 151223(1), 151311(2), 151323(1), 151423(1), 151428(6),
     151429(6), 153492(3), 159221(3), 159222(3), 159223(3), 159331(3),
     159351(3), 166211(3), 166212(2), 166312(2), 167311(2), 171111(3)
   - Major Course 63-65 Credits
     Science Instruction 10 Credits
     159271(2), 159361(1), 159362(2), 159381(2), 159495(2), 159497(1)
Science 53-55 Credits
405311(3), 417111(3), 420111(3), 420112(3), 420113(1), 420351(3),
420361(3), 422111(3), 424111(3), 424112(1)

choose one group below:
- Physics 28 Credits
  403111(4), 403112(1), 417112(3), 417241(3), 420211(3), 420212(3),
  420221(4), 420241(4), 420331(3)
- Chemistry 27 Credits
  402311(2), 402312(1), 403113(3), 403115(3), 403118(1), 403221(4),
  403222(1), 403231(2), 403232(2), 403244(4), 403312(4)
- Biology 27 Credits
  401114(3), 403111(4), 403112(1), 416311(3), 416312(1), 419211(3),
  419214(1), 423113(3), 423311(5), 424381(3)
- General Science 29 Credits
  401114(3), 403111(4), 403112(1), 404211(3), 404311(3), 411231(3)
  417112(3), 420333(3), 423113(3), 424381(3)

2. Major Electives 16 Credits
- Professiona Education 2 Credits
  choose from the following courses
  161211(2), 162222(2), 162321(2), 162426(2), 162427(2)
- Major Course 14 Credits
  Science Instruction 10 Credits
  choose from the following courses
  159224(2), 159242(2), 159325(2), 159332(3), 159333(3),
  159372(2), 159382(3), 159498(1-3)
- Sciences
  choose one group below as same as major requirement:
  - Physics
    choose at least 4 credits from the following courses or from physics (420)
    420241(3), 420243(2), 420244(1), 420261(3), 420321(3), 420341(3),
    420343(4), 420344(4), 420371(4), 420441(4), 420442(3), 420443(4),
    421311(4)
  - Chemistry
    choose at least 4 credits from the following courses or from chemistry (403) or
    bio-chemistry (402) or radio-isotope (421)
    402313(3), 402314(1), 403312(3), 403331(4), 421211(3), 421311(4)
  - Biology
    choose at least 4 credits from the following courses or from botany (401) or
    microbiology (419) or genetics (416) or zoology (423) or biology (424)
    401341(3), 401351(3), 416421(3), 423351(3), 423421(3), 423431(3),
    423441(4), 424351(3), 424454(3), 424482(3)
  - General Science
    choose at least 4 credits from the following courses or from chemistry (403) or
    general science (404) or atmosphere sciences (405) or environmental sciences (407) and
    (425) or earth technology sciences (411) or genetics (416) or microbiology (419) or
    physics (420)
    404481(3), 405431(3), 407322(3), 407431(4), 411351(3), 411431(3),
416311(3), 416312(1), 419211(3), 419214(1), 420221(4), 420333(3)

FREE ELECTIVES 6 Credits
FACULTY OF ECONOMICS

GENERAL INFORMATION

In 1941, Cooperative Department was developed in Kasetsart College. In 1943, it became one of four units in "Faculty of Co-operatives", which was one of the first four faculties of Kasetsart University.

In 1956, Faculty of Cooperatives was renamed "Faculty of Cooperative Economics", offered the first Master Degree Program in Agricultural Economics. In 1966, the name was changed again to "Faculty of Economics and Business Administration" to embrace both disciplines. In 1969, all units changed their status becoming "Departments" for better administration.

In 1992, Faculty of Economics and Business Administration was divided into two faculties: Faculty of Business Administration and Faculty of Economics.

The Faculty of Economics is concerned with proper ways and means of using the limited income, property, and resources most profitably. It offers curricular programs, conducts research, and renders technical services to the society in three subject-matter areas, namely Agricultural and Resource Economics, Cooperative Science, and Economics.

The Faculty consists of office of the Faculty's secretary and 3 academic departments: Department of Agricultural and Resource Economics, Department of Cooperative Science, Department of Economics.

DEGREES OFFERED

UNDERGRADUATE DEGREES

1. BACHELOR OF ECONOMICS
2. BACHELOR OF SCIENCE (Agribusiness)
3. BACHELOR OF SCIENCE (Agricultural Economics)
4. BACHELOR OF SCIENCE (Cooperative Economics)
STRUCTURE OF CURRICULA

BACHELOR OF ECONOMICS

Total Minimum Requirements 135 Credits

GENERAL EDUCATION 35 Credits

1. Science and Mathematics 6 Credits
   999012(3), 999211(3)

2. Language 18 Credits
   999021(3), 355xxx(6), 355224(3)
   and choose only one Foreign Language 6 credits

3. Social Sciences 6 Credits
   453111(3), 999141(3)

4. Humanities 3 Credits
   999032(3)

5. Physical Education 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 94 Credits

1. Major Requirements 60 Credits
   101311(3), 101312(3), 103311(3), 104311(3), 105211(3), 105311(3), 106311(3),
   107111(3), 107211(3), 107311(3), 107411(3), 107491(3), 108111(3), 108112(3),
   108211(3), 108212(3), 108311(3), 109311(3), 110311(3), 130101(3)

2. Major Electives 34 Credits
   - In Major Electives 25 Credits
     1) Choose any courses in economics 9 credits except from the general economics
        and 4 credits from below:
        xxx497(1), xxx498(3)
     2) choose from other in economics 12 credits
   - Other Major Electives 9 Credits

FREE ELECTIVES 6 Credits
BACHELOR OF SCIENCE  
(Agribusiness)

Total Minimum Requirements  136  Credits

GENERAL EDUCATION  30  Credits

1. Science and Mathematics   6   Credits
   999211(3), 999213(3)

2. Language   12   Credits
   999021(3), 355xxx(9)

3. Social Sciences   7   Credits
   132111(3), 371111(1), 999141(3)

4. Humanities   3   Credits
   999033(3)

5. Physical Education   2   Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS   103  Credits

1. Core Course   52  Credits
   002111(3), 015271(2), 108111(3), 108112(3), 108211(3), 108212(3), 130171(3),
   130172(3), 119111(3), 131211(3), 132142(3), 132221(3), 133211(3), 134111(3),
   417111(4), 417112(4), 422111(3)

2. Major Requirements   30   Credits
   119221(3), 119331(3), 119332(3), 119371(3), 119372(3), 119471(3), 119472(3),
   119473(3), 119491(3), 119497(1), 119498(2)

3. Major Electives   21   Credits
   choose from the following courses :
   119341(3), 119381(3), 119382(3), 119461(3), 119462(3), 119466(3), 132338(3),
   132413(3), 134421(3)

FREE ELECTIVES   3  Credits
BACHELOR OF SCIENCE
(Agricultural Economics)

Total Minimum Requirements 139 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 3 Credits
999xxx(3)

2. Language 12 Credits
999021(3), 355xxx(9)

3. Social Sciences 6 Credits
453111(3), 454111(3)

4. Humanities 7 Credits
371111(1), 387121(3), 999xxx(3)

5. Physical Education 2 Credits
175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 103 Credits

1. Core Course 43 Credits

2. Major Requirements 39 Credits

3. Major Electives 21 Credits
choose from 2 groups courses
- In Major Electives 15 credits
- choose from other 6 credits
FREE ELECTIVES  6  Credits

TRAINING  120  Hrs.

BACHELOR OF SCIENCE
(Cooperative Economics)

Total Minimum Requirements  145  Credits

GENERAL EDUCATION  44  Credits

1. Science and Mathematics  12  Credits
   417111(3), 417112(3), 422111(3)
   Science (Electives) 3 credits Choose 1 course from the following:
   999012(3), 999213(3)

2. Language  12  Credits
   355xxx(6)/
   and Language (electives) 6 credits choose from the following :
   355211(3), 355221(3), 355231(3), 355241(3)

3. Social Sciences  9  Credits
   459111(3), 453111(3), 999141(3)

4. Humanities  9  Credits
   361111(3), 387121(3), 999032(3)

5. Physical Education activities  2  Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS  93  Credits

1. Core Course  49  Credits
   125111(2), 125112(3), 125211(2), 125212(3), 125241(3), 125311(3), 125312(3),
   125415(3), 108111(3), 108112(3), 108211(3), 108212(3), 119111(3), 130171(3),
   130172(3), 132111(3), 134111(3)

2. Major Requirements  44  Credits
   - Major core courses 28 credits
     125221(3), 125231(3), 125313(3), 125314(3), 125411(3), 125414(3), 125491(3),
     125497(1), 418113(3), 422451(3)
   - Major electives 16 credits.
     Choose 16 credits from the following :
     125313(3), 125321(2), 125322(3), 125323(3), 125331(3), 125332(3), 125412(3),
     125413(3), 125421(3), 125422(3), 125423(3), 125431(3), 125432(3), 125441(3),
FREE ELECTIVES  6  Credits

TRAINING  120 Hrs.
GENERAL INFORMATION

The Faculty of Social Sciences currently consists of six departments: Department of Geography, Department of History, Department of Political Science and Public Administration, Department of Psychology, Department of Laws, and Department of Sociology and Anthropology. Department of Laws is now in the process of offering a degree program to the department's students in addition to various subjects provided for students of all faculties at Kasetsart University. Why study Social Sciences at Kasetsart University? A practical reason is to learn the skills that qualify one for a job. Beyond the job, let the question marks out the discussion from each department.

DEGREE OFFERED

UNDERGRADUATE DEGREES
1. BACHELOR OF ARTS (Geography)
2. BACHELOR OF ARTS (History)
3. BACHELOR OF ARTS (Political Science)
4. BACHELOR OF SCIENCE (Psychology)
5. BACHELOR OF ARTS (Sociology and Anthropology)
6. BACHELOR OF LAWS

STRUCTURE OF CURRICULA
BACHELOR OF SCIENCE  
(Geography)  

Total Minimum Requirements  141 Credits  

GENERAL EDUCATION  30 Credits  

1. Science and Mathematics  6 Credits  
   010111(3)  
   and choose 1 course from the followings :  
   999012(3), 999211(3), 999213(3)  

2. Social Sciences  6 Credits  
   999041(3)  
   and choose 1 course from the followings :  
   453111(3), 459111(3), 999141(3)  

3. Humanities  4 Credits  
   371111(1), 999033(3)  

4. Language  12 Credits  
   999021(3), xxxxxx(9)  

5. Physical Education Activities  2 Credits  
   175xxx(1), 175xxx(1)  

SPECIFIC REQUIREMENTS  105 Credits  

1. Major Requirements  75 Credits  
   203211(3), 387121(3), 417111(3), 418112(3), 422111(3), 451121(3), 451141(3),  
   451232(3), 451233(3), 451241(3), 451251(3), 451252(3), 451311(3), 451321(3),  
   451351(3), 451352(3), 451353(3), 451412(2), 451451(3), 451452(3), 451453(3),  
   451454(3), 451491(1), 451497(1), 451498(2), 453445(3), 454111(3)  

2. Major Electives  30 Credits  
   choose 15 credits from the following course :  
   451142(3), 451221(3), 451222(3), 451223(3), 451231(3), 451253(3), 451322(3),  
   451323(3), 451324(3), 451325(3), 451326(3), 451341(3), 451342(3), 451343(3),  
   451344(3), 451354(3), 451399(3), 451411(1), 451421(3), 451425(3), 451431(3),  
   451432(3), 451433(3), 451441(3), 451442(3), 451443(3), 451455(3), 451496(3)  
   choose 15 credits from other departments  

FREE ELECTIVES  6 Credits
BACHELOR OF ARTS
(History)

Total Minimum Requirements  139  Credits

GENERAL EDUCATION  38  Credits

1. Science and Mathematics  3  Credits
   999211(3) or 999213(3)

2. Social Sciences  6  Credits
   454111(3), 999141(3) or 999041(3)

3. Humanities  6  Credits
   352212(3), 999033(3)

4. Language  21  Credits
   355xxx(9), 999021(3), xxxxxx(9)

5. Physical Education Activities  2  Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS  95  Credits

1. Major Requirements  50  Credits
   351214(3), 452111(3), 452112(3), 452113(2), 452221(3), 452231(3), 452232(3),
      452241(3), 452251(3), 452261(3), 452321(3), 452333(3), 452421(3), 452452(3),
      452491(3), 452497(1), 452498(2), 455231(3)

2. Major Electives  45  Credits
   - choose any courses  30  credits from the following courses :
     452114(3), 452115(3), 452116(3), 452211(3), 452213(3), 452214(3), 452222(3),
     452223(3), 452224(3), 452252(3), 452271(3), 452272(3), 452311(3), 452313(3),
     452324(3), 452325(3), 452331(3), 452332(3), 452334(3), 452335(3), 452341(3),
     452342(3), 452351(3), 452352(3), 452353(3), 452354(3), 452361(3), 452422(3),
     452423(3), 452431(3), 452441(3), 452442(3), 452443(3), 452444(3), 452445(3),
     452451(3), 452461(3), 452462(3)
   - choose  15  credits from other departments

FREE ELECTIVES  6  Credits
BACHELOR OF ARTS
(Political Science)

Total Minimum Requirements 137 Credits

GENERAL EDUCATION 32 Credits

1. Science and Mathematics 9 Credits
   424101(3), 999211(3)
   and choose 3 credits from the followings
   999012(3), 999213(3)

2. Language 12 Credits
   355xxx(9), 999021(3)

3. Social Sciences 6 Credits
   108111(3), 999141(3)

4. Humanities 3 Credits
   choose 3 credits from the followings
   387102(3), 999031(3), 999032(3), 999033(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 99 Credits

1. Core Course 24 Credits
   453111(3), 454111(3), 454211(3), 454212(3), 455231(3), 456251(3), 457241(3), 458221(3)

2. Major Requirements 39 Credits
   choose one major from the followings below:

   Government
   454213(3), 454311(3), 454312(3), 454313(3), 454314(3), 454315(3), 454316(3),
   454411(3), 454412(3), 454491(3), 454497(1), 454498(2), 455233(3), 457242(3)

   International Relations
   104401(3), 452112(3), 453441(3), 454491(3), 455232(3), 455233(3), 455234(3),
   455331(3), 455334(3), 455337(3), 455431(3), 455435(3), 455497(1), 455498(2)

   Criminal Justice and Security Administration
   456252(3), 456253(3), 456254(3), 456255(3), 456351(3), 456352(3), 456355(3),
   456451(3), 456452(3), 456453(3), 456456(3), 456491(3), 456497(1), 456498(2)
Public Administration
458222(3), 458223(3), 458224(3), 458225(3), 458324(3), 458326(3), 458327(3),
458328(3), 458422(3), 458423(3), 458427(3), 458491(3), 458497(1), 458498(2)

2. Major Electives 36 Credits
- choose any courses 21 credits from the following courses

Politics
454317(3), 454413(3), 454414(3), 454496(3), 455334(3), 458224(3), 458225(3),
460323(3)

International Relations
choose 6 credits from the followings
455332(2), 455333(2), 455335(3), 455336(3), 455338(2), 455434(3),
choose 9 credits from the followings
454311(3), 454313(3), 454314(3), 454315(3), 454316(3)
choose 3 credits from the followings
453222(3), 453242(3), 452451(3), 452461(3)

Criminal Justice and Security Administration
choose 21 credits from the followings
456353(3), 456354(3), 456356(3), 456357(3), 456358(3), 456454(3), 456455(3),
456457(3), 456496(3)

Public Administration
choose 21 credits from the followings
458322(3), 458323(3), 458325(3), 458421(3), 458424(3), 458425(3), 458426(3),
458428(3), 458429(3), 458496(3)

- choose any course from others department 15 Credits

FREE ELECTIVES 6 Credits

BACHELOR OF SCIENCE
(Psychology)

Total Minimum Requirements 136 Credits

GENERAL EDUCATION 32 Credits

1. Science and Mathematics 6 Credits
416401(3), 999211(3)
2. Social Sciences 6 Credits
   108101(3), 999141(3)

3. Humanities 6 Credits
   387121(3), 999031(3)

4. Language 12 Credits
   355xxx(9), 999021(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 98 Credits

1. Core Course 47 Credits
   417111(3), 422111(3), 423251(3), 424111(3), 459111(3), 459222(3), 459224(3), 459225(3), 459226(3), 459227(3) or 459437(3), 459321(3), 459324(3), 459391(3), 459411(3), 459491(3), 459497(1), 459498(1)

2 Major Requirements 24 Credits
   choose one major from the following below:
   Community Psychology
   459231(3), 459233(3), 459333(3), 459431(3), 459432(3), 459434(3), 459435(3), 459439(3)
   Clinical Psychology
   459241(3), 459242(3), 459441(3), 459442(3), 459443(3), 459444(3), 459446(3), 459448(3)
   Developmental Psychology
   459261(3), 459262(3), 459332(3), 459333(3), 459361(3), 459362(3), 459363(3), 459465(3)
   Industrial Psychology
   459271(3), 459272(3), 459471(3), 459473(3), 459474(3), 459475(3), 459476(3), 459477(3)

3. Major Electives 27 Credits
   - choose any courses 18 credits from the following courses :
   Community Psychology
   Clinical Psychology
   Developmental Psychology
**Industrial Psychology**

- choose 9 credits from other Departments except Department of History

**FREE ELECTIVES 6 Credits**

**BACHELOR OF ARTS**
(Sociology and Anthropology)

Total Minimum Requirements 135 Credits

**GENERAL EDUCATION 32 Credits**

1. Science and Mathematics 6 Credits
999213(3)
and choose 1 course from the following courses:
418113(3) or 999211(3)

2. Social Sciences 6 Credits
453111(3), 999041(3)

3. Humanities 6 Credits
371411(3), 999031(3)

4. Language 12 credits
355xxx(9), 999021(3)

5. Physical Education Activities 2 Credits
175xxx(1), 175xxx(1)

**SPECIFIC REQUIREMENTS 97 Credits**

1. Major Requirements 67 Credits
352212(3), 387102(3), 454111(3), 459111(3), 459451(3), 460111(3), 460211(3),
460231(3), 460232(3), 460311(3), 460391(3), 460411(3), 460422(3), 460491(3),
460492(3), 460497(1), 461111(3), 461121(3), 461212(3), 461213(3), 461311(3),
461322(3), 461391(3)

2. Major Electives 30 Credits
- choose 15 credits in Sociology and Anthropology
- choose 15 credits in Sociology and Anthropology/others
choose in Department of Sociology and Anthropology from the following courses:
460312(3), 460313(3), 460321(3), 460322(3), 460323(3), 460324(3), 460325(3),
460331(3), 460332(3), 460421(3), 460431(3), 460441(3), 460442(3), 460443(3),
460444(3), 460445(3), 460446(3), 460447(3), 460448(3), 460498(1-3), 461312(3),
461321(3), 461323(3), 461324(3), 461325(3), 461326(3), 461327(3), 461331(3),
461332(3), 461333(3), 461341(3), 461342(2), 461411(3), 461421(3), 461422(3),
461441(3), 461496(3), 461497(1), 461498(1-3)

FREE ELECTIVES   6 Credits

BACHELOR OF LAWS

Total Minimum Requirements   135   Credits

GENERAL EDUCATION      30    Credits

1. Science and Mathematics   3    Credits
   choose  3    credits from the following courses
   999012(3), 999211(3), 999213(3)

2. Social Sciences     9    Credits
   choose  9    credits from the following courses
   108101(3), 132111(3), 451232(3), 452111(3), 452112(3), 454111(3), 459111(3),
   460111(3), 999141(3)

3. Humanities   4    Credits
   371111(1)
   choose  3    credits from the following courses
   387121(3), 999033(3)

4. Language     12    Credits
   999021(3), 355xxx(9)

5. Physical Education Activities   2    Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS    94    Credits

1. Major Requirements    73    Credits
   453111(3), 453121(3), 453131(2), 453132(3), 453221(3), 453222(4), 453223(3),
   453224(3), 453225(3), 453226(3), 453227(3), 453231(3), 453232(3), 453233(3),
   453321(2), 453322(3), 453341(4), 453342(2), 453343(4), 453344(3), 453351(2),
   453352(3), 453381(4), 453411(2), 453412(2)

2. Major Electives   21    Credits
   choose  one major  15    credits from the following courses from a, b and choose 6
   credits from c
a. Agricultural Natural Resources and Environmental Law
453361(3), 453362(3), 453363(3), 4753364(3), 453461(3), 453462(3), 453463(3), 453464(3), 453465(1), 453466(3),

b. Intellectual and Property Law
453371(3), 453372(3), 453471(4), 453472(3), 453473(3), 453474(3), 453475(3), 453476(3), 453477(3)

c. Electives Law

FREE ELECTIVES  11 Credits
FACULTY OF VETERINARY MEDICINE

GENERAL INFORMATION

The Faculty of Veterinary Medicine implements a Doctor of Veterinary Medicine curricular program, conducts research in various areas of Veterinary Medicine, and renders animal health-care services to the general public through its 10 academic departments and three animal hospitals. Student in this program are required to undergo field-work practice for a minimum of 200 working hours and encouraged to participate in the activities of the animal health-care service for skill development. Moreover, it is compulsory for each student to choose the three animal hospitals of the university as the sites for their field-work practice during the last two years of their curricular program. The present Doctor of Veterinary Medicine program is the result of a major program review and development in line with the prevailing expansion and personnel requirements of the livestock enterprise of the country.

DEGREES OFFERED

UNDERGRADUATE DEGREES

1. DOCTOR OF VETERINARY MEDICINE
2. BACHELOR OF SCIENCE (VETERINARY SCIENCES)

STRUCTURE OF CURRICULA
DOCTOR OF VETERINARY MEDICINE

Total Minimum Requirements    243    Credits

GENERAL EDUCATION      30    Credits

1. Science and Mathematics    9    Credits
   251101(2), 420115(1), 420119(3)
   choose 3 credits from the following below :
   422101(3), 424111(3), 999211(3)

2. Social Sciences     3    Credits
   choose 3 credits from the following below :
   108101(3), 132111(3), 459111(3), 999041(3), 999141(3)

3. Humanities   4   Credits
   371111(1)
   choose 3 credits from the following below :
   999031(3), 999032(3), 999033(3)

4. Language     12    Credits
   355XXX(9)
   choose 3 credits from the following below :
   355224(3), 355233(3), 356111(3), 357111(3), 358111(3), 362114(3), 999021(3)

3. Physical Education    2    Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS    207    Credits

1. Core Course     20    Credits
   015221(3), 403111(4), 403112(1), 403221(4), 403222(1), 416311(3), 43113(3),
   501251(1)

2. Major Requirements    187    Credits
   2.1 Core Course  180    Credits
   2.1.1 Veterinary Anatomy  17    Credits
   501111(2), 501212(3), 501213(4), 501221(2), 501222(3), 501231(3)
   2.1.2 Large Animal and Wildlife Clinical Sciences    23    Credits
   502411(1), 502412(3), 502413(1), 502421(3), 502511(2), 502512(1),
   502513(2), 502514(2), 502531(2), 502681(6)
2.1.3 Veterinary Obstetrics and Gynaecology 24 Credits
503411(2), 503511(2), 503512(2), 503521(2), 503522(2), 503531(2),
503532(2), 503541(2), 503542(2), 503681(6)
2.1.4 Veterinary Pathology 14 Credits
504311(4), 504312(4), 504411(4), 504681(1), 504682(1),
2.1.5 Veterinary Pharmacology 10 Credits
505311(4), 505312(4), 505313(2)
2.1.6 Veterinary Physiology 23 Credits
506211(3), 506212(2), 506221(3), 506222(2), 506313(3), 506314(3),
506331(2), 506341(4), 506497(1)
2.1.7 Companion Animal Clinical Sciences 31 Credits
507411(3), 507412(2), 507413(2), 507414(1), 507415(2), 507416(3),
507417(2), 507418(1), 507511(2), 507512(2), 507513(1), 507681(4),
507682(4), 507683(2)
2.1.8 Veterinary Microbiology and Immunology 13 Credits
508211(1), 508241(3), 508311(4), 508331(3), 508681(1), 508682(1)
2.1.9 Veterinary Parasitology 8 Credits
509211(4), 509321(2), 509331(2)
2.1.10 Veterinary Public Health and Diagnostic Sciences 17 Credits
510411(2), 510421(2), 510422(2), 510511(1), 510531(3), 510532(2),
510541(2), 510431(2), 510521(2), 510522(3), 510541(2), 510681(1)
2.2 Free 7 Credits
2.2.1 choose 2 credits from the following below:
501635(2), 502571(2), 502572(2), 503571(2), 504511(2), 505514(2),
506232(1), 506414(2), 506642(2), 507521(2)
2.2.2 choose 2 credits from the following below:
501698(2), 502698(2), 503698(2), 504698(2), 505698(2), 506698(2),
507798(2), 508698(2), 509698(2), 509698(2), 510698(2)
2.2.3 choose 3 credits from the following below:
502685(3), 503685(3), 507685(3), 510685(3)

FREE ELECTIVES 6 Credits

TRAINING 200 Hrs.
# BACHELOR OF SCIENCE (VETERINARY SCIENCES)

Total Minimum Requirements 141 Credits

## GENERAL EDUCATION 39 Credits

1. Science and Mathematics 15 Credits
   - 403112(4), 403113(4), 420119(4), 422111(3)

2. Social Sciences 7 Credits
   - 102181(3), 371111(1)
   - choose 3 credits from the following below:
     - 453111(3), 454111(3), 459111(3), 460111(3)

3. Humanities 6 Credits
   - 387102(3)
   - choose 3 credits from the following below:
     - 361111(3), 361222(2), 376111(3), 387101(3)

4. Language 9 Credits
   - 355XXX(9)

3. Physical Education 2 Credits
   - 175xxx(1), 175xxx(1)

## SPECIFIC REQUIREMENTS 96 Credits

1. Core Course 21 Credits
   - 403221(5), 416311(3), 423113(3), 423311(5), 424111(3), 424112(2)

2. Major Requirements 75 Credits
   2.1 Core Course 59 Credits
      - 002111(3), 251101(2), 501311(5), 501312(5), 501321(3), 501331(4),
        503321(3), 504421(3), 504422(2), 504424(4), 504431(4), 506221(5),
        506311(5), 506312(4), 506322(3), 506331(2)

   2.2 Free 16 Credits
      - choose 16 credits from the following below:
        - 501513(2), 502511(2), 502521(3), 502522(4), 502531(3), 502532(2), 502533(3),
          502541(3), 502612(4), 502613(4), 502623(3), 502651(3), 502652(2), 502653(2),
          502661(2), 502662(2), 503511(3), 503512(2), 503513(2), 503614(3), 503415(2),
503671(2), 503672(2), 504411(4), 504412(4), 504423(3), 504432(4), 504513(4), 504625(2), 504697(1), 505411(2), 505412(2), 505413(2), 505514(2), 506331(1), 506413(4), 507511(2), 507531(2), 507621(3), 507622(2), 507623(4)

FREE ELECTIVE S  6 Credits

TRAINING       150 Hrs.
FACULTY OF ARCHITECTURE

GENERAL INFORMATION

The five-year Architecture program deals with proper principles and justification of designing, resource selection, and technology development in architectural works with due observation of the professional code of conduct; architecture at various levels of complexity; and architectural project management.

DEGREE OFFERED

UNDERGRADUATE DEGREES

BACHELOR OF ARCHITECTURE
BACHELOR OF LANDSCAPE ARCHITECTURE

STRUCTURE OF THE CURRICULA

BACHELOR OF ARCHITECTURE

Total minimum Requirements 171 Credits

GENERAL EDUCATION 30 Credits
1. Science and Mathematics 5 Credits
   417152(2)
   and choose 3 credits from the following courses:
   999011(3), 999012(3), 999211(3), 999212(3), 999213(3)

2. Language 12 Credits
   355xxx(9), 999021(3)

3. Humanities 6 Credits
   452211(3)
   and choose 3 credits from Interdisciplinary course for General Education in Humanities
   999031(3), 999032(3), 999033(3)

4. Social Sciences 5 Credits
   choose 3 credits from Interdisciplinary course for General Education in Social Sciences
   999041(3), 999141(3)
   and choose 2-3 credits from the following courses:
   102181(3), 132111(3), 351211(3), 451122(2), 451322(2), 451323(2), 453111(3),
   459111(3)

5. Physical Education 2 Credits
   175xxx(1), 175xxx(1)

**SPECIFIC REQUIREMENTS 135 Credits**

1. Core Course 53 Credits
   240111(2), 240112(2), 240113(4), 240114(4), 240115(2), 240116(2), 240121(3),
   240122(3), 240131(2), 240211(2), 240213(4), 240214(4), 240217(2), 240218(2),
   240221(3), 240311(2), 240313(4), 240314(4), 240317(2),

2. Major Requirements 76 Credits
   240222(3), 240231(2), 240232(2), 240241(2), 240261(2), 240243(3), 240244(3),
   240271(2), 240319(2), 240321(3), 240322(3), 240331(2), 240332(3), 240341(2), 240361(2),
   240371(2), 240413(4), 240414(4), 240421(3), 240422(3), 240441(2), 240451(3),
   240461(3), 240462(3), 240561(2), 240591(3), 240597(2), 240599(9)

3. Major Electives 6 Credits
   choose 6 credits from the following courses:
   217452(3), 217453(2), 240491(2), 240496(1-3), 240498(1-3), 240511(3),
   240542(2), 240543(2), 240581(2), 241361(3), 241415(2), 241443(3), 246513(3),
   246531(3), 246591(1), 247511(3), 247531(3)

**FREE ELECTIVES 6 Credits**

**TRAINING 320 Hrs.**
BACHELOR OF LANDSCAPE ARCHITECTURE

Total Minimum Requirements 169 Credits

GENERAL EDUCATION 33 Credits

1. Science and Mathematics 7 Credits
   015271(2), 417152(2), 999213(3)

2. Language 12 Credits
   355xxx(9), 999021(3)

3. Social Sciences 9 Credits
   choose 3 credits from Interdisciplinary Course for General Education in Social Sciences
   451141(3), 452211(3), 999141(3)

4. Humanities 3 Credits
   999032(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 130 Credits

1. Core Course 25 Credits
   240111(2), 240112(2), 240114(4), 240115(2), 240116(2), 240121(3),
   240213(4), 240217(2)

2. Major Requirements 96 Credits
   007438(3), 240243(3), 240271(2), 240261(2), 240441(2), 241211(4), 241212(1),
   241231(3), 241232(3), 241241(3), 241311(4), 241312(4), 241313(1), 241314(1),
   241331(3), 241332(3), 241361(3), 241362(3), 241363(3), 241371(2), 241411(4),
   241412(4), 241413(1), 241414(1), 241415(2), 241441(2), 241451(2), 241452(2),
   241461(1), 241462(3), 241471(3), 241597(1), 241598(3), 241599(9), 302111(2),
   401114(3)

3. Major Electives 9 Credits
   Choose 9 credits from any courses below:
   005402(3), 210425(3), 240341(2), 241315(3), 241416(3), 241442(2), 241443(3),
   241444(2), 241463(3), 241464(3), 241496(1-3), 241498(1-3), 302221(2),
   304431(3), 306423(2), 308311(2), 308424(3), 401442(3), 451241(3)

FREE ELECTIVES 6 Credits

TRAINING 200 Hrs.
GENERAL INFORMATION

The Faculty of Agro-Industry consists of five departments; namely: Biotechnology, Food Science and Technology, Packaging Technology, Product Development, and Textile Science.

DEGREE OFFERED

UNGRADUATE DEGREES

1. BACHELOR OF SCIENCE (Biotechnology)
2. BACHELOR OF SCIENCE (Food Science and Technology)
3. BACHELOR OF SCIENCE (Food Engineering)
4. BACHELOR OF SCIENCE (Packaging Technology)
5. BACHELOR OF SCIENCE (Agro-Industrial Product Development)
6. BACHELOR OF SCIENCE (Textiles Technology)
7. BACHELOR OF SCIENCE (Physico-Chemical Processing Technology)

STRUCTURE OF THE CURRICULA
BACHELOR OF SCIENCE  
(Biotechnology)  
Total Minimum Requirements 144 Credits

GENERAL EDUCATION  31  Credits

1. Science and Mathematics 8 Credits
   054111(2), 208111(3), 999211(3)

2. Social Sciences 6 Credits
   999141(3)
   and choose 3 credits from the following courses below:
   102181(3), 132111(3), 459111(1)

3. Humanities 3 Credits
   999033(3)

4. Language 12 Credits
   355xxx(9), 999021(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS  107  Credits

1. Core Course 42 Credits
   051231(3), 402311(2), 402312(1), 403111(4), 403112(1), 403221(4), 403222(1),
   417111(3), 417112(3), 417241(3), 419211(3), 419214(1), 420117(3), 420118(3),
   422111(3), 424111(3), 424112(1)

2. Major Requirements 59 Credits
   051211(4), 051232(3), 051321(3), 051322(4), 051333(3), 051334(4), 051312(4),
   051361(4), 051423(3), 051431(3), 051471(3), 051497(1), 051499(3), 205201(3),
   402313(3), 403241(5), 417242(3), 422312(3) or 422481(3)

3. Major Electives 6 Credits
   Choose 6 credits from the following courses below:
   051462(3), 051463(3), 051464(3), 051481(3), 051483(3), 051484(3), 051487(3),
   051489(3), 051496(1-3), 056428(3), 056482(3), 056485(3)
FREE ELECTIVES   6   Credits

TRAINING             300   Hrs.

BACHELOR OF SCIENCE  
(Food Science and Technology)

Total Minimum Requirements   137   Credits

GENERAL EDUCATION   32   Credits

1. Science and Mathematics   3   Credits
   999211(3)

2. Social Sciences   9   Credits
   102181(3) or 132111(3), 134111(3), 999141(3)

3. Humanities   6   Credits
   459271(3), 999033(3)

4. Language   12   Credits
   355xxx(9), 999021(3)

5. Physical Education Activities   2   Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS   99   Credits

1. Core Course   50   Credits
   051231(3), 054111(2), 402311(2), 402312(1), 402313(3), 403111(4), 403112(1),
   403221(4), 403222(1), 403231(2), 403232(2), 403244(4), 417111(3), 417112(3),
   419211(3), 419214(1), 420191(4), 422111(3), 424111(3), 424112(1)

2. Major Requirements   45   Credits
   052221(4), 052312(2), 052322(4), 052323(3), 052324(1), 052331(4)
   052341(2), 052342(2), 052361(3), 052414(2), 052415(2), 052443(2), 052444(2),
   052462(3), 052471(3), 052497(1), 052491(3), 053302(1)

3. Major Electives   4   Credits
   choose from courses in Department of Food Science and Technology
   052424(2), 052425(2), 052426(2), 052427(2), 052428(2), 052429(2), 052432(3),
   052434(3), 052445(2), 052456(1), 052481(2), 052482(2), 052483(3), 052484(2),
   052485(3), 052491(3), 052496(1-3)
FREE ELECTIVES 6 Credits

TRAINING 300 Hrs.

BACHELOR OF SCIENCE
(Food Engineering)

Total Minimum Requirements 141 Credits

GENERAL EDUCATION 32 Credits

1. Science and Mathematics 9 Credits
   418112(3), 418xxx(3) (only 418213-418217), 999012(3)

2. Social Sciences 6 Credits
   102181(3), 999xxx(3)

3. Humanities 3 Credits
   999xxx(3) in Interdisciplinary Course for General Education in Humanities

4. Language 12 Credits
   355xxx(9), 361xxx(3), 999xxx(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 106 Credits

1. Core Course 37 Credits
   402311(2), 402312(1), 403111(5), 403221(4), 403222(1), 417167(4), 417168(3),
   417267(3), 419211(3), 420111(4), 420112(4), 424111(3)

2. Major Requirements 60 Credits
   - Food Science and Technology 31 Credits
     052221(3), 052322(4), 052323(3), 052331(4), 052332(3), 052433(3), 052443(2),
     052444(2), 052471(3), 052497(1), 052499(3)
   - Engineering 29 Credits
     205201(3), 205202(1), 206211(3), 206221(3), 206341(3), 208111(3), 208221(3),
     208222(3), 208281(1), 208241(3), 208341(3)

3. Major Electives 9 Credits
   choose courses in Food Science and Technology 6 Credits and other from
   Faculty of Engineering
FREE ELECTIVES 3 Credits

TRAINING 240 Hrs.

BACHELOR OF SCIENCE
(Package Technology)

Total Minimum Requirements 135 Credits

GENERAL EDUCATION 32 Credits

1. Science and Mathematics 6 Credits
   208111(3), 999211(3)

2. Social Sciences 9 Credits
   102181(3), 134111(3), 999141(3)

3. Humanities 3 Credits
   999033(3)

4. Language 12 Credits
   355xxx(9), 999021(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 97 Credits

1. Core Course 42 Credits
   420119(4), 402311(2), 402312(1), 403111(4), 403112(1), 403221(4), 403222(1),
   403231(2), 403232(2), 403244(4), 417111(3), 417112(3), 419211(3), 419214(1),
   422111(3), 424111(3), 424112(1)

2. Major Requirements 49 Credits
   053111(2), 053211(3), 053224(2), 053321(3), 053322(1), 053323(1), 053331(2),
   053341(2), 053351(3), 053432(2), 053441(3), 053452(3), 053453(1), 053471(3),
   053491(3), 053497(1), 054111(2), 109414(3), 132111(3), 133211(3), 422481(3)

3. Major Electives 6 Credits
   053411(3), 053412(3), 053421(3), 053423(3), 053424(3), 053454(1), 053455(2),
053461(3), 053496(1-3), 053498(1-3)

FREE ELECTIVES  6  Credits

TRAINING  300  Hrs.

BACHELOR OF SCIENCE
(Agro-Industrial Product Development)

Total Minimum Requirements  137  Credits

GENERAL EDUCATION  30  Credits

1. Science and Mathematics  3  Credits
   999011(3), 999012(3), 999211(3), 999212(3), 999213(3)

2. Social Sciences  7  Credits
   108101(3), 371111(1), 999141(3)

3. Humanities  6  Credits
   459111(3), 999033(3)

4. Language  12  Credits
   355xxx(9), 999021(3)

5. Physical Education Activities  2  Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS  101  Credits

1. Major Requirements  92  Credits
   054111(2), 054112(1), 054231(2), 054232(1), 054241(2), 054243(2), 054244(1),
   054251(2), 054321(2), 054322(1), 054323(2), 054341(2), 054342(1), 054343(1),
   054351(2), 054352(1), 054353(2), 054354(1), 054355(3), 054443(2), 054444(1),
   054446(2), 054447(1), 054448(1), 054451(2), 054452(2), 054458(3), 054491(3),
   054497(1), 132111(3), 134111(3), 134211(3), 402311(2), 402312(1), 403112(1),
   403221(4), 403222(1), 403231(2), 403232(2), 417111(3), 417112(3),
   420115(1), 420119(3), 422111(3), 424111(3), 424112(1)

2. Major Electives  9  Credits
   choose 9 credits from the following course below:
   054390(1), 054445(3), 054449(3), 054453(3), 054454(3), 054455(3), 054456(3),
FREE ELECTIVES  6 Credits

TRAINING        200 Hrs.

BACHELOR OF SCIENCE
(Textiles Technology)

Total Minimum Requirements 134 Credits

GENERAL EDUCATION  30 Credits

1. Science and Mathematics  3 Credits
   999211(3)

2. Language  12 Credits
   355xxx(9), 999021(3)

3. Social Science  9 Credits
   102181(3), 132111(3)
   and choose 3 credits from these courses below:
   999041(3), 999141(3)

4. Humanities  4 Credits
   371111(1), 999033(3)

5. Physical Education Activities  2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS  98 Credits

1. Core Courses  41 Credits
   134111(3), 403113(3), 403115(3), 403118(1), 403221(4), 403222(1), 417111(3)
   417112(3), 419211(3), 419214(1), 420117(3), 420118(3), 422111(3), 424111(3)
   424112(1), 459111(3)

2. Major Requirements  40 Credits
   054111(2), 055131(1), 055211(3), 055231(3), 055241(3), 055311(3), 055312(3)
   055324(2), 055331(3), 055333(2), 055343(2), 055424(3), 055461(3), 055462(3)
   055497(1), 055491(3)
3. Major Elective  17 Credits
   Students have to choose at least 17 credits from these courses
   3.1 Technology of Textile
       055321(3), 055411(3), 055421(3), 055422(3), 055423(3), 055425(3),
       055426(3), 055427(3), 055428(3), 055429(3), 0554936(1-3), 055498(1-3)

   3.2 Textile Product Technology
       055242(1), 055342(3), 055332(3), 055351(3), 055381(3), 055382(3), 055431(3),
       055432(3), 055433(3), 055434(3), 055435(2), 055436(3), 055442(3), 055443(2),
       055444(3), 055445(2), 055451(3), 055463(3), 055465(3), 055466(3), 055471(3),
       055496(1-3), 055498(1-3)

FREE ELECTIVES      6 Credits

TRAINING           not less than      300 Hrs.

BACHELOR OF SCIENCE
(Physico-Chemical Processing Technology)

Total Minimum Requirements 138 Credits

GENERAL EDUCATION  30 Credits

1. Science and Mathematics  3 Credits
   999211(3)

2. Language  12 Credits
   355xxx(9), 999021(3)

3. Social Science  10 Credits
   102181(3), 132111(3), 371111(1), 999141(3)

4. Humanities  3 Credits
   999033(3)

5. Physical Education Activities  2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS  103 Credits

1. Core Courses  61 Credits
051231(3), 051232(3), 054111(2), 208111(3), 402311(2), 402312(1), 403111(4), 403112(1), 403221(4), 403222(1), 403231(2), 403232(2), 403244(4), 417111(3), 417112(3), 417241(3), 419211(3), 419214(1), 420113(1), 420114(1), 420117(2), 420118(2), 422111(3), 422311(3) or 422481(3), 424111(3), 424112(1)

2. Major Requirements 33 Credits
056211(2), 056231(4), 056311(3), 056312(3), 056331(3), 056332(3), 056341(2), 056431(3), 056441(3), 056471(3), 056491(3), 056497(1)

3. Major Elective 9 Credits
choose at least 9 credits from these courses

FREE ELECTIVES 6 Credits

TRAINING COURSE not less than 200 Hrs.
FACULTY OF VETERINARY TECHNOLOGY

GENERAL IN FORMATION

Faculty of Veterinary Technology Kasetsart University is an excellent institute for analytical and diagnostic laboratory and veterinary nurse. The Veterinary Technologist is educated to be the biological laboratory technician, radiography technician, surgical assistance, veterinarian’s nurse and other areas requiring knowledge of medicine and animal. Graduates in Veterinary Technology can find employment in many sectors including small and large private animal practice, clinical laboratories, biomedical research, education, research, industry, zoos and wildlife medicine, livestock health management and pharmaceutical sales etc.

DEGREE OFFERED
UNDERGRADUATE DEGREE:
BACHELOR OF SCIENCE (Veterinary Technology)

STRUCTURE OF THE CURRICULA
BACHELOR OF SCIENCE
(Veterinary Technology)

Total Minimum Requirements 148 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 9 Credits
   001311(3), 422111(3), 999211(3)

2. Social Sciences 3 Credits
   999141(3)

3. Humanities 4 Credits
   371111(1), 999033(3)

4. Language 12 Credits
   355xxx(9), 999021(3)

3. Physical Education 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 112 Credits

1. Major Requirements 103 Credits
   002321(3), 002331(3), 015221(3), 251101(2), 403111(4), 403112(1), 403221(4),
   403222(1), 416311(3), 423113(3), 424111(3), 424112(1), 520211(4), 520212(4),
   520221(4), 520222(4), 520311(2), 520321(2), 520331(3), 520341(4), 520342(2),
   520343(2), 520351(3), 520352(3), 520353(2), 520361(3), 520362(2), 520363(3),
   520471(3), 520481(5), 520482(2), 520483(4), 520484(2), 520485(2), 520486(2),
   520488(2), 520489(2), 520497(1)

2. Major Electives 9 Credits
   002411(3), 002412(3), 002413(3), 002414(3), 002415(3), 002416(3), 002417(2),
   002418(2), 002421(3), 424452(3), 520487(3)

FREE ELECTIVES 6 Credits

TRANNING 200 Hrs.
KAMPHAENG SAEN CAMPUS

FACULTY OF AGRICULTURE
KAMPHAENG SAEN

DEGREE OFFERED
UNDERGRADUATE DEGREES

1. BACHELOR OF SCIENCE (Agriculture)
   - Entomology
   - Soil Science
   - Agronomy
   - Plant Pathology
   - Agricultural Extension and Communication
   - Horticulture
2. BACHELOR OF SCIENCE (Animal Science)
3. BACHELOR OF SCIENCE (Agricultural Mechanization)
4. BACHELOR OF SCIENCE (Agricultural Biotechnology)

STRUCTURE OF THE CURRICULA

BACHELOR OF SCIENCE (AGRICULTURE)

Total Minimum Requirements  134  Credits

GENERAL EDUCATION  32 Credits

1. Science and Mathematics  8  Credits
   417116(4), 420119(3), 420115(1)
2. Language  12 Credits
   355xxx(9)
   and choose  3  credits from the following courses :
   355xxx(3), 999021(3)

3. Social Sciences  7 Credits
   108101(3), 371111(1), 999141(3)
   and choose  3  credits from the following courses :
   119111(3), 132111(3)

4. Humanities  3 Credits
   choose  3  credits from for general education in Humanities
   990031(3), 999032(3), 999033(3)

5. Physical Education Activities  2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS  88 Credits

1. Core Courses  53 Credits
   - Sciences  28 Credits
     401114(3), 403111(4), 403112(1), 403221(4), 403222(1), 416311(3), 416312(1),
     419211(3), 419214(1), 422111(3), 424111(3), 424112(1)
   - Agriculture  25 Credits
     036111(1), 036211(3), 036221(3), 036231(2), 036241(3), 036251(3), 036261(3),
     036271(2), 036281(3), 036299(2)

2. Major Requirements  23 Credits
   Entomology  25 Credits
   026311(2), 026312(3), 026411(3), 026461(3), 026471(3), 026482(3), 026491(1),
   026497(1), 026498(3), 026499(3)

   Soil Science  33 Credits
   028421(3), 028433(3), 028442(3), 028451(3), 028463(3), 028471(3), 028497(1),
   028498(3), 028499(3), 401351(3), 403134(3)

   Agronomy  31 Credits
   028421(3), 029111(2), 029212(1), 029216(1), 029417(3), 029421(3), 029513(3),
   029471(3), 029493(3), 029497(1), 029498(3), 029499(3), 402311(2), 402312(1),

   Plant Pathology  23 Credits
   026312(3), 031371(3), 031468(3), 031469(1), 031481(3), 031491(3), 031497(1),
   031498(3), 031499(1)

   Agricultural Extension and Communication  31 Credits
   029211(2), 029212(1), 023312(3), 023324(3), 023352(3), 023353(3), 023466(3),
   023492(3), 023497(1), 023498(3), 032499(3), 037444(3)
Horticulture 30 Credits
034111(2), 037311(3), 037371(3), 037451(3), 037471(3), 037482(3), 037497(1), 037499(3), 401351(3), 402311(2), 402312(1), 422312(3)

3. Major Electives 12 Credits

Entomology 18 Credits
choose 9 credits from the following courses:
and choose in agricultural kamphaengsaen or another related field not less than 9 credits.
036390(1), 036490(6), 119407(3), 134111(3), 402311(2), 402312(1), 422311(3), 422413(3), 422422(3), 422456(3), 721101(3)

Soil Science 12 Credits
choose in soil science not less than 6 credits
and choose in agricultural kamphaengsaen or another related field not less than 6 credits.
029111(2), 029212(1), 036390(1), 037111(3), 417111(3), 422413(3)

Agronomy 14 Credits
choose not less than 14 credits from the following courses:
029418(3), 029419(3), 029423(3), 029431(3), 029432(3), 036390(1), 036490(6)

Plant Pathology 21 Credits
401351(3), 402311(2), 402312(3)
and choose in agricultural kamphaengsaen or another related field not less than 18 credits.

Agricultural Extension and Communication 12 Credits
choose 3 credits from the following courses:
028321(3), 028421(2)
and choose 3 credits from the following courses:
026321(3), 026471(3)
and choose in agricultural kamphaengsaen or another related field not less than 6 credits.
032311(3), 032411(3), 032454(2), 032465(3), 036390(1), 036490(6)

Horticulture 15 Credits
029417(3), 037411(3), 037412(3), 037421(3), 037422(3), 029417(3), 029417(3),
for not apply in Cooperative Education much take 6 credits from below:
037491(3), 037498(3)
for apply in Cooperative Education much take 7 credits from below:
036490(1), 036490(6)

FREE ELECTIVES    6    Credits

BACHELOR OF SCIENCE (AGRICULTURE)  
(Animal Science)

Total Minimum Requirements 140 Credits

GENERAL EDUCATION    31 Credits

1. Science and Mathematics  7   Credits
   733155(1), 733111(3), 9999211(3)

2. Language 12 Credits
   720xxx(9), 999021(3)

3. Social Sciences
   713111(1), 722181(3), 999141(3)

4. Humanities 10 Credits
   choose 3 credits from interdisciplinary course for general education in Humanities
   999031(3), 999032(3), 999033(3)

5. Physical Education Activities  2   Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS   103 Credits

1. Core Courses  44 Credits
   - Sciences  32 Credits
     726111(3), 726112 (1), 728111(4), 728112(1), 728221(4), 728222(1), 730311(3),
     730312(1), 731116(4), 732211(3), 732214(1), 734111(3), 737113(3)
   - Agriculture  12 Credits
     015111(1), 015211(3), 015221(3), 015231(2), 015251(3)

2. Major Requirements  36 Credits
   725311(2), 725312(1), 002231(3), 002241(3), 002242(3), 002291(3), 002292(2),
   002311(3), 002312(3), 002313(3), 002314(3), 002321(4), 002322(1), 002323(2),
   002351(3), 002381(3), 002399(2), 002419(3), 002497(1)

3. Major Electives  9   Credits
choose one group from below : 
1. Nutrition and Animal Food Technology 
   003412(3), 002421(3), 002422(3), 002423(3), 002424(3), 002425(3), 002426(3), 002441(3) 
2. Breeding, Physiology an Animal Health 
   002331(3), 002431(3), 002442(3), 002451(3), 002452(3) 
3. Animal Production and other 
4. Animal Dairy Product Technology 
   002461(3), 002462(3), 002463(3), 002464(3), 002465(3), 002466(3) 
5. Research in Animal Science 
   002472(3), 002473(1), 002491(3), 002498(1-3) 
6. Livestock Business 
   130101(3), 130171(3), 119111(3), 119221(3), 119331(3), 119371(3), 131211(3), 131313(3), 134111(3) 
7. Individual Specific 
   choose 9 credits from courses in the university that have been approved by the adviser and head of department. 

FREE ELECTIVES  3  Credits

BACHELOR OF SCIENCE 
(Agricultural Mechanization)

Total Minimum Requirements  142  Credits

GENERAL EDUCATION  31 Credits

1. Science and Mathematics  5  Credits 
   729101(2), 999213(3) 

2. Language  12  Credits 
   702xxx(9), 999021(3) 

3. Social Sciences  9  Credits 
   119407(3), 722181(3), 999141(3) 

4. Humanities  3  Credits 
   999033(3) 

5. Physical Education Activities  2  Credits 
   175xxx(1), 175xxx(1)
SPECIFIC REQUIREMENTS  105  Credits

1. Core Courses  55  Credits
   - Sciences and Statistics  34  Credits
     403341(4), 422413(3), 726111(3), 728111(4), 728112(1), 731111(4), 731112(4),
     733112(4), 734111(3)
   - Agriculture  21  Credits
     011411(3), 015221(3), 015231(2), 015261(3), 015271(2), 015299(2)
     and choose  3  credits from the following courses :
     009321(3), 009471(3), 009463(3)

2. Major Requirements  41  Credits
   005111(2), 005211(3), 005212(3), 005221(3), 005311(2), 005321(3), 005322(3),
   005331(3), 005332(3), 005341(3), 005371(3), 005399(1), 005442(3), 005451(3),
   005491(1), 005498(1), 005499(1)

3. Major Electives  9  Credits
   choose one program from five programs below:
   
   1. Farm Power and Machinery  9  credits
      005423(3), 005424(3)
      and choose  3  credits from courses in Department of Farm Mechanics
   2. Agricultural Land and Water Development  9  credits
      005333(3), 005433(3)
      and choose  3  credits from courses in Department of Farm Mechanics
   3. Agricultural Building and Environment  9  credits
      005443(3), 005424(3)
      and choose  3  credits from courses in Department of Farm Mechanics
   4. Post Harvest Technology  9  credits
      005452(3), 119111(3) or 054101(3)
      and choose  3  credits from courses in Department of Farm Mechanics
   5. Agricultural Computer and Control System  9  credits
      005471(3), 005472(3)
      and choose  3  credits from courses in Department of Farm Mechanics

FREE ELECTIVES  6  Credits

BACHELOR OF SCIENCE
(Agricultural Biotechnology)

Total Minimum Requirements  135  Credits

GENERAL EDUCATION  31  Credits

1. Science and Mathematics  7  Credits
420119(4), 999211(3)

2. Language 12 Credits  
355xxx(9), 999021(3)

3. Social Sciences 6 Credits  
102181(3)  
and choose 3 credits from Interdisciplinary Course for General Education in Social Sciences  
459111(3), 999041(3), 999141(3)

4. Humanities 4 Credits  
371111(1), 999xxx(3)

5. Physical Education Activities 2 Credits  
175xxx(1), 175xxx(1)

**SPECIFIC REQUIREMENTS 98 Credits**

1. Major Requirements 80 Credits  

2. Major Electives 18 Credits  
- Courses Group I : Agricultural Biotechnology basis  
choose 6 credits from the following courses :  
016321(3), 016322(3), 002481(3)

- Courses Group II : core courses in Agricultural Science relavant to Agricultural Bio-technology  
choose 6 credits from the following courses :  

- Courses Group III : Agricultural Bio-technology  
choose 6 credits from the following courses :  
016432(1), 016433(1), 016434(1), 016435(1), 016436(1), 016441(1), 016442(1), 016443(1), 016444(1), 016445(1), 016446(1), 016447(1), 016496(1-3)

**FREE ELECTIVES 6 Credits**
FACULTY OF SPORT SCIENCE

DEGREE OFFERED
UNDERGRADUATE DEGREES

1. BACHELOR OF SCIENCE (Sports Science) (Continuing Program)
2. BACHELOR OF SCIENCE (Sports Science)

STRUCTURE OF THE CURRICULA

BACHELOR OF SCIENCE
(Sports Science) (Continuing Program)

Total Minimum Requirements     75    Credits

GENERAL EDUCATION    9    Credits

1. Science and Mathematics  3    Credits
   999012(3)

2. Language  6    Credits
   355xxx(3), 355252(3)

SPECIFIC REQUIREMENTS     60    Credits

1. Core Courses   12    Credits
   424111(3), 424112(1), 424113(3), 424114(3), 424115(2)

2. Major Requirements     44    Credits
   183112(2), 183222(2), 183232(2), 183281(2), 183331(2), 183332(2), 183341(2),
   183343(2), 183344(2), 183361(2), 183362(2), 183371(2), 183381(2), 183431(2),
   183441(2), 183442(2), 183461(2), 183462(2), 183491(2), 183492(2), 183497(2),
   183498(2)

3. Major Electives   4    Credits
   choose one course from 183141-18147 and from 183241-183249
   183141(2), 183142(2), 183143(2), 183144(2), 183145(2), 183146(2), 183147(2),
   183241(2), 183242(2), 183243(2), 183244(2), 183245(2), 183246(2), 183247(2),
   183248(2), 183249(2)

FREE ELECTIVES    6    Credits
BACHELOR OF SCIENCE
(Sport Science)

Total Minimum Requirements 134 Credits

GENERAL EDUCATION 33 Credits

1. Science and Mathematics 9 Credits
   999012(3), 999211(3), 999213(3)

2. Language 15 Credits
   355xxx(9), 355252(3), 999021(3)

3. Social Sciences 3 Credits
   999141(3)

4. Humanities 4 Credits
   371111(1), 999033(3)

5. Physical Education Activities 2 Credits
   175xxx (1), 175xxx (1)

SPECIFIC REQUIREMENTS 95 Credits

1. Core Course 16 Credits
   424111(3), 424112(1), 183113(3), 183114(3), 183115(2), 183121(2), 183122(2)

2. Major Requirements 59 Credits
   183111(2), 183112(2), 183221(2), 183222(2), 183231(2), 183232(2), 183281(2),
   183331(2), 183332(2), 183341(2), 183342(2), 183343(2), 183344(1), 183351(2),
   183361(2), 183362(2), 183363(2), 183364(2), 183371(2), 183381(2), 183431(2),
   183441(2), 183442(2), 183461(2), 183462(2), 183491(2), 183492(2), 183497(1),
   183498(2)

3. Major Electives 20 Credits
   3.1 Major Course 4 Credits
   choose one course from 183141-18147 and from 183241-183249
   183141(2), 183142(2), 183143(2), 183144(2), 183145(2), 183146(2), 183147(2),
   183241(2), 183242(2), 183243(2), 183244(2), 183245(2), 183246(2), 183247(2),
   183248(2), 183249(2)

   3.2 Minor Course 16 Credits
   choose one field from another 16 Credits

FREE ELECTIVES 6 Credits
DEGREE OFFERED
UNDERGRADUATE DEGREES

1. BACHELOR OF ENGINEERING (Agricultural Engineering)
2. BACHELOR OF ENGINEERING (Irrigation Engineering)
3. BACHELOR OF ENGINEERING (Food Engineering)
4. BACHELOR OF ENGINEERING (Civil Engineering)
5. BACHELOR OF ENGINEERING (Mechanical Engineering)
(from 4-5 see structure of the curriculum in Faculty of Engineering)

STRUCTURE OF THE CURRICULA

BACHELOR OF ENGINEERING
(Agricultural Engineering)

Total Minimum Requirements 150 Credits

GENERAL EDUCATION  31 Credits

1. Science and Mathematics  11 Credits
   204111 (3), 728111 (4), 728112 (1)
   and choose  3  credits from Interdisciplinary Course for General Education in
   Science and Mathematics
   999011(3), 999012(3), 999213(3)

2. Language  12 Credits
   702xxx(9), 999021(3)

3. Social Sciences  3 Credits
   choose  3  credits from Interdisciplinary Course for General Education in Social Sciences
   999041(3), 999141(3)

4. Humanities  3 Credits
   choose  3  credits from Interdisciplinary Course for General Education in Humanities
   999031(3), 999032(3), 999033(3)

5. Physical Education  2 Credits
175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS  113  Credits

1. Core Course    25  Credits
   204112(1), 208111(3), 213211(3), 731167(4), 731168(3), 731267(3), 733111(4),
   733112(4), 733113(1), 733114(1)

2. Major Requirements    79  Credits
   205201(3), 205202(1), 206221(3), 208221(3), 208222(4), 208224(4), 208261(3),
   208281(1), 208342(3), 208361(3), 212211(1), 212311(3), 212312(3), 212313(3),
   212314(3), 212315(3), 212316(3), 212317(3), 212321(3), 212361(3), 212411(3),
   212412(3), 212421(3), 212422(3), 212441(3), 212461(3), 212462(2), 212495(1),
   212479(1), 212449(2), 417268(3)

3. Major Electives    9  Credits
   choose from the following courses :
   212318(3), 212331(3), 212341(3), 212342(3), 212424(3), 212431(3), 212432(3),
   212433(3), 212434(3), 212442(3), 212451(3), 212463(3), 212464(2), 212465(3),
   212471(3), 212496(1), 212498(1)

FREE ELECTIVES    6  Credits

TRAINING    240  Hrs.

BACHELOR OF ENGINEERING
(Food Engineering)

Total Minimum Requirements    150  Credits

GENERAL EDUCATION    31  Credits

1. Science and Mathematics    11  Credits
   204111(3), 728111(4), 728112(1)
   and choose 3 credits from Interdisciplinary course for General Education in
   Science and Mathematics
   999011(3), 999012(3), 999213(3)

2. Language    12  Credits
   702xxx(9), 999021(3)

3. Social Sciences    3  Credits
   choose 3 credits from Interdisciplinary Course for General Education in Social Sciences
   999041(3), 999141(3)

I-155
4. Humanities  3  Credits
choose  3  credits from Interdisciplinary Course for General Education in Humanities
999031(3), 999032(3), 999033(3)

5. Physical Education  2  Credits
175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS   113  Credits

1. Core Course   25  Credits
204112(1), 208111(3), 213211(3), 417167(4), 417168(3), 417267(3), 420111(3),
420112(3), 420113(1), 420114(1)

2. Major Requirements  79  Credits
205201(3), 205202(1), 206221(3), 208221(3), 208222(3), 208241(3), 208261(3),
208281(1), 208342(3), 208361(3), 212211(3), 212311(3), 212312(3), 212313(3),
212314(3), 212315(3), 212316(3), 212317(3), 212321(3), 212361(2), 212411(3),
212412(3), 212421(3), 212422(3), 212441(3), 212461(3), 212462(3), 212495(1),
212497(1), 212499(2), 417268(3)

3. Major Electives   9  Credits
choose from the following courses :
212318(3), 212331(3), 212341(3), 212342(3), 212424(3), 212431(3), 212432(3),
212433(3), 213434(3), 212442(3), 212451(3), 212463(3), 212464(2), 212465(3),
212471(3), 212496(1-3), 212498(1-3)

FREE ELECTIVES   6  Credits

TRAINING   240  Hrs.

BACHELOR OF ENGINEERING
(Irrigation Engineering)

Total Minimum Requirements  139  Credits

GENERAL EDUCATION  31  Credits

1. Science and Mathematics   11  Credits
204111(3), 403111(4), 403112(1)
and choose   3  credits from Interdisciplinary Course for General Education in
Science and Mathematics
999011(3), 999012(3), 999213(3)

2. Language   12  Credits
355xxx(9), 999021(3)

3. Social Sciences   3  Credits
choose  3  credits from Interdisciplinary Course for General Education in Social Sciences
  999041(3), 999141(3)

4. Humanities  3  Credits
choose  3  credits from Interdisciplinary Course for General Education in Humanities
  999031(3), 999032(3), 999033(3)

5. Physical Education  2  Credits
  175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS     102  Credits

1. Core Course     25  Credits
  204112(1), 208111(3), 213211(3), 417167(4), 417168(3), 417267(3), 420111(3),
  420112(3), 420113(1), 420114(1)

2. Major Requirements    74  Credits
  203211(3), 203212(1), 203221(3), 203222(3), 203322(3), 203331(3), 203341(2),
  203352(3), 203353(1), 207211(3), 207251(3), 207311(3), 207312(3), 207313(3),
  207321(3), 207341(3), 207351(3), 207391(1), 207421(3), 207422(3), 207423(3),
  207431(3), 207441(3), 207491(3), 207497(1), 207499(2), 208221(3), 209211(3),
  209212(1)

3. Major Electives     3  Credits
choose from the following courses :
  003201(3), 015261(3), 201432(3), 201434(3), 203321(3), 203323(3), 203332(2),
  203333(3), 203354(3), 203361(3), 203371(3), 203415(3), 203416(3), 203431(3),
  203451(3), 203456(3), 203471(3), 205201(3), 207342(3), 207496(1-3), 207498(1-3),
  208222(3), 208281(1), 209321(3), 209343(3), 209344(3), 209423(3), 209426(3)

FREE ELECTIVES     6  Credits

TRAINING               240  Hrs.
FACULTY OF EDUCATION KAMPHEANG SAEN

DEGREE OFFERED
UNDERGRADUATE DEGREES

1. BACHELOR OF EDUCATION (Agricultural)
2. BACHELOR OF EDUCATION (Agricultural and Environmental Education)
3. BACHELOR OF SCIENCE (Agricultural and Environmental Education)
4. BACHELOR OF EDUCATION (Mathematics Instruction)
5. BACHELOR OF EDUCATION (Physical Education)
(from 4-5 see structure of the curriculum in Faculty of Education)

STRUCTURE OF THE CURRICULA

BACHELOR OF EDUCATION
(Agricultural and Environmental Education)

Total Minimum Requirements  132  Credits

GENERAL EDUCATION   33  Credits

1. Science and Mathematics   6  Credits
   999213(3)
   and choose   3  credits from the following courses :
   999211(3), 999011(3), 999012(3)

2. Language   12  Credits
   999021(3), 702xxx(9)

3. Social Sciences   6  Credits
   722181(3), 999141(3)

4. Humanities   7  Credits
   713111(1)
   and choose   6  credits from the following courses :
   714102(3), 999031(3), 999032(3), 999033(3)

5. Physical Education   2  Credits
   175xxx(1) 175xxx(1)
SPECIFIC REQUIREMENTS  93  Credits

1. Core Course  26  Credits
   - General Education  17  credits
     151111(2), 151311(2), 151432(1), 151429(5), 161211(2), 166211(2), 171111(3)
   - Science  9  credits
     726111(3), 726112(1), 728111(4), 728112(1)

2. Major Requirements  43  Credits
   - Agricultural and Environmental Education  27  credits
     181111(3), 181261(1), 181321(3), 181331(3), 181351(3), 181361(3), 181421(3),
     181441(3), 181481(3), 181491(3), 181497(1)
   - Agricultural and Environmental Science  16  credits
     009472(3), 015221(3), 015231(2), 015261(3), 015271(2), 726381(3)

3. Major Electives  24  Credits
   - Agricultural and Environmental Science  15  credits
     choose from the following courses:
     003211(2), 003212(2), 003416(3), 003421(3), 003423(3), 003461(3), 004312(3),
     004471(3), 004475(3), 004481(3), 004482(3), 007311(3), 007421(3), 007422(3),
     007431(3), 007433(3), 007434(3), 007435(3), 007441(3), 007442(3), 007443(3),
     008371(3), 008471(3), 008481(3), 008483(3), 009321(3), 009401(3), 009421(3),
     009422(3), 009443(3), 009452(3), 009453(3), 009471(3), 009481(3), 015241(3),
     015281(3), 301111(2), 301201(3), 301401(3), 301481(3), 407322(3), 425101(3),
     425211(3), 425431(3), 425432(3), 425471(3), 726471(3)
   - Environmental Social Science  9  credits
     choose from the following courses:
     001302(3), 001411(3), 001412(3), 119405(3), 181471(3), 181472(3), 181482(2), 181483(2),
     181496(1-3), 181498(1-3), 301482(3), 451122(3), 451222(3), 451322(2),
     453445(3), 459233(3), 459234(3), 460412(3)

FREE ELECTIVES  6  Credits

BACHELOR OF SCIENCE
(Agricultural and Environmental Education)

Total Minimum Requirements  136  Credits

GENERAL EDUCATION  30 Credits

1. Science and Mathematics  3  Credits
   choose 3  credits from the following courses:
   01999012(3), 01999211(3), 01999212(3)
2. Language 12 Credits
01999021(3), or 02701011(3), 02702xxx(9)

3. Social Sciences and Humanities 6 Credits
01999141(3), or 01999042(1), 02722181(3)

4. Humanities 4 Credits
02713111(1)
and choose 6 credits from the following courses:
01999031(3), 01999032(3), 01999033(3), 02714102(3), 02724012(3)

5. Physical Education Activities 2 Credits
01175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 100 Credits

1. Major Requirements 70 Credits
- Sciences 21 Credits
02726111(3), 02726112(1), 02728111(4), 02728112(1), 02728221(4), 02728222(1),
02734111(3)
choose 4 credits from the following courses:
02732211(3) and 02732214(1) or 02733119(3) and 02733115(1)
- Agricultural and Environmental Education 30 Credit
02181111(3), 02181261(1), 02181262(1), 02181322(3), 02181331(3), 02181351(3),
02181361(1), 02181362(1), 02181421(3), 02181441(3), 02181481(2), 02181482(2),
02181491(3), 02181497(1)
Agricultural Sciences and Environmental 19 Credits
02036221(3), 02036231(2), 02036241(3), 02036261(3), 02036271(2), 02036281(3),
02726381(3)

2. Major Electives 30 Credits
- Agriculture Science and Environmental
choose 21 credits from the following courses:
01301111(2), 01301201(3), 01301481(3), 01403455(3), 01403456(3), 01404484(3),
01424482(3), 01425211(3), 01425431(3), 01425432(3), 01425471(3), 02026312(3),
02026471(3), 02026481(3), 02026482(3), 02028321(3), 02028421(3), 02028422(3),
02028443(3), 02028452(3), 02028453(3), 02028471(3), 02028472(3), 02029211(2),
02029212(1), 02029416(3), 02029421(3), 02029423(3), 02031371(3), 02031471(3),
02031481(3), 02031483(3), 02037311(3), 02037431(3), 02037433(3), 02037441(3),
02037442(3)
- Social and Environmental
choose 9 credits from the following courses:
01119405(3), 01301482(3), 01451122(3), 01451222(3), 01453445(3), 01459233(3),
02032411(3), 02032412(3), 02181390(1), 02181471(3), 02181483(2), 02181490(6),
02181496(1-3), 02181498(1-3)

FREE ELECTIVES 6 Credits
FACULTY OF VETERINARY MEDICINE

DEGREE OFFERED
UNDERGRADUATE DEGREES

1. BACHELOR OF VETERINARY MEDICINE
(see structure of the curriculum in Faculty of Veterinary)

FACULTY OF LIBERAL ARTS
AND SCIENCE

DEGREE OFFERED
UNDERGRADUATE DEGREES

1. BACHELOR OF Science (Bioscience)
2. BACHELOR OF Science (Information Technology)
3. BACHELOR OF Science (Computer Science)
4. BACHELOR OF Science (Chemistry)
5. BACHELOR OF Science (General Science)
   (from 3-5 see structure of the curriculum in Faculty of Science)
6. BACHELOR OF Arts (English)
   (from 6 see structure of the curriculum in Faculty of Humanities)

STRUCTURE OF THE CURRICULA

BACHELOR OF SCIENCE
(Biological Science)

Total Minimum Requirements  136  Credits

GENERAL EDUCATION  30  Credits

1. Science and Mathematics  6  Credits
   01418113(3), 01999212(3)

2. Language  12  Credits
   01355xxx(9), 01999021(3)
3. Social Sciences 6 Credits
   01999041(3), 01999141(3)

4. Humanities 4 Credits
   371111(1), 999033(3)

5. Physical Education Activities 2 Credits
   01175xxx(1) 01175xxx(1)

SPECIFIC REQUIREMENTS 100 Credits

1. Core Course 26 Credits
   01403111(4), 01403112(1), 01417111(3), 01417112(3), 01420111(3), 01420112(3),
   01420113(1), 01420114(1), 01422111(3), 01424111(3), 01424112(1)

2. Major Requirements 56 Credits
   01401114(3), 01401351(3), 01402311(2), 01402312(1), 01402313(3), 01403221(4),
   01403222(1), 01403231(2), 01403232(2), 01416311(3), 01416312(1), 01419211(3),
   01419213(2), 01422415(3), 01423113(3), 01423351(3), 01424381(3), 02738311(3),
   02738361(3), 02738472(3), 02738497(1), 02738498(3), 02738499(1)

3. Major Electives 18 Credits
   choose from the following courses :
   - Botany
     01401341(3), 01401442(3), 01401462(3),
   - Biochemistry
     01402441(3), 01402451(3), 01402461(3)
   - Genetics
     01416456(3)
   - Microbiology
     01419341(3), 01419371(3), 01419424(3), 01419427(3), 01419434(3), 01419436(4),
     01419438(3), 01419462(3)
   - Zoology
     01423352(1), 01423421(3), 01423431(3), 01423441(4), 01423451(3),
     01423454(3), 01423481(3)
   - Biology
     01424482(3)
   - Biotechnology in Agricultural
     02016321(3), 02016322(3)

FREE ELECTIVES 6 Credits
BACHELOR OF SCIENCE
(Information Technology)

Total Minimum Requirements 136 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 6 Credits
   01418113(3), 01999212(3)

2. Language 12 Credits
   01355xxx(9), 01999021(3)

3. Social Sciences 6 Credits
   01999041(3), 01999141(3)

4. Humanities 4 Credits
   371111(1), 999033(3)

5. Physical Education Activities 2 Credits
   01175xxx(1) 01175xxx(1)

SPECIFIC REQUIREMENTS 100 Credits

1. Core Course 26 Credits
   01403111(4), 01403112(1), 01417111(3), 01417112(3), 01420111(3), 01420112(3),
   01420113(1), 01420114(1), 01422111(3), 01424111(3), 01424112(1)

2. Major Requirements 56 Credits
   01401114(3), 01401351(3), 01402311(2), 01402312(1), 01402313(3), 01403221(4),
   01403222(1), 01403231(2), 01403232(2), 01416311(3), 01416312(1), 01419211(3),
   01419213(2), 01422415(3), 01423351(3), 01423424(3), 01423431(3), 01423441(4),
   01423451(3), 02738311(3), 02738361(3), 02738472(3), 02738497(1), 02738498(3), 02738499(1)

3. Major Electives 18 Credits
   choose from the following courses:
   - Botany
     01401341(3), 01401442 (3), 01401462(3),
   - Biochemistry
     01402441(3), 01402451(3), 01402461(3)
   - Genetics
     01416456(3)
   - Microbiology
     01419341(3), 01419371(3), 01419424(3), 01419427(3), 01419434(4),
     01419436(4), 01419438(3), 01419462(3)
   - Zoology
     01423352 (1), 01423421(3), 01423431(3), 01423441(4), 01423451(3),
01423454(3), 01423481(3)
- Biology
  01424482(3)
- Biotechnology in Agricultural
  02016321(3), 02016322(3)

FREE ELECTIVES  6  Credits
FACULTY OF MANAGEMENT SCIENCE

DEGREE OFFERED
UNDERGRADUATE DEGREES

1. BACHELOR OF BUSINESS ADMINISTRATION (International Business)
2. BACHELOR OF BUSINESS ADMINISTRATION (Hotel and Tourism Management)
3. BACHELOR OF BUSINESS ADMINISTRATION (Managerial Accounting)
4. BACHELOR OF BUSINESS ADMINISTRATION (Logistics Management)
5. BACHELOR OF BUSINESS ADMINISTRATION (Final)
6. BACHELOR OF BUSINESS ADMINISTRATION (Management)
7. BACHELOR OF BUSINESS ADMINISTRATION (Marketing)
   (from 5-7 see structure of the curriculum in Faculty of Business Administration)
8. BACHELOR OF ARTS (Hotel Studies)
   (see structure curriculum of the in Faculty of Humanities)

STRUCTURE OF THE CURRICULA

BACHELOR OF BUSINESS ADMINISTRATION
(International Business)

Total Minimum Requirements 142 Credits

GENERAL EDUCATION 33 Credits
1. Science and Mathematics  6  Credits  
   767111(3), 800213(3)

2. Language  15  Credits  
   754xxx(6), 754271(3), 800021(3)  
   choose  3  credits from any courses below:  
   754321(3), 754361(3)

3. Social Sciences  6  Credits  
   8000141(3)  
   choose  3  credits from any courses below:  
   751111(3), 751112(3), 751151(3)

4. Humanities  4  Credits  
   752111(1)  
   choose  3  credits from any courses below:  
   752171(3), 800031(3), 800033(3)

5. Physical Education Activities  2  Credits  
   168xxx(1), 168xxx(1)

SPECIFIC REQUIREMENTS  103  Credits

1. Core Course  52  Credits  
   753111(3), 753112(3), 757111(3), 757112(3), 757121(3), 757122(3), 757123(3),  
   757221(3), 757222(3), 757231(3), 757442(3), 758111(3), 759211(3), 760111(3),  
   760241(3), 761111(3), 762491(3), 762497(1)

2. Major Requirements  36  Credits  
   757321(3), 758341(3), 762311(3), 762312(3), 762313(3), 762314(3), 762332(3),  
   762341(3), 762342(3), 762343(3), 762344(3), 762441(3)

3. Major Electives  15  Credits  
   754291(3), 754471(3), 754472(3), 757322(3), 757331(3), 757421(3), 757441(3),  
   757443(3), 757444(3), 762331(3), 762333(3), 762431(3), 762498(3)

FREE ELECTIVES  6  Credits

BACHELOR OF BUSINESS ADMINISTRATION  
(Hotel and Tourism Management)

Total Minimum Requirements  142  Credits

GENERAL EDUCATION  33  Credits

1. Science and Mathematics  6  Credits  
   767111(3), 999213(3)
2. Language 15 Credits
754xxx(6), 754271(3), 999021(3)
choose 3 credits from any courses below:
754321(3), 754361(3)

3. Social Sciences 6 Credits
999141(3)
choose 3 credits from any courses below:
751111(3), 751112(3)

4. Humanities 4 Credits
752111(1)
choose 3 credits from any courses below:
999031(3), 999033(3)

5. Physical Education Activities 2 Credits
768xxx(1), 768xxx(1)

SPECIFIC REQUIREMENTS 103 Credits

1. Core Course 52 Credits
753111(3), 753112(3), 757111(3), 757112(3), 757121(3), 757122(3), 757123(3),
757221(3), 757222(3), 757231(3), 757442(3), 758111(3), 759211(3), 760111(3),
760241(3), 761111(3), 762491(3), 762497(1)

2. Major Requirements 36 Credits
751152(3), 751291(3), 757321(3), 763111(3), 763211(3), 763241(3), 763311(3),
763312(3), 763313(3), 763314(3), 763331(3), 763349(3)

3. Major Electives 15 Credits
754473(3), 754474(3), 757322(3), 757421(3), 757444(3), 757445(3), 758311(3),
762333(3), 763242(3), 763243(3), 763244(3), 763245(3), 763341(3), 763342(3),
763343(3), 763344(3), 763345(3), 763346(3), 763347(3), 763348(3), 763351(3),
763431(3), 763441(3), 763442(3), 763443(3), 763444(3), 763445(3), 763446(3),
763447(3), 763448(3), 763449(3),

FREE ELECTIVES 6 Credits

TRAINING 200 Hrs.
BACHELOR OF BUSINESS ADMINISTRATION
(Managerial Accounting)

Total Minimum Requirements 145 Credits

GENERAL EDUCATION 33 Credits

1. Science and Mathematics 3 Credits
   choose 3 credits from any courses below:
   01999213(3), 03767111(3)

2. Language 18 Credits
   01999021(3), 03754371(3), 03754xxx(6), Language(free)(6)

3. Social Sciences 6 Credits
   choose 6 credits from any courses below:
   01999141(3), 03751111(3), 03751112(3)

4. Humanities 4 Credits
   03752111(3)
   choose 3 credits from any courses below:
   01999033(3), 03752171(3)

5. Physical Education Activities 2 Credits
   03768xxx(1), 03768xxx(1)

SPECIFIC REQUIREMENTS 106 Credits

1. Core Course 52 Credits
   01130111(3), 01130321(3), 03753111(3), 03753112(3), 03757111(3), 03757112(3),
   03757121(3), 03757122(3), 03757123(3), 03757221(3), 03757222(3), 03757231(3),
   03757442(3), 03758111(3), 03759211(3), 03760491(3), 03760497(3), 03761111(3)

2. Major Requirements 39 Credits
   01130112(3), 01130211(3), 01130311(3), 01130312(3), 01130331(3), 03757361(3),
   03758341(3), 03759312(3), 03759425(3), 03760323(3), 03760421(3), 03760498(3)

3. Major Electives 15 Credits
   - In Major Electives 12 Credits from any courses below:
     01130351(3), 01130352(3), 01130361(3), 01130413(3), 01130431(3), 03760221(3),
     03760325(3), 03760441(3), 03762344(3), 03763314(3)
   - Other Major Electives 3 Credits

FREE ELECTIVES 6 Credits

TRAINING 400 Hrs.
BACHELOR OF BUSINESS ADMINISTRATION
(Logistic Management)

Total Minimum Requirements 142 Credits

GENERAL EDUCATION 33 Credits

1. Science and Mathematics 3 Credits
   choose 3 credits from any courses below:
   01999211(3), 01999213(3), 03757123(3)

2. Language 15 Credits
   01999021(3), 03754xxx(6), 03754271(3)
   choose 9 credits from any courses below:
   03754291(3), 03754321(3), 03754361(3), 03754416(3), 03754471(3), 03754472(3)

3. Social Sciences 6 Credits
   choose 3 credits from any courses below:
   01999141(3), 03751111(3), 03751112(3), 03751161(3)

4. Humanities 4 Credits
   03752111(1)
   choose 3 credits from any courses below:
   01999033(3), 03752171(3)

5. Physical Education Activities 2 Credits
   03768xxx(1), 03768xxx(1)

SPECIFIC REQUIREMENTS 103 Credits

1. Core Course 49 Credits
   03753111(3), 03753112(3), 03757111(3), 03757112(3), 03757121(3), 03757122(3),
   03757221(3), 03757222(3), 03757231(3), 03757442(3), 03758111(3), 03759211(3),
   03760111(3), 03760241(3), 03761111(3), 03764491(3), 03764497(1)

2. Major Requirements 39 Credits
   01133318(3), 01133425(3), 03757321(3), 03762321(3), 03762341(3), 03762342(3),
   03762421(3), 03764321(3), 03764322(3), 03764331(3), 03764341(3), 03764441(3),
   03764498(3)

3. Major Electives 15 Credits
   01133317(3), 03757322(3), 03757331(3), 03757332(3), 03757348(3), 03757421(3),
   03757441(3), 03757443(3), 03757444(3), 03757445(3), 03758341(3), 03758214(3),
   03762311(3), 03762312(3), 03762313(3), 03762314(3), 03762313(3), 03762332(3),
   03762333(3), 03762343(3), 03762344(3), 03762390(3), 03762422(3), 03762431(3),
   03762432(3), 03762433(3), 03762434(3), 03762435(3), 03762436(3), 03764421(3),
   03764490(3)

FREE ELECTIVES 6 Credits
FACULTY OF RESOURCES AND ENVIRONMENT

DEGREE OFFERED
UNDERGRADUATE DEGREES

1. BACHELOR OF SCIENCE (Computer Science)
2. BACHELOR OF SCIENCE (Environmental Science)
(from 1-2 see structure of the curriculum in Faculty of Science)

FACULTY OF SRI RACHA ENGINEERING

DEGREE OFFERED
UNDERGRADUATE DEGREES

1. BACHELOR OF ENGINEERING (Naval Architecture and Marine Engineering)
2. BACHELOR OF ENGINEERING (Nautical Science)
3. BACHELOR OF ENGINEERING (Computer Engineering)
4. BACHELOR OF ENGINEERING (Electrical Engineering)
5. BACHELOR OF ENGINEERING (Industrial Engineering)
6. BACHELOR OF ENGINEERING (Mechanical Engineering)
(from 3-6 see structure of the curriculum in Faculty of Engineering)
7. BACHELOR OF SCIENCE (Computer Science)
8. BACHELOR OF SCIENCE (Environmental Science)
(from 7-6 see structure of the curriculum in Faculty of Science)

STRUCTURE OF THE CURRICULA

BACHELOR OF ENGINEERING
(� Naval Architecture and Marine Engineering)

Total Minimum Requirements 150 Credits

GENERAL EDUCATION 31 Credits

1. Science and Mathematics 11 Credits
   789111(3), 770111(4), 770112(1)

I-170
and choose 3 credits from Interdisciplinary Course for General Education in Science and Mathematics
   999012(3), 999213(3)

2. Language 12 Credits
   754xxx(9), 999021(3)

3. Social Sciences 3 Credits
   choose 3 credits from Interdisciplinary Course for General Education in Social Sciences
   999041(3), 999141(3)

4. Humanities 3 Credits
   choose 3 credits from Interdisciplinary Course for General Education in Humanities
   999031(3), 999032(3), 999033(3)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 113 Credits

1. Core Course 27 Credits
   790111(3), 790221(3), 771167(4), 771168(3), 771267(3), 771268(3), 772111(3),
   772112(3), 772113(1), 772114(1)

2. Major Requirements 80 Credits
   788311(3), 790222(3), 790241(3), 790261(3), 790281(1), 790321(3), 790341(3),
   790342(3), 790351(3), 790361(3), 792211(3), 791211(3), 791212(3), 791213(3),
   791261(2), 791262(2), 791311(3), 791312(1), 791321(3), 791331(3), 791332(3),
   791341(3), 791342(3), 791381(1), 791421(3), 791422(3), 791461(3), 791481(1)
   791499(3), 771461(3)

3. Major Electives 6 Credits
   Choose 6 credits from any courses below:
   - Ocean Engineering
     791411(3)
   - Structures and Materials
     791423(3), 791425(3)
   - Power and Controls
     791431(3), 791432(3), 791471(3)
   - Hydrodynamics
     791441(3), 791442(3), 791443(3), 791444(3)
   - Ship Industry and Management
     791451(3), 791452(3), 791453(3)
   - Marine Design
     791462(3), 791463(3)
- General Technical Electives
  791496(1-3), 791497(1-3), 791498(1-3)

**FREE ELECTIVES**  6  Credits

**TRAINING**  400  Hrs.

**BACHELOR OF ENGINEERING**
(Nautical Science)

Total Minimum Requirements  157 Credits

**GENERAL EDUCATION**  31  Credits

1. Science and Mathematics   11 Credits
   204111(3), 403111(4), 403112(1),
   and choose  3 credits from Interdisciplinary Course for General Education in
   Science and Mathematics
   999012(3), 999213(3)

2. Language   12 Credits
   999021(3)
   and choose  9 credits for English
   355xxx(9)

3. Social Sciences   3 Credits
   choose  3 credits from Interdisciplinary Course for General Education in Social
   Sciences
   999041(3), 999141(3)

4. Humanities   3 Credits
   choose  3 credits from Interdisciplinary Course for General Education in
   Humanities
   999031(3), 999032(3), 999033(3)

5. Physical Education Activities   2 Credits
   175xxx(1), 175xxx(1)

**SPECIFIC REQUIREMENTS**  102  Credits

1. Major Requirements   96 Credits
   417111(3), 417112(3), 417241(3), 420111(3), 420112(3), 420113(1), 420114(1),
   03501211(3), 03501212(3), 03501213(3), 03501311(3), 03501312(1), 03521111(3),
   03521112(3), 03521113(3), 03521151(3), 03521241(3), 03521242(3), 03521251(3),

I-172
03521252(3), 03521253(2), 03525254(2), 03521261(2), 03521271(3), 03521321(3), 03521351(3), 03521352(3), 03521353(2), 03521354(2), 03521361(2), 03521362(1), 03521371(3), 03521372(3), 03521373(2), 03521374(2), 03521471(2)

2. Major Electives 6 Credits
choose 3 credits from the following courses:
03521441(3), 03521442(3), 03521443(3), 03521444(3), 03521472(3), 03521497(1), 03521498(1)

FREE ELECTIVES 6 Credits

TRAINING not less than 18 Credits
03521499(9,9)

and special program practicum during University vocation each semester.
FACULTY OF NATURAL RESOURCES AND AGRO-INDUSTRY

DEGREE OFFERED
UNDERGRADUATE DEGREES

1. BACHELOR OF SCIENCE (Agro-Bioresource)
2. BACHELOR OF SCIENCE (Food Technology)

STRUCTURE OF THE CURRICULA

BACHELOR OF SCIENCE
(Agro-Bioresource)

Total Minimum Requirements  135  Credits

GENERAL EDUCATION  32  Credits

1. Science and Mathematics  6  Credits
   04804111(3)
   and choose 3 credits from the following courses:
   01999011(3), 01999211(3)
2. Language 12 Credits
   04841xxx(9), 01999021(3)

3. Social Sciences 9 Credits
   04828201(3), 04832151(3), 01999141(3)

4. Humanities 3 Credits
   choose 3 credits from the following courses:
   01999031(3), 01999032(3), 01999033(3)

5. Physical Education Activities 2 Credits
   04837111(2)

SPECIFIC REQUIREMENTS 91 Credits

1. Core Course 33 Credits
   04804121(3), 04804122(3), 04804221(3), 04804222(1), 04821111(3),
   04821112(1), 04821221(1), 04821222(3), 04821251(1), 04821252(1),
   04824141(4), 04824171(3), 04825111(3), 04825112(1)

2. Major Requirements 49 Credits
   04804223(3), 04804281(3), 04804331(3), 04804341(3), 04804342(3),
   04804361(3), 04804362(1), 04804363(3), 04804364(1), 04804371(3),
   04804372(1), 04804381(3), 04804411(3), 04804451(3), 04804461(3),
   04804491(3), 04804497(1), 04804498(3), 04846311(3)

3. Major Electives 9 Credits
   04804421(3), 04804422(3), 04804462(3), 04804467(3), 04804481(3),
   04804482(3), 04804496(3), 04824371(3)

FREE ELECTIVES 6 Credits

TRAINING 6 Credits
   04804299(3), 04804399(3)

BACHELOR OF SCIENCE
(Food Technology)

Total Minimum Requirements 138 Credits

GENERAL EDUCATION 32 Credits

1. Science and Mathematics 6 Credits
   04804111(3)
   and choose 3 credits from the following courses:
   01999011(3), 01999211(3), 01999213(3)
2. Language  12  Credits  
01355xxx(9), 01999021(3)

3. Social Sciences  9  Credits  
01999141(3), 04831151(3), 04828211(3)

4. Humanities  3  Credits  
choose 3 credits from the following courses:  
01999031(3), 01999032(3), 01999033(3)

5. Physical Education Activities  2  Credits  
01837111(2)

SPECIFIC REQUIREMENTS  94  Credits

1. Core Course  39  Credits  
01419221(3), 01419222(1), 01422111(3), 04804121(3), 04804122(3),  
04821111(3), 04821112(1), 04821221(3), 04821222(1), 04821231(3),  
04821341(3), 04821251(3), 04821252(1), 04824141(4), 04825111(3),  
04825112(1)

2. Major Requirement  49  Credits  
01052313(2), 01052314(2), 01052322(4), 01052444(2), 01052462(3),  
01052471(3), 04801211(1), 04801221(3), 04801231(3), 04801312(3),  
04801323(3), 04801331(4), 04801341(3), 04801342(3), 04801361(3),  
04801443(3), 04801491(3), 04801497(1)

3. Major Electives  6  Credits  
01051464(3), 01051487(3), 01051489(3), 01051445(2), 01052483(3),  
04801424(3), 04801426(3), 04801428(3), 04801429(3), 04801496(1),  
04801498(1)

FREE ELECTIVES  6  Credits

TRAINING  6  Credits  
04801399(4), 04801499(2)
FACULTY OF SCIENCE AND ENGINEERING

DEGREE OFFERED
UNDERGRADUATE DEGREES

1. BACHELOR OF ENGINEERING (Mechanical and Manufacturing Engineering)
2. BACHELOR OF ENGINEERING (Civil and Environmental Engineering)
3. BACHELOR OF ENGINEERING (Electrical and Computer Engineering)
4. BACHELOR OF SCIENCE (Information Technology)
(from 4 see structure of the curriculum in Faculty of Liberal Arts and Science)

STRUCTURE OF THE CURRICULA

BACHELOR OF ENGINEERING
(Mechanical and Manufacturing Engineering)

Total Minimum Requirements 148 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 10 Credits
   01204111(3), 04821112(1), 04821113(3)
   and choose 3 credits from the following courses:
   01999012(3), 01999213(3)

2. Language 12 Credits
   01355111(noncredit), 01355112(3), 01355113(3), 01355xxx(3), 01999021(3)

3. Social Sciences 3 Credits
   choose 3 credits from the following courses:
   01999041(3), 01999141(3)

4. Humanities 3 Credits
   choose 3 credits from the following courses:
   01999031(3), 01999032(3), 01999033(3)

5. Physical Education Activities 2 Credits
   04837111(2)
SPECIFIC REQUIREMENTS  112  Credits

1. Core Course  24  Credits
   01208111(3), 01417167(4), 01417168(3), 01417267(3), 01420111(3), 01420112(3),
   01420113(1), 01420114(1), 04813282(3)

2. Major Requirement  79  Credits
   01205201(3), 01205202(1), 01205301(4), 01205302(1), 01206221(3), 01206311(3),
   01206321(3), 01206322(3), 01206341(3), 01206441(3), 01208221(3), 01208222(3),
   01208241(3), 01208261(3), 01208321(3), 01208322(3), 01208331(3), 01208332(3),
   01208341(3), 01208342(3), 01208351(3), 01208352(3), 01208371(3), 01208431(3),
   01208321(1), 04813361(4), 04813381(1), 04813481(1), 04813495(1), 04813497(1),
   04813499(1)

3. Major Electives  9  Credits
   choose  9 credits from the following courses in  4 groups:

   1. Automotive
      01208432(3), 01208433(3), 01208434(3), 01208435(3), 01208436(3), 01208437(3),
      01208438(3), 01208496(1), 01208261(1)

   2. Air Conditioning
      01208451(3), 01208452(3), 01208453(3), 01208454(3), 01208455(3), 01208456(3),
      01208457(3), 01208458(3), 04813496(1), 04813498(1)

   3. Energy
      01208441(3), 01208442(3), 01208443(3), 01208444(3), 01208445(3), 01208446(3),
      01208447(3), 04813496(1), 04813498(1)

   4. Design and Manufacturing
      01206351(3), 01206401(1), 01206412(3), 01206431(3), 01206442(3), 01206472(3),
      01208211(3), 01208212(3), 01208311(3), 01208411(3), 01208412(3), 01208422(3),
      01208472(3), 01208473(3), 04813371(1), 04813496(1), 04813498(1)

FREE ELECTIVES  6  Credits

TRAINING  not less than  240  Hrs.
BACHELOR OF ENGINEERING
(Civil and Environmental Engineering)

Total Minimum Requirements 142 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 10 Credits
   01204111(3), 04821112(1), 04821113(3)
   and choose 3 credits from the following Interdisciplinary Course for General Education in Science and Mathematics
   01999011(3), 01999012(3), 01999213(3)

2. Language 12 Credits
   01355111(noncredit), 01355112(3), 01355113(3), 01355xxx(3), 01999021(3)

3. Social Sciences 3 Credits
   choose 3 credits from the following Interdisciplinary Course for General Education in Social Science
   01999041(3), 01999141(3)

4. Humanities 3 Credits
   choose 3 credits from the following Interdisciplinary Course for General Education in Humanities
   01999031(3), 01999032(3), 01999033(3)

5. Physical Education 2 Credits
   04837111(2)

SPECIFIC REQUIREMENTS 106 Credits

1. Core Course 24 Credits
   01208111(3), 01417167(4), 01417168(3), 01417267(3), 01420111(3), 01420112(3), 01420113(1), 01420114 (1), 04813282(3),

2. Major Requirements 73 Credits

3. Major Electives 9 Credits
   choose 9 credits from the following courses:
FREE ELECTIVES  6  Credits

TRAINING  not less than  240  Hrs.

BACHELOR OF ENGINEERING
(Electrical and Computer Engineering)

Total Minimum Requirements  150  Credits

GENERAL EDUCATION  30  Credits

1. Science and Mathematics  10  Credits
   01204111(3), 04821112(1), 40821113(3)
   and choose  3  credits from the following Interdisciplinary Course for General
   Education in Science and Mathematics
   01999012(3), 01999023(3)

2. Language  12  Credits
   01355111(noncredit), 01355112(3), 01355113(3), 01355xxx(3), 01999021(3)

3. Social Sciences  3  Credits
   choose  3  credits from the following Interdisciplinary Course for General Education
   in Social Science
   01999041(3), 01999141(3)

4. Humanities  3  Credits
   choose  3  credits from the following Interdisciplinary Course for General Education
   in Humanities
   01999031(3), 01999032(3), 01999033(3)

5. Physical Education  2  Credits
   04837111(2)

SPECIFIC REQUIREMENTS  114  Credits

1. Core Course  24  Credits
   01208111(3), 01417167(4), 01417168(3), 01417267(3), 01420111(3), 1420112(3),
   01420113(1), 01420114(1), 04813282(3),
2. Major Requirements  69 Credits
01204211(3), 01204212(3), 01204221(3), 01204313(3), 01204325(3),
01204421(3), 01205211(3), 01205212(3), 01205213(1), 01205214(3),
01205215(3), 01205231(3), 01205232(3), 01205251(3), 01205331(3),
01205332(1), 01205335(3), 01205341(3), 01205352(1), 01205361(3),
01205362(3), 01206401(1), 01208201(3), 01208241(3), 04812291(1),
04812495(1), 04812497(1), 04812499(1), 04813281(1)

3. Major Electives  21 Credits
choose  21 credits from the following courses of one group:

1. Power
01205351(3), 01205353(1), 01205354(3), 01205355(3), 01205356(3),
01205451(3), 01205452(3), 01205453(3), 01205454(3), 01205455(1),
01205456(1), 01205457(3), 01205458(3), 01205459(3), 01205482(3),
01205484(3), 01205485(3), 04812496(3), 04812498(1-3)

2. Control and Measurement
01205311(3), 01205312(3), 01205363(1), 01205364(3), 01205412(3),
01205461(3), 01205462(3), 01205463(1), 01205464(3), 01205465(3),
01205466(3), 04812496(3), 04812498(1-3)

3. Communication
01205314(3), 01205315(1), 01205321(3), 01205322(3), 01205323(1),
01205324(3), 01205327(3), 01205328(3), 01205342(3), 01205413(3),
01205414(3), 01205415(3), 01205416(3), 01205421(3), 01205422(3),
01205423(3), 01205424(3), 01205425(3), 01205427(3), 01205428(3),
01205429(3), 01205441(3), 01205442(3), 01205443(1), 01205444(3),
01205445(1), 01205446(3), 01205447(3), 01205483(3), 04812496(3),
04812498(1-3)

4. Electronics
01205319(3), 01205333(1), 01205334(3), 01205337(3), 01205338(3),
01205431(3), 01205432(3), 01205433(3), 01205434(3), 01205435(3),
01205436(3), 01205481(3), 01205486(3), 01205487(1), 04812496(3),
04812498(1-3)

5. Computer
01204321(3), 01204331(3), 01204332(3), 01204341(3), 01204351(3),
01204411(3), 01204432(3), 01204433(3), 01204451(3), 01204471(3),
01204481(3), 01204482(3), 04812496(3), 04812498(1-3)

FREE ELECTIVES  6 Credits

TRAINING not less than  240 Hrs.
FACULTY OF LIBERAL ARTS AND MANAGEMENT SCIENCE

DEGREE OFFERED
UNDERGRADUATE DEGREES

1. BACHELOR OF BUSINESS ADMINISTRATION (Accounting)
2. BACHELOR OF BUSINESS ADMINISTRATION (Management)
3. BACHELOR OF BUSINESS ADMINISTRATION (Marketing)
   (from 1-3 see structure of the curriculum in Faculty of Business Administration)
4. BACHELOR OF BUSINESS ADMINISTRATION (Hotel and Tourism Management)
   (from 4 see structure of the curriculum in Faculty of Management Science)
SUPHAN BURI CAMPUS

DEGREE OFFERED
UNDERGRADUATE DEGREES

1. BACHELOR OF Public Health (Continuing Program)
2. BACHELOR OF BUSINESS ADMINISTRATION (Hotel and tourism Management)
   (from 2 see structure of the curriculum in Faculty of Management Science Si Racha Campus)
3. BACHELOR OF SCIENCE (Physical Therapy)
4. BACHELOR OF SCIENCE (Medical Technology)
5. BACHELOR OF SCIENCE (Radiological Technology)
6. BACHELOR OF SCIENCE (Medical Science)

STRUCTURE OF THE CURRICULA

BACHELOR OF PUBLIC HEALTH
(Continuing Program)

Total Minimum Requirements  77  Credits

GENERAL EDUCATION  17  Credits

1. Science and Mathematics  6  Credits
   001302(3), 999211(3)
2. Social Sciences 3 Credits
   999041(3)

3. Humanities 1 Credits
   371111(1)

4. Language 6 Credits
   355xxx(6)

5. Physical Education 1 Credits
   175xxx(1)

SPECIFIC REQUIREMENTS 57 Credits

1. Professional Basic 14 Credits
   199116(3), 199122(3), 199211(2), 199391(3), 199491(3)

2. Professional 43 Credits
   199251(3), 199262(3), 199311(3), 199331(3), 199361(2), 199362(3), 199364(3),
   199421(3), 199451(3), 199471(3), 199472(3), 199495(5), 199497(1,1)

FREE ELECTIVES 3 Credits

BACHELOR OF SCIENCE
(Physical Therapy)

Total Minimum Requirements 149 Credits

GENERAL EDUCATION 30 Credits

1. Science and Mathematics 3 Credits
   999211(3)

2. Social Sciences 9 Credits
   718261(3), 720111(3), 999141(3)

3. Humanities 4 Credits
   713111(1), 999033(3)

4. Language 12 Credits
   702xxx(9), 999021(3)

5. Physical Education 2 Credits
   175xxx(1), 175xxx(1)
SPECIFIC REQUIREMENTS  98 Credits

1. Basic career  28 Credits
   717212(3), 725311(2), 728111(4), 728112(1), 728221(4), 728222(1), 731111(3),
   733119(4), 734112(3), 726114(3)

2. Career  70 Credits
   901201(3), 901202(3), 901203(3), 901324(3), 902201(3), 902301(2), 905401(1),
   906201(2), 913401(1), 941241(2), 941242(1), 941261(2), 941311(3), 941312(3),
   941313(1), 941314(3), 941315(1), 941321(3), 941322(2), 941323(2), 941324(2),
   941325(3), 941341(2), 941342(2), 941343(2), 941344(2), 941423(3), 941424(2),
   941431(2), 941432(2), 941451(2), 941491(2)

FREE ELECTIVES  6 Credits

TRAINING  15 Credits
   941292(1), 941392(3), 941393(3), 941492(3), 941493(3), 941494(2)

BACHELOR OF SCIENCE
( Medical Technology)

Total Minimum Requirements  149 Credits

GENERAL EDUCATION  30 Credits

1. Science and Mathematics  3 Credits
   999211(3)

2. Social Sciences  6 Credits
   720111(3), 999141(3)

3. Humanities  7 Credits
   713111(1), 714322(3), 999033(3)

4. Language  12 Credits
   702xxx(9), 999021(3)

5. Physical Education  2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS  107 Credits
1. Basic career 39 Credits
   725311(2), 725312(1), 726114(3), 728111(4), 728112(1), 728221(4), 728222(1),
   730311(3), 731111(3), 732211(3), 733119(4), 734112(3), 901201(3), 906201(2),
   907301(2)

2. Career 68 Credits
   904201(3), 904401(2), 904402(2), 904403(1), 904404(3), 907302(3), 942211(1),
   942241(3), 942242(3), 942251(3), 942252(2), 942291(1), 942321(3), 942331(3),
   942332(3), 942333(3), 942334(3), 942341(3), 942342(3), 942343(3), 942344(3),
   942351(2), 942352(3), 942391(2), 942421(2), 942461(2), 942497(1), 942498(2)

FREE ELECTIVES 6 Credits

TRAINING 6 Credits
   942499(6)

BACHELOR OF SCIENCE
(Radiological Technology)

Total Minimum Requirements 141 Credits

GENERAL EDUCATION 33 Credits

1. Science and Mathematics 3 Credits
   999211(3)

2. Social Sciences 6 Credits
   720111(3), 999141(3)

3. Humanities 7 Credits
   713111(1), 714322(3), 999033(3)

4. Language 15 Credits
   702xxx(9), 999021(3)

5. Physical Education 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 92 Credits

1. Basic career 62 Credits
   726114(3), 728111(4), 728112(1), 729112(3), 729113(3), 731111(3), 731112(3),
733119(4), 734112(3), 901201(3), 901202(3), 901301(3), 902201(3), 906203(4),
943221(2), 943222(2), 943223(3), 943321(3), 943322(3), 943323(2), 943341(2),
943351(2)
2. Career  30  Credits
choose  30  credits from one group following below:
 Diagnostic Radiology  Career
 943311(2), 943324(3), 943325(3), 943331(4), 943332(3), 943333(2), 943335(1),
 943361(2), 943421(3), 943422(3), 943497(1), 943498(3)
 Radiation Therapy Career
 943312(2), 943313(3), 943326(3), 943336(2), 943337(3), 943342(2), 943352(3),
 943353(3), 943421(3), 943461(2), 943497(1), 943498(3)
 Nuclear Medicine Career
 725311(2), 728221(4), 728222(1), 943314(2), 943315(3), 943327(2), 943328(2),
 943329(3), 943334(2), 943343(1), 943341(2), 943462(2), 943497(1), 943498(3)

FREE ELECTIVES  6  Credits

TRAINING  10  Credits
 943499(5,5)

BACHELOR OF SCIENCE
(Medical Science)

Total Minimum Requirements  142  Credits

GENERAL EDUCATION  30  Credits

1. Science and Mathematics  3  Credits
   999211(3)

2. Social Sciences  6  Credits
   720111(3), 999141(3)

3. Humanities  7  Credits
   713111(1), 714322(3), 999033(3)

4. Language  12  Credits
   702xxx(9), 999021(3)

5. Physical Education  2  Credits
   175xxx(1), 175xxx(1)
SPECIFIC REQUIREMENTS  106  Credits

1. Core Course  103  Credits
   Basic career  39  Credits
   716112(1), 722301(3), 726111(3), 727114(3), 728113(3), 728115(3), 728118(1),
   728221(4), 728222(1), 731111(3), 731112(3), 733111(4), 733112(4), 734112(3),
   Career  64  Credits
   901211(3), 901221(3), 901321(2), 901322(6), 901323(4), 901324(3), 901341(3),
   901342(3), 903331(3), 903332(3), 904451(4), 904452(3), 905431(4), 905432(3),
   906351(4), 906352(3), 906451(3), 907461(3), 910291(2), 910495(2)

2. Major Requirements  3  Credits
   choose 3 credits from the following courses:
   910499(3), 923411(3)

FREE ELECTIVES  6  Credits
GENERAL INFORMATION

A small and attractive nursing college, BCNNV is a trendsetter in progressive teaching methods. Serving as the Lighthouse Nursing College for the BCN system, the faculty helps its students to develop and improve humanistic life-long learning skills. BCNNV collaborates with, and is affiliated to, Kasetsart University and operates graduate nursing programmes.

DEGREE OFFERED

UNDERGRADUATE DEGREES
1. BACHELOR OF NURSING SCIENCE
2. BACHELOR OF NURSING SCIENCE (Continuing Program)

STRUCTURE OF THE CURRICULA

BACHELOR OF NURSING SCIENCE

Total Minimum Requirements  144  Credits

GENERAL EDUCATION  38  Credits

1. Science and Mathematics  9  Credits
   choose  3  credits from the following courses :
   999011(3), 999012(3), 999211(3), 999212(3), 999213(3)
   choose  6  credits from the following courses :

I-189
2. Language 12 Credits
   355xxx(9), 999021(3)

3. Social Sciences 6 Credits
   choose 3 credits from the following courses:
   999041(3), 999141(3)
   choose 3 credits from the following courses:
   198131(2), 198132(3), 198133(2), 198331(2)

4. Humanities 9 Credits
   choose 3 credits from the following courses:
   999031(3), 999032(3), 999033(3)
   choose 6 credits from the following courses:
   198121(2), 198122(2), 198221(2), 198222(2), 198421(2)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 100 Credits

1. Basic career 27 Credits
   198141(4), 198142(4), 198143(3), 198144(3), 198145(3), 198241(3),
   198242(3), 198342(2), 198441(2)

2. Nursing 73 Credits
   198151(3), 198152(3), 198153(2), 198181(2), 198251(3), 198261(3),
   198262(2), 198263(4), 198264(3), 198266(2), 198271(3), 198272(3),
   198273(3), 198274(2), 198281(3), 198352(2), 198353(2), 198363(3),
   198364(3), 198371(2), 198372(3), 198373(3), 198377(2), 198461(3),
   198481(2), 198482(1), 198484(1), 198491(3), 198497(2)

FREE ELECTIVES 6 Credits

INTERNERSHIP 200 Hrs.

BACHELOR OF NURSING SCIENCE (Continuing Program)

Total Minimum Requirements 74 Credits

GENERAL EDUCATION 23 Credits

1. Science and Mathematics 3 Credits
   198111(2), 198114(1)
2. Language 11 Credits
   198326(2), 198327(3), 198328(3), 198329(3)

3. Social Sciences 5 Credits
   198335(2), 999032(3)

4. Humanities 4 Credits
   198121(2), 198421(2)

5. Physical Education Activities 2 Credits
   175xxx(1), 175xxx(1)

SPECIFIC REQUIREMENTS 51 Credits

1. Basic career 17 Credits
   198143(3), 198145(3), 198243(2), 198341(2), 198342(2), 198349(2),
   198441(2), 198484(1)

2. Nursing 34 Credits
   98274(2), 198351(2), 198352(2), 198353(2), 198361(2), 198365(3),
   198374(2), 198375(2), 198377(2), 198462(2), 198463(3), 198471(2),
   198483(2), 198485(2), 198491(2), 198497(2)

FREE ELECTIVES 6 Credits
IRRIGATION COLLEGE

DEGREE OFFERED
UNDERGRADUATE DEGREES
BACHELOR OF ENGINEERING (Irrigation Engineering)
(See structure of the Curriculum in Faculty of Engineering)
II. COURSE DESCRIPTION

FACULTY OF AGRICULTURE
(006xxx, 011xxx – 015xxx)

HOME ECONOMICS
(006xxx)

006121 Principles of Art and Application 3(2-3)
Theory of art composition and principles. Application on design of visual art.

006141 General Textiles 3(3-0)
Characteristics and general properties of various textile fibers, yarns and fabrics. Dyeing, printing and finishing of textiles. Caring of clothing.

006151 Food Sanitation 3(3-0)
Causative factors of unsafe food. Food borne illness and food toxicity. Principles of food sanitation and safety in food production. Thai food regulations.

006171 Home Resources and Consumption Management 3(3-0)
Process of home resources and consumption management aiming at the utmost outcome of home living. Solutions for environment impacts from those consumption.

006221 Principles of Drawing 3(1-4)
Characteristics of lines, light, shadow and the chiaroscuro of mass. Techniques of human figure, still-life and landscape drawing with pencil, ink and charcoal.

006222 Fundamental of Design 3(1-4)
Pre : 006121
Application of theory of art in 2- and 3-dimensional designs with emphasis on development of beauty and creativity of individual styles. Principles of design in fine art, commercial art and industrial art.

006223 Handicraft 3(1-4)
Pre : 006121
Evolution of folk craft. Materials in handicraft. Production techniques and utilization at household and small industry levels. Field trips.

006224 Interior Decoration I 3(1-4)
Pre : 006121
Selection of building, shelter and furniture. Space and furniture arrangement. Building improvement by interior decoration.

006231 Human and Family Development 4(3-2)
Pre : 459111
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>006241</td>
<td>Fundamental of Textiles</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 403221</td>
<td></td>
</tr>
<tr>
<td>006242</td>
<td>Laboratory in Fundamental of Textiles</td>
<td>1(0-2)</td>
</tr>
<tr>
<td></td>
<td>Pre : 006241</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Laboratory work on identification of fiber, yarn and fabric structure. Identification of textile coloring and finishing.</td>
<td></td>
</tr>
<tr>
<td>006243</td>
<td>Interior Fabrics</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 006141 or 006241</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Types, construction, properties and management of interior fabrics. Field trips.</td>
<td></td>
</tr>
<tr>
<td>006244</td>
<td>Clothing Management</td>
<td>3(2-3)</td>
</tr>
<tr>
<td></td>
<td>Pre : 006244</td>
<td></td>
</tr>
<tr>
<td>006245</td>
<td>Fashion Drawing Techniques</td>
<td>1(0-2)</td>
</tr>
<tr>
<td></td>
<td>Pre : 006244</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Drawing techniques for figure and fashion illustration.</td>
<td></td>
</tr>
<tr>
<td>006246</td>
<td>Principles of Clothing Construction</td>
<td>3(1-4)</td>
</tr>
<tr>
<td></td>
<td>Pre : 006244</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Selection, use and care of sewing equipment. Fabric selection. Pattern drafting and construction of simple blouses and skirts.</td>
<td></td>
</tr>
<tr>
<td>006251</td>
<td>Food Sanitation</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 403221</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Causative factors of unsafe food. Foodborne illness and food toxicity. Principles of food sanitation and safety in food production. Thai food regulations.</td>
<td></td>
</tr>
<tr>
<td>006272</td>
<td>Family Health and Hygiene</td>
<td>3(2-2)</td>
</tr>
<tr>
<td></td>
<td>Pre : 006251</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Functions and importance of body systems toward personal health and personality of family members. First aids, home nursing, mother and child care. Field trips.</td>
<td></td>
</tr>
<tr>
<td>006281</td>
<td>General Human Nutrition</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 403221</td>
<td></td>
</tr>
<tr>
<td>006282</td>
<td>Human Nutrition</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 403221</td>
<td></td>
</tr>
<tr>
<td>006283</td>
<td>Laboratory in Human Nutrition</td>
<td>1(0-2)</td>
</tr>
<tr>
<td></td>
<td>Pre : 006282 or together</td>
<td></td>
</tr>
<tr>
<td>006311</td>
<td>Demonstration Techniques</td>
<td>3(1-4)</td>
</tr>
<tr>
<td></td>
<td>Demonstration principles and techniques. Audio-visual equipment and materials for home economics extension. Field trips.</td>
<td></td>
</tr>
</tbody>
</table>
006321 Flower Arrangement I 3(1-4)  
Pre : 006121  
Selection, preparation and care of cut flowers and leaves. Oriental and Western flower arrangement.

006322 Home Economic Packaging 3(2-2)  
Pre : 006222  
Significance of home economic packaging. Types and properties of packaging materials. Selection and design of packaging for home economic products.

006323 Accessory Crafts 3(1-4)  
Pre : 006222  
Types and properties of materials in accessory crafting. Design and assembly. Care and repair.

006324 Perspective Drawing 3(1-4)  
Pre : 006224  
Principles of three dimensional drawing of objects. Application of perspective presentation in interior and exterior decoration.

006325 Art for Children 3(1-4)  
Pre : 006121  

006326 Ceramic I 3(1-4)  
Pre : 006222  

006327 History of Visual Art 3(3-0)  
Characteristics and significance of visual art. Work of art in past and present times.

006331 Preschool Child Rearing 3(2-2)  
Pre : 006231  
Theories, factors and principles of preschool child rearing for appropriate growth and development.

006332 Activity and Play for Preschool Child 3(2-2)  
Pre : 006231  
Principles and techniques in activity planning. Importance of play. Selection and making toys for preschool child.

006333 Rhythmic Arts and Music for Preschool Child 3(2-2)  
Pre : 006231  
Principles of teaching rhythmic arts and music. Selection of songs and music for movement. Techniques and roles of instructor.

006341 Textile Dyeing 3(2-3)  
Pre : 006141 or 006241  
Types and properties of textile dyes. Dyeing mechanism. Techniques in textile dyeing with synthetic and natural dyes. Field trips.

006342 Textile Quality Testing 3(2-3)  
Pre : 006241  
Principles and standard methods for textile quality testing. Field trips.
006343  Design and Construction of Interior Fabrics  
*Pre : 006243 or 006246*  
Style, design and construction techniques of various interior fabrics. Field trips.

006344  Clothing and Man  
*Pre : 006244*  
Interrelationship between clothing and society, culture and human behavior. Decision process for clothing consumption.

006345  Costume Design I  
*Pre : 006121 and 006245*  
Application of art principles and fashion trends in costume design for various purpose and occasions.

006346  Clothing Construction by Flat Pattern  
*Pre : 006246*  
Flat pattern drafting and construction of complicated garments.

006347  Fabrics Design  
*Pre : 006121*  
Techniques of making design on fabrics. Fabric design for various uses. Field trips.

006348  History of Costume  
Costume of various human races from ancient to present time.

006349  Textile and Clothing Detergency  
*Pre : 006141 or 006241*  

006351  Food Preparation  
*Pre : 006151*  
Cooking techniques and presentation of Thai and European cuisine. Recipe conduction. Field trips.

006352  Principles of Food Service  
Principles, techniques, management and service of food.

006353  Principles of Food Preservation  
*Pre : 006151 and 419201 or 419211*  
Food spoilage and prevention. Principles of food preservation. Applicable techniques for home and small scale food preservation. Problems and solving techniques.

006354  Science of Cookery  
*Pre : 006151 and 402311 or together*  
Experiment procedure on physical and chemical changes in food during post-harvest and cooking. Food quality evaluation.

006355  Beverage Operation  
Beverage classification. Equipment and techniques in beverage operation. Field trips.

006356  Cuisine Management  
*Pre : 006151*  
Management of Thai and international cuisine. Various types of food service. Field trips.
006371 Communication and Family Relations 3(3-0)
Pre : 006231
Significance and pattern of internal family communication. Skill in communication for better family relations.

006381 Family Nutrition 3(2-3)
Pre : 006282
Application of nutrition principles in menu planning for different ages and conditions of family members: pregnant woman, lactating mother, infant, child, adolescent, adult and elderly.

006382 Community Nutrition 3(2-3)
Pre : 006281 or 006282
Nutritional status of population and food situation in different communities. Assessment and improvement of nutritional status. Field trips.

006383 Diet Therapy 3(2-3)
Pre : 006282 and 006351
Application of nutrition principles for therapeutic program concerning anatomy, physiology and metabolism of the patient.

006399 General Practicum 2(0-10)
General practicum in home economics. Field trips.

006421 Flower Arrangement II 3(1-4)
Pre : 006321
Design and arrangement of flowers for various occasions and locations. Management of floral business.

006422 Furniture Design 3(1-4)
Pre : 006222

006423 Handicraft Development 3(1-4)
Pre : 006222 and 006223
Development of materials, style and production process of various handicrafts for business.

006424 Interior Decoration II 3(1-4)
Pre : 006224 and 006324
Plan, symbols and architectural structure. Planning and furnishing in relation to budget, beauty and function.

006425 Building Management 3(2-2)
Pre : 006224

006426 Ceramic II 3(1-4)
Pre : 006326
Various techniques in clay modeling. Molding with plaster cement and clay slip. Techniques in under and over glaze painting. Creation of modern ceramics.

006427 History of Furniture 3(3-0)
Pre : 006224  
Evolution of European and Asian furniture and decoration from past to present.  
Field trips.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>006431</td>
<td>Stories for Young Child</td>
<td>3(2-2)</td>
<td></td>
</tr>
<tr>
<td>Pre : 006231</td>
<td>Types and composition of stories for young children. Techniques in writing and telling stories. Puppet and picture creation. Activation of imagination for cognitive, emotional and social development.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>006432</td>
<td>Teaching Techniques for Preschool Child</td>
<td>3(2-2)</td>
<td></td>
</tr>
<tr>
<td>Pre : 006231</td>
<td>Theories, factors and teaching techniques. Teaching for development of learning experience for preschool child.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>006433</td>
<td>Program Administration for Preschool Child</td>
<td>3(2-2)</td>
<td></td>
</tr>
<tr>
<td>Pre : 006231</td>
<td>Principles, planning and administration for preschool child programs. Analysis of programs, policies and administration.</td>
<td></td>
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</tr>
<tr>
<td>006434</td>
<td>Kindergarten School</td>
<td>3(2-3)</td>
<td></td>
</tr>
<tr>
<td>006435</td>
<td>Program Administration for Infancy</td>
<td>3(2-2)</td>
<td></td>
</tr>
<tr>
<td>Pre : 006231</td>
<td>Program administration for infancy. Theories and characteristics of child development from birth to two years. Family, day care center and community factors affecting development. Observation and practical experience. Field trips.</td>
<td></td>
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</tr>
<tr>
<td>006436</td>
<td>Program Administration for Exceptional Child</td>
<td>3(2-2)</td>
<td></td>
</tr>
<tr>
<td>Pre : 006231</td>
<td>Basic knowledge and understanding of needs, learning characteristics and styles of exceptional child. Roles and responsibility of caregiver in designing an appropriate environment for development and growth of exceptional child. Field trips.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>006437</td>
<td>Program Administration for Youth Activities</td>
<td>3(2-2)</td>
<td></td>
</tr>
<tr>
<td>Pre : 006231</td>
<td>Principles of activity arrangement and experience development for youth. Project writing. Arrangement of various for youth. Field trips.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>006438</td>
<td>Program Administration for the Elderly</td>
<td>3(2-2)</td>
<td></td>
</tr>
<tr>
<td>Pre : 006231</td>
<td>Changing of biological and social factors toward human aging. Preparation for aging period. Program administration for the elderly ’s physical and mental health.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>006441</td>
<td>Textile Fibers</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td>Pre : 006241</td>
<td>Polymer synthesis, fiber spinning, internal structure and chemical properties of various textile fibers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>006442</td>
<td>Consumption Problems in Textiles and Clothing</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td>Pre : 006241 and 006244</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Assessment and analysis of problems related to production, distribution, consumption, expenditure and needs of textile and clothing merchandises. Factors leading to consumer satisfaction of textiles and clothing.

**006443 Native Textiles**
- **Pre:** 006141 or 006241
- Importance of native textiles. Materials, equipment, weaving techniques, motifs, and uses of native textiles in various regions of Thailand. Field trips.

**006444 Clothing for Children**
- **Pre:** 006246
- Selection and planning of clothing to suit physical and psychological development of children at different ages. Construction of children’s clothing.

**006445 Costume Design II**
- **Pre:** 006345 and 006348
- Application of costume from various periods, fashion trends and inspiration in costume design.

**006446 Clothing Construction by Draping**
- **Pre:** 006346
- Size adjustment from standard dress form. Pattern drafting and construction of various garments by draping.

**006447 Hand Woven Fabric Design**
- **Pre:** 006141 or 006241
- Equipment and techniques for hand weaving. Fabric design utilizing hand weaving tools and techniques.

**006448 Clothing for the Elderly and the Handicap**
- **Pre:** 006344
- Appropriate clothing for elderly and handicap. Selection, design and clothing construction.

**006449 Apparel Business**
- **Pre:** 006344

**006451 Institutional Food Management**
- **Pre:** 006151

**006452 School Food Services**
- **Pre:** 006151
- Importance, principles and methods of food service and management in educational institutions relevant to principles of economic, nutrition and hygiene.

**006453 Advanced Food Preservation**
- **Pre:** 006353
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>006454</td>
<td>Bakery</td>
<td>3(1-6)</td>
</tr>
<tr>
<td>006455</td>
<td>International Cuisine</td>
<td>3(1-6)</td>
</tr>
<tr>
<td></td>
<td>Pre: 006151</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Characteristics, preparation techniques, ingredients, equipment and serving of Eastern and Western foods. Field trips.</td>
<td></td>
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<tr>
<td>006456</td>
<td>Thai Dessert Production</td>
<td>3(1-6)</td>
</tr>
<tr>
<td></td>
<td>Pre: 006151</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Types, components, production, packaging and development of Thai dessert for catering and commercial purposes. Field trips.</td>
<td></td>
</tr>
<tr>
<td>006457</td>
<td>Quality Assurance in Food Business and Service Techniques</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 006451</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Standard of kitchen and equipment, quality control of production in food business and service techniques, problem solving, quality assurance and development in food business. Field trips.</td>
<td></td>
</tr>
<tr>
<td>006471</td>
<td>Modern Family and Quality of Life</td>
<td>3(2-2)</td>
</tr>
<tr>
<td></td>
<td>Pre: 006231</td>
<td></td>
</tr>
<tr>
<td>006472</td>
<td>Family Crisis and Guidance</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 006231</td>
<td></td>
</tr>
<tr>
<td>006481</td>
<td>Food and Nutrition Assessment</td>
<td>3(1-4)</td>
</tr>
<tr>
<td></td>
<td>Pre: 006282</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Principles and basic techniques of food analysis instruments. Biochemical and microbiological methods in nutrients determination. Nutritional assessment by biochemical techniques.</td>
<td></td>
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<tr>
<td>006482</td>
<td>Hospital Dietetics Management</td>
<td>3(2-3)</td>
</tr>
<tr>
<td></td>
<td>Pre: 006383</td>
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</tr>
<tr>
<td></td>
<td>The management of dietetic and food service system in hospital.</td>
<td></td>
</tr>
<tr>
<td>006483</td>
<td>Parenteral Nutrition</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 006383 and 402313</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Principles of parenteral nutrition. Calculation of suitable formula for patient receiving parenteral nutrition.</td>
<td></td>
</tr>
<tr>
<td>006496</td>
<td>Selected Topics in home Economics</td>
<td>1-3</td>
</tr>
<tr>
<td></td>
<td>Selected topics in home economics at the bachelor level. Subject will be changed each semester.</td>
<td></td>
</tr>
<tr>
<td>006497</td>
<td>Seminar</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Presentation and discussion of current topics of interest in home economics.</td>
<td></td>
</tr>
</tbody>
</table>
006498 Special Problems 2(0-4)
Study and research in home economics at the bachelor level and complied into writing report.

006499 Specific Practicum 2(0-10)
Pre : 006399
Specific practicum in home economics. Field trips.

PEST MANAGEMENT
(011xxx)

011399 Practice in Pest Management I 2(0-10)
Practice in general pest management techniques including basic agricultural work.

011411 Fundamentals of Pest Management 3(2-3)
Type of plant pests and natural enemies, factors affecting their abundance, regulation and distribution, their economic thresholds techniques in pest management including cultural, mechanical, physical, chemical and environmental control.

011431 Vertebrate Pests of Agricultural Crops 3(2-3)
Pre : 424111
Study of kinds, life cycle, growth, importance of vertebrate and other pests. Characteristic of damage to economic crops and agricultural products.

011432 Natural Enemies of Crop Pests and Management 3(2-3)
Pre : 011411
Biological attributes and ecology of natural enemies of crop pests. Utilization of natural enemies for management of insect pests, plant diseases and weeds.

011433 Plant Protection Laws 2(2-0)
History and importance of laws, legislations concerning plant protection and toxic agricultural products.

011441 Management of Economic Crop Pests 4(3-3)
Strategy in planning and management to control the outbreak of agronomy and horticulture pests important for economic aspects.

011443 Postharvest Pest Management 3(2-3)
Importance of postharvest pests, planning and management to control the outbreaks.

011451 Ecology of Crop Pests 3(2-3)
Agroecosystems, abiotic and biotic factors affecting plants and pests; role of pests in production process, quality and quantity of products; distribution and invasion methods of outbreak; population dynamics and regulatory factors; ecological pest control, damages, distribution and control measures. Field trips.

011452 Forecasting of Pest Outbreak and Crop Loss Assessment 3(2-3)
Pre : 011411
Principles and procedures in pest surveillance; pest monitoring; factors involved and obstacles; crop loss assessment procedures and methods.

011471 Pesticides and Their Applications 4(3-3)
Pre : 403221
Chemical and physical properties of the pesticides. Chemical reaction and their formulation. The application of pesticide in controlling the pests.

011472  **Pesticide Application Technology**  3(2-3)
History and importance of pesticide using, formulation of pesticide. Relationship between droplet size and sprayer nozzle type and mechanism of sprayer: hand operated, engine, electrostatic. Efficiency use of pesticide in order to be safe for human being and environment. Test, use and maintenance of pesticide application equipment.

011491  **Research Methodology in Pest Management**  3(2-3)
Pre : 011411
Scientific equipments and instruments used in pest management research. Research proposal writing, analysis and interpretation of research results and report writing.

011496  **Selected Topics in Pest Management**  1-3
Selected topics in pest management at the bachelor level. Topics are subject to change each semester.

011497  **Seminar**  1
Presentation and discussion on current interesting topics in pest management at the bachelor level.

011498  **Special Problems**  1-3
Study and research in pest management at the bachelor level and compiled into a report.

011499  **Practice in Pest Management II**  2(0-10)
Pre : 011399
Practice for skill in pest management including the application of agropesticides to control and eliminate insects, and plant pathogens.

**AGRICULTURE CHEMISTRY**
(012xxx)

012399  **Practice in Agricultural Chemistry I**  2(0-10)
Practice in agricultural chemicals and usage including basic agricultural work.

012431  **Chemical Analysis in Agriculture**  4(3-3)
Pre : 403231
Principle and application on chromatography, atomic and molecular electrochemical spectroscopy, analysis on structure formula of components by spectroscopy and radiochemistry, with laboratory practice emphasized on agricultural analysis.

012432  **Pesticide Toxicology**  4(3-3)
Pre : 012431
Structure formula and toxicity of pesticides, degradation and decomposition of pesticides under various condition, with methods in quantitative analysis by chromatography.

012481  **Chemical Used in Soil Science**  3(3-0)
Pre : 015261
Chemical, physical and biological properties and the reaction in soil of chemicals used as for plant nutrients.

**012482 Agricultural Chemicals and Their Environmental Impacts** 3(3-0)

Pre : 015261

Movement, distribution and environment impact of chemicals used for soil improvement. Pesticides and other agro-chemicals.

**012491 Research Methodology on Agricultural Chemistry** 3(2-3)

Research method on agricultural chemistry, utilization of scientific equipments in agricultural chemistry. Writing method on research proposal and report, result analysis and result assessment.

**012496 Selected Topics in Agricultural Chemistry** 1-3

Topics will be selected from various fields of agricultural chemistry. These topics may be varied from semester to semester.

**012497 Seminar** 1

Seminar for undergraduate study.

**012498 Special Problems** 2

Undergraduate research submitted as a report.

**012499 Practice in Agricultural Chemistry II** 2(0-10)

Pre : 012399

Specific practicum in pesticide analysis.

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**AGRICULTURAL SCIENCE**

**(015xxx)**

**015211 Agricultural Extension and Technology Transfer** 3(3-0)

Concept, meaning, philosophy and principles of agricultural extension, learning and communication processes for the transfer of technology. Program planning and evaluation for sustainable agricultural extension, comparative extension work, agricultural information and technology. Innovation and adoption for target audience. Media communication for technology transfer.

**015221 Animal Science and Technology** 3(3-0)

Fundamental principles of livestock production. Animal breeding, animal nutrition, physiology, management, hygiene and sanitation, Biotechnology in commercial system.

**015221 Animal Science and Technology** 3(3-0)

Importance of animal production, relationship to other agricultural production sectors, science and technology in animal production, farm management and the environment, primary products and animal products, livestock marketing, future trend of animal production.

**015231 Crop Science and Technology** 2(2-0)

Significance of field crop to global ecosystem, classification and center of origin, production physiology, crop improvement, cultural practices and production ecology, cropping system and management, seed science and technology of economic crops.

**012441 Introduction to Entomology** 3(2-3)

Pre : 424111 or 424113
Anatomy, physiology, biology, ecology and behavior of insects, classification of insects, beneficial and harmful insects and insect pest management, collecting and preserving insects for scientific studies and researches.

015261 Soil Science 3(2-3)
Genesis, survey and classification, physical, chemical and microbiological properties of soil; plant nutrients; fertilizer utilization and soil organic matter management; soil degradation; soil and water conservation; soil information for agricultural and environmental uses.

015271 Horticultural Science and Technology 2(2-0)
Socio-economic and environmental significance of horticulture; science and technology of production, propagation, harvesting, storage, processing; marketing and transport of fruit, flower, vegetable, ornamental, herb, spices and other horticultural crops.

015281 Introductory Plant Pathology 3(2-3)
Pre: 424111 and 424112 or 424112 and 424113
History and importance of plant diseases; plant disease concepts; disease development; etiology, symptomatology, epidemiology, classification, diagnosis; principles of plant disease control; biotechnology in plant pathology.

015299 General Practicum 2(0-10)
Farm practices in agronomy, horticulture, forage crops, pest management, soil and fertilizer; animal husbandry and farm machinery.

015390 Cooperative Education Preparation 1(1-0)

015471 Golf Course and Management 3(3-0)
Construction of golf course, turf selection, mowing techniques, fertilization, irrigation, pest management, equipment, maintenance and management. Field trips.

015472 Insect Pests and Diseases of Economic Crops 3(2-3)
Pattern of insect damage on economic crops. Order to insect pests of economic crops. Insect control and management. Diseases caused by bacteria, fungi, virus and viroid, phytoplasma and nematode.

015490 Co-operative Education 6
On the job training as a temporary employee in order to get experiences from the assignment.

015497 Seminar 1
Presentation and discussion on current interesting topics in the field of agricultural sciences at the bachelor level.

015499 Specific Practicum 3
Specific practicum on the field of agricultural sciences. Field trips required.
## FACULTY AGRO-INDUSTRY
(050XXX - 099XXX)

### BIOTECHNOLOGY (051XXX)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>051211</td>
<td>Biological Materials and their Mechanisms</td>
<td>4(3-3)</td>
</tr>
<tr>
<td></td>
<td>Pre : 402311</td>
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<tr>
<td></td>
<td>Chemical structure and property of biological materials in agriculture that are important for industrial biological process of sugar, starch, cellulose, pectin, gum, rubber, protein, fat and oil, essential oil, plant acid, pigment and bitter substance.</td>
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</tr>
<tr>
<td>051231</td>
<td>Unit Operation in Agro-Industry I</td>
<td>3(2-3)</td>
</tr>
<tr>
<td></td>
<td>Pre : 417112 and 420118 or 420119</td>
<td></td>
</tr>
<tr>
<td>051232</td>
<td>Unit Operation in Agro-Industry II</td>
<td>3(2-3)</td>
</tr>
<tr>
<td></td>
<td>Pre : 051231 and 417241</td>
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<tr>
<td></td>
<td>Principle of steady and unsteady state heat transfer, evaporation methods and equipment, psychometric chart, drying and freezing.</td>
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<tr>
<td>051312</td>
<td>Biophysical System and Activities of Microorganisms</td>
<td>4(3-3)</td>
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<tr>
<td></td>
<td>Pre : 419211 and 419214</td>
<td></td>
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<tr>
<td></td>
<td>Morphology, characteristics and classification of important and growth of industrial microorganism. Composition of cell and genetic material. Enzyme system, function and energy related to bioprocess.</td>
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<tr>
<td>051321</td>
<td>Biotechnology I</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 051211</td>
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<tr>
<td></td>
<td>Physical and chemical processes in biotechnology application, extraction and purification. Process systems in industry, data collection, analysis and evaluation. Flow diagram of industrial processes, including factory visit.</td>
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<tr>
<td>051322</td>
<td>Biotechnology II</td>
<td>4(3-3)</td>
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<tr>
<td></td>
<td>Pre : 051321 and 051231</td>
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<tr>
<td></td>
<td>The fermentation industries such as glutamic acid, citric acid, baker yeast, single cell protein, including enzymatic conversion of starch to glucose or fructose syrup and waste water treatment technology.</td>
<td></td>
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<tr>
<td>051333</td>
<td>Unit Operation in Agro-Industry III</td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Pre : 051232 and 417242</td>
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<tr>
<td></td>
<td>Diffusion processes, phase relationship, stage and continuous operations, multistage operations with and without reflux, unsteady state operations, gas absorption, distillation, solvent extraction, leaching adsorption, ion-exchange and crystallization.</td>
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<tr>
<td>051334</td>
<td>Biochemical Engineering</td>
<td>4(3-3)</td>
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<tr>
<td></td>
<td>Pre : 419211</td>
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<tr>
<td></td>
<td>Application of basic engineering and mathematical principles to describe growth and development and functioning mechanisms of micro-organisms, kinetics of growth, product formation and substrate utilization in batch and continuous culture as well as aeration and agitation, scale-up and basic principles of down stream processing, include factory visits.</td>
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<tr>
<td>Code</td>
<td>Course Title</td>
<td>Credits</td>
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<tr>
<td>051361</td>
<td>Microbial Biochemistry and Regulation</td>
<td>4(3-3)</td>
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<tr>
<td>Pre: 051312</td>
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<td></td>
<td>Biodegradation and fermentation pathways are examined in detail. Mechanisms of metabolic control are then examined along with the characteristic improvements of microorganism by mutation and genetic engineering.</td>
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<tr>
<td>051423</td>
<td>Biotechnology III</td>
<td>3(2-3)</td>
</tr>
<tr>
<td>Pre: 051322 and 051333</td>
<td></td>
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<tr>
<td></td>
<td>Engineering concept of heating and cooling such as unsteady state heat transfer, simultaneous mass transfer, refrigeration: calculation and design, irradiation technology and membrane technology.</td>
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</tr>
<tr>
<td>051431</td>
<td>Control and Instrumentation</td>
<td>3(2-3)</td>
</tr>
<tr>
<td>Pre: 205201</td>
<td></td>
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<tr>
<td></td>
<td>Principle of measurement, temperature measurement, pressure measurement, flow measurement, level measurement, principle of process control, process characteristics control actions, proportional control, integral control, derivative control, process controller, function control values, control system theory.</td>
<td></td>
</tr>
<tr>
<td>051432</td>
<td>Application of Mathematical Methods for Agro-Industry</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>051462</td>
<td>Industrial Fermentation</td>
<td>3(2-3)</td>
</tr>
<tr>
<td>Pre: 419211</td>
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<tr>
<td></td>
<td>Biochemistry and physiology of industrial microorganisms. Methods of fermentation, microbial strains and production processes of various industrial products, include factory visits.</td>
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<tr>
<td>051463</td>
<td>Fermentation Processes</td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Technological aspects of some fermentation processes. The trend and future potential of the fermentation industry are assessed, include factory visits.</td>
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<tr>
<td>051464</td>
<td>Enzyme Technology</td>
<td>3(2-3)</td>
</tr>
<tr>
<td></td>
<td>Principle of industrial enzyme production by microorganisms: principle of industrial enzymology, selection of microorganisms, model of enzyme synthesis, cultivation technique, cell disruption, extraction, separation and purification techniques. Application of enzyme in industry. Principle of immobilized enzyme. Safety aspect in working with enzyme, include factory visits.</td>
<td></td>
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<tr>
<td>051471</td>
<td>Biotechnology Design</td>
<td>3(1-6)</td>
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<tr>
<td></td>
<td>A principle of process design in biotechnological industries, the analysis of investment cost and cost of production evaluation of unit process requirement in the process. The process varies from year to year.</td>
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<tr>
<td>051481</td>
<td>Technology of Vegetable Oil Extraction</td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Technology of design, extraction and purification of vegetable oil and fats. The process varies from year to year.</td>
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<tr>
<td>051483</td>
<td>Waste Utilization</td>
<td>3(2-3)</td>
</tr>
<tr>
<td></td>
<td>Principle and process of industrial waste utilization. Various process optimization, include factory visits.</td>
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<tr>
<td>051487</td>
<td>Alcoholic Beverages Technology</td>
<td>3(2-3)</td>
</tr>
</tbody>
</table>
Kinds and production processes of alcoholic beverages. Quality control of raw material, processes and finished products, include factory visits.

**051489 Water and Waste Treatment**  
3(2-3)  
Principle of water preparation for industry use, control of industrial waste and waste treatment.

**051496 Selected Topics in Biotechnology**  
1-3  
Selected topics in biotechnology at the bachelor’s degree level. Topics are subject to change each semester.

**051497 Seminar**  
1  
**051498 Special Problems**  
1-3  
Bachelor degree research study and compiling into report.

**051499 Research Techniques**  
3(0-9)  
Study of research techniques in biotechnology, analysis and evaluation, and compiling into report.

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**FOOD SCIENCE AND TECHNOLOGY, FOOD ENGINEERING**  
**FOOD ENGINEERING**  
**(052XXX)**

**052101 General Food Science**  
3(3-0)  
Food resources, relation between agricultural products and food industry, food quality and nutritive value, causes of deterioration and methods of food preservation.

**052111 Introductory Food Science and Technology**  
2(2-0)  
Importance and sources of food materials, characteristics and quality of raw materials for foods, causes of food deterioration, food handling and processing.

**052221 Fundamental Food Processing**  
4(3-3)  
Raw materials, postharvesting of plant and animal for fresh market and food processing, raw materials preparation for industrial production, properties and uses of ingredients and processing aids in food industry, food formulation. Practical works included.

**052302 Principles of Plant Product Preservation**  
3(2-3)  
Deterioration of plant food products and factors related. Principles of plant food preservation, storage, and processing of cereal grain, legumes, fruit and vegetable products.

**052303 Principles of Animal Product Preservation**  
3(2-3)  
Deterioration of animal products and factors related. Principles of animal products, preservation, storage, and processing of meat, poultry, eggs, and fishes.

**052304 General Dairy Products**  
3(3-0)  
Composition and importance of dairy and diary products, chemical and biological quality control, principles of dairy products preservation and processing of various dairy products.

**052312 Food and Nutrition**  
2(2-0)  
Pre: 402311  
Current nutritional trend, nutrients, nutritive value, problems from nutrients deficiency and symptoms, recommended dietary allowance and nutritional evaluation, changes of nutrients upon processing.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits (Lecture-Lab)</th>
</tr>
</thead>
<tbody>
<tr>
<td>052313</td>
<td>Food Biochemistry</td>
<td>2(2-0)</td>
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<tr>
<td></td>
<td>Pre: 402311, 402312</td>
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<td>Chemical composition of foods, physio-chemical and functional properties of food components, chemical and biochemical changes during processing and storage, substances used as food additives.</td>
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<tr>
<td>052322</td>
<td>Food Processing</td>
<td>4(3-3)</td>
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<tr>
<td></td>
<td>Pre: 052322</td>
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<tr>
<td></td>
<td>Principles of food processing and preservation by high and low temperature, water activity control, concentration, dehydration, chemical treatment and other means.</td>
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<tr>
<td>052323</td>
<td>Food Processing Technology</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 052322</td>
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<tr>
<td></td>
<td>Technology of food processing, preservation and product development for food products, fermented products, products from cereal, meat, fishery, dairy, fat and oil; beverage, confectionery, industrial waste and packaging technology.</td>
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<tr>
<td>052324</td>
<td>Laboratory in Food Process Technology</td>
<td>1(0-3)</td>
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<tr>
<td></td>
<td>Pre: 052323 or together</td>
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<td></td>
<td>Production and quality control of food products from fruit and vegetable, cereals, meat, fishery, dairy, fat and oil, confectionery, beverages and others.</td>
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<tr>
<td>052331</td>
<td>Food Engineering I</td>
<td>4(3-3)</td>
</tr>
<tr>
<td></td>
<td>Pre: 051231 or 208221 and 208241</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Engineering theory and principles in food processing, food processing equipment and food engineering operations including sedimentation, centrifugation, filtration, extraction, distillation, crystallization, heat exchanger, evaporation, dehydration, refrigeration and size reduction.</td>
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<tr>
<td>052332</td>
<td>Food Engineering II</td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Pre: 052322</td>
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<tr>
<td>052341</td>
<td>Food Standard and Regulations</td>
<td>2(2-0)</td>
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<tr>
<td></td>
<td>Pre: 052322</td>
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<tr>
<td></td>
<td>Principles of quality grading, establishment of standards for food products, national and international food standards and regulations.</td>
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<tr>
<td>052342</td>
<td>Food Quality Measurement</td>
<td>2(1-3)</td>
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<tr>
<td></td>
<td>Pre: 052322</td>
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<tr>
<td></td>
<td>Important quality characteristic of food products, physical properties of food products and their measuring methods, criteria for selection of appropriate method for food product quality measurement.</td>
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<tr>
<td>052361</td>
<td>Microbiology of Agricultural Products</td>
<td>3(2-3)</td>
</tr>
<tr>
<td></td>
<td>Pre: 419211 and 419214</td>
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<td></td>
<td>Classification of microorganisms important to agro-industry, factors affecting life and death of microorganisms in foods, food poisoning microorganisms, microbiological standards and quality assurance of foods.</td>
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<tr>
<td>052414</td>
<td>Fundamental of Food Analysis</td>
<td>2(2-0)</td>
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<tr>
<td></td>
<td>Pre: 402311</td>
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<tr>
<td></td>
<td>Principles and methodology of qualitative and quantitative analyses of food compositions, additives and contaminants; instrumental techniques.</td>
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<tr>
<td>052415</td>
<td>Laboratory in Food Biochemistry and Analysis</td>
<td>2(0-4)</td>
</tr>
</tbody>
</table>
Laboratory practice on chemical analyses for food composition and additives, determination of specific food components, experiment on physio-chemical and functional properties of food substances and test for chemical deterioration of foods.

**052424 Fruit and Vegetable Technology**  
2(2-0)  
Relation between physiological properties of fruit or vegetables and processing condition to finished product qualities, processing methods and preservation, waste utilization.

**052425 Cereal Technology**  
2(2-0)  
Characteristics and quality of cereal grains used in milling and milling products, processing of flour based products, storage and product quality change.

**052426 Bakery Technology**  
2(2-0)  
Type and properties of baking ingredients; formula balance, cereal products, processing and their keeping qualities, packaging and storage, quality control and management of industries.

**052427 Confectionery Technology**  
3(2-3)  
Principles and technology of confectionery product manufacturing, raw materials and their properties, quality control, packaging, storage and changes of confections during storage. Practical works included.

**052428 Technology of Meat Poultry and Products**  
2(2-0)  
Physical, chemical, and biological properties of meat, poultry, egg and their products related to processing and product qualities, preservation and processing of animal products, factors affecting animal products deterioration.

**052429 Dairy Products Technology**  
2(2-0)  
Chemical and physical properties of milk and dairy products including microbiological grades and classes of milk, processing of milk and other dairy products, quality control of milk and dairy products.

**052432 Food Processing Operations**  
3(2-3)  
Plant layout; selection of processes, controlling system and transportation of materials and products; introduction to model of operation research and network.

**052433 Food Engineering III**  
3(2-3)  

**052434 Refrigeration and Cold Storage**  
3(2-3)  
Refrigeration system, quality and deterioration of food during storage, and field studies.

**052442 Principles of Food Inspection**  
3(2-3)  
Pre : 052332  
General principles of food quality control and food inspection, quality attributes and their measurements, statistics approach for food inspection and applications of inspection for quality control in food processing and management.

**052443 Food Quality Assurance**  
2(2-0)  
Pre : 052342  
Quality, quality control and assurance, principle of organization management concerning quality, quality system and standard of quality system.

**052444 Food Plant Sanitation**  
2(2-0)
Principles of food plant sanitation, sanitary design of process, equipment, cleaning and sanitizing, food-borne diseases and their prevention, insect control, rodent control and personal hygiene.

052445 Hazard Analysis and Critical Control Point 2(2-0)
Principle and implementation of HACCP in food processing plant to assure the safety of food products. Hazard analysis. Identification of critical points and establishment of critical limits, CCP monitoring requirement and corrective action. Effective record keeping procedure. Procedures for verification the HACCP. Case Study.

052456 Laboratory in Cereal Processing 1(0-3)
Practical works in cereal product processing. Field trip required.

052462 Microbiology of Food Products 3(2-3)
Pre : 052361
Quality deterioration and spoilage of foods and food products from meat, egg, fish, fruit, vegetable and cereal grain; sugar; beverage, canned food and spice and condiment. Industrial uses of microorganisms in lactic acid, citric acid and acetic acid production. Field study.

052471 Design in food Industry 3(2-3)
Pre : 052322
Applications of chemical, microbiological and technical aspects of food processing to the plant design and improvement of products, food production processes and their influence on equipment design, economics and cost optimization of food products, field study.

052481 Fishery Products Technology 2(2-0)
Physical and biochemical properties of fish, principle of fish preservation and processing, deterioration and quality control and standard quality of fishery products.

052482 Technology of Edible Fats and Oils 2(2-0)
Chemical and physical properties of edible fats and oils, extraction techniques, refining processes and modification technology, deterioration of fat and oil and their products, storage stability, production techniques of edible fat and oil products.

052483 Post Harvest Technology 3(2-3)
Quality of agricultural products for food and their postharvest loss, postharvest handling and storage, changes of the quality, deterioration and preservation of fresh products, packing and transportation.

052484 Non-Alcoholic Beverage Technology 2(2-0)
Types of non-alcoholic beverage; quality, composition, processing methods and development of new products; carbonated, non-carbonated, concentrated and powdered beverages including beverages from tea, coffee, and cocoa.

052485 Freezing Technology of Foods 3(2-3)
Principles of freezing; thermodynamics in freezing; freezing system; quality and stability of frozen foods; freezing of fruits and vegetables, fishery products, poultry, meat, bakery products and prepared foods; packing for frozen foods; microorganism in frozen foods; storage and transportation of frozen food. Field trips required.

052491 Research Techniques 3(1-6)
Techniques in conducting experimental research, proposal writing, experimental design, data collection and interpretation; development of an independent research paper in Food Science and Technology.
<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>052496</td>
<td>Selected Topics in Food Science and Technology</td>
<td>1-3</td>
</tr>
<tr>
<td></td>
<td>Study on selected topics in the area of food science and technology, topics are subject to change each semester.</td>
<td></td>
</tr>
<tr>
<td>052497</td>
<td>Seminar</td>
<td>1</td>
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<tr>
<td></td>
<td>Review of recent papers relating to food science and technology and giving oral presentation of the technical topics.</td>
<td></td>
</tr>
<tr>
<td>052498</td>
<td>Special Problems</td>
<td>1-3</td>
</tr>
<tr>
<td></td>
<td>Guided investigation on selected topics related to food science and technology.</td>
<td></td>
</tr>
</tbody>
</table>

### PACKAGING TECHNOLOGY (053XXX)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>053101</td>
<td>Introduction to Packaging</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Functions and significance of packages. Definition and system of packaging. Material and package fabrication. Applications of packaging in industry.</td>
<td></td>
</tr>
<tr>
<td>053111</td>
<td>Principles of Packaging</td>
<td>2(2-0)</td>
</tr>
<tr>
<td>053211</td>
<td>Materials in Packaging</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 053111</td>
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</tr>
<tr>
<td></td>
<td>Composition, chemical and physical properties of packaging materials. Production and utilization of materials in packaging industry.</td>
<td></td>
</tr>
<tr>
<td>053224</td>
<td>Packaging Operations of Agricultural Products</td>
<td>2(2-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 053111</td>
<td></td>
</tr>
<tr>
<td>053301</td>
<td>Packaging Materials and Containers</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Types and properties of packaging materials. Retail and shipping containers. Package manufacture and application.</td>
<td></td>
</tr>
<tr>
<td>053302</td>
<td>Food Packaging Technology</td>
<td>1(1-0)</td>
</tr>
<tr>
<td></td>
<td>Importance of packaging for food industry. Packaging materials. Effects of processing and storage condition on chemical and physical property change of packaging materials. Novel packaging materials for food industry.</td>
<td></td>
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<tr>
<td>053321</td>
<td>Packaging Technology Systems</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 053211</td>
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<tr>
<td>053322</td>
<td>Laboratory in Packaging Technology I</td>
<td>1(0-3)</td>
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<tr>
<td></td>
<td>Pre: 053321 or together</td>
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<tr>
<td>053323</td>
<td>Laboratory in Packaging Technology II</td>
<td>1(0-3)</td>
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<tr>
<td></td>
<td>Pre: 053322</td>
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<tr>
<td></td>
<td>Package fabrication methods from packaging materials. Performance testing of packages during application. Dynamics testing of packages. Field trip required.</td>
<td></td>
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<tr>
<td>Code</td>
<td>Course Title</td>
<td>Credits</td>
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<tr>
<td>053331</td>
<td>Dynamics of Packaging</td>
<td>2(2-0)</td>
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<tr>
<td></td>
<td>Pre: 053211</td>
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<tr>
<td>053341</td>
<td>Packaging Standards and Regulations</td>
<td>2(2-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 053211</td>
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<tr>
<td></td>
<td>Standard and laws in packaging relating to quality of products and safety in consumption. Packaging rules for inland and international transportation. Law of packaging waste disposal.</td>
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<tr>
<td>053351</td>
<td>Packaging Design I</td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Pre: 053211</td>
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<tr>
<td></td>
<td>Theory and concept in design. Art composition arrangement. Application of geometric forms, colors, and letters in design. Figure, symbol, and emblem design. Three dimension design.</td>
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<tr>
<td>053411</td>
<td>Flexible Packaging Materials</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 053211</td>
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<tr>
<td></td>
<td>Types, chemical and physical properties of flexible materials. Production and processing of materials for packaging technology application.</td>
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<tr>
<td>053412</td>
<td>Adhesives in Packaging</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 053211</td>
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<tr>
<td></td>
<td>Adhesive types, properties and testing methods. Formation for production and application in packaging industry.</td>
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<tr>
<td>053421</td>
<td>Packaging in Food Industry</td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Pre: 053211</td>
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<tr>
<td></td>
<td>Relationship of foods, packages and environment. Packaging for food storage. Types and application of packaging in food industry. Field trip required.</td>
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<tr>
<td>053423</td>
<td>Packaging Handling and Transportation</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 053211</td>
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<tr>
<td>053424</td>
<td>Principles of Aerosol Technology</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 053211</td>
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<tr>
<td>053432</td>
<td>Packaging Machinery</td>
<td>2(2-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 053331</td>
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<tr>
<td></td>
<td>Types, components and mechanisms of packaging machines. Working components. Design and selection of automatic and semiautomatic machine for industrial work. Field trip required.</td>
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<tr>
<td>053441</td>
<td>Packaging Process Analysis</td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Pre: 053321 and 053331</td>
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<tr>
<td>053452</td>
<td>Packaging Design II</td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Pre: 053351</td>
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<tr>
<td></td>
<td>Principles of structural and graphic design on packages. Package development in relevant to packaging materials and production processes with environmental concerns. Cost analysis in package design for mass production. Field trip required.</td>
<td></td>
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<tr>
<td>053453</td>
<td>Package Prototype Construction</td>
<td>1(0-3)</td>
</tr>
</tbody>
</table>
Package prototype construction from packaging materials in three dimensions. Consumer test on package prototype. Field trip required.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>053454</td>
<td><strong>Packaging Drawing</strong></td>
<td>1(0-3)</td>
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<tr>
<td>053455</td>
<td><strong>Graphic Design for Packages</strong></td>
<td>2(1-3)</td>
</tr>
<tr>
<td></td>
<td>Pre : 053351</td>
<td></td>
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<tr>
<td>053461</td>
<td><strong>Package Printing</strong></td>
<td>3(2-3)</td>
</tr>
<tr>
<td></td>
<td>Pre : 053211</td>
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<tr>
<td></td>
<td>Methods and systems of packaging material and package printing. Type and selection of ink for printing. Field trip required.</td>
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<tr>
<td>053462</td>
<td><strong>Offset Lithography and Flexography on Packages</strong></td>
<td>3(3-0)</td>
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<tr>
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<td>Pre : 053211</td>
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<tr>
<td>053471</td>
<td><strong>Applied Economics in Packaging</strong></td>
<td>3(3-0)</td>
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<tr>
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<td>Pre : 053321</td>
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<tr>
<td>053491</td>
<td><strong>Research Methodology in Packaging Technology</strong></td>
<td>3(1-6)</td>
</tr>
<tr>
<td></td>
<td>Pre : 053321</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Research methodology in packaging technology at bachelor program level. Report writing.</td>
<td></td>
</tr>
<tr>
<td>053496</td>
<td><strong>Selected Topics in Packaging technology</strong></td>
<td>1-3</td>
</tr>
<tr>
<td></td>
<td>Pre : 053321</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interesting topics in packaging technology.</td>
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<tr>
<td>053497</td>
<td><strong>Seminar</strong></td>
<td>1</td>
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<tr>
<td></td>
<td>Pre : 053321</td>
<td></td>
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<tr>
<td></td>
<td>Presentation and discussion on current interesting topic in packaging technology at the bachelor’s degree level.</td>
<td></td>
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<tr>
<td>053498</td>
<td><strong>Special Problems</strong></td>
<td>1-3</td>
</tr>
<tr>
<td></td>
<td>Pre : 053321</td>
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<tr>
<td></td>
<td>Study and research in specific topics with a report presentation.</td>
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</tbody>
</table>

**AGRO-INDUSTRIAL PRODUCT DEVELOPMENT (054XXX)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>054101</td>
<td><strong>General Agro-Industry</strong></td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Importance of agro-industries, revolution and involving factors on the development of agro-industries and utilization of agricultural products.</td>
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<tr>
<td>054111</td>
<td><strong>Introduction to Agro-Industry</strong></td>
<td>2(2-0)</td>
</tr>
<tr>
<td></td>
<td>Importance of agro-industries, principle of agro-industrial operation, agriculture and agro-industry, raw material deterioration and post harvest technology, manufacturing of agro-industry, by products, agro-industry and environment.</td>
<td></td>
</tr>
</tbody>
</table>
054112 Laboratory in Introduction to Agro-Industry 1(0-3)
Laboratory in metrology, specification of agricultural raw material for agro-industrial processing, raw material deterioration, raw material sources and agro-industrial product processing.

054231 Fundamental Process Engineering 2(2-0)
Pre: 417112 and 420119
Fundamental of engineering drawing, interpretation and computer-aids for agro-industry, dimension and unit engineering, fundamental of mass and energy balance, heat and mass transfer for agro-industrial processing, fluid flow, refrigeration and Psychrometrics.

054232 Laboratory in Fundamental Process Engineering 1(0-3)
Pre: 054231 or together
Laboratory practices related to 054231 Fundamental Process Engineering.

054241 Standard and Regulations for Agro-Industrial Products 2(2-0)
Pre: 054111
Importance of standard and regulations for agro-industrial products; setting up and grading systems of standard and grading systems of products; standard and regulations of products in Thailand and international.

054242 Laboratory in Standard and Regulations for Agro-industrial Products 1(0-3)
Pre: 054241 or together
Laboratory practices related to 054241 Standard and Regulations for Agro-Industrial Products.

054243 Biological Quality Measurement 2(2-0)
Pre: 054241
Microorganism in agro-industrial products, factors affecting the growth of microorganism, food-poison from microorganism. Principle and method in microorganism measurement, food sanitation, waste treatment, evaluation of nutrition and safety using biological method.

054244 Laboratory in Biological Quality Measurement 1(0-3)
Pre: 054243
Laboratory practices related to 054441 Biological Quality Measurement.

054251 Packaging Materials for Product Development 2(2-0)
Types and properties of materials for product development, selection of packaging materials for agro-industrial products, packaging and product development for environment conservation.

054301 General Agricultural Product Development 3(3-0)
Revolution and history of agricultural product development, prediction of markets, and products and general principles of product development systems for agricultural products.

054321 Processing of Agro-Industrial Products I 2(2-0)
Principles of preservation of agro-industrial products. Preservation by chemical, thermal processing, cooling and freezing, irradiation, drying and fermentation.

054322 Laboratory in Processing of Agro-industrial Products I 1(0-3)
Pre: 054321 or together
Laboratory practices related to 054321 Processing of Agro-industrial Products I.
054323 Processing of Agro-Industrial Products II
Pre : 054321
Principles of agro-industrial products processing, processing steps in food, semi food and non-food products.

054324 Laboratory in Processing of Agro-Industrial Products II
Pre : 054323 or together
Laboratory practices related to 054323 Processing of Agro-Industrial Products II.

054341 Chemical and Physical Quality Measurement
Pre : 054241
Quality components, methods of chemical and physical quality measurement in raw material and agro-industrial products.

054342 Laboratory in Chemical Quality Measurement
Pre : 054341
Laboratory practices related to 054341 on the topics of Chemical Quality Measurement.

054343 Laboratory in Physical Quality Measurement
Pre : 054342 or together
Laboratory practices related to 054341 on the topic of Physical Quality Measurement.

054351 Principles of Agro-Industrial Product Development
Pre : 054351 or together
Importance and role of product development, product development process, consumer behavior and needs, generation and screening of new product idea, development product concept, product design, product specifications. Project feasibility study.

054352 Laboratory in Principles of Agro-Industrial Product Development
Pre : 054351 or together
Laboratory practices related to 054351 Principles of Agro-Industrial Product Development.

054353 Principles of Process Development
Pre : 054231
Principles of unit operation, mixing, mechanical separation, sedimentation, centrifugation, filtration, distillation, extraction, crystallization, size reduction, homogenization and process development.

054354 Laboratory in Principles of Process Development
Pre : 054353 or together
Laboratory practices related to 054351 Principle of Process Development.

054355 Statistics for Product Development
Pre : 422111
Experimental design, regression analysis, statistical techniques, using statistical package program, data analysis and interpretation, application of statistics in product development.

054390 Cooperative Education Preparation
Pre : 054390
Principle and concept of cooperative education, processing step of cooperative education, rule involving cooperative education, basic and technique for applying professional jobs, essential basic knowledge for working in the
factory, industrial quality management system, presentation technique and report writing, personal developing for social and preparation for successful.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits (Contact Hours)</th>
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<tbody>
<tr>
<td>054401</td>
<td>General Quality Assurance of Agro-industrial Products</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Principle and involving factors in quality assurance; methods of quality measurement and evaluation of agricultural raw material and field studies.</td>
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<tr>
<td>054402</td>
<td>New Product Development in Food Industry</td>
<td>2(2-0)</td>
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<tr>
<td>054443</td>
<td>Quality Management System in Agro-Industry</td>
<td>2(2-0)</td>
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<tr>
<td></td>
<td>Principle of quality management, factors affecting quality, quality management system, quality assurance, tools and techniques for total quality management, standards and institutes related to quality control in agro-industry.</td>
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<tr>
<td>054444</td>
<td>Laboratory in Quality Management System in Agro-Industry</td>
<td>1(0-3)</td>
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<td>Laboratory practice for 054443 Quality Management System in Agro-Industry.</td>
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<tr>
<td>054445</td>
<td>Management and Evaluation of Quality Control in Agro-Industry</td>
<td>3(2-3)</td>
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<td></td>
<td>Pre : 054441</td>
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<tr>
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<td>Collecting data, planning experiments, management and data processing, evaluation and quality improvement; setting standards and appropriate quality control in agro-industry.</td>
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<tr>
<td>054446</td>
<td>Sensory Evaluation of Quality</td>
<td>2(2-0)</td>
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<tr>
<td></td>
<td>Sensory evaluation of agro-industrial products, physiology of sensory organs, methods of screening and training of panelists, planning and statistics analysis, questionnaire and data processing, consumer testing.</td>
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<tr>
<td>054447</td>
<td>Laboratory in Sensory Evaluation of Quality</td>
<td>1(0-3)</td>
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<tr>
<td></td>
<td>Pre : 054446 or together</td>
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<tr>
<td></td>
<td>Laboratory practices related to 054446 Sensory Evaluation of Quality.</td>
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<tr>
<td>054448</td>
<td>Project in Sensory Evaluation of Quality</td>
<td>1(0-3)</td>
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<tr>
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<td>Pre : 054447</td>
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<tr>
<td></td>
<td>Project in Sensory evaluation of quality for specific products , development of tools and techniques in order to increase efficiency of evaluation and quality of data sed for the product development research.</td>
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<tr>
<td>054451</td>
<td>Techniques for Product Development</td>
<td>2(2-0)</td>
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<tr>
<td></td>
<td>Pre : 054351 or 054355</td>
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<tr>
<td></td>
<td>Project planning, formulation of prototype products, optimization techniques, process development, product testing, product testing consumer and storage testing.</td>
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<tr>
<td>054452</td>
<td>Laboratory in Techniques for Product Development</td>
<td>2(0-6)</td>
</tr>
<tr>
<td></td>
<td>Pre : 054451 or together</td>
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<tr>
<td></td>
<td>Laboratory practices related to 054451 Techniques for Product Development.</td>
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<tr>
<td>054453</td>
<td>Process Development of Agro-Industrial Products</td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Pre : 054353</td>
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</table>
Physical and chemical quality factors of raw material involving in equipment
design, specific unit operation of the processes and improvement of the process,
application of new technique in process development, field studies

054454 Consumer Product Development 3(2-3)
Pre : 054351
Types, function, quality and networks of consumer products in the local and
international markets; specification of quality of raw material; products and process
control of consumer products; markets of consumer product; background on eating
habits, behaviors and requirement of consumer considering of product quality, packaging
and prices and paths of consumer product development systems, field studies.

054455 Institutional and Catering Product Development 3(2-3)
Pre : 054351
Types and functions of institutional and catering products; status and situation
of consumer and product; convenient foods, fast foods and franchised products;
preparation of foods to processed foods; menus and displays of products; raw materials
and product quality, packaging, storage condition and price and paths of consumer
product development system, field studies.

054456 Nutritional Product Development 3(2-3)
Pre : 054351
Roles of nutrition to the human growth; types, functions and quality of
nutritional products; effects of processing on nutritive values and sensory quality of
products; specification of raw materials and products; formulation and process
development; consumers tests and storage test of the products.

054457 Traditional Food Product Development 3(2-3)
Pre : 054351
Types, markets and quality of traditional products, weak points of processes
and quality, improvement of processes and product quality; specification of raw material,
formulation and quality control, and field studies.

054458 Research and Development for Agro-Industry 3(3-0)
Pre : 054451
Importance of research and development in agro-industry, production scale up,
costing and pricing, product strategy and management, new product management,
marketing and product development interface, product standard and regulation.

054459 Product Development Project 2(0-6)
Pre : 054451
Product development from idea generation to final products, report writing and
presentation.

054471 Agro-Industry Management 3(3-0)
Development of agro-industry, planning and setting up of management
systems, selection of equipment, process, financial operation and depreciation, field
studies.

054472 Design in Agro-Industry 3(2-3)
Agro-Industrial processes layout, product design and selection equipment,
plant location and its influence in plant layout, improvement of processing, design of
production and factory layout.

054490 Cooperative Education 6
On the job training as temporary employee according to the assigned project including report writing and presentation.

**054491 Research Methodology**
3(1-6)
*Pre : 054243, 054341 and 054451*
Research techniques in planning experiment, analysis and evaluation, report writing and presentation.

**054496 Selected Topics in Product Development**
3(3-0)
Interesting topics in agro-industrial product development.

**054497 Seminar**
1
Presentation and discussion on current interesting topic in agro-industrial product development at the bachelor’s degree level.

**054498 Special Problems**
1-3
Guided investigation on selected topic related to product development.

**TEXTILE SCIENCE AND TECHNOLOGY**
(055XXX)

**055131 Basic Apparel Construction**
1(0-2)
Characteristics of stitches seams and stitching. Classifications, applications and maintenance of basic industrial machines. Practical techniques in basic sewing.

**055211 Textile Technology I**
3(2-2)
*Pre : 403221*
Natural and man-made fiber utilization in textile industry. Effect of chemical and physical structure of fiber to textile processing and end uses.

**055241 Basic Arts for Textiles**
3(2-2)
*Pre : 055241*
Principles and elements of arts relating to textile and their product design.

**055242 Fashion Illustration Techniques**
1(0-2)
*Pre : 055241*
The human figure and fashion figure proportions. Principles and techniques of drawing of various pose figures. Presentation by coloring techniques and other materials.

**055311 Textile Technology II**
3(2-2)
*Pre : 055211*

**055312 Textile Technology III**
3(2-2)
*Pre : 055311*

**055321 Technology of Textile Dyeing**
3(1-4)
Pre : 403221

055324 Color Science 2(2-0)
Theory of color vision. Color measurement system, color order system, Munsell standard system and other related standard systems used in textile and textile product industry.

055325 Nonwoven Fabric Technology 3(3-0)
Pre : 055221
Nonwoven fabrics, web formation, and bonding technology used in the nonwoven industry. The sequential processes employed in the conversion of staple-fiber raw materials into fabrics. Fabric properties and characteristics to determine the application or end-use.

055331 Apparel Production Processes 3(3-0)
Pre : 055231
Methods and processes essential to apparel production with emphasis on design, size, specification, equipment, construction method and determination, packing inspection, quality control, transferring and retention. Field trip required.

055332 Construction Techniques for Apparel Industry 3(1-4)
Pre : 055131
Development of skills, techniques of sewing construction and the arrangement of necessary equipment in apparel industry considering style and fabric.

055333 Type and Style in Ready to Wear 2(1-2)
Types and styles of apparel and their utilization as related to environment, economy and culture to be used as guideline in design planning for industrial production.

055342 Principles of Apparel Design 3(2-2)
Pre : 055333
Principles and elements of apparel design with emphasis on the importance of a total fashion outlook in relation to style and details.

055343 Textile Design 2(0-4)
Pre : 055211, 055241
The use of principles of weaving and essential elements of art in creating textile sample.

055351 The Chronicle of Costume 3(2-2)
Characteristics and evolution of traditional costumes in various periods.

055381 Computer System for Textiles and Apparel Manufacturing 3(3-0)
The use of computer systems to develop the textile product and apparel information; material sourcing, fabric and apparel design, pre-production, apparel production, and product development. Automation in the production systems.

055382 Computer-Aided Design for Textile Printing Design 3(1-4)
Pre : 055241
The use of computer graphics in textile printing design. Utilization of computer-aided design in the design process from croquis to final design. Preparation of artwork for printing process.

055411 Knitting Technology and Products 3(1-4)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>055421</td>
<td>Linen and Ramie Processing</td>
<td>3(2-2)</td>
</tr>
<tr>
<td></td>
<td>Pre : 055311</td>
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<tr>
<td></td>
<td>Kinds of fiber and yarn processing suitable for flat knitted machinery. Designing and knitted processing suitable for end uses.</td>
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<tr>
<td>055422</td>
<td>Silk Processing</td>
<td>3(2-2)</td>
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<tr>
<td></td>
<td>Pre : 055312</td>
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<tr>
<td></td>
<td>Physical structure of linen fiber and ramie fiber. Processes of fiber separating, yarn spinning, weaving, bleaching, dyeing and finishing suitable for linen and ramie. Field trip.</td>
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</tr>
<tr>
<td>055423</td>
<td>Wool Processing</td>
<td>3(2-2)</td>
</tr>
<tr>
<td></td>
<td>Pre : 055312</td>
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<tr>
<td></td>
<td>Physical structure of wool fiber. Processing required for wool textiles starting from scouring, yarn spinning, weaving, dyeing, printing and finishing. Field trip.</td>
<td></td>
</tr>
<tr>
<td>055424</td>
<td>Textile Testing and Quality Control</td>
<td>3(2-2)</td>
</tr>
<tr>
<td></td>
<td>Pre : 422111</td>
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</tr>
<tr>
<td></td>
<td>Principles and methods of physical testing for textiles and textile products. Quality control of manufacturing process.</td>
<td></td>
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<tr>
<td>055425</td>
<td>Textile Printing Technology</td>
<td>3(1-4)</td>
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<tr>
<td></td>
<td>Pre : 055324</td>
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<tr>
<td></td>
<td>Theory of textile printing designs and printing methods. Techniques of print making. Related technology in textile printing. Field trip required.</td>
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<tr>
<td>055426</td>
<td>Textile Cleaning</td>
<td>3(2-2)</td>
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<tr>
<td></td>
<td>Pre : 403221</td>
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<tr>
<td></td>
<td>Kinds and chemical composition of cleaning substances, and their activities. Type and working systems of washing machines. Selection of cleaning agent suitable for particular kinds of textiles. Method of stain removal and cleaning system.</td>
<td></td>
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<tr>
<td>055427</td>
<td>Basic Textile Analysis</td>
<td>3(1-4)</td>
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<tr>
<td></td>
<td>Pre : 055312</td>
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</tr>
<tr>
<td></td>
<td>Qualitative and quantitative chemical and physical analyses of textile components.</td>
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<tr>
<td>055428</td>
<td>Polymer in Textile Industry</td>
<td>3(2-2)</td>
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<tr>
<td></td>
<td>Pre : 055211</td>
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<tr>
<td></td>
<td>Kinds and roles of polymer in textile production. Fiber properties and finishing agents. Uses and identification of polymers used in textile industry. Field trip required.</td>
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<tr>
<td>055429</td>
<td>Museum Textile Conservation</td>
<td>3(2-2)</td>
</tr>
<tr>
<td></td>
<td>Pre : 055211</td>
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</tr>
<tr>
<td>055431</td>
<td>Pattern Construction for Apparel Industry</td>
<td>3(1-4)</td>
</tr>
<tr>
<td></td>
<td>Pre : 055231</td>
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<tr>
<td></td>
<td>Principles of flat pattern making. Methods of pattern grading. Industrial pattern development with emphasis on apparel style and various fabrics.</td>
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<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits (L-T-P)</td>
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<tr>
<td>055432</td>
<td>Motion and Time Study in Apparel Industry</td>
<td>3(2-2)</td>
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<tr>
<td></td>
<td>The application of basic motion and time study, work measurement and line balancing techniques in assembly of labor-intense apparel and related products. Tools to enhance the highest efficiency in the shortest cycle time and at the lowest cost of production.</td>
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<tr>
<td>055433</td>
<td>Computerized Pattern Making of Women’s Wear</td>
<td>3(1-4)</td>
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<tr>
<td></td>
<td>Pre: 055431</td>
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<tr>
<td></td>
<td>Pattern making of womenswear and product development capabilities of computer-aided design used in the apparel industry. Softwares and technique to develop the basic blocks.</td>
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<tr>
<td>055434</td>
<td>Computerized Pattern Making of Men’s Wear</td>
<td>3(1-4)</td>
</tr>
<tr>
<td></td>
<td>Pre: 055431</td>
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</tr>
<tr>
<td></td>
<td>Method of computerized pattern making and development for menswear. Relationship of specifications to garment sizes and fit. Techniques for development of styled patterns to fit the design and purchase order.</td>
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<tr>
<td>055435</td>
<td>Textile Product Technology</td>
<td>2(0-4)</td>
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<tr>
<td></td>
<td>Pre: 055241</td>
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<tr>
<td></td>
<td>Textile product design and production lines. Technology and machinery involving in production lines. Field trip required.</td>
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<tr>
<td>055436</td>
<td>Computerized Pattern Making of Children’s Wear</td>
<td>3(1-4)</td>
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<tr>
<td></td>
<td>Pre: 055431</td>
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<tr>
<td></td>
<td>Method of computerized pattern making and development for childrenswear. Relationship of specifications to garment sizes and fit. Techniques for development of styled patterns to fit the design and purchase order.</td>
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<tr>
<td>055442</td>
<td>Apparel Design Collection and Presentation</td>
<td>3(0-6)</td>
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<tr>
<td></td>
<td>Pre: 055333</td>
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<tr>
<td></td>
<td>Workshop on individual creative projects as related to student’s area of design interests. Students present their projects including the draft designs and collections.</td>
<td></td>
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<tr>
<td>055443</td>
<td>Textile Design for Special Use</td>
<td>2(0-4)</td>
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<tr>
<td></td>
<td>Pre: 055343</td>
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<tr>
<td></td>
<td>Creative textile design for special propose by using weaving techniques, texture design techniques and decorative materials.</td>
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<tr>
<td>055444</td>
<td>Textile and Products for Interior</td>
<td>3(1-4)</td>
</tr>
<tr>
<td></td>
<td>Pre: 055241, 055312</td>
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<tr>
<td></td>
<td>Selection of textile products for interior decoration in various patterns according to material properties, patterns and method of productions.</td>
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<tr>
<td>055445</td>
<td>Packaging for Textiles and Products</td>
<td>2(1-2)</td>
</tr>
<tr>
<td></td>
<td>Pre: 055241</td>
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<tr>
<td>055451</td>
<td>Ancient World Textiles</td>
<td>3(2-2)</td>
</tr>
<tr>
<td></td>
<td>Sources of textiles, kinds of fibers, design, coloring, material use, weaving techniques and end uses of historic textiles native textiles of Tai ethnic. Field trip required.</td>
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<tr>
<td>055461</td>
<td>Textile and Product Merchandising</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 055333, 145111</td>
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</tbody>
</table>
Principle of textile and product merchandising starting from planning, marketing, purchasing. Retail and wholesale system. Promotion and product presentation.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>055462</td>
<td>Textile and Product Industrial Management</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 132111</td>
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<tr>
<td></td>
<td>Structure of textile and product industries.</td>
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<tr>
<td></td>
<td>Management and operation procedures related to</td>
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<td>production system. Textile product analysis.</td>
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<td>Operation planning to make a balance in production</td>
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<tr>
<td>055463</td>
<td>Production Control in Textile and Product Industries</td>
<td>3(3-0)</td>
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<tr>
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<td>Pre : 055462</td>
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</tr>
<tr>
<td></td>
<td>Principles of textile production control and</td>
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<tr>
<td></td>
<td>product control according to production planning</td>
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<tr>
<td></td>
<td>and system which based on personnel, machinery,</td>
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<td></td>
<td>equipment and materials.</td>
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<tr>
<td>055465</td>
<td>Quality Management in Textile and Apparel</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Manufacturing</td>
<td></td>
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<tr>
<td></td>
<td>Pre : 132111</td>
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<tr>
<td></td>
<td>Quality management and control in textile and</td>
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<td></td>
<td>apparel manufacturing. The development of quality</td>
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<td></td>
<td>assurance systems, principles of quality</td>
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<tr>
<td></td>
<td>management, statistical process control methods</td>
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<tr>
<td>055466</td>
<td>Supply Chain Management and Logistics in Textile</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>and Apparel Industries</td>
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<tr>
<td></td>
<td>Pre : 132111</td>
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<tr>
<td></td>
<td>Management of textile and apparel supply chain</td>
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<tr>
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<td>to reduce product costs and delivery time. A</td>
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<td>cycle of material requirements, procuring the</td>
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<tr>
<td></td>
<td>raw materials, production, selling and</td>
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<td>delivering to customers. World material sourcing</td>
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<td>and integrated logistic activities.</td>
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</tr>
<tr>
<td>055471</td>
<td>Creative Fabric Decoration</td>
<td>3(1-4)</td>
</tr>
<tr>
<td></td>
<td>Pre : 055241</td>
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</tr>
<tr>
<td></td>
<td>Materials and equipment for fabric decoration.</td>
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<tr>
<td></td>
<td>Advanced methods of printing and dyeing to</td>
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<tr>
<td></td>
<td>create patterns and texture on fabric. Dye</td>
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<td></td>
<td>printing and dyeing different types of fabric.</td>
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<td></td>
<td>Creative textile design by applying techniques</td>
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<td></td>
<td>of fabric decorations.</td>
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<tr>
<td>055491</td>
<td>Basic Research Methods in Textile and Products</td>
<td>3(1-4)</td>
</tr>
<tr>
<td></td>
<td>Pre : 132111</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Research techniques used in textiles and</td>
<td></td>
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<td></td>
<td>products. Analysis and evaluation of results.</td>
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<tr>
<td></td>
<td>Report writing and presentation.</td>
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</tr>
<tr>
<td>055496</td>
<td>Selected Topics in Textile and Product Technology</td>
<td>1-3</td>
</tr>
<tr>
<td></td>
<td>Pre : 132111</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interesting topic in textile and product technology. Topic can be changed each semester.</td>
<td></td>
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<tr>
<td>055497</td>
<td>Seminar</td>
<td>1</td>
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<tr>
<td></td>
<td>Pre : 132111</td>
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</tr>
<tr>
<td></td>
<td>Review of recent papers relating to textile and</td>
<td></td>
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<tr>
<td></td>
<td>product technology and giving oral presentation</td>
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</tr>
<tr>
<td></td>
<td>on the selected topics for undergraduate students.</td>
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<tr>
<td>055498</td>
<td>Special Problems</td>
<td>1-3</td>
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<tr>
<td></td>
<td>Pre : 132111</td>
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</tr>
<tr>
<td></td>
<td>Study and research in specific topic for</td>
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<td>undergraduate students with a written report or</td>
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<tr>
<td></td>
<td>report presentation.</td>
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</table>
**PHYSICO-CHEMICAL PROCESSING TECHNOLOGY**

(056XXX)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>056211</td>
<td>Introduction to Physico-Chemical Processing Technology</td>
<td>2(2-0)</td>
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<tr>
<td></td>
<td>Principles of agro-processing by means of chemical and physical methods, products and economic impact of value-added products from agriculture raw materials.</td>
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<tr>
<td>056231</td>
<td>Physico-Chemical Processing I</td>
<td>4(3-3)</td>
</tr>
<tr>
<td></td>
<td>Pre : 051231</td>
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<tr>
<td></td>
<td>Theories of physico-chemical processes and their industrial applications. Mass balance, disintegration, filtration, extraction, mixing, precipitation, crystallization and immobilization.</td>
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<tr>
<td>056311</td>
<td>Physico-Chemical Properties of Agro-Industrial Products</td>
<td>3(2-3)</td>
</tr>
<tr>
<td></td>
<td>Pre : 056211 and 403111 and 4020118</td>
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<tr>
<td>056312</td>
<td>Physico-Chemical Analysis of Agro-Industrial Products</td>
<td>3(2-3)</td>
</tr>
<tr>
<td></td>
<td>Pre : 402331 and 402312</td>
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<tr>
<td></td>
<td>Analyses of chemical and physical components of starch, protein, and fat that related to agro-industry. Use of analytical instruments, gas chromatograph, HPLC and NMR.</td>
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<tr>
<td>056321</td>
<td>Polymer Technology I</td>
<td>3(3-0)</td>
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<td></td>
<td>Pre : 056231 and 403221</td>
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<tr>
<td></td>
<td>Structure and morphology of polymers and copolymers. Characterization of polymer and copolymer structure. Theories of crystallization and melting. Relationship between physical properties and crystal morphology.</td>
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<tr>
<td>056322</td>
<td>Leather Processing Technology I</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Types of physical properties, hides structure of tissues, preparation of raw materials. Degradation and preservation of hides for tanning. Inspection of raw hides.</td>
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<tr>
<td>056331</td>
<td>Physico-Chemical Processing II</td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Pre : 056231</td>
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<tr>
<td>056332</td>
<td>Chemistry of Agricultural Raw Materials</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 056231</td>
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<tr>
<td></td>
<td>Chemical composition of agricultural raw materials. Chemical and physical changes during pre and post harvest. Chemical reactions of changes in raw materials during physico-chemical processing and in products during storage.</td>
<td></td>
</tr>
<tr>
<td>056341</td>
<td>Agricultural Product Standard and Law</td>
<td>2(2-0)</td>
</tr>
<tr>
<td></td>
<td>Laws, regulations, and standards of international and Thai agricultural products.</td>
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<tr>
<td>056411</td>
<td>Rubber Chemistry</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 403221</td>
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<tr>
<td></td>
<td>Chemical and physical properties of natural and synthetic rubbers. Use of chemical compounds to preserve and modify properties of rubber. Chemical analyses of rubber and latex.</td>
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</tr>
<tr>
<td>056412</td>
<td>Leather Chemistry</td>
<td>3(2-3)</td>
</tr>
<tr>
<td></td>
<td>Pre : 403221</td>
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</tr>
</tbody>
</table>
Chemical composition of leather. Theory of aldehydes and elements that affect chemical reaction of leather. Kinetics of consequence chemical reactions, including reactions upon collagen.

056421  Polymer Technology II  3(2-3)
Pre : 056321
Polymerization and copolymerization in industry. Mechanical properties of polymers. Modification of polymer properties by chemical and physical processing. Production and selection of polymeric materials for specific use.

056422  Polymer Molding and Die Technology  3(2-3)
Polymer moulding for industrial use with die technology.

056423  Rubber Technology  3(2-3)
Production of latex and different types of dried rubbers. Standard and regulations of rubber and latex. Chemical analysis of latex.

056424  Leather Processing Technology II  3(2-3)
Pre : 056322

056425  Leather Processing Technology III  3(2-3)
Pre : 056424

056427  Vegetables Oil Technology  3(2-3)
Design, extraction and refining of various fats and oils. Progress in fat and oil processing technology.

056428  Essential Oil Technology  3(2-3)

056431  Instrumentation and Control in Physico-Chemical Processing  3(3-0)
Pre : 056231

056441  Quality Control in Physico-Chemical Processing  3(3-0)
Pre : 422111

056471  Physico-Chemical Processing Plant Design  3(3-0)
Pre : 056331
Analysis and design of plant, equipment and necessary instrument for production of assigned products.

056481  Synthetic Rubber and Rubber Product Technology  3(2-3)
Theories and methods of production of synthetic rubber. Production of rubber products from latex and synthetic rubber. Mechanical properties and mechanical testing of rubber products.
056482  Sugar Technology  3(2-3)
Processing and operations of sugar industry. Deterioration, storage, and processing of sugar in industrial plants. By-products from sugar industry. Industrial plant visits.

056483  Starch Technology  3(2-3)

056484  Leather By-Product Technology  3(2-3)
Chemical and physical properties of by-product from tannery. Application of by-product from tannery in gelatin, pet food, and film manufacturing.

056485  Color and Flavor Technology  3(2-3)
Principles and processing of colors and flavors. Sources of raw materials. Utilization of colors and flavors in industry.

056486  Feed Technology  3(2-3)
Principle of feed production, nutritional value added in feed, composition of feed and feed safety, include factory visits.

056490  Cooperative Education  6
On the job training as temporary employee according to the assigned project including report writing and presentation.

056491  Research Techniques  3(1-6)

056496  Selected Topic in Physico-Chemical Processing Technology  1-3
Selected topics in physico-chemical processing technology at the bachelor degree level. Topics are subject to change each semester.

056497  Seminar  1
Presentation and discussion on current interesting topic in Physico-Chemical Processing Technology at the bachelor’s degree level.
ECONOMICS OF DEVELOPMENT AND PLANNING

101241 Economic History 3(3-0)
Pre : 108111 and 108112 or 108101
Analysis of development in economic and social structure of the developed economy. Problems in economic and political system from feudalism, mercantilism, industrial revolution, up to World War II.

101312 Thai Economy 3(3-0)
Pre : 108211 and 108212
Structure of Thai Economy and its present day performance.

101311 Economics of Development and Planning 3(3-0)
Pre : 108211 and 108212
Meaning and measurement of economic growth and development. Characteristics of underdeveloped economies. Internal and external economic factors and others which significantly influencing development. Obstacles to economic development. Case study of economic development and planning in Thailand and some other countries.

101421 Economic Development 3(3-0)
Pre : 101311

101422 Rural Economics 3(3-0)
Pre : 108112 or 108101

101423 Urban Economics 3(3-0)
Pre : 108211 and 108212
Analysis of urban development and its concomitant problems: housing, land use, transportation, public utilities, income, consumption, and urban poverty. Remedial and economic development policies. Field trip required.

101431 Economic Planning 3(3-0)
Pre : 101311

101432 Regional Economics 3(3-0)
Pre : 108211 and 108212

**101433  Project Preparation and Evaluation**  
3(3-0)  
Pre : 101311  
Project preparation with emphasis on economic and social aspects. Economic and financial analysis of project. Identification and analysis of project benefits and costs. Project implementation. Project selection criteria.

**101441  Economic Administration**  
3(3-0)  
Pre : 108211 and 108212  
Theoretical and practical analysis of government administration of economic policies, the NESDB's economic and social development plan in particular. Topics include the structuring of the economic development organizations, the effect of fiscal and monetary policy, and the impact of politics on the country's economic administration.

**101442  Economic Development of Selected Asian Countries**  
3(3-0)  
Pre : 108211 and 108212  
Asian economic development. Characteristics and economic structure. Dilemmas, planning and policies in stimulating economic development.

**101443  Economics of Poverty and Inequality**  
3(3-0)  
Pre : 108112 or 108101  
Definition and characteristics of poverty and inequality. Their causes and resulting problems. Measurement of poverty. Policies and measures to overcome such problems with emphasis on the case of Thailand. Field trip required.

**101444  Economic History of Thailand**  
3(3-0)  
Pre : 108111 and 108112 or 102181  
Historical study of Thai economy up to Ratanakosin period, emphasizing economic development since Bowring Agreements in 2398 B.E. until the setting-up of the early National Social and Economic Development Plans.

**101445  Economic History of the United States**  
3(3-0)  
Pre : 108111 and 108112 or 108101  
The evolution of the United States economy since the time of household industries up to large scale business. Development of agriculture, transportation, trade, and finance. The role of government in the economy.

**101446  Economic History of Japan**  
3(3-0)  
Pre : 108111 and 108112 or 108101  
The evolution of Japanese economy up to post World War II period emphasizing the economic, social and political change in Tokugawa and Meiji periods.

**101447  Comparative Economic Systems**  
3(3-0)  
Pre : 108212 or 108101  
Comparison of capitalism, socialism and other economic systems. Organizational administration, institutions, values, objectives, and behavior of each economic system.

**101497  Seminar**  
1  
Presentation and discussion on interesting topics in economics of development and planning at the bachelor's degree level.
101498  **Special Problems**  
Study and research in economics of development and planning at the bachelor’s degree level and compile into a written report.

### HUMAN RESOURCE AND INDUSTRIAL ECONOMICS  
**103xxx**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>103301</td>
<td>Health Economics</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 108101</td>
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<tr>
<td></td>
<td>Application of basic economic concepts to public health, sanitary and health care issues. Planning and allocation of public health resources. Cost and benefits for a public health project. Paradox of economic and public health concepts.</td>
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<tr>
<td>103302</td>
<td>Economics of Education</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 108101</td>
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<tr>
<td></td>
<td>Theories and concepts as well as roles of government and private sectors in education management. Education impacts on economic development. Manpower planning. Education and socio-economic problems.</td>
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</tr>
<tr>
<td>103311</td>
<td>Labour and Industrial Economics</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 108112 and 108211</td>
<td></td>
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<tr>
<td>103403</td>
<td>Labour Management Economics</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 108101</td>
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<tr>
<td>103404</td>
<td>Economics of Population</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 108101</td>
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<tr>
<td>103421</td>
<td>Economics of Human Resources</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 103311</td>
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<tr>
<td></td>
<td>Human resources and economic development. Investment on human resources in the aspect of education, training, migration and health care. Role of human resource investment in economic development and income distribution.</td>
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</tr>
<tr>
<td>103431</td>
<td>Labour Economics</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 103311</td>
<td></td>
</tr>
<tr>
<td>103432</td>
<td>Labour Market Analysis</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 103311</td>
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</tr>
<tr>
<td></td>
<td>Analysis of wage formulation with an emphasis on employment and unemployment problems. Wage rate and unemployment. Labour market information.</td>
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</tbody>
</table>
Role of government and labour union in labour market. Policy implication and measures to unemployment issues.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>103433</td>
<td>Economics of Labour Relations</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 103311</td>
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<tr>
<td>103434</td>
<td>Economics of Collective Bargaining</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 103311</td>
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<tr>
<td></td>
<td>Theoretical issues and forms of collective bargaining. Strategies and practice in collective bargaining by group and by individual.</td>
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<tr>
<td>103435</td>
<td>Economics of Remuneration</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 103311</td>
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<tr>
<td></td>
<td>Wage theory and labour welfare for industrial enterprises. Problems and issues in wage determination. Government policy and implication on wage determination and labour welfare.</td>
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<tr>
<td>103441</td>
<td>Economics of Industrial Organization</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 103311</td>
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<tr>
<td></td>
<td>Economic principles applied in industrial structure. Industrial conduct and industrial performance. Public policy and implication to industrial structure and industrial behavior.</td>
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<tr>
<td>103442</td>
<td>Economics of Industrialization</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 103311</td>
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<tr>
<td></td>
<td>Conditions and factors affecting industrial growth and development. Policies and planning for industrialization.</td>
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<tr>
<td>103497</td>
<td>Seminar</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Presentation and discussion on interesting topics in human resource and industrial economics at the bachelor’s degree level.</td>
<td></td>
</tr>
<tr>
<td>103498</td>
<td>Special Problems</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Study and research in human resource and industrial economics at the bachelor’s degree level and compile into a written report.</td>
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</table>

**INTERNATIONAL ECONOMICS (104xxx)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>104311</td>
<td>International Economics</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 108211</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Basic theory and policy of international trade. The effect international trade. Import tariff and export tax and their effects on the economy. Basic theory and policy of international finance, exchange rate, balance of payments, and international monetary system. The relationship between internal and external economy. International economic integration and foreign investment.</td>
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<tr>
<td>104401</td>
<td>International Economic Systems</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 108101 or 108111 and 108112</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The importance of international economic system. Basic theory and trend of international trade, investment and monetary system. Theory of international economic</td>
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</tbody>
</table>
integration and stage of international integration. International trade, investment, monetary, economic integration and negotiation policies of several countries. Role of international economic institution.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>104421</td>
<td>International Trade Policy</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 108212</td>
<td></td>
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<tr>
<td>104431</td>
<td>Theory of International Finance</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 108212</td>
<td></td>
</tr>
<tr>
<td>104432</td>
<td>International Finance Policy</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 108212</td>
<td></td>
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<tr>
<td></td>
<td>Balance of payments. An analytical framework for the flexibility of foreign debt service. Macroeconomic and international monetary measures and policies for internal and external balance. The evolution and experience of the international monetary system up to Bretton Woods. Roles of the International Monetary Fund. Problems of foreign debt repayment among developing countries.</td>
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<tr>
<td>104441</td>
<td>Economics of International Investment</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 104311</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Types of international investment and theories explaining causes. The economic effects of international investment on home and host countries. Measures for promoting foreign investment. Multinational corporations and government and international organization policies.</td>
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<tr>
<td>104451</td>
<td>Economics of International Integration</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 104311</td>
<td></td>
</tr>
<tr>
<td>104497</td>
<td>Seminar</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Presentation and discussion on interesting topics in international economics at the bachelor’s degree level.</td>
<td></td>
</tr>
<tr>
<td>104498</td>
<td>Special Problems</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Study and research in international economics at the bachelor’s degree level and compile into a written report.</td>
<td></td>
</tr>
</tbody>
</table>
# MONETARY ECONOMICS AND PUBLIC FINANCE

**(105xxx)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisite(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>105211</td>
<td>Money and Banking</td>
<td>3(3-0)</td>
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<tr>
<td>105311</td>
<td>Public Finance</td>
<td>3(3-0)</td>
<td>Pre: 108112 and 108211</td>
</tr>
<tr>
<td>105401</td>
<td>Economics of Household Finance</td>
<td>3(3-0)</td>
<td>Pre: 108101</td>
</tr>
<tr>
<td></td>
<td>Contemporary Thai economic system, the standard of living and family welfare. The correlation between income, expenditure, and the standard of living. General description on savings, investment, taxation, legal aspect of will making and inheritance receiving.</td>
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</tr>
<tr>
<td>105421</td>
<td>Monetary Theory and Policy</td>
<td>3(3-0)</td>
<td>Pre: 105211</td>
</tr>
<tr>
<td></td>
<td>Various kinds of monetary theories. The impacts of monetary variables on price, employment, income, interest and international balance of payment. Monetary policy for economic stabilization. Internal monetary policy. Field trip required.</td>
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</tr>
<tr>
<td>105422</td>
<td>Financial Market Theory</td>
<td>3(3-0)</td>
<td>Pre: 105211</td>
</tr>
<tr>
<td>105423</td>
<td>Economics of Monetary Fluctuations</td>
<td>3(3-0)</td>
<td>Pre: 105211</td>
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<tr>
<td></td>
<td>Monetary fluctuations and causes. Its impact on the efficiency of resources utilization, income distribution, and economic development. Monetary stabilization policy.</td>
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<tr>
<td>105424</td>
<td>Financial Institutions and the Economy</td>
<td>3(3-0)</td>
<td>Pre: 105211</td>
</tr>
<tr>
<td></td>
<td>Main characteristics of financial institutions in Thailand. Their behavior and role in mobilizing and distributing financial fund. Impact on monetary variables and economic development. The international financial institutions and their role in Thailand. Field trip required.</td>
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<tr>
<td>105431</td>
<td>Fiscal Theory and Policy</td>
<td>3(3-0)</td>
<td>Pre: 105311</td>
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</table>
Economics of public activities including the analysis of government functions, expenditures, as well as alternative means of obtaining revenue. Government policies for economic stabilization and growth. The relationship between monetary policy and fiscal policy. Public debt and policies for managing public debt.

**105432 Economics of Government Expenditure** 3(3-0)

Pre : 105311


**105433 Economics of Government Revenue** 3(3-0)

Pre : 105311


**105434 Wealth Theory** 3(3-0)

Pre : 105211


**105497 Seminar** 1

Presentation and discussion on interesting topics in monetary economics and public finance at the bachelor’s degree level.

**105498 Special Problems** 3

Study and research in monetary economics and public finance at the bachelor’s degree level and compile into a written report.

**NATURAL RESOURCES AND ENVIRONMENTAL ECONOMICS (106xxx)**

**106311 Introduction to Natural Resources and Environmental Economics** 3(3-0)

Pre : 108211

Human, natural resources and the environment; resources classification and utilization; economic growth, quality of natural resources and the environment; consumption, production and effects of environmental impacts on quality of life; corrective and mitigation measures for natural resources and environmental problems; natural resources and the environmental situations and management in Thailand. Field trip required.

**106421 Natural Resources Economics** 3(3-0)

Pre : 106311

Natural resources as production factors and consumer’s goods; resources depletion and scarcity; resource classification; principles of resources utilization; intertemporal economics, resources conservation and sustainable uses; principles, guidelines and economic tools in the management of natural resources. Field trip required.
106422  Environmental Economics  3(3-0)  
Pre : 106311  
Welfare economics; market and market failures; externalities and public goods; carrying capacity of natural resources and the environment; the problem of natural resources depletion and causes of environment pollution; effects of environmental pollution on quality of life; principles, guidelines and economic tools in solving environmental problems. Field trip required.

106423  Economic Development and Natural Resources Utilization  3(3-0)  
Pre : 106311  
Concept and theory of economic development: natural resources and the environment as production factors and waste absorptive resources: the material balance model principle and toxic waste discharged into the atmosphere; resources depletion; creation of environmental pollutions; status of Thailand’s and world’s vital natural resources and the environment; impacts of natural resources’ and the environment deterioration; guidelines for natural resources development and corrective measures to cope with natural resources and the environment deteriorations. Field trip required.

106424  Economic Valuation Techniques of Natural Resources and Environment  3(3-0)  
Pre : 106311  
Value in economic context, market failure in valuation benefit and cost in market and non-market values. Principles and concepts of resources and environmental valuations; economic concepts related to natural resources and environmental valuation, preliminary-valuation techniques and application; valuation techniques used in Thailand and obstacles.

106425  Energy Resources Economics  3(3-0)  
Pre : 106311  
Definitions and types of energy in various forms; applications of economic concepts to energy topics and environmental impacts due to energy consumption and production; energy price determination mechanism; public policies in managing energy utilization and environmental impact mitigation. Field trip required.

106497  Seminar  1  
Presentation and discussion on interesting topics in natural resources and environment economics at the bachelor’s degree level.

106498  Special Problems  3  
Study and research in natural resources and environment economics at the bachelor’s degree level and compile into a written report.

QUANTITATIVE ECONOMICS  
(107xxx)

107111  Quantitative Methods for Economists  3(3-0)  
Methods and principles of mathematics and statistics for economists. Functions, graphs, equations, system of equations, matrices, limits and continuity, of function derivatives and anti derivatives, integrations, and descriptive statistics.

107211  Mathematical Economics I  3(3-0)  
Pre : 108111, 108112 and 107111  
The use of mathematical techniques as a tool to explain economic concepts by applying calculus and matrix algebra to economic problems, both static and comparative static. The construction of simple econometric models.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits (Lecture-Tutorial)</th>
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<tbody>
<tr>
<td>107311</td>
<td>Economic Statistics</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 108111, 108112 and 107111</td>
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<td></td>
<td>An introduction to statistics as a tool to summarize the description of data and to test economic variables. Simple designs and sample distribution, statistical estimation, Chi-square test, the analysis of variance, basic regression and correlation techniques, multiple regression and correlation, time series and index numbers.</td>
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<tr>
<td>107321</td>
<td>Mathematical Economics II</td>
<td>3(3-0)</td>
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<td>Pre: 107211</td>
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<td>The use of advanced mathematical method to analyse the change in economic condition. Integral calculus, first-order differential equations, higher-order differential equations and linear programming are applied to economic theories and problems.</td>
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<tr>
<td>107411</td>
<td>Econometrics I</td>
<td>3(3-0)</td>
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<td>Pre: 107311</td>
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<td></td>
<td>Relationships between variables, and the role of econometrics. Simple regression theories and application, measures of goodness of fit, and logarithmic functional forms. Multiple regression theory and application, dummy variables, multicollinearity problem, autocorrelation and simultaneous equation models.</td>
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<tr>
<td>107421</td>
<td>Mathematical Programming for Economic Application</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: (1)108111, 108112 and 107211 or (2)108101 and 107211</td>
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<tr>
<td></td>
<td>Concepts and theories of linear and nonlinear programming for economic applications.</td>
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<tr>
<td>107422</td>
<td>Operations Research for Economic Applications</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 108211, 108212 and 107211</td>
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<tr>
<td></td>
<td>Analysis of economic problems by using mathematical methods, linear programming, and queuing methods. Decision under uncertainty.</td>
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<tr>
<td>107423</td>
<td>Input-Output Analysis</td>
<td>3(3-0)</td>
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<td></td>
<td>Pre: 108211, 108212 and 107211</td>
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<tr>
<td></td>
<td>Concepts and theories of input-output analysis. Its application to economic problems.</td>
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<tr>
<td>107431</td>
<td>Econometrics II</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 107421</td>
<td></td>
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<tr>
<td></td>
<td>Simultaneous-equations estimation, types of equation systems, identification problems, problems of contra-assumptions, ordinary least squares, maximum likelihood estimation, K-class estimators, and lagged variables. Econometric forecasting.</td>
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<tr>
<td>107491</td>
<td>Research Methods in Economics</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 108211 and 108212 and 107311</td>
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<tr>
<td></td>
<td>Principle and procedure of economic research. Research methodology, problem identification, hypothesis testing, data collecting, data processing, data analysing, and research conclusion. Computer usage in economic research.</td>
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<tr>
<td>107497</td>
<td>Seminar</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Presentation and discussion on interesting topics in quantitative economics at the bachelor’s degree level.</td>
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</tr>
<tr>
<td>107498</td>
<td>Special Problems</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Study and research in quantitative economics at the bachelor’s degree level and compile into a written report.</td>
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</table>
### ECONOMIC THEORY

(108xxx)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits (Lecture-Tutorial)</th>
</tr>
</thead>
<tbody>
<tr>
<td>108101</td>
<td>Introduction to Economics</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>108111</td>
<td>Microeconomics I</td>
<td>3(3-0)</td>
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<tr>
<td>108112</td>
<td>Macroeconomics I</td>
<td>3(3-0)</td>
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<tr>
<td>108211</td>
<td>Microeconomics II</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 108111 Microeconomic principles concerning economic functioning of free-trade economic system in dealing with basic economic problems. Demand, supply, market equilibrium. Theories of consumer, production and cost. Principles of price and quantity determination of goods and services in different types of market. Determination of factor prices and principles of resource allocation.</td>
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<tr>
<td>108212</td>
<td>Macroeconomics II</td>
<td>3(3-0)</td>
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<tr>
<td>108311</td>
<td>History of Economic Thoughts</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 108212 History of the evolution of economic thoughts since the time of Bible, Greek, Roman, and Medieval up to Mercantilism, Physiocrats, Classical School, Socialism, Keynes, Neoclassical, and Contemporary Schools.</td>
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<tr>
<td>108321</td>
<td>Microeconomics III</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 108211 Mathematical analysis of consumer behavior theory, production and cost theory, market price determination theory, general equilibrium theory, welfare economics and economic model.</td>
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</tbody>
</table>
108322  Macroeconomics III  
Pre : 108212  
Mathematical analysis in determining national income, equilibrium in demand, and supply side of the economy, static equilibrium model, wage determination and unemployment, monetary and fiscal policies, international revenue policies and balance of payments, inflation, relationship between wage, price, and output and economic growth.

108431  Welfare Economics  
Pre : 108211  
Concept and basic proposals for economic welfare. Theory of welfare economics and social optimum. The application of welfare policy for social and state enterprises.

108441  Economic Growth and stability  
Pre : 108212  
Dynamic theories in economics, business cycle, and growth models. Policy impact on economic growth acceleration and stability.

108451  Political Economics  
Pre : 108111 and 108112 or 108101  

108452  Contemporary Political Economics  
Pre : 108111 and 108112 or 108101  
Methodology for socio-politico-economic operation and application, including evolution of operation guidelines of Marxist, Lenin, and other similar schools of economics. Their applications in underdeveloped countries, with particular reference to Thailand's conditions and problems by emphasizing on comparative analysis with present economic concept.

108497  Seminar  
Presentation and discussion on interesting topics in economic theory at the bachelor's degree level.

108498  Special Problems  
Study and research in economic theory at the bachelor’s degree level and compile into a written report.

TRANSPORTATION AND PUBLIC UTILITIES ECONOMICS  
(109xxx)

109311  Introductory Transportation Economics  
Pre : 108111 and 108112  
Meaning and scope of transportation economics, significance and role of transport system in the economy. Economic characteristics of road, rail, air, water, and pipeline transportation. Fundamental theories of transportation economics. Government transport policy, rules, regulations, and legal issues. Contemporary Thai transportation problems and development. Field trip required.

109421  Location Economics of Location  
3(3-0)
<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>109422</td>
<td>Public Utilities Economics</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>Pre: 109311</td>
<td>Interrelationship among locations of economic activities, resources, and markets. Role of location on transport cost. Government policy on location.</td>
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<tr>
<td>109423</td>
<td>Logistic Management Economics</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>Pre: 109311</td>
<td>Principles of traffic control and their application in commerce and industry. Managing transportation business and physical distribution of raw materials and finished goods. Location theory. Warehouse management and inventory control. (And field study).</td>
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<tr>
<td>109424</td>
<td>International Transportation</td>
<td>3(3-0)</td>
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<tr>
<td>Pre: 109311</td>
<td>Role of transportation in international goods and passenger movement. Operations of international air and ocean transportations. Organizations and associations controlling international transportation to raise efficiency. Problems and suggested solution. Field trip required.</td>
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<tr>
<td>109425</td>
<td>Urban Transportation</td>
<td>3(3-0)</td>
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<tr>
<td>Pre: 109311</td>
<td>Urban transport problems. Interrelationship between urban transportation planning and land uses. Urban transportation modes. Urban transportation planning processes, transportation demand and supply estimation, analysis and evaluation of urban transport system.</td>
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<tr>
<td>109426</td>
<td>Transport Development and Planning</td>
<td>3(3-0)</td>
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<tr>
<td>Pre: 109311</td>
<td>General transportation planning processes. Transportation demand and supply estimation. Transport system analysis and evaluation. The choice of transport program and project appropriate to the economy, society, and environment. Co-ordination of various transportation modes.</td>
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<tr>
<td>109427</td>
<td>Transportation Pricing</td>
<td>3(3-0)</td>
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<tr>
<td>Pre: 109311</td>
<td>Principles of transportation rate determination of various modes of road, water, and air transportation. The effect of transportation cost and rate on economic activities.</td>
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<tr>
<td>109497</td>
<td>Seminar</td>
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<td>Presentation and discussion on interesting topics in transportation and public utilities economic at the bachelor’s degree level.</td>
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<tr>
<td>109498</td>
<td>Special Problems</td>
<td>3</td>
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<tr>
<td></td>
<td>Study and research in transportation and public utilities economic at the bachelor’s degree level and compile into a written report.</td>
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<td>Course Code</td>
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<tr>
<td>110311</td>
<td>Managerial Economics</td>
<td>3(3-0)</td>
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<td></td>
<td><strong>Pre:</strong> 108111 and 108112</td>
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<td></td>
<td>Application of economic theories to firm’s decision process. Analyses of demand, cost, profit, pricing, and investment criteria. Analyses of aggregate demand, aggregate supply, economic stabilization, and economic policies for business decision making. Application of international economics for management and decision making rules in managerial problems.</td>
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<tr>
<td>110421</td>
<td>Business Economics Forecasting</td>
<td>3(3-0)</td>
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<td></td>
<td><strong>Pre:</strong> 107311</td>
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<td></td>
<td>Basic business economics forecasting, model selection for forecasting, forecasting with multiple regression, time-series decomposition, choosing forecasting techniques.</td>
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<tr>
<td>110431</td>
<td>Financial Business Economics</td>
<td>3(3-0)</td>
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<td><strong>Pre:</strong> 105211</td>
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<td>Business finance and its role in the economy, the impact of monetary policies on business, financial statements, cost of capital and structure of the capital, the short-term and long-term financing.</td>
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<tr>
<td>110441</td>
<td>Marketing Business Economics</td>
<td>3(3-0)</td>
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<td></td>
<td><strong>Pre:</strong> 108211</td>
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<td>The role of marketing, marketing process, analyzing the marketing environment, consumer behavior, marketing research and information, estimating and forecasting market demand, identifying market segments and selecting market targets, production and costs, market structure and designing marketing strategies, pricing, managing marketing channels, marketing promotion and international marketing.</td>
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<td>110451</td>
<td>Business Economics Policy</td>
<td>3(3-0)</td>
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<td><strong>Pre:</strong> 108111 and 108112</td>
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<td>External business environment, international and domestic, particularly the economic policies affecting present and future business performance, policy and strategy of the firm. Internal environment and the firm’s competitive advantage. The competitive advantage of nation to determine production location in a global competition. Business policy and strategy formulation and implementation.</td>
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<td>110452</td>
<td>Business Economics Ethics</td>
<td>3(3-0)</td>
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<td><strong>Pre:</strong> 108111 and 108112</td>
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<td>The relationship between business economics and social ethics. Developments of social ethics from personal to organization and institutional levels. Ethics, efficiency, and the market system. Ethical responsiveness to business and economic stakeholders. Ethical issues related to politics and socio-economics, economics policy, environment, human rights and corporate good governance. Trend of social ethical standard and its application for business and economic developments.</td>
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<tr>
<td>110497</td>
<td>Seminar</td>
<td>1</td>
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<tr>
<td></td>
<td>Presentation and discussion on interesting topics in business economics at the bachelor’s degree level.</td>
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</table>
110498  Special Problems            3
Study and research in business economics at bachelor’s degree level and compile into a written report.

AGRICULTURAL ECONOMICS
(119xxx)

119111  Introduction to Agricultural Economics 3(3-0)
Pre : 108111 and 102181

119221  Principles of Farm Management 3(3-0)
Pre : 119111
Decision-making process of a farmer as a farm manager. Economic principles applied to farm management. Analysis of capital and land requirements. Selecting and integrating farm enterprises. Farm accounts and accounting analysis. Farm planning and farm budgeting. Farm layout, Management of crops, livestock, labour, mechanization, building, and water resources. Influences of changes affecting farm management.

119331  Principles of Agricultural Marketing 3(3-0)
Pre : 119111

119332  Agricultural Product Prices 3(3-0)
Pre : 119331

119341  Agricultural Credit 3(3-0)
Pre : 119111

119351  Agricultural Resource Economics 3(3-0)
Pre : 108211

119371 Introduction to Agribusiness 3(3-0)
Pre : 119111 or 132111

119372 Agribusiness Process 3(3-0)
Pre : 119111 or 132111
Agribusiness defined, its scope and composition. The organization of an agribusiness. The process of management in agribusiness. Managerial type and style. The agribusiness planning process and policy. Field-trip included.

119381 Quantitative Analysis Agricultural Economics I 3(3-0)
Pre : 119111 and 417112

119382 Quantitative Analysis in Agricultural Economics II 3(3-0)
Pre : 119111 and 422111

119383 Quantitative Analysis in Agricultural Economics III 3(3-0)
Pre : 119111 and 422111

119401 General Agricultural Marketing 3(3-0)
Definition of market and marketing of agricultural products, market structure and type of markets. Buying and selling as well as price determination of agricultural products. Marketing costs and margin. Market regulation and contracts. Agricultural prices analysis, government policy and regulations in marketing of specific agricultural commodities particularly cereals, upland crops, horticultural products, livestock and livestock products, fisheries products, and agricultural production inputs. Role of government in the development of agricultural marketing.

119405 Economics for Sustainable Agriculture 3(3-0)
Pre : 102181
Definitions and structure of sustainable agriculture. An application of economic concepts of natural resources and environment to agriculture in order to understand the impacts of agriculture on environment. Economic evaluation of various
agricultural system. Public policies for sustainable agriculture. Case studies on sustainable and non-sustainable agriculture.

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Pre-Requisites</th>
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<tbody>
<tr>
<td>119411</td>
<td>Food and Population Problems</td>
<td>3(3-0)</td>
<td>119111</td>
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<tr>
<td>119412</td>
<td>Food Distribution</td>
<td>3(3-0)</td>
<td>119332</td>
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<td></td>
<td>Analysis of factors affecting food consumption of various population groups. Structure and structural changes in the food production industry in Thailand. Analysis of problems and obstacles of Thailand's and world's food distribution. Field-trip included.</td>
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<tr>
<td>119413</td>
<td>Economics of Biotechnology</td>
<td>3(3-0)</td>
<td>119111 or 108101 or 108111</td>
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<td>Economics concepts, analytical framework, and related policies in food and agricultural commodities modified and developed by biotechnology.</td>
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<td>119421</td>
<td>Farm Organization</td>
<td>3(3-0)</td>
<td>119221</td>
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<td></td>
<td>Farm organization. Types and sizes of farmer organizations. Principles and methods of farm organization and planning of various types and sizes in terms of physical and economic points of view. Field trip included.</td>
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<tr>
<td>119422</td>
<td>Agricultural Production Economics</td>
<td>3(3-0)</td>
<td>119221</td>
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<tr>
<td>119423</td>
<td>Farm Appraisal</td>
<td>3(3-0)</td>
<td>119221</td>
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<td></td>
<td>History of farm appraisal. Objectives and types of farm appraisal. Appraisals of present and future values of land and buildings. Depreciation allowance. Farm appraisal as a measurement device for credit and taxation consideration.</td>
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<tr>
<td>119431</td>
<td>Marketing and Pricing of Agricultural Inputs</td>
<td>3(3-0)</td>
<td>119331</td>
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<td></td>
<td>Market structure and organization. Market conduct in business, procurement, distribution, competition and pricing of agricultural input. Problems and policies relating to agricultural mechanization, fertilizer, chemicals, pesticides, seeds, land, and agricultural labors.</td>
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<td>119432</td>
<td>Agricultural Marketing Information Development</td>
<td>3(3-0)</td>
<td>119331</td>
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<tr>
<td>119433</td>
<td>Marketing and Pricing of Food Grains and Upland Crops</td>
<td>3(3-0)</td>
<td>119332</td>
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119434  **Marketing of Livestock and Poultry**  3(3-0)

**Pre : 119331**

Demand for and supply of livestock and poultry. Marketing system, functions channels, costs and margins. Technological changes affecting marketing system. Problems and obstacles in livestock and poultry marketing development. Marketing research. Public role in the promotion of livestock and poultry marketing. Field trip included.

119435  **Marketing of Fisheries and Fishery Products**  3(3-0)

**Pre : 119311**

Demand for and supply of fish and fishery products. Marketing system, functions, channels, costs and margins. Technological changes affecting marketing system. Problems and obstacles in the development of fish and fishery products marketing. Marketing research. Public role in the promotion of fish and fishery product marketing. Field trip included.

119436  **Marketing of Horticultural Products**  3(3-0)

**Pre : 119331**

Demand for and supply of horticultural products. Marketing system, functions, channels, costs and margins. Technological changes affecting marketing system. Problems and obstacles in the development of horticultural products. Marketing research. Public role in the promotion of horticultural products marketing. Field trip included.

119437  **Agricultural Marketing Problems and Policies**  3(3-0)

**Pre : 119331**

Marketing problems on rice, upland crops, livestock, poultry, fish, fruits and vegetables, especially problems on processing, transportation, storage, distribution, advertisement, and pricing. Problems and public policies and market institutions on agricultural product market. Expansion of existing markets and search for new markets both domestic and overseas ones.

119441  **Agricultural Capital Markets and Credit Institutions**  3(3-0)

**Pre : 119341**

Structural analysis of agricultural capital markets and various credit institutions with special emphasis on organizational aspects and efficiency of credit operation. Public role and policies towards market structure and agricultural capital markets. Field trip included.

119451  **Land Economics**  3(3-0)

**Pre : 119111**


119452  **Land Problems and Policies**  3(3-0)

**Pre : 119111**

119453  Economics of Fishery Resources  3(3-0)
Pre : 108211

119454  Economics of Aquaculture  3(3-0)
Pre : 108211
Importance of aquaculture, existing characteristics and production potential of aquaculture, getting information for considering economic feasibility of aquaculture and investment decision, factors affecting economics of aquaculture, economic theory in application for aquaculture, utilization of aquatic animals, including policy and development. Policy and development planning for fishery resources especially aquaculture. Field study is included.

119455  Economics of Forestry Resources  3(3-0)
Pre : 108211

119461  Agricultural Policy  3(3-0)
Pre : 119221 and 119332

119462  Economics of Agricultural Development  3(3-0)
Pre : 119111 and 108212

119463  Economics of Rural Development  3(3-0)
Pre : 119111 or 102181
Problems on poverty, population, and rural employment. Policies and programs in rural development. Concept and planning in rural development. Types of planning and operation. Effects of rural development projects on rural income and population. Field trip included.

119464  Local Government in Agriculture  3(3-0)
Pre : 119111
Form of local government in agriculture, finance, recruitment and personnel administration. Planning and programming of agricultural administration.
Evaluation of agricultural programs. Description and classification of agricultural public problems in local areas.

119465 Taxation in Agriculture 3(3-0)
Pre : 119341

119466 International Agricultural Trade 3(3-0)
Pre : 119331
Role of international trade. Role of agriculture in international trade picture. International trade principles. Thailand's trade pattern and trade policy in agriculture. Primary commodity problems and role of international trade organizations in agricultural trade negotiations.

119467 Agricultural Project Planning and Management 3(3-0)
Pre : 119111
The project planning process. Review of procedures used to identify projects in developing countries. Case study in project planning and management: development targets; resource requirements; project design; feasibility study; financial, economic and social appraisal; project financing; project implementation; performance monitoring and control; evaluation procedures; integration of projects into development plans.

119471 Problem Solving and Decision Making in Agribusiness 3(3-0)
Pre : 119371
Systematic approach to problem analysis and decision making using case studies related to some major agricultural firms and agro-industries. Field-trip included.

119472 Agribusiness Management 3(3-0)
Pre : 119371

119473 Economics of Agricultural Processing Industries 3(3-0)
Pre : 119331
Economic principles of firm plants and agricultural processing industries concerning sizes, location and procurement of raw materials. Problems and obstacles in the agricultural processing industries’ operation. Government’s roles and policies in the agricultural processing industries’ structure and expansion. Field trip included.

119474 Economics of Agro-industrial Organization 3(3-0)
Pre : 108211
Interrelationship of market structure, business behavior, and economic performance of firms in agro-industry. Game theory. Related government policies.

119481 Using Computer Programme in Agricultural Economics Analysis 3(2-2)
Pre : 119383
The application of microcomputer programs to the fields of agricultural economics is emphasized. The topics for analysis are included demand, supply, farm management and project evaluations. The statistical analysis related to agricultural economics are also presented. The introduction of system modeling is developed.
119490  Cooperative Education 6
   On the job training as a temporary employee according to the assigned project including report writing and presentation.

119491  Basic Research Methods in Agricultural Economics 3(3-0)
   Pre : 119111 and 422111
   Principles and methods in agricultural economics research, identification of research problems, formulation of research objectives and hypotheses, collection of data, construction of questionnaire, data analysis and interpretation, application of statistic for research, report writing and presentation.

119496  Selected Topics in Agricultural Economics 3(3-0)
   Selected topics in agricultural economics at the bachelor’s degree level. Topics are subject to changed each semester.

119497  Seminar 1
   Presentation and discussion on current interesting topics in agricultural economic at the bachelor's degree level.

119498  Special Problems 2
   Study and research in agricultural economics at the bachelor’s degree level and compile into a written report.

COOPERATIVE ECONOMICS
(125xxx)

125101  Introduction to Cooperative Sciences 3(3-0)

125111  History of Cooperative Development 2(2-0)
   History of cooperation/mutual aid among people and different forms of economic institutions appeared through human history. Important personalities in the development of cooperatives. Emergence of early cooperatives in western Europe, early cooperative efforts in other selected countries. Nature and objectives of cooperative enterprise: principles and characteristics of the cooperatives-definition, aim differences between cooperatives and other forms of enterprises-the dual characters of the cooperative, cooperative and economic system-problems and obstacles in the development of cooperatives and solutions proposed.

125112  Cooperative Principles and Practices 3(3-0)
   The nature of cooperative principles, ideas and practices. Historical development of cooperative principles. ICA cooperative principles. Other principles of cooperatives in general and principles for cooperatives of specific types, Procedures for organizing cooperatives Ways to run and manage cooperatives.

125211  Cooperative Doctrines 2(2-0)
   Pre : 125111
   Basic concept of cooperatives. Cooperative principles and philosophy. Comparative study of cooperative and other economic doctrines.

125212  Structures and Management of Cooperatives 3(3-0)
   Pre : 125112
   Different ways of forming cooperatives. Cooperative classification in Thailand. Organization of cooperative structure and activities. Cooperatives management
and its unique features: financing, marketing, purchasing, merchandising, accounting, personnel management, communication, member, director and employee education.

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<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>125221</td>
<td><strong>Agricultural Cooperatives Thailand</strong></td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 125112</td>
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<td>Meaning, original development, business operations and objectives of agricultural cooperatives in Thailand, Cooperative administration structure, relationship between agricultural cooperatives and other related institutions.</td>
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<tr>
<td>125231</td>
<td><strong>Non-Agricultural Cooperatives in Thailand</strong></td>
<td>3(3-0)</td>
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<td>Pre: 125112</td>
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<td>Meaning and original development, objectives and business operations of non-agricultural cooperatives. Administration structure of some basic cooperatives. Relationship between different non-agricultural cooperatives and other related institutions. Importance of non-agricultural cooperatives to national economic development.</td>
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<tr>
<td>125241</td>
<td><strong>Cooperative Movement in Thailand</strong></td>
<td>3(3-0)</td>
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<td>Pre: 125101 or 125111</td>
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<td>Developments, structure organization of the movement, operations and trend of cooperative movements in Thailand. Cooperative organization by the state and by the cooperative movement. Cooperative promotion by the state, by the cooperative movements and by the privates.</td>
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<tr>
<td>125311</td>
<td><strong>Cooperative Laws and Regulations</strong></td>
<td>3(3-0)</td>
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<td>Pre: 125112</td>
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<td>Development of cooperative legislation. General provision of cooperative law, different formats of legislation governing cooperative societies. Content of cooperative laws, by-laws, which the cooperatives have to follow.</td>
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<td>125312</td>
<td><strong>Cooperative Accounting System</strong></td>
<td>3(3-0)</td>
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<td>Pre: 125212 and 130171</td>
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<tr>
<td>125313</td>
<td><strong>Quantitative Analysis for Cooperative Management I</strong></td>
<td>3(3-0)</td>
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<td>Pre: 125212 and 422111</td>
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<tr>
<td>125314</td>
<td><strong>Quantitative Analysis for Cooperative Management II</strong></td>
<td>3(3-0)</td>
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<td>Pre: 125212 and 417112</td>
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<tr>
<td>125321</td>
<td><strong>Credit Management of Agricultural Cooperatives</strong></td>
<td>3(3-0)</td>
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<td>Meaning and nature of agricultural credit. Planning and supervising of the provision of credit to members. Repayment, rates of interest, collateral and sources of funds. Comparative aspects of cooperatives in relation to other credit institutions. Practical problems in providing credit of .</td>
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<tr>
<td>125322</td>
<td><strong>Agricultural Cooperatives Purchasing</strong></td>
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Pre : 125221

125323 Agricultural Cooperatives Marketing 3(3-0)
Pre : 125221
Meaning and importance of cooperative marketing. Methods of members product assembling, processing and marketing. Grading, storing, packing, shipping, pricing, providing efficient marketing system and techniques of marketing promotion. Cooperative financing. Practical problems of product assembling and marketing of agricultural cooperatives in Thailand. Field trip included.

125331 Savings Cooperatives Management 3(3-0)
Pre : 125231
Analysis of business operation of savings cooperatives. Structure organization of savings cooperative movement. Credit analysis, credit inspection and supervision, working capital management, investment analysis, capital structure, cost of capital, rates of interest. Problems and obstacles in the administration of savings cooperatives in Thailand.

125332 Consumer Cooperatives Management 3(3-0)
Pre : 125231

125411 Cooperatives and Economic and Social Development 3(3-0)
Pre : 125212 and 108212
Role, duty and importance of cooperatives to economic and social development in the field of promotion of savings, capital accumulation, occupation development and cooperation among people in various forms of business operations including in the provision of credit, marketing, processing, transportation and communication, banking and insurance together with necessary welfare services, and in the functioning as important mechanism of government and private organization in community and society development.

125412 Cooperative Policy and Planning 3(3-0)
Pre : 125212
Cooperative policy making and planning. Application of knowledge and theoretical ideas to practical situations for making decisions and decision making, as the cooperative administrative management personals.

125413 Budgeting Management of Cooperatives 3(3-0)
Pre : 125212 and 130172

125414 Cooperative Education and Extension 3(3-0)
Pre : 125112

125415  Cooperatives Economics            3(3-0)  
Pre : 125112 and 108111  
Applications of economic principles and theories to cooperative business. Economic concept as relevant to cooperatives: pricing, production, control of supply, and income stabilization, Economics of collective bargaining, Cooperative income distribution.

125421  Warehouse Management of Agricultural Cooperatives 3(3-0)  
Pre : 125221  
Importance and types of warehouses and processing activities in agricultural cooperatives. Business operations of agricultural cooperative warehouses. Analysis of decision making on size of warehouse, transportation, internal work system, inventory management. Practical problem of warehouse management of agricultural cooperative in Thailand.

125422  Financial Management of Agricultural Cooperatives 3(3-0)  
Pre : 125221  

125423  Agricultural Cooperatives and Rural Development 3(3-0)  
Pre : 125221  
Rural socio-economic background, concepts and principles if economic and social development of rural society. Roles of agricultural cooperatives and other institutions in development in relation to the government rural development policies. Cooperatives as the economic, social and cultural center both domestic international.

125431  Housing Cooperatives Management 3(3-0)  
Pre : 125231  
Analysis of business operations of housing cooperatives. Structure organization of housing cooperative movement. Investment analysis, capital structure, role and operations, problems and obstacles of housing cooperatives in Thailand. Field trip included.

125432  Service Cooperatives Management 3(3-0)  
Pre : 125231  

125441  Cooperative Movement in Asia 3(3-0)  
Pre : 125101 or 125111
Development, structures, operations and trend of cooperative movements in Japan, India, Israel, Republic of Korea, People’s Republic of China, Asean and Oceania countries.

125442  Cooperative Movement in Europe  3(3-0)
Pre : 125101 or 125111
Development, structures, operations and trend of cooperative movement in the United Kingdom of Great Britain and Northern Ireland, Federal Republic of Germany, Netherlands, France, Scandinavia and Eastern Europe.

125443  Cooperative Movement in America  3(3-0)
Pre : 125101 or 125111
Development, structures, operations and trends of cooperative movement in the United States of America and Canada.

125491  Research Methods in Cooperatives  3(3-0)
Pre : 125313 or 422451

125492  Computer Application in Cooperative Sciences  3(2-2)
Pre : 418112 or 4181131
The application of computer programs to various cooperatives’ tasks.

125497  Seminar  1
Presentation and discussion on interesting topics in cooperatives economics at the bachelor’s degree level.

125498  Special Problems  3
Study and research in cooperatives economics at the bachelor’s degree level and compiled into a written report.
**FACULTY OF BUSINESS ADMINISTRATION**  
(130xxx – 149xxx)  

**ACCOUNTING**  
(130xxx)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>130101</td>
<td>General Accounting</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Basic principles, concepts and accounting practice, recording, financial statement preparation, the use of accounting information in management.</td>
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<tr>
<td>130102</td>
<td>Accounting for Non-Accountant</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Definition and importance of accounting, accounting principles, accounting under cash-basis for personal-income tax units, preparation of cash budget, Thai Accounting Act, recognition of transactions under accrual basis, accounting procedures under double entry system, financial statement preparation and basis analysis.</td>
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<tr>
<td>130111</td>
<td>Principles of Accounting, Introduction</td>
<td>3(2-2)</td>
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<tr>
<td></td>
<td>Principles of accounting; accounting framework; accounting cycle; and financial statements preparation for servicing, merchandising and manufacturing firms; voucher system; special journals, control account; and subsidiary ledgers; emphasizing accounting professional ethics.</td>
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<tr>
<td>130112</td>
<td>Intermediate Accounting I</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 130111</td>
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<tr>
<td></td>
<td>Principles of Accounting for assets description, valuation and presentation in the financial statement.</td>
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<tr>
<td>130171</td>
<td>Financial of Accounting</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>General accounting principles; principles of recording transactions for cash, account receivables, note receivables, inventories, investment, tangible and intangible assets, liabilities, owner equities; preparation of financial reports.</td>
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<tr>
<td>130172</td>
<td>Management Accounting</td>
<td>3(3-0)</td>
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<td></td>
<td>Pre : 130171</td>
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<td></td>
<td>Role of management accounting; cost accounting; standard costing; activity based costing; budgeting; flexible budgeting; cost-volume-profit analysis; responsibility accounting; segment reporting; pricing decision; use of accounting information for management.</td>
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<tr>
<td>130211</td>
<td>Intermediate Accounting II</td>
<td>3(3-0)</td>
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<td></td>
<td>Pre : 130111</td>
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<tr>
<td></td>
<td>Accounting principles and practice for liabilities and owners’ equity, disclosure and valuation measurement, accounting changes and correction, financial statement presentation.</td>
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<tr>
<td>130221</td>
<td>Principles of Cost Accounting</td>
<td>3(3-0)</td>
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<td></td>
<td>Pre : 130112 and 130211</td>
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<tr>
<td></td>
<td>Basic principles of cost accounting; job order costing; process costing; accounting for direct material, direct labor and manufacturing overhead; accounting for joint and by product; accounting for spoiled goods, scrap and waste materials; standard costing; budgeting, flexible budgets and variance analysis; just-in-time system; activity based costing.</td>
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</tr>
<tr>
<td>130251</td>
<td>Accounting Software Package</td>
<td>3(2-2)</td>
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</tbody>
</table>
Pre: 130101 or 130111 or 130171


130311 Advanced Accounting I 3(3-0)
Pre: 130112 and 130211

Accounting practice for various types of businesses; consignment; joint venture; installment sales; leasing business; partnerships; home-office and branch accounting; and business liquidations.

130312 Advanced Accounting II 3(3-0)
Pre: 130112 and 130211

Accounting for combined corporate entities, preparation of consolidated financial statements, foreign currency transactions, translation of foreign financial statements and fund accounting.

130321 Managerial Accounting 3(3-0)
Pre: 130221

Roles of management accountants and managerial accounting in organization; cost concept and classification for management; traditional and contemporary managerial accounting for decision making, planning and control.

130331 Principles of Auditing 3(3-0)
Pre: 130112 and 130211

Objectives, scope, rules and regulation of auditing, principles and procedures of internal control; audit techniques, computer assisted audit techniques, audit planning and auditor’s reports.

130332 Internal Control 3(3-0)
Pre: 130211

Principle, concept and the component of integrated control framework. Internal accounting controls that can apply to various standards of accounting profession: accounting and auditing. The importance of professional ethics which required good governance in business.

130341 Modern Budgeting 3(3-0)
Pre: 130211

The budgeting process; method and procedures in preparation of financial and operating budgets; traditional and modern budget; computer application in budgeting; case studies in developing all budgets and performance reports.

130351 Accounting Systems 3(3-0)
Pre: 130221

Principles of accounting system design; evaluation and design of internal control system; document and book design; design of reporting which suits businesses and demand of related parties; field trip required.

130352 Accounting Information System 3(3-0)
Pre: 130221 and 418112 or 418113

Foundations of accounting information systems; technology of accounting information; accounting information system applications in business; systems development process; case studies and accounting software practices.

130361 Tax Accounting 3(3-0)
Pre: 130112, 130211 and 132242

Tax liability of businesses to Accounting Acts and Revenue Code; accounting for withholding tax, value added tax, and specific business tax; personal
income tax and corporate income tax computations; difference between accounting income and taxable income; disclosures of income tax in financial statements.

130413 Accounting Theory 3(3-0)
   Pre : 130311
   Evolution, nature, structures, concept and assumptions of accounting; application of accounting principles and procedures to economic law and regulation, professional standards, and social environment; principles of income measurement; evaluation of assets, liabilities and owner equities; presentation in financial reporting and related problem.

130421 Managerial Cost Accounting 3(3-0)
   Pre : 130221
   Special topics on contemporary cost approaches for decision making; and contemporary cost planning and control systems.

130431 Problems in Auditing 3(3-0)
   Pre : 130331
   Various problems in auditing; application of auditing principles for various situations and auditor's reports.

130432 Internal Audit and Control 3(3-0)
   Pre : 130331
   Scope; type of internal auditing; professional standard of internal audit; internal control structure and evaluation; internal audit technique and process; internal audit program; audit finding and reports.

130433 Accounting Information System Controls and Audit 3(3-0)
   Pre: 130331
   Roles and impact of computer on control and audit; relevant professional standards; risk and computer crimes; structure of computer controls; audit process and computer assisted audit techniques; fields trip required.

130441 Financial Statement Preparation and Analysis 3(3-0)
   Pre : 130112 and 130211
   Preparation of financial statements; analysis of structure and trend from financial statements, analysis of cash flow statement and statement of change in financial position; use of ratios analysis for planning, controlling and decision making through a case study; adjustment of financial statements under the price level changes.

130442 Accounting for Planning and Control 3(3-0)
   Pre : 130172 or 130211
   Nature and role of controller; organization structures; planning and control techniques; using accounting information in planning and control in operating. Field trip required.

130451 Accounting Information Systems Analysis and Design 3(3-0)
   Pre : 130352
   Accounting information systems analysis and design; use of data flow diagrams; data dictionaries in systems analysis; output and input design; file and database design.

130452 Internet Accounting 3(3-0)
   Pre : 130352
   Advances in computer technology; world wide web; internet services for accounting profession; modern accounting software and international issues for internet accounting.

130453 Database Systems for Accounting 3(3-0)
Pre : 130352
Basic concept of database; languages; design of database; database system
implementation techniques and trends; and commercial database systems.

130461 Governmental and Fund Accounting  3(3-0)
Pre : 130112 and 130211
Principles of Fund Accounting for nonprofit organization. Differences
between Fund Accounting and Financial Accounting. Governmental Budgeting,
Accounting systems for Thai governmental units.

130462 Specialized Accounting  3(3-0)
Pre : 130112 and 130211
Accounting procedures and systems of various kinds of institutes such as
financing business, insurance, warehouse, public welfare, agriculture business, hotel
hospital and others. Selected one or more topics; field trip required.

130463 Bank Accounting  3(3-0)
Pre : 130112 and 130211
Accounting systems for commercial bank. Perform the financial reports due
to the regulation of the commercial bank; field trip required.

130464 International Accounting  3(3-0)
Pre : 130312
Accounting systems in the international business; comparative international
accounting and practices; the harmonization of international accounting diversity;
forward contract and inflation; international financial statements and disclosure;
consolidation; business combination and segmental reporting; international statement
analysis; transfer pricing and taxation; planning and control in the multinational
enterprises.

130497 Seminar  1
Presentation and discussion on current interesting topics in accounting at
the bachelor’s degree level.

130498 Special Problems  3
Study and research in accounting at the bachelor’s degree level and compile
into a written report.

FINANCE
(131xxx)

131211 Business Finance  3(3-0)
Objectives and role of financial management, financial forecasting and
planning, financial decisions in cash and marketable securities management, receivables
management, inventory management and financial decisions.

131331 Business Financing  3(3-0)
Pre : 131211
Techniques and methods of financing business: short-term financing,
mortgage loan, leasing, bonds or long-term debt, preferred stock and common stock,
capital budgeting, cost of capital, capital market and corporate restructuring.

131312 Financial Planning and Control  3(3-0)
Pre : 131211
Techniques that should be used in financial analysis, comprehensive
method for financial review and discussion of business firms.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>131313</td>
<td>Personal Finance</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Personal financial management techniques, financial planning and control, a system of spending. Consumer credits, life and securities, retirement planning.</td>
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<tr>
<td>131314</td>
<td>Industrial Finance</td>
<td>3(3-0)</td>
<td>Pre : 131211</td>
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<tr>
<td></td>
<td>The finance of industrial project for all levels, especially that belongs to government and private sector including the planning of project proposal with project analysis and implementation.</td>
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<tr>
<td>131315</td>
<td>Credit and Collection</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Principles and methods of credit-granting and collection policies to all business, functions of credit and operation of credit department, scope of credit management, credit limited, investigation and analysis of credit risk, collection policies, management control of credit and collection operations.</td>
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<tr>
<td>131316</td>
<td>Business Asset Management</td>
<td>3(3-0)</td>
<td>Pre : 131211</td>
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<tr>
<td></td>
<td>Techniques and decision planning in working capital management, models of cash and marketable securities management, models of account receivable and models of inventories, factors and theories in investment decisions under risk and uncertainty.</td>
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<tr>
<td>131317</td>
<td>Principles and Policy of Investment</td>
<td>3(3-0)</td>
<td>Pre : 131211</td>
</tr>
<tr>
<td></td>
<td>Principles and policy of securities investment, investment and speculation, factor considerations for investment, analysis, measuring of return on investment, making investment decision.</td>
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<tr>
<td>131321</td>
<td>International Finance</td>
<td>3(3-0)</td>
<td>Pre : 131211</td>
</tr>
<tr>
<td></td>
<td>Operation, policies and function of international financial institutions, foreign exchange tools, foreign exchange rate system, policies of controlling and promotions, international agreements that affecting business profit, international business operations including capital, taxation, labour, marketing problems and international agreements, operation of foreign department of commercial banks.</td>
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<tr>
<td>131322</td>
<td>International Business Finance</td>
<td>3(3-0)</td>
<td>Pre : 131211</td>
</tr>
<tr>
<td></td>
<td>Types of international business, operations and objectives of business including the environmental affected, assets and liabilities management, financial decisions, investments and dividend policies of international business, financial instruments used in foreign trade, business risk, investment risk, foreign exchange risk that affect the international business financial management.</td>
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<tr>
<td>131331</td>
<td>Financial Institutions</td>
<td>3(3-0)</td>
<td>Pre : 132111</td>
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<tr>
<td></td>
<td>Nature and operations of financial markets and institutions classified by function. Financial intermediaries : an overview, commercial banks, thrift and insurance intermediaries, other non-bank financial intermediaries.</td>
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<tr>
<td>131332</td>
<td>Principles of Insurance</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Principles, management and operations in insurance: fire insurance, marine insurance, automobile insurance, accident insurance and life insurance.</td>
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<tr>
<td>131333</td>
<td>Principles of Life Insurance</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>History of insurance, definition and advantages of life insurance in family, society, business, principles and life insurance business operation, factors in determining</td>
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</tbody>
</table>
premium rates, types of life insurance and premium plan reserve and cash surrender value.

131334  Social Insurance  3(3-0)
   History of social insurance, the differentiation between social insurance and underwriting insurance, the type of social insurance, the social welfare, fund reserves, the government policy and the law of social insurance.

131335  Commercial Bank Management  3(3-0)
   Pre: 131211
   Structure, function, management of commercial banks, commercial bank system, credit granting policies, bank loans, investment, and bank reserves, clearing house, foreign exchange and other credit instruments.

131411  Securities Analysis  3(3-0)
   Pre: 131211
   Scope in securities analysis, characteristic of securities, portfolio selection process, selecting optimal portfolio, earnings and dividend estimation, the valuation theory of security.

131412  Finance in Non-Profit Organization  3(3-0)
   Pre: 131211
   Nature and operations of non-profit organization, the difference between business and non-profit organization, policy, objectives and organization structure, financial management and analysis for non-profit organization, planning and control, financial planning through budgeting, financial reporting and performance analysis.

131413  Financial Planning and Control  3(3-0)
   Pre: 131211
   Problems in financial planning and control. Auditing technique and managerial control. Financial Managers, budgeting decisions in profit planning and costs, budgets preparations.

131414  Derivative Securities  3(3-0)
   Pre: 131211

131431  Asset Evaluation of Financial Institution  3(3-0)
   Pre: 132111
   The Principles, methods, and guidelines of financial institution. The inspection of asset. The asset evaluation and real estate evaluations.

131432  Banking Policy and Problem  3(3-0)
   Pre: 131335
   Policies and problems of commercial bank, banks operation and competition among the financial institutions and case study in such areas.

131491  Financial Research  3(3-0)
   Characteristics of financial research. Objective methodologies instruments and research designs of financial research and writing the report.

131497  Seminar  1
   Basic principles and functions in seminar management. Presenting the selected issue in the class.

131498  Special Problems  3
   Concept and principles of research, type of research and reporting. Suitable required research for financial items.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>132111</td>
<td>Principles of Management</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Concepts of administration and management, scientific management and human relation approach, bureaucracy system, business structure, function and classification, the influences of environment to business administration, management process and executives' significant roles and activities.</td>
<td></td>
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<tr>
<td>132142</td>
<td>Business and Legal Environment</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Legal environment of business, definition, sources and classification of law. The judicial system, dispute settlement by court and arbitrators, legal liabilities of business.</td>
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<tr>
<td>132211</td>
<td>Organization Behavior</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Organization theory and design structure of formal and informal organization. Individual behavior and group perception behavior, motivation process. Environment of organization. The management of conflict in organization. Organization development.</td>
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<tr>
<td>132221</td>
<td>Human Resource Management</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>132242</td>
<td>Business Tax System</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Role of taxation on country development. Principles and practices of good tax collections, tax liability of individuals and businesses under the Revenue Code, custom tax, excise tax, and taxes administered by local government.</td>
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<tr>
<td>132243</td>
<td>Business and Social Responsibilities</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Roles, functions and responsibilities of business toward society, environmental impact business, business response to social need and stakeholder management.</td>
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<tr>
<td>132311</td>
<td>Office Management</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Operation and efficient office management. Various filing systems, office stationaries, budgeting, business correspondence and public relation.</td>
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<tr>
<td>132312</td>
<td>Management by Objectives</td>
<td>3(3-0)</td>
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<td></td>
<td>Definition of management, business management by objectives. Planning for goal achievement, the participative management, appraisal the results by objective setting. Properly selection for the best pattern and system of management by objectives.</td>
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<tr>
<td>132313</td>
<td>Organization Communication</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Significance, channels of communication, barrier to communicate planning and type of communication achieving and role of effective communication in private sector and government sector.</td>
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<tr>
<td>132314</td>
<td>Environment of Business</td>
<td>3(3-0)</td>
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<td>Course Code</td>
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<tr>
<td>132321</td>
<td>Human Resource Development</td>
<td>3(3-0)</td>
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<td>Pre: 132221</td>
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<td>General business atmosphere, social responsibility of</td>
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<td>the business institutions, the influences of social,</td>
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<td>economic and political environments, business</td>
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<td>development to coping with environment change and</td>
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<td>general legal aspects.</td>
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<tr>
<td>132322</td>
<td>Wage and Remuneration Management</td>
<td>3(3-0)</td>
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<tr>
<td>Pre: 132221</td>
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<tr>
<td></td>
<td>Principle and policy of wages and salary. Compensation,</td>
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<td>other form of wages, salaries and compensation.</td>
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<td>Payment design. Planning of wage and salaries</td>
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<td>structure, incentive and welfare.</td>
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<tr>
<td>132323</td>
<td>Industrial Relations</td>
<td>3(3-0)</td>
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<tr>
<td>Pre: 132221</td>
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<tr>
<td></td>
<td>Factors concerning working conditions, labor</td>
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<td>administration. Procedure of collective bargaining</td>
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<td>agreement and settlement of labor dispute. Morale,</td>
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<td>industrial psychology, efficiency of industrial</td>
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<td>relations policies.</td>
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<tr>
<td>132333</td>
<td>Management Information System</td>
<td>3(3-0)</td>
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<tr>
<td>Pre: 132111</td>
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<tr>
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<td>Information for management, collecting data system,</td>
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<td>using the data and information for short-long term</td>
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<td>planning, day-to-day management information service,</td>
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<td>flows of data and information between organizations,</td>
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<td>techniques in keeping and using data by mathematical</td>
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<td>method and analysing the result from using the data</td>
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<td>system.</td>
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<tr>
<td>132334</td>
<td>Business System Analysis</td>
<td>3(3-0)</td>
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<tr>
<td>Pre: 132111</td>
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<tr>
<td></td>
<td>Techniques in analysing and designing business system,</td>
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<td>application of the system, computer system design,</td>
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<td>selection of computer system suitable for business,</td>
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<td></td>
<td>control and safety for computer data. Field trip</td>
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<td>included.</td>
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<tr>
<td>132335</td>
<td>Business Management with Computer Application</td>
<td>3(3-0)</td>
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<tr>
<td>Pre: 418112</td>
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<tr>
<td></td>
<td>or 418113</td>
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<td></td>
<td>Techniques for system and computer application in</td>
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<td>business. Personnel management, feasibility study of</td>
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<td></td>
<td>computer application in business. Data processing and</td>
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<td></td>
<td>analysis for decision making. Field trip included.</td>
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<tr>
<td>132336</td>
<td>Business Forecasting</td>
<td>3(3-0)</td>
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<tr>
<td>Pre: 132338</td>
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<tr>
<td></td>
<td>The method of forecasting business situation, the</td>
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<td>fundamental and method of statistics. The time series</td>
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<td>analysis, correlation and regression analysis, trend</td>
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<td>analysis market survey and testing. Different models</td>
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<td>with stem from learning behavior. The model building</td>
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<td>and simulation, indirect forecasting method, the</td>
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<td>evaluation and complete form of forecasting.</td>
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<tr>
<td>132337</td>
<td>Business Negotiation</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Introduction of concepts and theories of business</td>
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<td>negotiation, factors to be considered for negotiation</td>
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<td>as well as the process of negotiation. All enable</td>
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<td>students to analyze situations and make plans for</td>
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<td>successful negotiations. General techniques, tactics</td>
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<td>and ethical approaches of negotiations are also</td>
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<td>introduced in this course.</td>
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<tr>
<td>132338</td>
<td>Statistics and Quantitative Analysis for Decision</td>
<td>3(3-0)</td>
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<td>Making in Business</td>
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</tbody>
</table>

II-65
Decision making under uncertainty and risk. Quantitative analysis for business problems applying concept of mathematical programming, queuing theory, game’s theory and Markov analysis.

132341 Business Law on Industry 3(3-0)
Pre : 132142 or 453111
Business law concerns with the application for construction of factory. Application for investment promotion privilege. Machinery registration. Warehouse, undertaking registration and juristic act on land. Housing and real estate business.

132342 Business Law on Finance 3(3-0)
Pre : 132142 or 453111
Legal aspects on various kind of financial institutes. Commercial bank, finance company, securities company, credit foncier company, insurance company, and the control of the state to such institutes. Use of various credit instruments, bill of exchange, promissory note, check, life and non-life insurance.

132343 Business Law on Maritime 3(3-0)
Pre : 132142 or 453111

132344 Business Law on Consumer Protection 3(3-0)
Pre : 132142 or 453111
Legal aspects on product liability, consumers' rights. Consumer protection in the field of advertising. Consumer protection in the field of labelling. Price fixing. Industrial goods standardization. And monopoly, promotion of fair competition and fair trade. The consumer protection of the certain products.

132411 Resource Management in Business 3(3-0)
Pre : 108111 or 132111
Resource management in business for production, financial marketing and human resource. Situational management limited resources by evaluate the earning from the resource used.

132412 Small Business Management 3(3-0)
Pre : 132111
Small business definition and type of business, feasibility study in establishing the firm. The nature and problem in personnel management, financial, production and operation management for product and service, involving in marketing area.

132413 Business Policy 3(3-0)
Pre : 134111 and 131211 or 132211
Business strategy, policy and problem analysis by managerial level for business operating plan implementation.

132414 New Enterprise Management 3(3-0)
Pre : 132111
Functional and organizational structure, management of new enterprise. Problems in operation of new enterprise. Funding, promotion procedure, planning, expansion and project study.

132415 Management of Learning Organization 3(3-0)
Pre : 132111
Meaning and importance of learning organization. The development processes of learning organization: knowledge acquisition, knowledge sharing and
knowledge utilization. The characteristics that indicate the level of learning organization: cultural values, leadership commitment and empowerment, communication, knowledge transfer, employee characteristics and performance improvement.

132421  Manpower Planning  3(3-0)
Pre : 132111
Personnel planning and auditing. Ability and compatibility in quality and quantity of work in organization for placement, promotion, transfer, termination and dismissal including manpower problem solving and development.

132422  Personnel Testing and Evaluation  3(3-0)
Pre : 132111
Plan and technique and structure testing personnel evaluation use for personnel job. Theory and measurement evaluation performance personnel testing and attitude by quantitative description. Psychological personnel testing. Problem in testing technique.

132431  Management Simulation Techniques  3(3-0)
Pre : 132338
Theory and fundamental techniques of management simulation and games applicable to business problem solving in finance, marketing and production. Field study included.

132432  Project Evaluation in Business  3(3-0)
Pre : 132111
Project evaluation in business concerning management, production, finance, marketing, personnel and economic value of project. Calculation project benefit, decision criteria on project preparation, feasibility study and environmental effect on the project operation.

132441  International Business Law  3(3-0)
Pre : 132142 or 453111
Legal aspects on international sales. Importation and exportation of goods, custom procedure and tariff. Transnational investment (direct and portfolio). International monetary market, foreign exchange control, international credit facility, international loan of private sector. Tax consideration of international financial transact.

132442  Business Law on Intellectual Properties  3(3-0)
Pre : 132142 or 453111
Legal aspects on patent, trade mark, copy rights. Procedure of application for rights conferred. Assignment and infringement of intellectual properties. Licensing system.

132451  International Business  3(3-0)
Concept, objective and international business practice under international economic, social and political environment, organization structure, policy formulation, international finance investment, production, marketing, human resources and management information system under current economics environment.

132452  Comparative Management  3(3-0)

132491  Research Methods in Business  3(3-0)
Pre : 132338
Importance of business research. Steps of research operations. Research proposal, objective and hypothesis. Data collection and processing, data analysis and
research writing including the application of the result from research in business management.

132497 Seminar 1
Basic principles and functions in seminar management. Presenting the selected issue in the class.

132498 Special Problems 3
Concept and principles of research, type of research and reporting. Suitable required research for Management items.

OPERATIONS MANAGEMENT (133xxx)

133211 Operations Management 3(3-0)
Pre: 132111
Basic principles and functions in operations management. Planning, organizing design and control of operations system; quantitatively. Field study included.

133242 Introduction to Electric Commerce 3(3-0)
Roles of electronic commerce on business, business models for electronic commerce, technology basic, world wide web commerce. Report of application in business and study tour are included.

133312 Operations System Design 3(3-0)
Pre: 133211
Location analysis, facilities and process design, facilities layout planning, solution of process equipments and material handling equipments, work study and work design. Field study included.

133313 Operations Cost Control 3(3-0)
Pre: 133211 and 130172
Controlling techniques for production cost, controlling of materials, labour and overhead costs. Standard costing and work simplification. Controlling of work methods, accounting procedures and management techniques.

133314 Materials Management 3(3-0)
Pre: 133211
Strategy for buying material in production. Work-in process material controlling system inventory control and transportation management in operations.

133315 Operation Planning and Control 3(3-0)
Pre: 133211
Operation planning and control, states forecasting techniques, intermittent operations planning, project planning and control, operations sequencing and assignment, quality control.

133317 Quality Management 3(3-0)
Pre: 133211

133318 Supply Chain Management 3(3-0)
Pre: 133211
Concepts and fundamental of supply chain management. Methodologies for designing and managing integrated supply chain networks. Physical distribution
strategy, strategic alliances, inventory management, coordinated product and network design. Management information system for supply chain.

133319  Managing Continuous Improvement  3(3-0)  
Pre : 133211  
Concepts and fundamental of continuous improvement. Systematic approach in analysis and in improvement. Planning and managing in continuous improvement process.

133321  Tourism Management  3(3-0)  
Pre : 133211  
Principles, concepts, objectives and how to operate tourism area potential evaluation and demand survey, and analysing of tourism areas in order to do a developing plan and conservative, managing tour program and field study.

133322  Transportation Management  3(3-0)  
Pre : 132111  
Transportation; its scopes and functions. Significance of transportation. The forms of intercity carriage and how to operate transportation system effectively.

133323  Hotel Management  3(3-0)  
Principles of hotel management, job description duties and procedure of each departments in hotel business, public relation and marketing promotion, communication between hotel business and other related business, and field study.

133324  Meal Service and Restaurant Management  3(3-0)  
Basic principles of meal service and restaurant management. Industrial catering management. Designing menu, banqueting and operations aspects of food service.

133415  Operations Strategy  3(3-0)  
Pre : 133211  
Role of operations strategy for competitive advantage; industry analysis, formulation of appropriate organization and operations strategy, and development of operations system capabilities.

133416  Reliability Management  3(3-0)  
Pre : 133211  
Management approach to make output from operations meet standard quantitatively and qualitatively, quality control of input and output from operations using statistical and management approach, setting up policy for maintenance of equipments and facilities for operations by considering probability of failure of equipments.

133417  Industrial Safety Management  3(3-0)  
Pre : 133211  
Management principles for industrial safety; types, causes and preventive methods for accidents, safety planning and motivation method to prevent accident, principles for controlling population from industrial factory. Field study included.

133418  Warehouse Management  3(3-0)  
Pre : 132121  
Principle of warehouse management. Category of warehouse, location selection, and activities and network management. Legal aspects, plus outside study.

133419  Decision Making in Operations Management  3(3-0)  
Pre : 133211  
Analysis of problems occurred in business which are operational concerned, application of knowledge in operations management and operations research for business decision, case study required.

133425  Shipping Management  3(3-0)
Pre : 132111
Principles of ship operation, types of ships. Ship procurement, planning sailing schedules, ship's paper, custom procedures, expenses and freight rates, chartering, lines conferences and port operations.

133427  Airline Management 3(3-0)
Pre : 132111
Principles of Airline operation. Organizing, planning and controlling of various department including air and ground services. Flight schedules reservation and pricing. Agreement and practices for Federal Aviation Administration. Field trip included.

133428  Food and Beverage Control 3(3-0)
Pre : 133324
General knowledge of food service planning and controlling in food and beverage operations. Purchasing, budgetary control. Operational features and preparing report about related items. Field study included.

133490  Cooperative Education 6
On the job training as a temporary employee according to the assigned project including report writing and presentation.

133497  Seminar 1
Presentation and discussion on current interesting topics in operations management at the bachelor’s degree level.

133498  Special Problems 3
Study and research in operations management at the bachelor’s degree level and compile into a written report.

MARKETING (134xxx)

134111  Principles of Marketing 3(3-0)

134211  Consumer Behavior 3(3-0)
Pre : 134111 and 459111
Principles and analysis of consumer behavior. Considering factors for buying decision both internal and external factors. Including the results from studying consumer behavior to set up marketing strategies.

134311  Purchasing 3(3-0)
Pre : 134111

134312  Business Communication in Marketing 3(3-0)
Pre : 134111

134313 International Marketing 3(3-0)
Pre : 134111

134314 Retailing 3(3-0)
Pre : 134111

134315 Wholesaling 3(3-0)
Pre : 134111
The character and development of wholesale business. Structure; roles; functions; types and pattern of wholesaling. Managerial system of wholesaling in buying and selling functions. Locating; transporting; storage; pricing; financing and controlling.

134321 Sales Management 3(3-0)
Pre : 134111

134322 Marketing Channel Management 3(3-0)
Pre : 134111
Nature, structure and type of marketing channel. Role, function and development of channel systems. Conflict and co-operation of marketing institutions. Selecting, evaluating and controlling marketing channel. Factors and environments that effect marketing channel management.

134331 Advertising 3(3-0)
Pre : 134111
Roles; importance; development and concept of advertising. Organizing of advertising, composition of advertising work, selecting media, preparing campaign, budgeting and evaluation of advertising. Law and ethic concerning with advertising.

134332 Sales Promotion 3(3-0)
Pre : 134111
Definition, importance and objectives of sales promotion. Consumer promotion, trade promotion, sales force promotion, communication and selling promotion. Decision to select sales promotion tools. Roles of sender, receiver and message of sales promotion. Marketing communication process and the effectiveness of sales promotion.

134333 Salesmanship 3(3-0)
Pre : 134111

134411 Service Marketing 3(3-0)
Pre: 134111

134412 Industrial Goods Marketing 3(3-0)
Pre: 134111
Principles and activities involved in marketing of industrial goods; differences between consumer goods marketing and industrial goods marketing in the areas of buyer behavior, marketing mix decisions. Analysis of market structures; habits and motives of purchasers; types of industrial products; pricing problems; distribution channels and promotional techniques.

134413 Wholesaling of Agricultural Products 3(3-0)
Pre: 134111 or 139331
Importance of wholesalers in agricultural markets. Functions and types of wholesales. Marketing channels, pricing, handling, and storing. Problems and policies of agricultural products and markets.

134414 Physical Distribution 3(3-0)
Pre: 134111
Principles and process of physical distribution. Purchasing, storage, inventory control, order processing, transportation. Law and regulations of transportation and claims.

134415 Marketing System and Environment 3(3-0)
Pre: 134111 and 132142
The roles of marketing system to economy and society. Functions and types of marketing institutions. Influence of government agencies, the environment of economics, technologies, resources and politics. Law and ethics that business people should pay attention.

134421 Marketing Management 3(3-0)
Pre: 134111
Concepts of marketing management. Roles and functions of marketing manager. Policy and strategy of product management, price management, channel management and promotion management. Analysis, planning, controlling and organizing. Problems and case study in marketing.

134422 Product and Price Policy 3(3-0)
Pre: 134111
Manager's concepts in planning and setting product and price policy. Setting product mix. Developing marketing strategy for product and price related to product life cycle. Studying internal and external environment that influence and to set product and price policy.

134423 Export-Import Management 3(3-0)
Pre: 134313
and managing export-import departments. Government offices and private institutions relating to export-import business.

**134431 Creativity and Production in Advertising**  
*Pre : 134331*

Perspective and technique in advertising creativity for consumer product, industrial product and service concerning writing theme message, logo and brand of product, planning for advertising campaign including advertisement design through media.

**134432 Advertising Media Management**  
*Pre : 134331*

Theory of media selection, content and nature of each media, quality of media, select audience size and time consistency to advertising objective, effectiveness and cost of media.

**134490 Cooperative Education**

On the job training as a temporary employee according to the assigned project including report writing and presentation.

**134491 Research Methods in Marketing**  
*Pre : 134111 and 132331 or 422311*

Marketing research's history. Role and influence of marketing research to modern business. Type and scope of marketing research. Procedure, design, and budgeting. Quantitative application in analysis and interpretation of data. Research presentation for executive planning and making decision.

**134492 Sales Forecasting**  
*Pre : 134111 and 132331 or 422311*

Theory and importance of sales forecasting. Techniques and methods of forecasting: types of data, analysing data in quantitative and qualitative. Factors influencing the reliability of forecasting including the application of forecasting output for improvement and development the marketing plan.

**134497 Seminar**  

**134498 Special Problems**

Concepts and principles of research, type of research and reporting. Suitable required research for Marketing items.
FACULTY OF EDUCATION  
(150xxx – 199xxx)

EDUCATION  
(151xxx)

151111 Basic Concepts of Education  2(2-0)  
Meaning and educational goals based on educational philosophies; emphasis on Thai educational goals, National Education Schemes, principles of educational management in response to individual, social, economic, as well as national needs; rational for organization of particular schools; and trends of educational practices.

151223 Field experiences: Observation and Practice in school  1(0-2)  
Observation and study of school administrative system on academic, student affairs, office function, service centers, and other special projects.

151311 Ethics and Codes for Teachers  2(2-0)  
Concept of ethics and codes for teachers, the meaning and the importance of ethics and codes for teachers, teacher roles, teacher status for social activities, social value for good teacher characters, Garudhamniyom; teacher morals developing process: self, behavior, virtue, ideal, mind, and others.

151323 Field experiences: Observation and Practice in Classroom  1(0-2)  
Observation and practice of classroom teachers both at primary and secondary level.

151423 Field experiences: Observation and Practice in Teaching  1(0-2)  
Observation of teachers in major subject at primary and secondary levels. Observation of students’ learning behavior. Observation of classroom management. Teaching practice in major subjects at primary and secondary levels.

151428 Field experiences: Student Teaching  6  
Teaching practice in an educational institution.

151429 Field Experiences : Student Teaching and Classroom Research  6  
Teaching practice and conducting classroom research cooperatively with Cooperative teachers and supervising teachers.

EDUCATION RESEARCH AND EVALUATION  
(153xxx)

153351 Principles of Educational Measurement and Evaluation  3(3-0)  
Significance, principles and process of education measurement and evaluation, tools and tools construction, the quality of education tools, scoring and interpreting, measurement and evaluation of learning in schools, reporting of educational achievement.

153429 Classroom Research  3(3-0)  
Principles and methods of inquiry, development system in an action cycle, classroom action research and teaching professional development, planning and writing up classroom research proposal, implementing, collecting and analyzing data,
synthesizing, discussing and reporting research finding, teacher researcher’s learning outcomes and developing a new vision of teaching practice, ethics in classroom research.

### TEACHING MATHEMATICS

(158xxx)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>158221</td>
<td>Curriculum and Mathematics Instruction</td>
<td>3(3-0)</td>
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<td></td>
<td>The meaning and objectives of curriculum, the important factors contribute to curriculum development; curriculum and mathematics instruction at the elementary and secondary levels; the process of teaching mathematics and cooperative learning; the comparison of Thai mathematics curriculum and instruction with other countries; and the mathematics measurement and evaluation.</td>
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<tr>
<td>158222</td>
<td>Algorithms in Mathematics Proofs I</td>
<td>3(3-0)</td>
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<tr>
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<td>Mathematical structure and reasoning process; definition; meaning of mathematical languages; logics; algorithms in mathematics proofs; proof of existence and uniqueness, mathematical induction.</td>
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<tr>
<td>158321</td>
<td>Principles and Methods of Teaching Mathematics at the Elementary Secondary Levels</td>
<td>3(3-0)</td>
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<td>Pre: 158221</td>
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<td>Principles and development of mathematics teaching methods and student’s abilities at the elementary and secondary levels; using appropriate materials with grade level, mathematics media, technology, and research results in improving mathematics teaching.</td>
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<tr>
<td>158322</td>
<td>Algorithms in Mathematical Proofs II</td>
<td>3(3-0)</td>
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<td>Pre: 158222</td>
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<td>Techniques and algorithms in mathematics proofs as basis for content such as sets, real number system, introductory number theory, relations and functions, limit and continuity by using variety of mathematics proofs correctly and appropriately.</td>
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<tr>
<td>158331</td>
<td>Media Construction in Teaching Mathematics</td>
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<td>The meaning of teaching media; construct and using teaching mathematics media, printed matter and innovation media.</td>
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<tr>
<td>158351</td>
<td>Measurement and Evaluation in Mathematics</td>
<td>3(3-0)</td>
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<td></td>
<td>Principles of mathematics measurement and evaluation for teachers in pratomsuksa and mathayomsuksa including test construction, meaning of score, test quality: index of item difficulty, index of discrimination test reliability.</td>
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<tr>
<td>158421</td>
<td>Mathematical Problem Solving</td>
<td>3(3-0)</td>
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<td>Meaning of mathematical problems and mathematical problem solving; process in solving problems; necessary compositions of mathematical problem solving; strategies in solving problems; algorithms in mathematics proofs; instruction enhancing problem solving skills.</td>
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<tr>
<td>158422</td>
<td>Mathematics in Everyday Life</td>
<td>3(3-0)</td>
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<td>Nature of mathematics; mathematical development; mathematical problem solving in everyday life; mathematical patterns in everyday life; concepts about geometry and transformation, algebra, trigonometry, probability and statistics in everyday life; the management of mathematics learning and instruction in everyday life.</td>
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</table>
Computer Application for Mathematics Teachers 3(3-0)  
**Pre:** 171111  
Concepts and theory of innovation and educational technology for mathematics instruction; information technology and data search; resource from databases in education; fundamental package programs and package programs in mathematics; application of computer in mathematics instruction.

Selected Topics in Mathematics Instruction 3(3-0)  
Selected topics in teaching mathematics at the bachelor’s degree level. Topics are subject to change each semester.

Special Problems 3  
Study and research in teaching mathematics at the bachelor’s degree level and compile into a written report.

**TEACHING SCIENCE**  
(159xxx)

Science Curriculum 3(3-0)  
History, principles, aims, and structure of science curriculum according to the framework of basic education curriculum; science and standard, Sc. Curriculum development, curriculum analysis, curriculum implementation; evaluation and trends of science curriculum.

Methods of Teaching Science at the Elementary Level 3(2-3)  
Purposes and science content science in teaching at the elementary level; nature of science, techniques and methods of teaching science, activities, media, and evaluation relevant to intellectual development and learning.

Methods of Teaching Science and Technology at the Secondary Level 3(2-2)  
Purposes and science content at the second level; learning environment; techniques and methods of teaching science, media, and evaluation relevant to new learning theories.

Strategies in Teaching Computer 2(1-3)  
Strategies in teaching computer consistent with learning theories. Emphasis on instructional software, including simulations, problem solving, drill and practice, tutorial, and instructional games. Programming in Logo.

Creativity in Science 2(2-0)  
The principle and scientific creativity defined. Creativity in curriculum, teaching techniques, creative science activity and program. Field trip is required.

Science Process Skills 2(1-2)  
Meaning and definition of science process skills. Practicum and application in using science process skills in classroom instruction.

Science Extracurricular Activities in School 2(1-2)  
Examples of planning, procedures and evaluation for extracurricular activities in science. Observation and practice in managing extracurricular activities for the science teacher. Field trip is required.

Construction and Utilization of Science Instructional Media 3(2-2)  
Importance, kinds selection and utilization of science instruction media, Problems and limitation of each kind of media. Media construction including utilization of innovations and educational technology in science instruction.
### Utilization and Maintenance of Science Equipment

Significance of science equipment. Standard of measurement basic science equipment in weighing and measurement. Utilization and maintenance of science equipment.

### Computer Assisted Science Instruction

Strategies in using computer assist science instruction design, construct, programming and determining efficiency of science courseware.

### Measurement and Evaluation in Science


### Practicum I

Observation and participation in activities related to science education at least 45 credits hours.

### Practicum II

Training in scientific research and management in both governmental and private educational or science institutions at least 90 credit hours.

### Readings in Contemporary Science Education Issues

Study and analyze problems in science and technology education from science and technology issues by using thinking process in searching for knowledge and establishing understanding.

### Science and Technology Education and Society

Meanings of science and technology education. Relations between science, technology education and social. Problems and how to solve social and environmental problems derived from over using of science and technology. The creative ways of using science and technology for society. Field trip is required.

### Environmental Education for School


### Science and Technology Project in School


### Seminar

Presentation and discussion on current interested topics in teaching science at the bachelor's degree level.

### Special Problems

Study and research in teaching science at the bachelor's degree level and compile into a written report.

### CURRICULUM AND INSTRUCTION (162xxx)

### Curriculum and Instruction

Definitions and component of curriculum, curriculum development, organizing of instruction, media, measurement and evaluation.
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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>162222</td>
<td>Elementary School Curriculum</td>
<td>2(2-0)</td>
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<tr>
<td></td>
<td>Structure of standard-based elementary curriculum: strand; standard; and benchmark. Elementary curriculum development based on curriculum standard: learning period and learning activity setting; and curriculum evaluation.</td>
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<tr>
<td>162321</td>
<td>Secondary School Curriculum</td>
<td>2(2-0)</td>
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<tr>
<td></td>
<td>Structure of standard-based secondary curriculum: strand; standard; and benchmark. Secondary curriculum development based on curriculum standard: learning period and learning activity setting; and curriculum evaluation.</td>
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<tr>
<td>162425</td>
<td>Methods of Teaching</td>
<td>3(3-0)</td>
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<td></td>
<td>Types of teaching methods, teaching techniques, advantages and limitations of each method, preparation of lesson plan, appropriate use of teaching methods, innovation and technology in education, measurement and evaluation.</td>
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<tr>
<td>162426</td>
<td>Elementary Education</td>
<td>2(2-0)</td>
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<tr>
<td>162427</td>
<td>Secondary School</td>
<td>2(2-0)</td>
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**EDUCATION PSYCHOLOGY AND GUIDANCE (166xxx)**

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<thead>
<tr>
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<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>166211</td>
<td>Educational Psychology</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Definitions, and functions of educational psychology, human brain and learning, human intelligence, relationships between intelligence and environment, human development, Theories of learning, methods of knowledge, skills and attitudes, classroom management, self-concept and learning achievement.</td>
<td></td>
</tr>
<tr>
<td>166212</td>
<td>Developmental Psychology for Teacher</td>
<td>2(2-0)</td>
</tr>
<tr>
<td></td>
<td>Development of physical structure, intelligence, emotion, social and adjustment of students in the elementary and secondary school levels; the emphasis is on helping teachers to realize and understand how to create school and classroom environment to fit with child development; methods of teaching and solving of problems occur in these age levels are included to make sure that the students have complete development.</td>
<td></td>
</tr>
<tr>
<td>166312</td>
<td>Education for Individuals with Special Needs</td>
<td>2(2-0)</td>
</tr>
<tr>
<td></td>
<td>Philosophical, historical and legal foundations of special education, characteristics and needs of individuals with special needs, current practices and research in the field of special education.</td>
<td></td>
</tr>
<tr>
<td>166311</td>
<td>Principles of Guidance</td>
<td>2(2-0)</td>
</tr>
</tbody>
</table>
History, philosophy, and definitions of guidance, needs for guidance in school; types of guidance: guidance techniques, personality of guidance teachers; all school staff in relation to guidance programs, public relations and evaluation of guidance program.

**166323 Classroom Dynamics**  
**Pre : 166211**  
Concepts and theories of classroom leaning and interaction. Theories of human and environment relations. Group structures, roles and influences of group on persons, person-group relationships, classroom management. Current trends and research findings pertaining to educational social environment.

**166331 Guidance Activities Management in Classroom**  
**Pre : 166311**  
Principles, objectives, structure and scope of guidance activities in classroom. Techniques and methods of managing guidance activities to serve students’ needs. Coverage of practices: provision of guidance activities manual, workbook, and implement all guidance activities as being planned.

**166432 Mental Health for Teacher**  
Definition, history and characteristic of mentally healthy person, factors effecting development of mental and personality, adjustment of one-self along with age and context, behavior disorders of school age children, teacher’s role in promotion, prevention and treatment of student’s mental health problems.

**166433 Psychology and Guidance for Teachers**  
Human development, learning processes and teaching principles, motivation in leaning, classroom management, teaching and guidance, guidance services, teachers’ roles related to guidance services.

**EDUCATION TECHNOLOGY (169xxx)**

**169311 Introduction to Educational Technology**  
Thoughts, approaches, and basic skills in producing and making use of materials for the classroom use.

**169312 Introduction to Selection and Utilization of Instructional Media**  
**Pre : 169311**  
Basic concepts and skills in selecting and using instructional media in both primary and secondary school.

**169322 Fundamental Skills of Graphic Materials Production**  
**Pre : 169311**  
Basic skills for graphic designing, coloring, and lettering design. Direct experiences in using tools and materials for graphic production.

**169323 Exhibition technique**  
Principles and techniques for arranging an exhibition. This involves designing, planning and preparing for the exhibition. It also includes creative approaches to enhance the exhibition for the educational purposes.

**169324 Puppet for Instruction**  
Principles and methods for the preparation of puppet, setting, and script for instructional purposes.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>169325</td>
<td>Introduction to Educational Photographic Production</td>
<td>3(2-3)</td>
</tr>
<tr>
<td></td>
<td>Photographic techniques such as taking pictures and slides, making filmstrip, and film developing. This also involves creative approaches for using pictures for educational purposes.</td>
<td></td>
</tr>
<tr>
<td>169341</td>
<td>Instructional Innovation</td>
<td>2(2-0)</td>
</tr>
<tr>
<td></td>
<td>Novel thoughts and concepts toward classroom instructional innovations, applications and implication of educational technology for instruction purpose, field trips.</td>
<td></td>
</tr>
<tr>
<td>169411</td>
<td>Instruction Media</td>
<td>3(2-3)</td>
</tr>
<tr>
<td></td>
<td>Basic concepts of instruction media, roles of media in teaching and learning process, types of instructional media, selection, design, production, and utilization media for effective teaching and leaning.</td>
<td></td>
</tr>
<tr>
<td>169421</td>
<td>Design and Construction of Instruction Media</td>
<td>3(2-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 169311</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Instructional Media design and development for classroom teaching.</td>
<td></td>
</tr>
<tr>
<td>169431</td>
<td>Operation of Audio-Visual Equipment</td>
<td>3(2-2)</td>
</tr>
<tr>
<td></td>
<td>Pre : 169311</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Principles and methods of using various types of projector such as motion picture projector, overhead projector, opaque, and slide projector. This also involves handling tape-recorders, amplifiers and the language lab. A student is also required to learn how to maintain and repair tools and materials.</td>
<td></td>
</tr>
<tr>
<td>169432</td>
<td>Utilization of Mass Media in Education</td>
<td>2(2-0)</td>
</tr>
<tr>
<td></td>
<td>Significance of mass media roles in education. Approaches, selections, utilization, and evaluation of the mass media for instructional purposes.</td>
<td></td>
</tr>
<tr>
<td>169451</td>
<td>Organization and Administration of Instructional Media Center</td>
<td>2(2-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 169311</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Principles and administrative approaches for media center management.</td>
<td></td>
</tr>
<tr>
<td>Field trip.</td>
<td></td>
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</tr>
<tr>
<td>169498</td>
<td>Special Problems</td>
<td>1-3</td>
</tr>
<tr>
<td></td>
<td>An individual or group study or a conference with an instructor. A student is to write a summary in a well-written term paper.</td>
<td></td>
</tr>
</tbody>
</table>

**COMPUTER EDUCATION**

**171111 Introduction to Computers Education**

Computer and daily life, especially computer in education; computer evolution; computer system organization and component; ethical issue on these of computer and copyright law; practice in microcomputer operation and maintenance; practice in using microcomputer operating command; practice in using basic software packages; principle of information system development, and practice; the use of computer for retrieving information from various educational database, and practice.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>172113</td>
<td><strong>Anatomy and Physiology in Physical Education I</strong></td>
<td>2(2–0)</td>
<td>Basic knowledge of human body. Structure and development of cells and tissues. Integument organizations, skeletal, muscular and nervous systems. Physical activities on human system development.</td>
</tr>
<tr>
<td>172114</td>
<td><strong>Anatomy and Physiology in Physical Education II</strong></td>
<td>2(2–0)</td>
<td>Pre : 172113 Structure, function and development of endocrine, respiratory, circulatory, digestive, urinary and reproductive systems. Physical activities on human system development.</td>
</tr>
<tr>
<td>172162</td>
<td><strong>Principles and Methods of Teaching Handball</strong></td>
<td>2(1-2)</td>
<td>Basic skills of handball. Techniques of team play. Rules of competition and basic knowledge in officiating. Instructional planning, teaching styles and strategies. Assessment of student learning.</td>
</tr>
<tr>
<td>172171</td>
<td><strong>Principles and Methods of Teaching Gymnastics</strong></td>
<td>2(1-2)</td>
<td>Definition, history and basic skills of gymnastics. The importance of safety and basic rules. Instructional planning, teaching styles and strategies. Assessment of student learning.</td>
</tr>
<tr>
<td>172172</td>
<td><strong>Principles and Methods of Teaching Track</strong></td>
<td>2(1-2)</td>
<td>Basic skills in various of track events. Rules, regulations and safety principles. Building a track facility. Basic knowledge in officiating. Instructional planning, teaching styles and strategies. Assessment of student learning.</td>
</tr>
<tr>
<td>172173</td>
<td><strong>Principles and Methods of Teaching Badminton</strong></td>
<td>2(1-2)</td>
<td>Basic skills, rules of competition. Single and double plays. Basic knowledge in officiating. Instructional planning, teaching styles and strategies. Assessment of student learning.</td>
</tr>
<tr>
<td>172231</td>
<td><strong>Principles and Methods of Teaching Krabi-Krabong</strong></td>
<td>2(1-2)</td>
<td></td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
<td></td>
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</tr>
<tr>
<td>172232</td>
<td>Principles and Methods of Teaching Aikido</td>
<td>2(1-2)</td>
<td></td>
</tr>
<tr>
<td>172233</td>
<td>Principles and Methods of Teaching Judo</td>
<td>2(1-2)</td>
<td></td>
</tr>
<tr>
<td>172234</td>
<td>Principles and Methods of Teaching Tae Kwon Do</td>
<td>2(1-2)</td>
<td></td>
</tr>
<tr>
<td>172241</td>
<td>Principles and Methods of Teaching Rhythmic Activities</td>
<td>2(1-2)</td>
<td></td>
</tr>
<tr>
<td>172242</td>
<td>Principles and Methods of Teaching Thai Classical Dance</td>
<td>2(1-2)</td>
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<tr>
<td>172243</td>
<td>Principles and Methods of Teaching Basketball</td>
<td>2(1-2)</td>
<td></td>
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<tr>
<td>172244</td>
<td>Principles and Methods of Teaching Volleyball</td>
<td>2(1-2)</td>
<td></td>
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<tr>
<td>172245</td>
<td>Principles and Methods of Teaching Soccer</td>
<td>2(1-2)</td>
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<tr>
<td>172246</td>
<td>Principles and Methods of Teaching Softball</td>
<td>2(1-2)</td>
<td></td>
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<tr>
<td>172247</td>
<td>Principles and Methods of Teaching Rugby-Football</td>
<td>2(1-2)</td>
<td></td>
</tr>
<tr>
<td>172248</td>
<td>Principles and Methods of Teaching Hockey</td>
<td>2(1-2)</td>
<td></td>
</tr>
<tr>
<td>172249</td>
<td>Principles and Methods of Teaching Takraw</td>
<td>2(1-2)</td>
<td></td>
</tr>
</tbody>
</table>


History, traditional discipline, etiquette and basic skills of aikido. Safety and physical conditioning principles. Instructional planning, teaching styles and strategies. Assessment of student learning.


Basic knowledge and scope of rhythmic activities. Fundamental movement, steps, formations, and directions for the dances. Instructional planning, teaching styles and strategies. Assessment of student learning.

Type and basic skills of Thai classical dances. Instructional planning, teaching styles and strategies. Assessment of student learning.

History, definitions, technical terms and basic skills of basketball. Team play strategies, rules of competition and safety. Basic knowledge in officiating. Instructional planning, teaching styles and strategies. Assessment of student learning.


172268  Principles and Methods of Teaching Kabaddi  2(1-2)
Pre : 172114

172269  Principles and Methods of Teaching Weight Training  2(1-2)
Pre : 172114
Basic skills in weight training. Principles of weight training and exercise prescription. Designing weight training programs for physical fitness development of special populations. Instructional planning, teaching styles and strategies. Assessment of student learning.

172271  Principles and Methods of Teaching Field  2(1-2)
Pre : 172172
Types and basic skills for field events. Rules of competition. Methods of field lay out. Basic knowledge in officiating. Instructional planning, teaching styles and strategies. Assessment of student learning.

172272  Principles and Methods of Teaching Archery  2(1-2)
Pre : 172114

172273  Principles and Methods of Teaching Table Tennis  2(1-2)
Pre : 172114

172311  Prevention and Care of Athletic Injuries  2(2-0)
Pre : 172112 and 172114
Type of injuries and hazards in sports. Principles of equipment and facilities utilization. Hazards and injuries presentation in playing sports. Personnel training in health examination. Treatment by using physical therapy.

172312  Kinesiology  2(2-0)
Pre : 172112 and 172114

172313  Assessment in Physical Education  2(2-0)
Pre : 153351
Basic knowledge of test, measurement, and assessment in physical education. Test construction on cognitive, psychomotor and affective domains. Alternative assessment in physical education.

172314  Physical Education Management  2(2-0)
Pre : 172111
Meaning, scope and theory of management and administration of physical education in schools. Physical education instructional programs. Class management, equipment and facility management. Organizing intramural and interscholastic programs.
172315  Principles and Methods of Teaching Physical Education  3(3-0)  
Pre : 162221  

172316  Learning and Development of Motor Skills  2(2-0)  
Pre : 172112  
Meaning, theories and principles of motor skills learning, the process involved learning, performing motor skills and motor skills development. Human growth and factors involved in learning and acquisition of motor skills. Assessment of skills learning and motor ability. Field trips required.

172317  Foundations of Coaching  2(2-0)  
Pre : 172312  
Characteristics and philosophy of coaching. Coaching skills and techniques. Application of psychology, physiology and kinesiology to sport coaching. Team sport management. Developing sport training program.

172318  Human Relationship Aspects on Coaching  2(2-0)  
Pre : 172317  

172319  Conditioning in Physical Education  2(2-0)  
Pre : 172114  
Health-related physical fitness and motor fitness components. Concepts and applications of exercise science in physical fitness conditioning. Health-related and motor fitness testing and evaluation. Methods of exercise and fitness conditioning program development.

172331  Principles and Methods of Teaching Thai Sword  2(1-2)  

172332  Principles and Methods of Teaching Fencing  2(1-2)  

172333  Principles and Methods of Teaching Muay Thai  2(1-2)  

172334  Principles and Methods of Teaching Boxing  2(1-2)  

172335  Officiating and Coaching in Judo  2(1-2)  
Pre : 172233  
Theory and methods of coaching judo. Analysis of skills and error.
<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>172341</td>
<td>Principles and Methods of Teaching Social Dance</td>
<td>2(1-2)</td>
<td>Pre: 172151</td>
</tr>
<tr>
<td>172342</td>
<td>Principles and Methods of Teaching Folk Dance and Square Dance</td>
<td>2(1-2)</td>
<td>Pre: 172151, 172152</td>
</tr>
<tr>
<td></td>
<td>Fundamental skills of folk dance and square dance. Dance etiquette, steps, formations, and directions for dances. Regional dance characteristics. Instructional planning, teaching styles and strategies. Assessment of student learning.</td>
<td></td>
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</tr>
<tr>
<td>172351</td>
<td>Principles and Methods of Teaching Water Polo</td>
<td>2(1-2)</td>
<td>Pre: 172151</td>
</tr>
<tr>
<td>172352</td>
<td>Officiating and Coaching in Swimming</td>
<td>2(1-2)</td>
<td>Pre: 172151, 172152</td>
</tr>
<tr>
<td>172361</td>
<td>Officiating and Coaching in Basketball</td>
<td>2(1-2)</td>
<td>Pre: 172261</td>
</tr>
<tr>
<td>172362</td>
<td>Officiating and Coaching in Volleyball</td>
<td>2(1-2)</td>
<td>Pre: 172262</td>
</tr>
<tr>
<td>172363</td>
<td>Officiating and Coaching in Soccer</td>
<td>2(1-2)</td>
<td>Pre: 172263</td>
</tr>
<tr>
<td>172364</td>
<td>Officiating and Coaching of Sepak Takraw</td>
<td>2(1-2)</td>
<td>Pre: 172267</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
<td>Prerequisite(s)</td>
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<tr>
<td>172371</td>
<td>Principles and Methods of teaching Lawn Tennis</td>
<td>2(1-2)</td>
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</tr>
<tr>
<td>172372</td>
<td>Officiating and Coaching in Badminton</td>
<td>2(1-2)</td>
<td>Pre: 172173</td>
</tr>
<tr>
<td>172373</td>
<td>Officiating and Coaching in Gymnastics</td>
<td>2(1-2)</td>
<td>Pre: 172171</td>
</tr>
<tr>
<td>172374</td>
<td>Officiating and Coaching in Track and Field</td>
<td>2(1-2)</td>
<td>Pre: 172172 and 172271</td>
</tr>
<tr>
<td>172375</td>
<td>Officiating and Coaching in Archery</td>
<td>2(1-2)</td>
<td>Pre: 172272</td>
</tr>
<tr>
<td>172411</td>
<td>Physiology of Exercise</td>
<td>2(2-0)</td>
<td>Pre: 172114</td>
</tr>
<tr>
<td></td>
<td>Structure and development of muscles and nerves. Effects of exercise on circulatory and respiratory systems. Fatigue, recovery and adaptation. Using exercise equipment muscle training.</td>
<td></td>
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</tr>
<tr>
<td>172412</td>
<td>Physical Education for Special Children</td>
<td>2(2-0)</td>
<td>Pre: 172114</td>
</tr>
<tr>
<td></td>
<td>Definition and types of special children. Conditions resulting in enervated and impaired movement. Selection of physical activities and recreational activities. Teaching techniques and evaluation in special physical children.</td>
<td></td>
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</tr>
<tr>
<td>172413</td>
<td>Equipment and Facilities in Physical Education</td>
<td>2(2-0)</td>
<td>Pre: 172111</td>
</tr>
<tr>
<td>172414</td>
<td>Organization and Administration of Physical Education in Community</td>
<td>2(2-0)</td>
<td>Pre: 172314</td>
</tr>
<tr>
<td></td>
<td>Meaning, scope and theory of organization and administration of physical education in community. Principles organization and administration of physical education programs in the community. Developing and providing physical activity</td>
<td></td>
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</tr>
</tbody>
</table>
properly for community sector. Relationship between physical education programs and other community programs.

**172415 Technology and Computer in Physical Education** 2(1-2)
Concepts of technology and computer utilization in physical education and sports. Computer applications in physical education and sports. Searching physical education and sports information. Use of the computers as a problem solving tool in physical education and sports. Field trips required.

**172416 Women and Sports** 2(2-0)
History of women and sports, social portrayal of women in sports knowledge on physiological, psychological and sociological implication of girls' and women's participation in sports, important athletes and leaders in the history of women's sport, societal and cultural issues affecting the opportunities for girls and women participation in sports, leadership development, promoting physical activities for girl and women. Field trips required.

**172417 Olympic Education** 2(1-2)
Olympic games from past to present, promoting education through sport, humanitarian values of the ancient Olympic games, promoting the spirit of team-building, leadership, sportsmanship, and voluntarism, disseminating of the spirit of multiculturalism, encouraging world peace and harmony. Field trips required.

**172431 Principles and Methods of Teaching Wrestling** 2(1-2)

**172432 Officiating and Coaching in Muay Thai** 2(1-2)
Pre : 17233

**172451 Lifesaving and Water Safety** 2(1-2)
Pre : 172151

**172452 Principles and Methods of Teaching Synchronized Swimming** 2(1-2)
Pre : 172151

**172453 Principles and Methods of Teaching Springboard Diving** 2(1-2)
Pre : 172151

**172454 Principles and Methods of Teaching High Board Diving** 2(1-2)
Pre : 172151

**172455  Principles and Methods of Teaching Skin and Scuba Diving**  
**Pre :** 172151  

**172461  Officiating and Coaching in Hockey**  
**Pre :** 172266  

**172462  Officiating and Coaching in Rugby-Football**  
**Pre :** 172265  

**172463  Science of Volleyball**  
**Pre :** 172362  
Basic concepts on motor learning, sport psychology, biomechanics, exercise physiology, sport medicine and nutrition in volleyball. Field trips required.

**172471  Principles and Methods of Teaching Bowling**  
**Pre :** 172371  

**172472  Principles and Methods of Teaching Golf**  
**Pre :** 172371  

**172473  Officiating and Coaching in Lawn Tennis**  
**Pre :** 172371  

**172491  Basic Research methods in Physical Education**  
Principles and methods in physical education research, identification of research problems, formulation of research objectives and hypotheses, collection of data, construction of questionnaire, data analysis and interpretation, application of statistics for research, report writing and presentation.

**172497  Seminar**  
Presentation and discussion on current interesting topics in physical education at the bachelor's degree level.

**172498  Special Problems**
Study and research in physical education at the bachelor's degree level and compile into a written report.

**HEALTH EDUCATION**

*(173xxx)*

**173112 Personal and Community Health**  
2(2-0)  

**173141 Introduction to Public Health**  
2(2-0)  
Basic principles and concepts of mutual living in a community and environment. Public health administration. Health services facilities in a community. Management of health services in different organizations. Problems and difficulties of health maintenance and health promotion in the public laws enforcement and public health Laws.

**173142 Health and Environment**  
2(2-0)  

**173151 AIDS Education**  
2(2-0)  
A study on AIDS in relation to its causes, infection, and transmission. Risk factors contributing to HIV infection. Symptoms and signs of this disease. Its detection and measures for prevention and control of transmission. Public relation and dissemination of information approach to students and the public as well. Field trip.

**173161 Introduction to Behavioral Science in Health Education**  
3(3-0)  
Concepts and theories concerning behavior, health behavior, and health. Learning process for health behavior development. Cultivation of health behaviors and health behaviors modification. The implementation of health education for inculcation and modification of health behavior. Roles of individuals, families, community, and organization in health behaviors development.

**173222 Physical Fitness and Well-being**  
2(2-0)  
Principles and concepts of physical fitness and well-being. The relationship between physical fitness and well-being. The components of physical fitness. Physical fitness development for well-being. Field trip required.

**173251 Communicable Diseases**  
2(2-0)  

**173252 Non-Communicable Disease**  
2(2-0)  

**173253 Drugs and Narcotics**  
3(3-0)

173254 The Control of Diseases 3(3-0)

173321 Safety Education 2(2-0)
Principles and concepts of safety education. The causation and prevention of home, school, workplace, and public accidents. The prevention of fire and traffic accidents. The safety on sports and recreation.

173322 First Aid 3(2-2)
Accidents in school and daily life. Prevention, analysis of injury and emergency care for accident victims before hospitalization.

173341 Health and Physical Activity 2(2-0)
Principles, concepts and theories of physical activity for health and application. Health Promotion. Field trip required.

173342 Health and Thai Wisdom 2(2-0)
Principles and concepts of Thai wisdom on health. An integration of Thai wisdom for health care. Field trip required.

173343 Public Health Statistics and Population Education 3(3-0)

173351 Consumer Health 3(3-0)
Principles of consumer health, selection of health products and health services. Health belief and misconcept, laws enforcement and organizations responsible for consumer protection.

173352 Sex Education and Reproductive Health 3(3-0)
Physiology, psychology, sociology and health aspects of sex education. Principles and concepts in teaching sex education in school. Problems and trends in teaching sex education. Reproductive health care service for family members.

173364 Health Education Curriculum in Basic Education 2(2-0)
Basic education curriculum. Health education curriculum in basic education. Health Promotion, institutions development. Field trip required.

173441 Occupational Health 2(2-0)

173442 Public Health Nutrition 2(2-0)
Relationship between nutrition and health, nutritional status, food production and preparation. Food sanitation. Investigation and experimental study on public health nutrition.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>173443</td>
<td>Rural Health Education</td>
<td>2(2-0)</td>
</tr>
<tr>
<td></td>
<td>Health problems and its context in a rural community. Factors associating with individual, family, and community health problems in a rural society. Concepts, principles, and processes of health education for health behavior development among the rural people.</td>
<td></td>
</tr>
<tr>
<td>173444</td>
<td>Health Education in Health Service</td>
<td>2(2-0)</td>
</tr>
<tr>
<td></td>
<td>Theories, principles and concepts of health education and application. Appropriate health education models for health service. Field trip required.</td>
<td></td>
</tr>
<tr>
<td>173445</td>
<td>Health Education in Workplace</td>
<td>2(2-0)</td>
</tr>
<tr>
<td>173446</td>
<td>Alternative Health Promotion</td>
<td>2(2-0)</td>
</tr>
<tr>
<td></td>
<td>Theories, principles and concepts on alternative health promotion guidelines. An analysis and synthesis of appropriate alternative health promotion guidelines Thai society context. Field trip required.</td>
<td></td>
</tr>
<tr>
<td>173447</td>
<td>Health Care for Elderly</td>
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<td>173448</td>
<td>Quality of Life Development</td>
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<td>173461</td>
<td>Organization and Administration of School Health Program</td>
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<td>Concept and principles of organization and administration of school health and safety programs. Processes and approaches for organizing school health and safety programs. Management of health promotion program for students. Roles of families, school, and community for the enhancement of health and safety for students.</td>
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<td>173462</td>
<td>Measurement and Evaluation in Health Education</td>
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<td>173463</td>
<td>Principles and Methods of Teaching Health Education in School</td>
<td>3(3-0)</td>
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<td>Principles of teaching health education in school. Curriculum and methods of teaching materials evaluation, lesson plan and school health services.</td>
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<td>173492</td>
<td>Classroom Research on Health Education</td>
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<td>Principles and concepts of research. Characteristics of health education classroom research. Conducting the classroom research on health education. Field trip required.</td>
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<tr>
<td>173497</td>
<td>Seminar</td>
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<td>Presentation and discussion on current interesting topics in health education at the bachelor’s degree level.</td>
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</table>
173498  **Special Problems**  
2(2-0)  
Study and research in health education at the bachelor’s degree level and compile into a written report.

**RECREATION**  
*(174xxx)*

174121  **Camping and Outdoor Education**  
2(2-0)  
Knowledge and information on the history of camping and outdoor education, types of camping, camp management, camp program management, the use of indigenous materials, health and safety, leadership, evaluation of camp programs and application of theories learned. (1 week outdoor camping)

174231  **Introduction to Recreation**  
2(2-0)  
Knowledge and information on the history of recreation, its purposes, importance, and benefits derived from recreation in the social setting; type of recreation, facilities and equipment used in recreation; and relationships between recreation and general education in other fields.

174232  **School Recreation**  
2(2-0)  
Pre : 174231  
This course includes the development of programs for recreation in schools considering current trends and practices in recreation services in schools.

174233  **Basic Boy Scout Training Course**  
1(1-0)  
Pre : 174231  
History of boy scouting, the purposes of the program community service, boy scout orimise and laws, rank progression, methods in organizing boy scout troops. It includes activities in the development of outdoor skills like: story-telling, games, songs, handicrafts, and trip-outs.

174234  **Red Cross**  
2(2-0)  
This course includes the history of the Red-Cross, community services, policies, methods, and administration of Red-Cross activities; organization of curricula for different education levels; and knowledge and information on conducting a leadership training for Red-Cross programs.

174321  **Community Recreation**  
2(2-0)  
Pre : 174231  
This course covers aspects of community recreation. It includes program development, knowledge of the characteristics and nature of community problems; current and future trends of practices in community recreation.

174322  **Youth Agencies**  
2(2-0)  
Pre : 174231  
This course covers the identification of needs for recreation of youth, wise use leisure time, various government an private recreation agencies, and management of recreation services.

174323  **The Arts and Crafts and Recreation**  
2(2-0)  
Pre : 174231  
Purposes, values. And types of arts and crafts in recreation, selection of appropriate types of arts and crafts for various recreation programs.

174331  **Leadership Recreation**  
2(2-0)
Pre : 174231
Principles and methods of leadership, characteristics of recreation leaders in school and community.

174332 Advanced Boy Scout Training Course  2(2-0)
This course provides experiences to practice the boy scout laws, develop good relationships among boy scout troops, develop creativity, leadership and followership, and methods of conduction seminars and trip-outs.

174421 Recreation for Special Group  2(2-0)
Pre : 174231
Principles, development and management of recreational activities for special groups considering appropriate programs based on abilities, background, and individual differences of specific groups.

174422 Music and Local Activity Recreation  2(2-0)
Pre : 174231
Importance, purposes, and fundamental knowledge of music and local activities, leadership in action songs and other types of musical activities; management of music programs and local activities in recreation.

174431 Philosophy in Recreation  2(2-0)
Pre : 174231
Aspects of psychology and social science applied in the management of play, recreation and leisure time. Concepts of the basic philosophy, principles and methods involved in the management of recreation programs are also stressed.

174432 Supervision in Recreation  2(2-0)
Pre : 174231
Policies, purposes, principles and techniques of supervision in recreation as well as the obstacles and problems in supervising recreational programs.

174433 Organization and Administration in Recreation  2(2-0)
Pre : 174231
This course includes principles and methods in the organization and administration of school recreation in the district level and established recreation agencies. It deals with community problems in organizing, managing, and evaluating recreating programs.

174497 Seminar  1
174498 Special Problems  1-3
This course provides experiences for research and writing a research report.

PHYSICAL EDUCATION ACTIVITIES (175xxx)

175111 Track and Field  1(0-2)
History, techniques and basic skills in running, relay, and hurdle, basic skills in several kind of field events, regular and rules in competition.

175112 Badminton  1(0-2)
History, basic skills in playing badminton, forehand, backhand, drive, short, hit and serving techniques, strategies in playing single, double, and mixed double, regular and rules.

175113 Lawn Tennis  1(0-2)
History, techniques and basic skills in playing lawn tennis strategies in playing single, double and mixed double, regular and rules.

175114 Table-Tennis 1(0-2)  
History, basic skills in table-tennis, equipments and how to taking care of them, techniques and tactics in playing in single, double, mixed double, regular and rules.

175115 Shooting 1(0-2)  
Techniques and basic skills in shooting, self-preparation in shooting, shooting styles and goal setting, how to saved from gun using, regular and rules in competition.

175116 Gymnastics 1(0-2)  
History, basic skills in movement toward gymnastics, several types of gymnastics, how to play trampoline, to jump, to move in several styles in continuous and practice how to save oneself, regular and rules.

175117 Archery 1(0-2)  
History, how to use and keep the equipments, basic skills in archery, regular and rules.

175121 Basketball 1(0-2)  
History, techniques and basic skills in basketball, strategies in team playing, regular and rules.

175122 Soccer 1(0-2)  
History, techniques and basic skills in soccer, strategies and team playing, regular and rules.

175123 Volleyball 1(0-2)  
History, basic skill and techniques in team playing, regular and rules.

175124 Handball 1(0-2)  
History, basic skill in handball, fundamental skills in movement, keeping the ball, dribbling, shooting and team playing, regular and rules.

175125 Softball 1(0-2)  
History, basic and team playing, general knowledge, regular and rules in softball.

175126 Takraw 1(0-2)  
History, basic skill and techniques in playing, how to use and keep the equipments, regular and rules.

175127 Hockey 1(0-2)  
History, basic skills in individual and team players, responsibilities in each position, team playing strategies, regular and rules.

175128 Rugby Football 1(0-2)  
History, basic skills in individual and team players, responsibilities in each position, how to be saved in playing. Rules and regular.

175131 Swimming 1(0-2)  
History and benefits of swimming, basic skills in several kinds of swimming, how to use and keep the equipments, how to be saved from swimming, regular and rules.

175132 Lifesaving 1(0-2)  
History, basic skills in several types of strokes in swimming, basic skills and techniques for being lifeguard, how to use the equipments for life saving.
175133  **Diving**  
History, basic skills and techniques in diving, how to be saved from diving, regular and rules.

175134  **Water Polo**  
History, basic skills and techniques in water-polo, passing, receiving, dribbling, shooting and how to be the goal-keepers, strategies in team playing and how to be saved while playing in the water, regular and rules.

175141  **Aerobic Dance**  
History, definition, principles and methods of aerobic exercises, several steps in aerobic dance, factors for physical fitness development, knowledge and rules for aerobic dance practice.

175142  **Folk Dance**  
History and the benefits of folk-dance and square dance, format of folk dance and square dance, dance rhythm, basic skills of folk dance and square dance from various countries.

175143  **Social Dance**  
History and basic skills in social dance, direction and how to lead and follow partner, how to move in various kinds of steps in dancing.

175144  **Thai Classical Dance**  
History and benefits of Thai Classical dance, basic skills in various types of Thai classical dance.

175151  **Thai Fencing**  
History and values of Thai fencing, how to use, keep and to be saved from using the equipment, techniques and skill in fighting and defending, regular and rules.

175152  **Fencing**  
History and values in fencing, basic skills and techniques in offending and defending, using and keeping the equipments, knowing how to be saved, regular and rules.

175153  **Thai Boxing**  
History, values and benefits of Muay-Thai, basic skills and techniques in offending and defending, knowing how to move, body balancing, using knees, feet and elbow, regular and rules.

175154  **Boxing**  
History, basic skills of boxing, strategies in offending and defending. Regular and rules.

175155  **Judo**  
History and values of judo, regular and rules, knowing how to be saved from playing, basic skills in judo, offending and defending in judo fighting.

175156  **Aikido**  
History, basic skills in Aikido, movement skills using hands and feet, falling techniques and how to be saved from playing, regular and rules.

175157  **Sword and Pole Fighting**  
History, basic skills in sword and pole fighting, various types of weapons, offending and defending positions, knowing how to use, keep and to be saved the equipments.

175158  **Wrestling**  

History, techniques and basic skills in wrestling, strategies in playing and competition, knowing how to be saved from practicing, regular and rules.

175159  Karate  1(0-2)
History, basic skills in karate, knowing how to pay respect to each other, techniques of using hands and feet, regular and rules.

175161  Contract Bridge  1(0-2)
History, techniques and basic skills in contract bridge, strategies in single, double and team playing, regular and rules.

175162  Bowling  1(0-2)
History, techniques and basic skills in bowling, how to use, keep the equipment, regular and rules.

175163  Golf  1(0-2)
History, techniques and basic skills in playing golf, knowing how to use, keep and to be saved from the equipments, regular and rules.

175164  Cycling  1(0-2)
History, values and benefits of cycling, traffic rules in cycling, knowing how to use, keep and to be saved from the equipments, regular and rules.

175165  Weight Training  1(0-2)
History, basic skills in weight training, the different between weight training and weight lifting, methods of weight training programs construction for individuals, weight training programs for physical fitness development.

ADULT EDUCATION
(177xxx)

177411  Principles and Foundations of Adult Education  3(3-0)
Philosophy, principles, purposes, significance, historical aspects, and roles of adult education upon country development. Emphasis made on the institution, theory, approach, and preparation for adult education program.

177412  Learning Process and Teaching Methodology for Adults  3(3-0)
Pre : 177411
Learning process, preparation of suitable instructional environment enhancing the most effective learning process, teaching methods, instructional media preparation, course planning, and evaluation.

177431  Teaching General Subjects to Adult Learners  3(3-0)
Pre : 177411
Characteristics, and objectives of major general subjects, learning, teaching methods of special subjects, media preparation and operation and learning evaluation.

AGRICULTURAL EDUCATION
(178xxx)

178111  Fundamentals of Agricultural Education  2(2-0)
Philosophical foundation, purpose and objectives of agricultural education. Role of agricultural education within the context of vocational education
and the national development scheme. Overview of agricultural education system and programs in all educational levels. Problems and issues involved.

178161 Agricultural Practices for Teachers I 1(0-3)
Introductory farm experiences for agriculture teachers.

178162 Agricultural Practices for Teachers II 1(0-3)
Practicum in basic agricultural skills for agriculture teachers.

178251 Evaluation Techniques of Agricultural Teaching and Learning 2(1-3)
Basic concepts on measurement and evaluation applied to agriculture teaching and learning. Procedures and techniques in evaluation all the three program components: in class and laboratory learning, supervised farming experience, and F.F.T. activities. Practices in analysis of instructional objectives, construction and analysis of tests and other evaluation tools for evaluating the three domains of learning behaviors: cognitive, affective, and psychomotor.

178261 Principles and Methods of Teaching Archery III 2(1-2)
Basic farm practices in vegetable production, field crop production, fruit production, floriculture, nursery management, plant propagation and mushroom production.

178262 Agricultural Practices for Teachers IV 1(0-3)
Basic farm practices in poultry production, ruminant production, non-ruminant production and aquaculture.

178321 Agricultural Instruction 3(2-3)
Principles, objectives, and methods of teaching agriculture. Lesson planning applies to agriculture program of each school level. Teaching observation and practice in simulated as real classroom environments.

178331 Instructional Media in Agriculture 3(2-3)
Theories and applications of instructional media for teaching agriculture in formal and non-formal situations. Practices in selection, utilization, and production of teaching media.

178365 Directed Farming Programs 1(0-3)
Practicum on directed farming programs, involving production and management of farm products.

178366 Supervised Farming Programs 1(0-3)
Supervised planning and management of farming programs for agriculture teachers.

178421 Young and Adult Farmers Education 2(2-0)
Principles, objectives and methods of providing agricultural education to farmers and others in the agriculture-related sector. Implementation and administration of farmers’ organizations.

178431 Computer Applications in Agricultural Education 3(2-2)
Applications of computer for data system management and retrieval for educational purposes in agriculture. Data analysis for classroom research and evaluation, and production of teaching media in agriculture.

178441 Programs and Organizations in Agricultural Education 3(3-0)
Significance and philosophy of programs in agricultural education. Planning supervision and follow-ups of farming programs. Organizations and activities in agricultural education.

178442 Administration of School Agricultural Program 2(2-0)
School policy and administration as to management of agriculture program; involving management of resources, personnel, budget, facilities, and school environment for agriculture learning. Basic concepts of program planning and evaluation of school agriculture program.

178461 Professional Experiences in Agriculture 2(0-6)
Supplementary experiences in agribusiness and leadership from government or private farms.

178481 Leadership Training for Agriculture Teachers 3(2-3)
Significance, definition and leadership characteristics of agriculture teacher; theory and method of development of agriculture teacher for being community leader; leadership development by method or group dynamic, and other techniques.

178491 Classroom Research Techniques 3(2-3)
Pre: 178321
Basic concepts and techniques of action-oriented research in agriculture teaching and learning situations. Planning and conducting simple designs of classroom research. Reporting and utilization of research results for instructional purposes.

178496 Selected topics in Agricultural Education 1-3
Exploratory study in agricultural education. Topics of interest vary from semester to semester.

178497 Seminar 1
Undergraduate seminar in agricultural education. Focus on presentation and sharing of experiences on current issues of interest in agricultural education.

178498 Special Problems 1-3
Independent study and scholarly report on selected topics of individual interest in agricultural education.

BUSINESS EDUCATION (179xxx)

179111 Principles of Business Education 2(2-0)
Fundamental, philosophies of teaching, the role of business teacher, planning and policy of business education, the problem of teaching activities, how to solve these problems and guideline to create learning activities for serving the need of our society.

179212 Consumer Education for Business Teacher 2(2-0)
Budget planning, saving and investment. How to select and buy for household use, basic knowledge in consumer credit. Guideline in selective content for teaching consumer education for each level.

179221 Curriculum and Instruction in Business Education 3(3-0)
Pre: 179111
Business education curriculum, career education and technology curriculum, lesson plan, principles and methods of teaching in business education.

179231 Computer Assisted Instruction for Business Education 3(2-2)
Introduction to Computer Assistant Instruction, CAI contents development, contents analysis and design, evaluation.
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<th>Course Code</th>
<th>Course Title</th>
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<tr>
<td>179322</td>
<td>Methods of Teaching Basic Business Subjects</td>
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<td>Pre: 179111</td>
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<td>Micro Teaching in Business Education</td>
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<td>179332</td>
<td>Educational Media for Business Teacher</td>
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<td>An overview of education media for business</td>
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<td>An application of automatic office machine as a</td>
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<td>Methods of Evaluation in Business Education</td>
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<td>Computer Programming for Business Teacher</td>
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<td>179441</td>
<td>Administration School Office in Educational</td>
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<td>179462</td>
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<td>179495</td>
<td>Projects in Business Education</td>
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<td>The layout of project planning, objective, and</td>
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<td>development plan.</td>
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<td>179496</td>
<td>Selected Topics in Business Education</td>
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<td>179498</td>
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<td>the bachelor’s degree level and compile into a</td>
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<td>written report.</td>
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HOME ECONOMICS EDUCATION

(180xxx)

180111 Principles of Home Economics Education 3(3-0)
Background, principles, philosophy and the purposes of home economics education. The approach to various levels of education. Roles of home economists concerning the National Economics and Social Development Plan. The application of technology and resources in families and occupations.

180321 Methods of Teaching Home Economics 3(2-2)
Pre: 180331
Principles of teaching home economics, objectives and teaching methods and techniques. Teaching preparation with emphasis on lesson plans for both formal and nonformal education of various school levels and groups. Directed observation and participation experiences in classroom situations.

180322 Critical Thinking Skills in Family Study 3(3-0)
Importance of family development. Family problems solution. Application of critical thinking skills for family problem solving and development.

180331 Materials and Aids in Teaching Home Economics 3(2-2)
Principles of selection, preparation, production, implementation, evaluation and maintenance of instructional materials and aids in home economics.

180341 Homemaking Programs and Organizations 3(3-0)
Objectives, organizing, implementation and evaluation of home economics programs and concerned organizations.

180342 Homemaking Education for Adults and Community Services 3(2-2)
Principles and purposes of community work and development of homemaking programs for community. Principles of adult learning. Group formation and working with the target groups. Factors related to program management. The process of program planning, implementation, monitoring and evaluation. Field trip required.

180361 Field Experiences: Specialized Home Economics 2(0-6)
Skill training and supplementary experiences in specialized home economics from governmental or private sector.

180362 Field Experience: Home Economics in Rural Areas 3(0-9)
Home economics practices in rural areas in cooperation with the government sector and field practitioners in order to gain experiences on systematic planning, implementation and evaluation of the home economics projects with emphasis on collaborative working and the urgent problem solving.

180371 Special Activities in Home Economics 3(2-3)
Importance and purposes of extra-curriculum activities to promote use of home economics in family and social development. Principles and organizing experiences, implementation and activity controlling. Field trip required.

180421 Teaching Home Economics for Special Groups 3(2-2)
Selecting teaching methods and techniques for special needs such as slow learners, handicapped students, culturally different students. Methods of basic skills development for occupation. Field trip required.

180451 Statistics for Home Economics Research 2(2-0)
Fundamental descriptive and inference statistics. Statistical methods, procedures and tests of importance to home economics research.

180471 Personal and Family Economics Education 3(3-0)
Individual and family economics in everyday life; economics system and factors related to money management; analysis of consumer problems; budgeting and family life cycle; and money management teaching methods.

180472 Home Economics in Business 3(2-3)
Practical of home economics for wholesaling and retailing business, production and services industries as well as home economics business administration in various parts of governmental and private sectors. Field trip required.

180473 Consumers Decision Making 3(3-0)
Roles and responsibilities of consumers. Decision making process related to various factors concerning producers and consumers. Analysis of consumer problems.

180491 Basic Research Methods in Home Economics Education 3(3-0)
Principles and methods in Home economics research, identification of research problem, formulation of research objective and hypotheses, collection of data, construction of questionnaire, data analysis and interpretation, application of statistics for research, report writing and presentation.

180496 Selected Topic in Home Economics Education 1-3
Selected Topic in Home economics education at the bachelor’s degree level. Topics are very to change each semester.

180497 Seminar 1
Presentation and discussion on current interesting topics in home economics education at the bachelor’s degree level.

180498 Special Problems 1-3
Study and research in home economics education at the bachelor degree level and compile into a written report.
FACULTY OF ENGINEERING  
(201XXX-219XXX) 

CENTER COURSE  
(200XXX) 

200111 Communication Skills for Engineers 3(2-2)  
Practice of English speaking and listening in general topics, specific topics and engineering topics. 

200390 Co-operative Education Preparation for Engineers 3(3-0)  
Principles and concepts of co-operative education. Preparation for working With others; ethics in profession; communication and human relations; work safety and first-aid techniques; work planning and management; efficiency, effectiveness and evaluation of work; report writing and presentation. 

200490 Co-operative Education 3(3-0)  
On the job training as a temporary employee in order to get experiences from the assignment. 

CHEMICAL ENGINEERING  
(202XXX) 

202211 Basic Principles and Calculations in Chemical Engineering 3(3-0)  
Introduction to chemical engineering calculations; stoichiometry and material balance with and without chemical reactions; energy balances using chemical and phase equilibrium data, physical property data, and thermodynamic data; solving material and energy balance problems; unsteady-state material and energy balances. 

202212 Unit Operations I 3(3-0)  
Introduction to unit operations; fluid static and its applications; fluid dynamics; fluid flow phenomena, basic equations of fluid flow, flow of incompressible fluids in pipelines and thin layers, flow of compressible fluids; fluid transporting devices; fluid measuring devices; mixing and agitation; particle mechanics and principles of gravity and centrifugal separation; sedimentation; fluidization; size reduction and mechanical separation. 

202213 Numerical Methods for Chemical Engineers 3(3-0)  
Pre: 204111 and 417267  
Mathematical formulation of chemical engineering problems, numerical solutions of algebraic equations, numerical integration, numerical solutions of ordinary and partial differential equations. 

202215 Chemical Engineering Thermodynamics I 3(3-0)  
Pre: 417167  
Work and heat, the first law and basic concept of thermodynamics, equations of states, state property relation, the second and the third laws of thermodynamics, thermodynamic cycles. 

202218 Momentum and Heat Transfer Operations 3(3-0)
Fluid statics and its applications; fluid dynamics; fluid flow phenomena and basic equations of fluid flow; flow of incompressible fluids in pipelines and thin layers; fluid transporting devices; fluid measuring devices; mixing and agitation; fundamental of heat transfer: conduction, convection, and radiation; double pipe heat exchangers; heat exchange equipment; filtration; evaporation; sedimentation; centrifuge; fluidization.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>202222</td>
<td>Chemical Engineering Processes</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Chemical reactions and physical changes forming the processes; equipment and operating conditions used in chemical process industries; fuel industries, petrochemical industries, food industries, Chemical industries, consumer product industries.</td>
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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>202311</td>
<td>Unit Operations II</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Heat conduction, heat convection, heat radiation, double pipe heat exchangers, shell and tube heat exchangers, plate heat exchangers, condenser, evaporator, equilibrium stage calculations, distillation.</td>
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</tbody>
</table>

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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>202312</td>
<td>Unit Operations III</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>Pre:</td>
<td>202311</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mass transfer, equipment for gas-liquid operations, humidification operation, gas absorption, drying, extraction, adsorption.</td>
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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>202313</td>
<td>Chemical Engineering Laboratory I</td>
<td>1(0-3)</td>
</tr>
<tr>
<td>Pre:</td>
<td>202212</td>
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<tr>
<td></td>
<td>Laboratory works in transport phenomena and fluid mechanics.</td>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>202314</td>
<td>Chemical Engineering Laboratory II</td>
<td>1(0-3)</td>
</tr>
<tr>
<td>Pre:</td>
<td>202311</td>
<td></td>
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<tr>
<td></td>
<td>Laboratory works in operations involving particulate solids and heat transfer operations.</td>
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</tbody>
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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>202316</td>
<td>Chemical Engineering Thermodynamics II</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>Pre:</td>
<td>202215</td>
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<td></td>
<td>Multi-component system, multi-component phase equilibrium, solution thermodynamics chemical reaction equilibria.</td>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>202317</td>
<td>Introduction to Chemical Engineering Thermodynamics</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Introduction to chemical engineering thermodynamics, first law of thermodynamics, volumetric properties of pure fluids, heat effects, second law of thermodynamics, thermodynamics properties of fluids, thermodynamics of flow processes, phase equilibrium, heat of mixing, chemical reaction equilibrium.</td>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>202318</td>
<td>Mass Transfer Operations</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Mass transfer, gas absorption, equilibrium-stage calculations, distillation, extraction, drying, adsorption, and control of unit operations.</td>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>202321</td>
<td>Computer Applications for Process Modeling and Simulation</td>
<td>3(2-2)</td>
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<tr>
<td>Pre:</td>
<td>202211</td>
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<tr>
<td></td>
<td>Fundamentals for chemical engineering calculation, mass balance, energy balance, computer application for chemical engineering calculation, development of mathematical model and computer solution, process simulation and process analysis using software package.</td>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>202322</td>
<td>Physicochemical Laboratory in Chemical Engineering</td>
<td>1(0-3)</td>
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<tr>
<td>Pre:</td>
<td>403112</td>
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<td></td>
<td>Physicochemical analysis by using spectroscopy and chromatography; special topics in analytical methods; petroleum products, water quality and particulate matter.</td>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>202341</td>
<td>Chemical Reaction Engineering</td>
<td>3(3-0)</td>
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<tr>
<td>Pre:</td>
<td>202211</td>
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</tbody>
</table>
Principles of chemical kinetics, kinetics of homogeneous reactions, design fundamentals for chemical reactors, solid catalysts, heterogeneous catalytic reactors.

**202361 Pollution Prevention and Control** 3(3-0)
Pollution prevention concept, environmental management system and ISO 14000, cleaner technology audit methodology; principles of industrial pollution control; treatment and disposal method for industrial waste water, particulate and gaseous solid waste, and pollutants, hazardous wastes from chemical industry.

**202411 Chemical Engineering Laboratory III** 1(0-3)
Pre : 202311 and (202314 or 200490)
Laboratory works in mass transfer operations, process control and chemical engineering kinetics.

**202412 Transport Phenomena** 3(3-0)
Pre : 417267
Newton's law of viscosity; Fourier's law of conduction; Fick's law of diffusion; momentum balances; energy balances; mass balances; shell balance method; equations of change; interphase momentum energy and mass transports; macroscopic balances.

**202413 Chemical Engineering Plant Design** 3(3-0)
Pre : 202311
Plant design project; process design; general design and economic considerations; design report; material selection and fabrication method; material transfer and handling; heat and mass transfer operation; optimum design.

**202414 Chemical Engineering Equipment Design** 2(1-2)
Pre : 202311 and (202312 or 200490)
Design of various chemical engineering process equipment, specification and drawing. Calculation and practice in design.

**202421 Process Dynamics and Control** 3(3-0)
Pre : 417267
Mathematical modeling of chemical engineering processes, solution techniques and dynamics of these systems, feedback control concept, stability analysis, frequency response and control system designs, advanced control techniques.

**202422 Multi-variable Control and Instruments** 3(3-0)
Pre : 202421
State space method, operability controllability, digital control, and design of large scale process control.

**202423 Design Know-how in Process Engineering** 3(3-0)
Pre : 202321
Principles of problem-based learning, design know-how of petroleum and petrochemical processes, chemical processes, optimization and heat integration.

**202431 Chemical Engineering Economics and Cost Estimation** 3(3-0)
Interpreting the accounting data and financial statements in chemical industry, chemical process equipment cost estimation and economic evaluation in chemical engineering plant design, economic evaluation for selection of alternative chemical processes and investment in chemical industry.

**202432 Chemical Engineering Production Management** 3(3-0)
Fundamentals for chemical engineering plant design, construction and operation; location, layout of chemical process, job design and inventory management; chemical engineering project planning and construction management; chemical industrial production planning and management.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits (Lecture-Tutorial)</th>
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</thead>
<tbody>
<tr>
<td>202441</td>
<td>Fundamental of Petrochemical Technology</td>
<td>3(3-0)</td>
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<td></td>
<td>Pre: 202211</td>
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<td></td>
<td>Petrochemical industries in Thailand; natural gas separation plant; ethylene and propylene industries; petrochemical industries based on methane, ethylene, propylene and aromatics.</td>
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<tr>
<td>202451</td>
<td>Bioprocess Engineering</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>The principal concepts of biological and bioprocess engineering and application for chemical engineers; essence in microbiology, biochemistry and genetics, the application of engineering principles to design, develop and analyze processes using biocatalysis.</td>
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<tr>
<td>202462</td>
<td>Safety Engineering in Process Industry</td>
<td>3(3-0)</td>
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<td></td>
<td>Toxicology and industrial hygiene; toxic-released dispersion models; fire, explosions and prevention; relief; hazard identification and risk assessment; accident investigation, laboratory safety; safety law and regulation; case study.</td>
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<tr>
<td>202471</td>
<td>Polymer Engineering</td>
<td>3(3-0)</td>
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<td>Pre: 403221</td>
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<td>The principles and methods of polymer preparation, structure of polymer, physical properties, mechanical properties and other general properties, flow properties, additives, fabrication processes, and elastomer technology.</td>
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<tr>
<td>202481</td>
<td>Petroleum Engineering</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>The origin of petroleum; exploring for petroleum; drilling for oil; reservoir engineering; production of oil and gas; chemical and physical properties of petroleum; economics, safety and environmental concern in petroleum exploration and production.</td>
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<tr>
<td>202495</td>
<td>Chemical Engineering Project I</td>
<td>2(0-6)</td>
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<td></td>
<td>Pre: 202211, 202212, 202215 and 202311</td>
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<tr>
<td></td>
<td>Proposal preparation of projects in chemical engineering areas.</td>
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<tr>
<td>202496</td>
<td>Selected Topics in Chemical Engineering</td>
<td>1-3</td>
</tr>
<tr>
<td></td>
<td>Selected topics in chemical engineering at the bachelor degree level.</td>
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<tr>
<td>202497</td>
<td>Seminar</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Presentation and discussion on current interesting topics in chemical engineering at the bachelor degree level.</td>
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<tr>
<td>202498</td>
<td>Special Problems</td>
<td>1-3</td>
</tr>
<tr>
<td></td>
<td>Study and research in chemical engineering at the bachelor degree level and compiled into a report.</td>
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<tr>
<td>202499</td>
<td>Chemical Engineering Project II</td>
<td>3(0-9)</td>
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<tr>
<td></td>
<td>Pre: 202495</td>
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<tr>
<td></td>
<td>Implementation of the proposed chemical engineering project. Experimental operation. Report preparation and oral presentation.</td>
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### CIVIL ENGINEERING

**203211 Surveying**

General principles, errors in surveying, map and scales, principles and the use of theodolite, distance and precise angle measurements, traverse, levelling and precise
levelling, calculation and adjustment of field data work, error specification, triangulation and precise determination of azimuth, plane coordinate system, detail surveying for plotting topographic map, construction surveying, horizontal and vertical curves.

**203212 Survey Camp** 1
Pre: 203211
Field practice for the course 203211 not less than 170 hours.

**203221 Mechanics of Materials** 3(3-0)
Pre: 420111
Stress, strain, Hooke's law, Poisson's ratio; stresses in thin walled cylinders; torsion in cylinders; helical springs; stress, shear and bending moment in beams; deflection of beams; total stress; Mohr’s circle; total strain.

**203222 Structural Analysis I** 3(3-0)
Pre: 208221
Introduction to structural analysis, reactions, shears and moments in statically determinate structures; graphic statics; influence lines; analysis of stresses in trusses; structures subjected to moving loads; deflections of beams and frames, method of virtual work and strain energy; Williot-Mohr diagrams; analysis of statically indeterminate structures by method of consistent deformation.

**203311 Applied Surveying** 3(2-3)
Pre: 203211
Error; Triangulation; precise determination of azimuth; precise traverse; plane coordinate system; precise leveling; hydrographic surveying; highway route surveying, simple circular curve, compound and reverse curve, spiral curve, vertical curve; slope staking; earthwork; mass diagram; principles of highway safety and design.

**203312 Photogrammetry** 3(2-3)
Pre: 203211
Principles of photogrammetry, cameras and photography, photographic coordinate system and refinement, vertical photographs, geometry of photographs; stereoscopic viewing, stereoscopic parallax; aerial photography planning, control point for aerial photography, aerial mosaics; tilted photographs and rectification; stereoplotter, orthophotography; terrestrial photogrammetry, coordinate transformations.

**203321 Mechanics of Materials II** 3(3-0)
Pre: 203221
Shear center; unsymmetrical bending; curves beams; beams on elastic foundation; torsion of shafts of noncircular cross-section, torsion of thin-walled section; composite beams; medium length column and long column, critical load, Euler formula; strain energy method; theories of failure.

**203322 Civil Engineering Materials and Testing Laboratory** 3(2-3)
Pre: 203221
Physical Physical properties of construction materials: steel, non-ferrous metals, wood, aggregates, concrete, bituminous; laboratory tests of construction material properties for compression, tension, shear, torsion, flexure, and hardness.

**203323 Structural Analysis II** 3(3-0)
Pre: 203222
Analysis of indeterminate structures by elastic load method, strain energy method, slope-deflection method, moment distribution method; influence line of continuous beams and frames; introduction to plastic analysis; second order analysis by load and lateral deflection method; approximate analysis of building frame; matrix method; computer program in structural analysis.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisite(s)</th>
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</thead>
<tbody>
<tr>
<td>203331</td>
<td><strong>Reinforced Concrete Design I</strong></td>
<td>3(3-0)</td>
<td>Pre: 203221</td>
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<tr>
<td></td>
<td>Design: Fundamental behavior in trust, flexure,</td>
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<tr>
<td></td>
<td>torsion, shear, bond and interaction among these</td>
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<tr>
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<td>forces; design of reinforced concrete structures</td>
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<td>by working stress and ultimate strength method;</td>
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<td></td>
<td>design principles; application to structural</td>
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<tr>
<td></td>
<td>members, slabs, walls, retaining walls and</td>
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<td></td>
<td>frames; secondary effects; design practice.</td>
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<tr>
<td>203332</td>
<td><strong>Concrete Technology</strong></td>
<td>2(1-3)</td>
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<tr>
<td></td>
<td>Production of Portland cement; hydration process;</td>
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<td>testing of hydraulic cement; types of hydraulic</td>
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<td></td>
<td>cement; admixtures; properties of aggregates;</td>
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<td>fresh concrete; strength of concrete;</td>
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<tr>
<td></td>
<td>testing of concrete.</td>
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<tr>
<td>203333</td>
<td><strong>Design of Timber and Steel Structures</strong></td>
<td>3(2-3)</td>
<td>Pre: 203222</td>
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<tr>
<td></td>
<td>Design of timber and steel structures, tension</td>
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<tr>
<td></td>
<td>and compression members, beams, beam-columns,</td>
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<td></td>
<td>built-up members, plate girders, connections;</td>
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<tr>
<td></td>
<td>design practice.</td>
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<tr>
<td>203341</td>
<td><strong>Sanitary Engineering and Water Supply</strong></td>
<td>3(3-0)</td>
<td>Pre: 209211</td>
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<tr>
<td></td>
<td>Quantity of water and sewage; water supply;</td>
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<td>water transmission; design of water distribution</td>
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<td>system; amount of storm sewage; hydraulics of</td>
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<td>sewer; wastewater collection and disposal;</td>
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<td></td>
<td>design of sanitary and storm sewers; pumps and</td>
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<td></td>
<td>pumping stations; building sanitation and piping.</td>
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<tr>
<td>203351</td>
<td><strong>Engineering Geology</strong></td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Minerals and rocks; rock cycle and weathering;</td>
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<td>physical geology, structural geology; topographic</td>
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<td></td>
<td>map and geologic map; laboratory in minerals and</td>
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<td>rocks, laboratory in structural geology, damsite</td>
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<tr>
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<td>geology, tunnel, and foundation on rock.</td>
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<tr>
<td>203352</td>
<td><strong>Soil Mechanics</strong></td>
<td>3(3-0)</td>
<td>Pre: 203221</td>
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<tr>
<td></td>
<td>Soil genesis; physical properties of soil;</td>
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<td></td>
<td>engineering soil classifications; soil</td>
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<td></td>
<td>investigation and testing; density, compaction</td>
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<td>and soil improvement; soil and pore water</td>
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<td>relationship, flow of water in soil; stress</td>
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<td></td>
<td>within soil mass; strength and stability of soil;</td>
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<td>bearing capacity theories; consolidation and</td>
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<td></td>
<td>settlement.</td>
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<tr>
<td>203353</td>
<td><strong>Soil Mechanics Laboratory</strong></td>
<td>1(0-3)</td>
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<tr>
<td></td>
<td>Principles of engineering soil testing; data</td>
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<td>collection and interpretation; report,</td>
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<td>applications of test results in civil engineering</td>
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<td>works; laboratory works on soil boring,</td>
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<td>sampling, physical properties, engineering soil</td>
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<td>classification, engineering properties, soil</td>
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<td>compaction, field density, permeability.</td>
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<tr>
<td>203354</td>
<td><strong>Foundation Design</strong></td>
<td>3(3-0)</td>
<td>Pre: 203352</td>
</tr>
<tr>
<td></td>
<td>Application of soil mechanics principles to solve</td>
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<tr>
<td></td>
<td>civil engineering problems; soil investigation</td>
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<td></td>
<td>for foundation design; design of shallow and</td>
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<td></td>
<td>piled foundations; settlement analysis of</td>
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<td></td>
<td>foundations; design of earth structures and</td>
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<tr>
<td></td>
<td>earth retaining structures; stability design of</td>
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<td></td>
<td>earth slopes; design practice.</td>
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<tr>
<td>203361</td>
<td><strong>Construction Engineering and Management</strong></td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>The fundamental of construction management;</td>
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<tr>
<td></td>
<td>organizational administration; construction</td>
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<tr>
<td></td>
<td>bidding and cost estimation; construction contract</td>
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<tr>
<td></td>
<td>and specifications; construction planning,</td>
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<td></td>
<td>scheduling and controlling; resource management;</td>
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<td></td>
<td>equipment; safety in construction.</td>
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<tr>
<td>203371</td>
<td><strong>Transportation Engineering</strong></td>
<td>3(3-0)</td>
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</tbody>
</table>
Planning and evaluation of transportation systems, transportation models; water transportation; pipeline transportation; road transportation; railway transportation; air transportation.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Pre-requisites</th>
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</thead>
<tbody>
<tr>
<td>203411</td>
<td>Aerial Photography Interpretation</td>
<td>3(2-3)</td>
<td>203211</td>
</tr>
<tr>
<td></td>
<td>Principles of interpretation of aerial photographs,</td>
<td></td>
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<tr>
<td></td>
<td>geological processes of land formation, patterns of</td>
<td></td>
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<tr>
<td></td>
<td>land forms as seen on aerial photograph; application</td>
<td></td>
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<tr>
<td></td>
<td>of air photo for planning and solving the engineering</td>
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<tr>
<td></td>
<td>problems such as location of granular material,</td>
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<tr>
<td></td>
<td>drainage area delineations, highway location, pipeline,</td>
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<tr>
<td></td>
<td>selection of photo central points and optimum</td>
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<tr>
<td></td>
<td>monumentation sites for survey of high precision.</td>
<td></td>
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<tr>
<td>203412</td>
<td>Adjustment Computation in Surveying</td>
<td>3(2-3)</td>
<td>203211</td>
</tr>
<tr>
<td></td>
<td>Basic of statistical concepts; errors; principles</td>
<td></td>
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<tr>
<td></td>
<td>and techniques of propagation; principles of least</td>
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<tr>
<td></td>
<td>squares adjustment; general model for least squares</td>
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<tr>
<td></td>
<td>solution by normal, observation and condition</td>
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<tr>
<td></td>
<td>equations; statistical analysis or the results.</td>
<td></td>
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<tr>
<td>203413</td>
<td>Astronomy Surveying</td>
<td>3(2-3)</td>
<td>203211</td>
</tr>
<tr>
<td></td>
<td>Spherical trigonometry; celestial sphere coordinate</td>
<td></td>
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<tr>
<td></td>
<td>systems; stellar position and motion; time systems;</td>
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<tr>
<td></td>
<td>star almanac; determination of azimuth, latitude and</td>
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<tr>
<td></td>
<td>longitude by astronomical methods.</td>
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<tr>
<td>203414</td>
<td>Cadastral Surveying</td>
<td>3(3-0)</td>
<td>203211</td>
</tr>
<tr>
<td></td>
<td>Cadastral system and property laws; cadastral mapping</td>
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<tr>
<td></td>
<td>system; land boundary surveying; cadastral for</td>
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<tr>
<td></td>
<td>forestry, land reform, irrigation and land</td>
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<tr>
<td></td>
<td>development; land evaluation; real estate management.</td>
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<tr>
<td>203415</td>
<td>Remote Sensing for Engineers</td>
<td>S3(2-3)</td>
<td>203211</td>
</tr>
<tr>
<td></td>
<td>Principles of remote sensing; theory of</td>
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<tr>
<td></td>
<td>electromagnetic energy; photo interpretation; digital</td>
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<tr>
<td></td>
<td>image processing; applications of satellite</td>
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<tr>
<td></td>
<td>imageries for natural resource and environmental</td>
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<tr>
<td></td>
<td>surveying.</td>
<td></td>
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<tr>
<td>203416</td>
<td>Geographic Information Systems for Engineers</td>
<td>3(2-3)</td>
<td>203211</td>
</tr>
<tr>
<td></td>
<td>Definition and concepts of geographic information</td>
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<tr>
<td></td>
<td>system; design of database and base map; data</td>
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<tr>
<td></td>
<td>capture, data analysis, data retrieval and</td>
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<td></td>
<td>presentation; software application for geographic</td>
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<tr>
<td></td>
<td>information system.</td>
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<tr>
<td>203421</td>
<td>Computer Applications in Structural Engineering</td>
<td>3(2-3)</td>
<td>203321</td>
</tr>
<tr>
<td></td>
<td>Strain Introduction to numerical methods; computer</td>
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<td></td>
<td>programming techniques; computer applications in</td>
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<tr>
<td></td>
<td>structural analysis and design, application of finite</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>element method in structural analysis.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>203431</td>
<td>Prestressed Concrete Design</td>
<td>3(3-0)</td>
<td>203331</td>
</tr>
<tr>
<td></td>
<td>Principle of prestressed concrete members; material</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>properties and allowable stresses; analysis for</td>
<td></td>
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<tr>
<td></td>
<td>stressed in prestressed concrete beams; loss of</td>
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<td></td>
<td>prestress; design of beams for flexure and shear;</td>
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<tr>
<td></td>
<td>deflection of beams under working load; strength of</td>
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<td></td>
<td>prestressed concrete beams; design of composite</td>
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<td></td>
<td>beams and precast composite floor system; floor</td>
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<td></td>
<td>system design of prestressed flat slabs; design of</td>
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<tr>
<td></td>
<td>piles.</td>
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<tr>
<td>203432</td>
<td>Bridge Structural Design</td>
<td>3(3-0)</td>
<td>203331</td>
</tr>
<tr>
<td></td>
<td>Pre : 203331</td>
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</tbody>
</table>
Types of bridges; design codes and loading requirements; superstructure design of steel, concrete and prestressed concrete bridges; substructure design.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits: Weeks</th>
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</thead>
<tbody>
<tr>
<td>203433</td>
<td><strong>Building Structural Design</strong></td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Pre : 203331</td>
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<tr>
<td></td>
<td>Structural design of reinforced concrete buildings; building structural systems; slab and footing systems; frame analysis due to vertical loads and wind loads; building laws, standards and codes; member design; shear wall and water tank in building.</td>
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</tbody>
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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits: Weeks</th>
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<tbody>
<tr>
<td>203434</td>
<td><strong>Structural Steel Technology</strong></td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 203321</td>
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<tr>
<td></td>
<td>Properties and specifications of structural steel; causes of brittle fracture and protective measure; fatigue of structural steel; behavior of riveted, bolted and welded connection; principle and design specification for cold formed light gage steel members.</td>
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</tbody>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits: Weeks</th>
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<tbody>
<tr>
<td>203451</td>
<td><strong>Analysis and Design of Earth Structures</strong></td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 203352</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Characteristics of earth structures, soil investigation and properties evaluation for design, stability analysis of earth slopes, seepage analysis and pore pressure during construction and service, slope and excavation design; settlement analysis; soil strengthening design, construction and field control.</td>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits: Weeks</th>
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<tbody>
<tr>
<td>203452</td>
<td><strong>Engineering Soil Exploration</strong></td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Pre : 203352</td>
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<tr>
<td></td>
<td>Soil exploration planning; use of aerial photograph and geologic maps for soil exploration; exploration methods, soil samplings and field tests; material investigation; interpretation and conclusion of exploration results; exploration report writing; principles of geotechnical instruments, installation and monitoring; field works.</td>
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</table>

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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits: Weeks</th>
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<tbody>
<tr>
<td>203453</td>
<td><strong>Principles of Geomechanics</strong></td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 203352</td>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits: Weeks</th>
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<tbody>
<tr>
<td>203454</td>
<td><strong>Computer Applications in Geotechnical Engineering</strong></td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Pre : 203352</td>
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<td></td>
<td>Geotechnical problem solving; numerical methods; finite element analysis of flow of water in soil, consolidation, stress and strain; the use of computer software in geotechnical analysis and design.</td>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits: Weeks</th>
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<tbody>
<tr>
<td>203455</td>
<td><strong>Principles of Rock Mechanics and Tunneling</strong></td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Pre : 203352</td>
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<tr>
<td></td>
<td>Rock classifications; physical properties, engineering properties and strength of rock; tunnels and stresses around tunnels; tunnel supporting and lining design; settlement of soil upon tunnel; machine and excavation method of tunnel; laboratory determination of physical properties and engineering properties of rock.</td>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits: Weeks</th>
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<tbody>
<tr>
<td>203456</td>
<td><strong>Geo-environmental Engineering</strong></td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 203352</td>
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<tr>
<td></td>
<td>Concepts and principles of geo-environmental engineering; environmental conservation and rehabilitation; disaster prevention from nature and construction by applying knowledge in geotechnical engineering, concrete technology and environmental engineering; basic principles of waste utilization as construction materials; geotechnical engineering of solid waste landfill; foundation improvement to prevent groundwater contamination.</td>
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</tbody>
</table>
203461  **Construction Equipment**  
Pre : 203361  
Organization Equipment for wood, earthworks, concreting, transporting, compacting, and material testing; equipment management.

203462  **Contract, Specification and Construction Estimation**  
Pre : 203361  
Construction cost estimation involving budget, work, time limit and material to be used in resource analysis required for critical path method; details and specification listing for attachment with the plan; construction contracting and work procedure under the contract.

203463  **Building Design**  
Pre : 203331  
Consideration in architectural planning; selection of materials for building; construction drawings for commercial, industrial, residential, and office building; considerations of structural, mechanical, electrical, and sanitary systems for building; on-site utilities and facilities.

203464  **Materials and Methods of Construction**  
Pre : 203361  
Materials and methods of construction for structural, finishing, and system works; structural work including foundation, reinforced concrete, prestressed concrete, prefabricated concrete, timber and steel; finishing works including floor, wall, ceiling, and roofing; system works including mechanical and electrical related works.

203465  **Computer Applications in Construction**  
Pre : 203361  
Construction management problems solving by computers; software packages for construction management; applications of computer in construction engineering and management.

203466  **Construction Project Analysis**  
Pre : 203461  
Construction Construction project planning process, decision making for investment, cost analysis, return on investment and financial analysis of construction project, construction project analysis under risk.

203467  **Supervision and Inspection in Construction**  
Pre : 203461  
Professionalism and ethics in the practice of engineering; roles and characteristics of inspectors; general supervision; inspection for structural, architectural, and system works; safety inspections; failure and repair in construction.

203468  **Large Scale Construction**  
Pre : 203361  
and considerations in heavy construction, material and manpower, earth and piling works, civil works, equipment; underground and in water construction; utilities and facilities; construction sequencing.

203471  **Highway Engineering**  
Pre : 203211 and 203352  
Historical Historical development of highways; development of highways in Thailand; highway administration; principles of highway planning and traffic analysis; route survey for design and construction of highway; soil investigation and testing; geometric design and operations of highways; highway finance and economic; design of flexible pavement and rigid pavement; highway materials; bituminous surface and asphalt; highway drainage; highway construction and maintenance.
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>203472</td>
<td>Highway Materials</td>
<td>3(2-3)</td>
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<tr>
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<td>Pre : 203352</td>
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<td></td>
<td>Characteristics and properties of highway materials: soil, aggregate, asphalt; standards and specifications; mix design methods for asphalt concrete by Marshall and superpave methods; soil improvement; laboratory tests of highway materials.</td>
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<tr>
<td>203473</td>
<td>Traffic Engineering</td>
<td>3(3-0)</td>
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<td></td>
<td>Pre : 203371</td>
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<tr>
<td></td>
<td>Road, vehicle, driver and pedestrian characteristics; general traffic characteristics; traffic flow theory; highway capacity and level of services; traffic studies; traffic signal design.</td>
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<tr>
<td>203474</td>
<td>Urban Transportation Planning</td>
<td>3(3-0)</td>
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<td>Pre : 203371</td>
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<td></td>
<td>Urban transportation characteristics and problems; transportation planning process; analysis and forecast of transport demand; survey, collection and analysis of transportation planning data; economic analysis for transport plans.</td>
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<tr>
<td>203475</td>
<td>Urban Mass Transportation Planning</td>
<td>3(3-0)</td>
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<td>Pre : 203371</td>
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<td></td>
<td>Roles and history of mass transit system; conventional mass transit modes, paratransit system, innovative technology; mass transit networks planning; operations and management; system costs estimation.</td>
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<tr>
<td>203476</td>
<td>Airport Planning and Design</td>
<td>3(3-0)</td>
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<td>Pre : 203371</td>
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<td></td>
<td>Aircraft characteristics; air traffic control; airport planning; airport configuration; geometric design of the airfield; planning and design of the terminal building; structural design of pavement and lighting; airport marking and signing.</td>
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<tr>
<td>203477</td>
<td>Pavement Structures</td>
<td>3(3-0)</td>
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<td></td>
<td>Pre : 203371</td>
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<td></td>
<td>Structural design of rigid and flexible pavements; loading characteristics; properties of pavement components; stress distribution; effects of climate variables on design criteria; pavement management.</td>
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<tr>
<td>203478</td>
<td>Traffic Design and Operations</td>
<td>3(2-3)</td>
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<td>Pre : 203371</td>
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<tr>
<td></td>
<td>Traffic studies; traffic control devices; highway safety design; lighting design; parking, loading and terminal facilities; accidental analysis; traffic system management.</td>
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<tr>
<td>203481</td>
<td>Selected Topics in Survey Engineering</td>
<td>1-3</td>
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<tr>
<td></td>
<td>Interesting topics in survey engineering.</td>
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<tr>
<td>203482</td>
<td>Selected Topics in Structural Engineering</td>
<td>1-3</td>
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<tr>
<td></td>
<td>Interesting topics in structural engineering.</td>
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<tr>
<td>203483</td>
<td>Selected Topics in Geotechnical Engineering</td>
<td>1-3</td>
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<tr>
<td></td>
<td>Interesting topics in geotechnical engineering.</td>
<td></td>
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<tr>
<td>203484</td>
<td>Selected Topics in Transportation Engineering</td>
<td>1-3</td>
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<tr>
<td></td>
<td>Interesting topics in transportation engineering.</td>
<td></td>
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<tr>
<td>203485</td>
<td>Selected Topics in Construction Management</td>
<td>1-3</td>
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<tr>
<td></td>
<td>Interesting topics in construction management.</td>
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<tr>
<td>203495</td>
<td>Civil Engineering Project Preparation</td>
<td>1(0-3)</td>
</tr>
<tr>
<td></td>
<td>Preparation of project proposal, literature review and progress report.</td>
<td></td>
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<tr>
<td>203496</td>
<td>Selected Topics in Civil Engineering</td>
<td>1-3</td>
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<tr>
<td></td>
<td>Interesting topics in civil engineering.</td>
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<tr>
<td>203497</td>
<td>Seminar</td>
<td>1</td>
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</tbody>
</table>
Discussion and presentation of topics relevant to civil engineering.

203498  Special Problems  1-3
Independent investigation of assigned problems together with presentation of study report.

203499  Civil Engineering Project  2(0-6)
Pre: 203495
Integrating project in various disciplines of civil engineering.

COMPUTER ENGINEERING
(204XXX)

204101  Basic Concepts and Applications of Computers  1(1-0)
Basic computer concepts; computer components and organization; flowcharts and structured programming; computer applications; the impact of computers on society.

204111  Computers and Programming  3(2-3)
Basic structure of modern computer systems; data representation in computers; algorithmic problem solving; program design and development methodology; introductory programming using a high-level programming language; programming practice in computer laboratory.

204112  Information Technology for Engineers  1(0-2)
Self-learning from electronic sources concerning computer architecture, data storage in computer system, computer software classification, computer software installation and usage, office software usage, computer network, internet surfing, information and database management system, basic computer maintenance, and applications of computer in engineering fields.

204211  Discrete Mathematics  3(3-0)
Sets, sequences, and functions; logic; the growth of functions; methods of proof and mathematical induction; recursive definitions and algorithms; counting methods and recurrence relations; relations; introduction to graph theory.

204212  Abstract Data Types and Problem Solving  3(3-0)
Abstract data types; data abstraction; basic algorithms for problem solving; application of abstract data types; heuristic techniques; analysis of algorithm complexity.

204213  Theory of Computation  3(3-0)
Pre: 204211
Deterministic and non-deterministic finite automata; regular languages and regular grammars; pushdown automata and context-free grammars; Turing machines and computability; the Chomsky hierarchy; uncomputability and undecidable problems.

204214  Programming Skill Development Laboratory  1(0-3)
Programming skill development; practice the use of practical programming languages and their integrated environments.

204221  Computer Organization and Assembly Language  3(3-0)
Basic computer organization; registers, arithmetic-logic unit, and control unit; machine representation of data and instructions; machine language and assembly language programming; addressing modes; interrupts and input/output programming.
204222  Digital Systems Design  
Basic digital systems; boolean algebra; digital design techniques; logic gates; logic minimization; standard combinational circuits, sequential circuits; flip-flops; synchronous and asynchronous sequential circuits; PLA, ROM, and RAM; arithmetic circuits; computer-aided logic design.

204223  Practicum for Computer Engineering  
Software practice in the use of a modern operating system programming environment and the use of program development and networking tools; hardware practice in electronic circuits assembly and basic network cabling and installation; small project assignments.

204224  Logic Circuit Laboratory  
Laboratory works related to the topics in 204222.

204312  Probability and Random Processes for Computer Engineers  
Pre: 417168
Probability; conditional probability and independence of events; random variables; distribution and density functions; functions of one random variable; multiple random variables; operations on one and multiple random variables; laws of large numbers; central limit theorem; random processes and their applications; application to computer engineering problems.

204313  Algorithm Design and Analysis  
Pre: 204211 and 204212
Design and analysis of algorithms, correctness of algorithms, complexity analysis, divide-and-conquer techniques, selection, searching, dynamic programming, combinatorial problems, graph problems, NP-complete problems, parallel algorithms.

204321  Computer Architecture  
Pre: 204221 and 204222
Basic concepts of computer architecture and organization; computer evolution; design methodology; performance evaluation; CPU architecture; instruction sets; ALU design; hardwired and microprogrammed control; memory hierarchies; virtual memory; cache memory; input/output architectures; interrupts and DMA; parallel processing; pipelined processors; multiprocessors.

204323  Microprocessors and Microcomputer Design  
Pre: 204321
Technology and architecture of microprocessors; characteristics and classification of microprocessors; microprocessor interfacing techniques; standard and high-speed buses; design of memory, input/output, and peripheral devices; design of microcomputers.

204324  Computer System Laboratory  
Pre: 204224 and 204321
Laboratory works related to the topics in 204224 and 204321.

204325  Data Communication and Computer Networks  
Data communication networks and open system standards; data transmission; data link controls; technologies of local area networks and wide area networks; communication architecture and protocols.

204331  System Software  
Pre: 204212 and 204221
Basic principles of programming systems; relationship between system software and machine architecture; principles and design of assemblers, loaders, linkers, and macroprocessors; introduction to programming language processors.
204332 Operating Systems
Pre : 204331
Basic concepts of operating systems; processes and concurrency; process management and scheduling; input/output management; memory management; file systems; computer systems security.

204341 Design and Construction of Large Software Systems
Pre : 204313
Software design concepts; object-oriented analysis and design techniques; unified modeling language; software architecture; design patterns; software components and design; software construction techniques; software testing techniques.

204342 Managing Software Development
Pre : 204341
Software process concepts; software process improvement and quality models; software process models; requirement management and elicitation; software project management; software quality assurance; inspection techniques; software configuration management.

204351 Database Systems
Pre : 204212
General characteristics of information systems; data storage techniques; data manipulation and searching services; file management; information retrieval techniques; principles of database systems and database management; database modeling: hierachical model, network model, relational model, and object-oriented model; applications of database systems.

204352 Laws and Ethics in Information Technology
Pre : 204313
Laws and ethical issues related to computer engineering and information technology; trading and commerce issues; computer abuse; social justice issues; free speech; privacy; risk in computer systems; intellectual properties.

204371 Transform Techniques in Signal Analysis
Pre : 417267
Analysis techniques of continuous and discrete signals of linear system in time domain; Fourier series; Fourier transform, Laplace transform, and Z-transform; sampling theory; solving differential equations and difference equations using transform techniques with applications.

204411 Symbolic Computation
Pre : 204213
Symbolic logic; syntax and semantic analyses of terms and sentences; reasoning and theorem proving; symbolic computation with functional programming and logic programming.

204421 Computer Networks
Pre : 204325
TCP/IP protocol suite; routing protocols; internetworking with TCP/IP; network management; network security.

204422 Computer Communication and Network Laboratory
Pre : 204325
Laboratory experiments on topics covered in 204325.

204424 Digital Design Automation
Pre : 204222
Basics of digital design automation; techniques and tools for digital
design automation; hardware descriptive language; hardware compiler; computer architecture testing and simulating; logic circuit simulation; automation programs; partitioning; component placing and routing of digital circuits.

**204425 Network Programming** 3(3-0)
Pre : 204325
TCP/IP; client-server model; interprocess communications; socket interface; TCP and UDP sockets; daemon process; raw sockets; algorithm for client and server.

**204426 Network Configuration** 3(2-3)
Pre : 204325
Open system interconnection model; local area network; local area network design and documentation; TCP/IP and IP addressing; wide area network; router components and configuration; routing protocol; network troubleshooting; virtual local area network; network management; wide area network design.

**204432 Object-Oriented Computing** 3(3-0)
Pre : 204313
Object-oriented software development for enterprise information system; distributed object technology; common object request broker architecture (CORBA) and its applications.

**204433 Programming Language Translation** 3(3-0)
Pre : 204213 and 204331
Organization of programming languages; introduction to programming language translation and translators; lexical, syntax, and semantic analysis; symbol-table manipulation; code generation and code optimization; compile-time error handling.

**204434 Parallel and Distributed Computing Systems** 3(3-0)
Pre : 204313
Computer architecture for parallel processing, pipelining and distributed processing; parallel algorithms; design of parallel and distributed computing systems; file transfer methods; monitoring management; network topologies and distributed operating systems.

**204435 Programming Language Concepts** 3(3-0)
Pre : 204213 and 204331
Structure and organization of programming languages; language processors; syntax; data types; sequence control; subprogram control; storage management; implementation techniques of each language feature; the study and comparison of major programming paradigms.

**204451 Database Systems Design** 3(3-0)
Pre : 204351
Data models; hierarchical databases, network databases, and relational databases; structures of logical databases; entities and relations; normalization; data definition languages and data manipulation languages; data security, backup, consistency, reliability, and integrity; distributed databases.

**204452 Information Technology Management** 3(3-0)
Organizing information technology (IT) departments; planning information systems; managing IT resources; project management for the design, development, implementation, installation, and evaluation of an information system; cost/benefit analysis for information systems; impacts of IT on organizations, individuals, and societies; ethics, laws, and national policies concerning IT.

**204461 Artificial Intelligence** 3(3-0)
Pre : 204213 and 204313
Introduction to artificial intelligence: its scope, history and techniques; knowledge representation; memory structures; reasoning mechanisms; probabilistic reasoning and searching techniques; games; planning; machine learning; natural language processing; computer vision; expert systems.

204462 Introduction to Expert Systems 3(3-0)
Pre : 204461
Knowledge representation techniques: frames, rules, and semantic networks; searching knowledge base; reasoning mechanisms with forward chaining and backward chaining; expert system case studies; design and development of expert systems: knowledge acquisition, validation and verification, user interface and natural language understanding.

204463 Introduction to Natural Language Processing 3(3-0)
Pre : 204213
Introduction to basic computation of natural language processing; syntax analysis of structure of sentences; semantics of sentences; analysis and relation creation between sentences.

204464 Computer Vision 3(3-0)
Pre : 204461
Study of automatic and semi-automatic of vision management; pattern selection; groups processing; hierarchical structures; graphical procedures for structure description; 3-dimensional object representation methods.

204471 Microcomputer Interfacing 3(3-0)
Pre : 204323
Switching devices and applications; sensors; signal conversion; automatic control systems; microcomputer interfacing techniques; microcontrollers and interfacing; robotics.

204472 Numerical Computation 3(3-0)
Pre : 204212 and 417267
Number systems; algorithms for number crunching; solving engineering problems with computers: estimation, differentiation, numerical integration, differential equations, linear and non-linear system equations, curve fitting, and fast Fourier transform.

204481 Foundations of Computer Graphics 3(3-0)
Pre : 204313
Hardware for the display of graphics generation; data structures for graphical display, 2- and 3-dimensional transformations; matrix transformation techniques in 3-dimensional viewport; clipping; window user interface.

204482 Computer-Human Interfaces 3(3-0)
Pre : 204313
Design and construction of human-computer interfaces; hardware and software architecture for personal workstations; object-oriented programming; interactive display management and windows.

204495 Computer Engineering Project Preparation 2(2-0)
Design and management of engineering projects; technical report writing; literature review and reference; technical report presentation; preparation for a computer engineering project proposal; presentation of the project proposal.

204496 Selected Topics in Computer Engineering 1-3
Selected topics in computer engineering at the bachelor degree level. Topics are subject to change in each semester.
### Seminar
204497  
Presentation and discussion of interesting topics in computer engineering at the bachelor degree level.

### Special Problems
204498  
Study and research in computer engineering at the bachelor degree level and compiled into a report.

### Computer Engineering Project
204499  
Pre : 204495  
Project of practical interest in various fields of computer engineering.

## ELECTRICAL ENGINEERING (205XXX)

### Introduction to Electrical Engineering
205201  
Physical and electrical characteristic of electrical components, resistive circuits, network theorem, circuits response, ac circuit, physical and electrical characteristics of electronic devices, equivalent circuit and electronic circuit analysis, magnetic circuit, transformer, three phase circuit, principles of electromechanical energy conversion, dc machine, ac machine, control system.

### Electrical Engineering Laboratory I
205202  
Pre : 205201  
Laboratory experiments on topics covered in Introduction to Electrical Engineering.

### Electronics for Computer Engineer
205203  
Solid state materials, diode circuits, rectifier and AC/DC conversions, MOStransistors, bipolar transistors, switches, TTL circuits, amplifiers, power amplifiers, pulse circuits, latches, flip flops, operational amplifiers, power electronic devices and circuits.

### Electric Circuit Analysis I
205211  
Definitions, basic concept and units, resistive circuits, dependent source, circuit analysis, network theorem, graph theory, energy storage elements, first order system, and second order circuits, sinusoidal signal, alternating current steady-state analysis, three-phase circuit.

### Electric Circuit Analysis II
205212  
Pre : 205211  
Complex frequency and s-plane analysis, network function, frequency response, Laplace transformation and its application to circuit analysis, resonance and scaling circuits, coupled circuits, transformer, two-port networks, three-phase circuit.

### Electric Circuit Laboratory
205213  
Pre : 205211  
Laboratory experiments on topics covered in Electric Circuit Analysis I

### Signals and Systems
205214  
Pre : 205212 or together  
Continuous and discrete-time transform analysis techniques, linear and
time variant systems, transfer functions, Fourier series, Fourier transform, Laplace and z transform, sampling theorem, solution of differential and difference equations using transforms.

**205215 Applied Probability for Electrical Engineers**  
**Pre:** 417168  
Joint and conditional probability, statistical independence, discrete and continuous random variables, distribution and density functions, operations on one and multiple random variables, expectation, moments and characteristic functions, law of large numbers, central limit theorem, basic reliability calculations, testing the fit of a distribution of data.

**205216 C Language and Data Structure**  
Computing concepts, structured program development, program control, functions, arrays, pointers, characters and strings, formatted input/output, file processing, stacks and recursion, queues and linked lists, searching, sorting, trees and graphs, C++ language and classes.

**205231 Electronic Circuits and Systems I**  
**Pre:** 205211  
Electrical property of insulator, semiconductor and conductor, energy band theory of crystal, various properties of semiconductor, property of p-n junction, dc characteristics of diodes, transistor, FET and MOSFET, diodes and its applications, differential amplifier, operational amplifier characteristic and basic applications, digital circuit, combination circuit and synthesis techniques, computer simulation for combination logic, diode logic circuit, TTL circuit, MOS logic circuit, IC fabrication process.

**205232 Digital Circuits and Logic Design**  
Number systems and codes, boolean algebra, combinational logic design principles and practices, logic design by using Karnaugh map, sequential logic design principles and practices, logic design by using state machine, synchronous and asynchronous sequential logic design, various families of digital integrated circuits, programmable logic devices, interfacing with analogue circuits, introduction to computer aid design for digital logic design.

**205251 Electromechanical Energy Conversion I**  
**Pre:** 205211  
Energy sources, magnetic circuits, principles of electromagnetic and electromechanical energy conversion, energy and co-energy, principles of rotating machines, dc machines, starting method of dc motors, methods of dc motors speed control, theory and analysis of single phase and three phase transformers

**205291 Electrical Practice**  
Workshop practice in basic electrical equipment and in wiring installation.

**205301 Electrical Engineering**  
**Pre:** 205201  
Electrical devices, power electronics, solid state motor control, digital electronics, synthesis of synchronous sequential circuits, dc generator, dc motor, ac motor, controlled motor.

**205302 Electrical Engineering Laboratory II**  
**Pre:** 205301  
Laboratory experiments on topics covered in Electrical Engineering.

**205303 Electronics Laboratory for Computer Engineer**  
**Pre:** 205203  
Laboratory experiments on topics covered in Electronics for Computer Engineering.
Engineer.

205311 Network Analysis 3(3-0)
Pre : 205212
Characterization of networks, network topology, nodal network analysis, loop and cutset network analysis, state equations, network functions and energy.

205312 Network Synthesis 3(3-0)
Pre : 205311
Review network analysis, introduction to filter concepts, approximation, sensitivity, passive network synthesis, basic of active filter synthesis, positive and negative feedback biquad circuits, amplifier biquad.

205314 Digital Signal Processing 3(3-0)
Pre : 205214
Discrete-time signals and systems, z transform, sampling of continuous time signal, transform analysis of linear time-invariant systems, structures for discrete-time systems, infinite impulse response and finite impulse response filter design techniques, discrete Fourier transform, fast Fourier transform.

205315 Digital Signal Processing Laboratory 1(0-3)
Pre : 205314
Experiments for digital filter design : finite impulse response filter design and infinite impulse response filter design, fast Fourier transform, currently interesting projects in digital signal processing applications.

205319 Electrical Engineering Materials 3(3-0)
Fundamentals of solid materials, structure of solids, preparation of materials, practical determination of structure, mechanical properties, electrical properties, dielectrics, magnetic properties, superconductivity, optical properties.

205321 Principles of Communication 3(3-0)
Pre : 205214 and 205215
Communication system, signal to noise ratio, channel capacity, signals and vectors, signal and system analysis, amplitude modulation, angle modulation, random process, behavior of analog signals in the presence of noise, sampling theorem, PCM, digital communications, signal space, constellation diagram, digital modulation, optimum receiver, probability of error.

205322 Digital Communication 3(3-0)
Pre : 205321
Sampling theorems, random and nonrandom signals. Lowpass random signal, baseband digital systems, quantization, source coding, PCM, DM; bandpass digital systems: ASK, PSK, FSK; channel coding methods, transmission and synchronization, interesting modern digital communication topics.

205323 Communication Laboratory 1(0-3)
Pre : 205321 or together
Laboratory experiments on topics covered in Communication Systems I.

205324 Telecommunication Engineering 3(3-0)
Telecommunication engineering, integrated broadband communication networks, transmission systems, transmission media, analog and digital transmission and modulation techniques, time division multiplexing and frequency division multiplexing, multiple access, traffic engineering, modems, pulse code modulation, microwave transmission, satellite transmission, and fiber optic transmission.

205327 Data Communications and Networks I 3(3-0)
Fundamentals of data communications and networks, layered network architecture, point-to-point protocols and links, delay models in data networks, multi-access communication, routing in data networks, data flow control.

<table>
<thead>
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<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
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<td>205328</td>
<td>Wireless Communications I</td>
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<td>205331</td>
<td>Electronic Circuits and Systems II</td>
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<td>circuits, power amplifier circuits analysis,</td>
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<td>analog circuits simulation, digital sequential</td>
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<td>205332</td>
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<td>205333</td>
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<td>Introduction to semiconductor devices, energy</td>
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<td>205335</td>
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<td>Microprocessor.</td>
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<td>205337</td>
<td>Electronic Circuit Design</td>
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<td>frequency response of AF amplifiers, voltage</td>
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<td>advanced applications of Op-Amps.</td>
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<td>205338</td>
<td>VLSI Systems</td>
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<td>Theories and models of MOS transistor, CMOS</td>
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<td>gate construction,</td>
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</table>
integrated circuit technology and fabrication process, techniques and rules for IC design, performance estimation using CAD and simulation tools, optimizing the performance of CMOS circuits, theories of FPGA and related technologies, prototyping VLSI circuits using VHDL, testing and optimizing.

**205341 Electromagnetic Fields and Waves I** 3(3-0)
**Pre : 417267**
Vector analysis, electrostatic fields, potential and energy, conductors and dielectric, convection and conduction currents, solution of Laplace’s and Poisson’s equations, magnetic fields, inductance, displacement current, time-varying electromagnetic field and Maxwell’s equation, and plane wave.

**205342 Photonic Engineering** 3(3-0)
**Pre : 205341**
Wave optics, electromagnetic field, reflection and refraction, geometrical optics, radiation and detection, polarization, interference and coherence, diffraction, Fourier optics, holography, photonic switching technology, applications.

**205351 Electromechanical Energy Conversion II** 3(3-0)
**Pre : 205251**
Transformers in three-phase systems, AC machines construction, steady state performance and analysis of induction machines and synchronous machines.

**205352 Electromechanical Energy Conversion Laboratory I** 1(0-3)
**Pre : 205251**
Laboratory experiments on topics in Electromechanical Energy Conversion I and parts of Electromechanical Energy Conversion II and other related topics.

**205353 Electromechanical Energy Conversion Laboratory II** 1(0-3)
**Pre : 205351**
Laboratory experiments on topics in Electromechanical Energy Conversion II and others related topics.

**205354 Power Systems in Buildings** (3-0)
**Pre : 205351**
Basic design concepts, power distribution schemes, codes and standards for electrical installation, electrical drawing, load estimation, wiring design, grounding, short-circuit calculation, coordination of protective devices, power factor improvement, emergency power systems.

**205355 Electric Power System Analysis I** 3(3-0)
**Pre : 205351**
Voltage, current, and power calculation in single and three phase systems, principles of generation, transmission line parameters, voltage and current relationship in transmission and distribution systems, network calculation.

**205356 High-Voltage Engineering** 3(3-0)
**Pre : 205341**
Generation and uses of high-voltage, high-voltage measurement techniques, electric field and insulation techniques, breakdown of gas, liquid and solid dielectrics, test of high-voltage material and equipment, lightning and lightning protection.

**205361 Electrical Measurements and instruments I** 3(3-0)
**Pre : 205231**
Basic principles and terminology, system of units, sources of measurement errors, calibration and traceability, grounding and safety, analogue measurements and instrumentation, measurements of energy, instrument transformers,
oscilloscope, digital instrumentation, digital displays, digital multimeter, principles of electrical transducers, temperature, pressure, flow, level, displacement, speed.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<td>205362</td>
<td>Linear Control Systems</td>
<td>3(3-0)</td>
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<tr>
<td>205363</td>
<td>Control and Measurement Laboratory</td>
<td>1(0-3)</td>
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<td>205364</td>
<td>Digital Control Systems</td>
<td>3(3-0)</td>
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<tr>
<td>205411</td>
<td>Applied Linear Algebra in Electrical Engineering</td>
<td>3(3-0)</td>
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<td>205412</td>
<td>Complex Analysis in Electrical Engineering</td>
<td>3(3-0)</td>
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<td>205413</td>
<td>Applied Random Processes</td>
<td>3(3-0)</td>
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<tr>
<td>205414</td>
<td>Digital Signal Processing Design and Implementation</td>
<td>3(3-0)</td>
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<tr>
<td>205415</td>
<td>Digital Image Processing</td>
<td>3(3-0)</td>
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</table>

**205362 Linear Control Systems**  
Pre : 205212  
Consideration of feedback concept, application in time domain and frequency domain techniques to modeling, analysis and design of linear systems, stability analysis, introduction to state-space representation.

**205363 Control and Measurement Laboratory**  
Pre : 205361 and 205362  
Laboratory experiments on topics covered in Electrical Measurements and Instrumentation I and Linear Control Systems.

**205364 Digital Control Systems**  
Pre : 205362  
Discrete-data and digital control systems, signal conversion and processing, z transform and modified z transform, transfer function, block diagram, signal flow graph, state variable techniques, controllability, observability, stability, optimal control.

**205411 Applied Linear Algebra in Electrical Engineering**  
Pre : 205214  

**205412 Complex Analysis in Electrical Engineering**  
Pre : 205214  
Complex number and complex functions, Cauchy-Riemann equation, analytic functions, harmonic function, Cauchy integral theorem, Taylor and Laurent series, residue theorem, complex integration, conformal mapping, applications in electrical engineering.

**205413 Applied Random Processes**  
Pre : 205215  
Probability, random variables, function of random variables, moments and conditional statistics, sequence of random variables, general concepts of random processes, spectral analysis, analysis and processing of random signals, Markov chains, estimation and decision theory, application of random processes to communication and signal processing.

**205414 Digital Signal Processing Design and Implementation**  
Pre : 205314  
Fundamentals of digital signal processing, filter design and implementation, adaptive digital filters, multirate digital signal processing, general and special-purpose digital signal processors, real-time signal processing, analysis of finite word length effects in fixed point systems, system design methods and tools, applications and design studies.

**205415 Digital Image Processing**  
Fundamentals of digital image processing, image enhancement in spatial and frequency domains, image restoration, color image processing, wavelets and multi-resolution processing, image compression, morphological image processing, image
segmentation, representation and description, object recognition, currently interesting image processing topics.

**205416 Statistical and Adaptive Signal Processing** 3(3-0)
*Pre : 205314*
Discrete time signal processing, random processes, linear signal models, nonparametric power spectrum estimation, optimum linear filters, least-squares filtering and prediction, signal modeling and parametric spectral estimation, adaptive filters, array signal processing.

**205421 Radio Frequency Engineering** 3(3-0)
*Pre : 205231 and 205321*
Design of radio transmitter and receiver circuits: oscillators, mixers, tuned power amplifiers, wideband transformers, and phase lock loops, radio frequency measuring techniques; radio receiver architecture; receiver sensitivity and its noise performance; spurious response and intermediate frequency selection; digital modulation and demodulation.

**205422 Communication Networks and Transmission Lines** 3(3-0)
*Pre : 205341*
Network theorems: analysis and design of equivalent one-port and two-port, series and parallel resonance, multiple resonance, wave filters; impedance transformation and matching networks; network approach to theory of transformation line; telephone line; utilization of transmission lines for impedance matching.

**205423 Applied Coding** 3(3-0)
*Pre : 205322*
Fundamentals of information theory, data compression and source coding, channel capacity, run-length-limited codes, linear block error-correcting codes, cyclic codes, convolutional codes, Trellis-coded modulation, cryptography, Shannon’s coding theorems.

**205424 Digital Telephone Systems** 3(3-0)
*Pre : 205321*
Public analog telephone network, descriptions and comparison of voice digitization algorithms, digital transmission and multiplexing, digital switching architecture, switching system operation and circuits, network synchronization, digital telephone networks control and management, traffic analysis, IP telephony systems, network integration with wireless and data networks.

**205425 Visual Communications** 3(3-0)
*Pre : 205321*
 Fundamental of visual communication and television, information theory, models of human vision system, bilevel image coding, transform image coding, video formation and representation, video sampling, video coding and motion estimation, scalable video coding, video compression standards, stereo and multi-view sequence processing, error control in video communications, video over internet and wireless networks.

**205427 Data Communications and Networks II** 3(3-0)
*Pre : 205327*
Protocols and architectures of data networks, broadband networks, client-server computing, naming and addressing, media access protocols, routing and transport protocols, flow and congestion control, and other application-specific protocols, network security, multicasting, network planning and design, traffic management.

**205428 Wireless Communications II** 3(3-0)
Pre : 205322 and 205328
Fundamental theories on equalization, diversity, and channel coding, speech coding, multiple access techniques, wireless networking and systems, smart antenna, advanced topics in wireless communications, simulation projects assignment related to wireless communications theories.

205429 Satellite Communications 3(3-0)
Pre : 205322
Theory and practice of satellite communications, orbital aspects, modulation and multiplexing, coding, multiple access techniques, satellite link design, propagation effects, earth terminals and very small aperture terminal networks.

205431 Microelectronics Processing and Device Modeling 3(3-0)
Pre : 205334
Theory and technology of integrated-circuit fabrication, basic processing techniques, interrelationships between material properties, device structure and electrical behavior of devices, design, fabrication, modeling and characterization of MOS, bipolar devices, integrated circuits, physics and modeling of semiconductor devices, digital circuit concepts and logic gates, MOS and bipolar small-signal amplifiers.

205432 Optical Devices 3(3-0)
Light, solid state physics, modulation of light, display devices, principle of laser operation, types of laser, technique and application of laser, photodetectors, optical fiber waveguides.

205433 Solid-State Sensors 3(3-0)
Pre : 205334
Classification and terminology of sensors, basic sensor technologies, thermal sensors, radiation sensors, mechanical sensors, magnetic sensors, chemical and biosensors, smart sensors.

205434 Communication Electronics 3(3-0)
Pre : 205231
Fundamentals of communication electronics, amplitude modulation circuits, frequency modulation circuits, digital modulation circuits, communication circuits, coding circuits, digital transmission circuits, network communication circuits, transmission lines, wave propagation, antennas, waveguides and radar, microwaves and lasers, television, optical fiber.

205435 Electronic Product Manufacture and Development 3(3-0)
Electronic industry, principles of production and electronic components, new manufacturing technologies, planning, producibility, product assurance, packaging and testing, printing wiring boards, soldering, laser soldering, multilayer PCB and surface-mount device placement, fabrication techniques, use of CAD/CAM and role of computers in CIM, functions of manufacturing operations, group technology, process planning, production planning.

205436 Radio Frequency Circuit Design 3(3-0)
Pre : 205231
Fundamental of radio frequency circuit design, transmission line analysis, Smith chart, single and multi-port networks, radio frequency filter design, active radio frequency components, active radio frequency components modeling, matching networks, radio frequency amplifier design, oscillators and mixers, radio frequency measurement techniques.

205441 Electromagnetic Fields and Waves II 3(3-0)
Pre : 205341
Maxwell's equations, electromagnetic waves, wave polarization, reflection and refraction of waves, pointing vector and the flow of power, guided waves, transmission lines, waveguides, interaction of fields and matters, radiation.

205442 Antenna Engineering 3(3-0)
Pre : 205341
Basic definitions and theorems, formulation of the radiation problems, isotropic point source, power and field patterns, directivity and gain, radiation impedance, wave polarization, radiation from current elements, radiation properties of linear wire antenna, linear array antenna, Uda-Yagi antenna, log-periodic antenna, aperture antenna, smart antenna.

205443 Antenna Engineering Laboratory 1(0-3)
Pre : 205442 or together
Laboratory experiments on topics covered in Antenna Engineering.

205444 Microwave Engineering 3(3-0)
Pre : 205341
Maxwell’s equations and boundary conditions, transmission-line theory, parameters, using Smith charts, impedance matching, microwave transmission line and waveguides, microwave resonators and filters, microwave network analysis, power dividers and directional couplers, microwave measurement and applications.

205445 Microwave Engineering Laboratory 1(0-3)
Pre : 205444 or together
Laboratory experiments on topics covered in Microwave Engineering.

205446 Radio Wave Propagation 3(3-0)
Pre : 205341 or together
Ground wave propagation, sky wave propagation, space wave propagation in the troposphere, tropospheric scattering propagation, microwave radio relay systems, satellite and space communication, radar, propagation into seawater, atmospheric ducts, nonstandard refraction.

205447 Optical Fiber Communications 3(3-0)
Pre : 205321 and 205341
Cylindrical dielectric waveguides and propagating conditions; optical cable types; link budget and evaluation; optical transmission parameters; laser principles; laser modulation techniques by feeding baseband, intermediate frequency, or radio frequency, optical detections; regenerative repeater; applications of optical components; optical divider and combiner; couplers and lens; optical fiber production processes.

205451 Analysis and Applications of Electrical Machines 3(3-0)
Pre : 205351
Motor applications, control of motors by contactor and relay, introduction to machine dynamics, solid state control of motors, special machines, starting methods of polyphase induction motors and polyphase synchronous motors, fractional horse-power motors.

205452 Electric Drives 3(3-0)
Pre : 205351
Development of electric drives, moments of electric drives, types of duties, electric braking, energy relations during starting and braking, calculations of motions of electric machines using analytical and graphical methods, calculations of motor ratings, important traction machines, electric circuits and control of traction machines, simple calculations, industrial applications of electric motors.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>205453</td>
<td>Electric Power Plants</td>
<td>3(3-0)</td>
<td>Pre : 208241 and 205351</td>
</tr>
<tr>
<td></td>
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<td>Load curve, load duration curve and load factor, energy resources, hydro power plant, steam power plant, combined cycle plant, gas turbine plant, diesel plant, nuclear power plant, economic operation in power system.</td>
</tr>
<tr>
<td>205454</td>
<td>Electric Power System Analysis II</td>
<td>3(3-0)</td>
<td>Pre : 205355</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Symmetrical and unsymmetrical short circuit analysis, power system protection, transient stability, economical operation, insulation coordination, grounding, load flow and load flow control.</td>
</tr>
<tr>
<td>205455</td>
<td>Electric Power System Analysis Laboratory</td>
<td>1(0-3)</td>
<td>Pre : 205355</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Laboratory experiments about Electric Power System Analysis I and Electric Power System Analysis II.</td>
</tr>
<tr>
<td>205456</td>
<td>High-Voltage Engineering Laboratory</td>
<td>1(0-3)</td>
<td>Pre : 205356</td>
</tr>
<tr>
<td></td>
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<td>Laboratory experiments on topics covered in High-Voltage Engineering.</td>
</tr>
<tr>
<td>205457</td>
<td>Power System Protection</td>
<td>3(3-0)</td>
<td>Pre : 205355</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Causes and statistics of faults, role of protective relays, relay structures and characteristics, overcurrent and earth fault protection for transmission lines, differential protection, transmission line protection by pilot relaying and distance relaying, transformer protection, generator protection, bus-zone protection, motor protection.</td>
</tr>
<tr>
<td>205458</td>
<td>Harmonics in Power Systems</td>
<td>3(3-0)</td>
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<tr>
<td></td>
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<td>Quality and pollution in power systems, harmonic sources, harmonic effects, harmonic measurements, standard of harmonic level, harmonic penetration in power systems, harmonic elimination.</td>
</tr>
<tr>
<td>205459</td>
<td>Basic Power System Reliability</td>
<td>3(3-0)</td>
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<td></td>
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<td></td>
<td>Rules of reliability: independent and dependent events, discrete and continuous random variables, failure density function, application of binomial, Poisson and exponential distributions in reliability evaluation, series systems, parallel redundant systems, partially redundant systems, standby redundant systems, minimal cutset analysis, Markov process, Monte Carlo simulation interruption indices, series systems, parallel redundant systems, partially redundant systems, standby redundant systems, minimal cutset analysis, Markov process, Monte Carlo simulation interruption indices.</td>
</tr>
<tr>
<td>205461</td>
<td>Introduction to Dynamic Control</td>
<td>3(3-0)</td>
<td>Pre : 205362</td>
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<tr>
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<td>State-space model, state-space analysis, state-space design, discrete-time control systems, describing functions of nonlinear control systems.</td>
</tr>
<tr>
<td>205462</td>
<td>Process Control</td>
<td>3(3-0)</td>
<td>Pre : 205361 and 205362</td>
</tr>
<tr>
<td></td>
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<td>Process control, elements in process control system, discrete and continuous process control system, PID control system, feedback control, feedforward control, adaptive control and predictive control, examples of industrial process control.</td>
</tr>
<tr>
<td>205463</td>
<td>Process Control Laboratory</td>
<td>1(0-3)</td>
<td>Pre : 205462</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Laboratory experiments on topics covered in Process Control.</td>
</tr>
<tr>
<td>205464</td>
<td>Computer Control of Machines and Processes</td>
<td>3(3-0)</td>
<td></td>
</tr>
</tbody>
</table>
|            |                                               |         | Computer control, elements of discrete modeling, discrete controller.
design control computers, computer interfacing, sensors for computer control, command generation in machine and process control, sequential control using programmable logic controllers, process modeling.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>205465</td>
<td>Real-Time Computer Control</td>
<td>3 (3-0)</td>
</tr>
<tr>
<td></td>
<td>Introduction to real-time system, concepts of computer control, computer hardware requirements for real-time applications, DDC control algorithms and their implementations, design of real-time languages, programming languages.</td>
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<tr>
<td>205466</td>
<td>Introduction to Robotic Systems</td>
<td>3 (3-0)</td>
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<tr>
<td></td>
<td>Pre: 205362</td>
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<tr>
<td></td>
<td>Design, analysis, control, and operation of robotic mechanisms, use of homogeneous coordinates for kinematics and dynamics, camera orientation, sensors and actuators, control, task planning, vision and intelligence.</td>
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<tr>
<td>205481</td>
<td>Biomedical Electronics</td>
<td>3 (3-0)</td>
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<td></td>
<td>Pre: 205231</td>
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<tr>
<td></td>
<td>Introduction to the fundamental and terminology in physiology sources and properties of bioelectric potentials of heart, brain and muscle, dynamic characteristic of biomedical instrumentation, interference and instability of the system, common biomedical circuits and applications of electronics for clinical used, filtering techniques, patient safety, transducer and electrode for biophysical measurements, specials topics in ultrasonic, telemetry, biomedical computers and microprocessors and related materials, students must submit at least one design project or term paper, and present in class at the end of the course.</td>
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<tr>
<td>205482</td>
<td>Illumination Engineering</td>
<td>3 (3-0)</td>
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<tr>
<td></td>
<td>Pre: 205441</td>
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<tr>
<td></td>
<td>Light sources, light and color, luminaries, basic illumination, lumen method, point-point method, interior lighting techniques, resident, office, school, hotel, industry, etc., exterior lighting techniques, floodlight, area lighting, street lighting techniques, sport lighting techniques.</td>
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<tr>
<td>205483</td>
<td>Outside Plant</td>
<td>3 (3-0)</td>
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<td></td>
<td>Pre: 205441</td>
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<tr>
<td></td>
<td>Transmission lines and their applications, multicore copper wire, coaxial cable and optical fibers, color counting, line marking and standard, arial and buried cable installation and site preparation, shielding, splicing and preventing the cable from animals and civil works, cost estimation and budget, field test measurements, OTDR, optical spectrum analyzer, and hybrid.</td>
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<tr>
<td>205484</td>
<td>Computer Operating Systems for Electrical Engineers</td>
<td>3 (3-0)</td>
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<tr>
<td></td>
<td>Pre: 205216</td>
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<tr>
<td></td>
<td>Operating systems, major components of operating systems including management, synchronization and deadlocks, memory management, input/output subsystems, file system management, interesting topics related to operating systems, distributed operating systems, interconnection networks, multiprocessor systems.</td>
<td></td>
</tr>
<tr>
<td>205485</td>
<td>Electrical Systems and Signal Systems in Building</td>
<td>3 (3-0)</td>
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<tr>
<td></td>
<td>Fire alarm systems, telephone systems, sound systems, MATV systems, lightning protection systems, standby generators, other systems for modern buildings.</td>
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<tr>
<td>205486</td>
<td>Power Electronics</td>
<td>3 (3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 205331</td>
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<tr>
<td></td>
<td>Characteristics of power electronics devices, power diode, SCR, GTO, power bipolar, power MOSFET, IGBT, characteristics of magnetic material, power transformer core, ferrite core, iron powder core, converters, ac to dc converter, dc to dc converter, cycloconverter, inverter, dc to ac converters, frequency changer, solid state</td>
<td></td>
</tr>
</tbody>
</table>
motor drive, direct current motor control, induction motor control, synchronous motor control.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>205487</td>
<td>Power Electronics Laboratory</td>
<td>1(0-3)</td>
<td>Pre : 205486</td>
</tr>
<tr>
<td></td>
<td>Laboratory experiments on topics covered in Power Electronics.</td>
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<tr>
<td>205491</td>
<td>Electrical Engineering Project I</td>
<td>1(0-3)</td>
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</tr>
<tr>
<td></td>
<td>Select and prepare interesting project in electrical engineering.</td>
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<tr>
<td>205492</td>
<td>Selected Topics in Power Engineering</td>
<td>3(3-0)</td>
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</tr>
<tr>
<td></td>
<td>Study in selected topics in power engineering.</td>
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<tr>
<td>205493</td>
<td>Selected Topics in Control and Measurement Engineering</td>
<td>3(3-0)</td>
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</tr>
<tr>
<td></td>
<td>Study in selected topics in control and measurement engineering.</td>
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<tr>
<td>205494</td>
<td>Selected Topics in Communication Engineering</td>
<td>3(3-0)</td>
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</tr>
<tr>
<td></td>
<td>Study in selected topics in communication engineering.</td>
<td></td>
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</tr>
<tr>
<td>205495</td>
<td>Selected Topics in Electronics Engineering</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Study in selected topics in electronics engineering.</td>
<td></td>
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<tr>
<td>205497</td>
<td>Seminar</td>
<td>1</td>
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<tr>
<td></td>
<td>Presentation and discussion on current interesting topics in electrical engineering at the bachelor degree level.</td>
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<tr>
<td>205498</td>
<td>Special Problems</td>
<td>1 - 3</td>
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<tr>
<td></td>
<td>Study and research in electrical engineering at the bachelor degree level and compiled into a written reports.</td>
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</tr>
<tr>
<td>205499</td>
<td>Electrical Engineering Project II</td>
<td>2(0-6)</td>
<td>Pre : 205491</td>
</tr>
<tr>
<td></td>
<td>Continuing the same project as in electrical engineering project I.</td>
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</tbody>
</table>

**INDUSTRIAL ENGINEERING**

*(206XXX)*

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>206221</td>
<td>Applied Probability and Statistics for Engineers</td>
<td>3(3-0)</td>
<td>Pre : 417168</td>
</tr>
<tr>
<td></td>
<td>Probability, expectation and common probability distributions, sampling distributions, statistical inference for one - and - two - sample problems, regression analysis, analysis of variance and their applications to industrial systems.</td>
<td></td>
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</tr>
<tr>
<td>206222</td>
<td>Applied Mathematics for Industrial Engineers</td>
<td>3(3-0)</td>
<td>Pre : 417168</td>
</tr>
<tr>
<td></td>
<td>Mathematical model building, numerical linear algebra, fourier series and transform, closed form and numerical solutions for ordinary and partial differential equations, analysis of linear system under random parameters.</td>
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</tr>
<tr>
<td>206223</td>
<td>Statistical Analysis for Industrial Engineers</td>
<td>3(3-0)</td>
<td>Pre : 417168</td>
</tr>
<tr>
<td></td>
<td>Statistical inference in industrial applications: forecasting, product and process designs, and production planning; multiple regression analysis; analysis of variance; moving average forecasting and exponential smoothing forecasting; goodness-of-fit test; and nonparametric technique.</td>
<td></td>
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</tr>
<tr>
<td>206311</td>
<td>Manufacturing Processes I</td>
<td>3(3-0)</td>
<td></td>
</tr>
</tbody>
</table>
**206321 Operations Research for Engineers I** 3(3-0)
Pre : 206221
Techniques for solving deterministic problems: mathematical modeling, linear programming and dual problems, network models, inventory models, transportation and transshipment problems, assignment problems; techniques for solving non-deterministic problems: decision making under uncertainty and risk, games theory, queuing theory, simulation model for decision making.

**206322 Quality Control** 3(3-0)
Pre : 206221
Quality concepts, evolution of quality control methods, quality planning and control in production process, statistical quality control, control charts, process capability, quality inspection, sampling, and quality improvement tools, reliability engineering in manufacturing, quality assurance, quality engineering, and related quality standards.

**206341 Industrial Work Study** 3(3-0)
Pre : 206221
Principles of elements of works, analysis of production process by using of production process chart, flow process, man-machine chart, micromotion study, SIMO chart, work improvement and job design including applications of principles of motion economy, standardization of works operations, work sampling, time study principles, direct time study and elemental time data, determination of allowance factor and the use of standard time in establishing various production-based incentive schemes.

**206351 Engineering Economy** 3(3-0)
Pre : 206221
Analysis of economic aspects for engineering decisions under certainty and uncertainty, methods of measurement of equivalent value based on total investment analysis and incremental investment analysis, applications of replacement analysis, break-even analysis and government project analysis including effects of income taxes and inflation.

**206361 Computer Applications for Industrial Engineers** 3(3-0)
Pre : 206321
Problems in industrial engineering and operational research, analysis and solving all or parts of the problems by applications of computer programs available, presentation by oral and written reports.

**206371 Industrial Safety** 3(3-0)
Pre : 206311
Industrial safety laws, accident prevention techniques, relationship of safety designs to production efficiency, risk analysis, principles of industrial environmental control, safety management system and industrial psychology and first aid techniques.

**206381 Industrial Engineering Laboratory I** 1(0-3)
Pre : 206221
Laboratory on work study, quality control, statistical experiment, use of
measuring equipment in industry and mechanical machinery, plastic and other metal forming.

**206401 Introduction to Safety Engineering** 1(1-0)
Basic principles of accidents, safety and safety management, technology and safety in workplaces, principles and methods for preventing fire accident in industries, safety laws in factories and occupational health management system.

**206411 Industrial Instrumentation and Measurement** 3(3-0)
Pre : 206221
The characteristics and use of analog and digital instrumentation applicable to industrial engineering problems, basic measurement theory, concepts of mechanical, electrical sensors, transducers, signal conditioning and recording devices, analysis of experimental data using statistical methods.

**206412 Tool Engineering** 3(3-0)
Pre : 206311
Theory of metal cutting, cutting tools, coolants, measurement standard, metrology, accuracy in measurement, jig and fixture, punch and die design.

**206413 Industrial Pollution** 3(3-0)
Pre : 206311
Industrial pollution; air pollution, waste water, solid waste, hazardous waste and noise with emphasis on sources, cause and effects, control, treatment and disposal methods, environmental management system, waste minimization, duties and punishment according to Thailand’s environmental laws.

**206414 Manufacturing Processes II** 3(3-0)
Pre : 206311
Selection of materials, machines and manufacturing processes, production planning and control, quality control and measurement, selection of supporting equipment and systems, numerical control, automation, computer aided for flexible manufacturing.

**206415 Industrial Problem Study** 3(3-0)
Pre : 206311
Industrial visits and data gathering for problem study, analysis and suggestion, and reporting with presentations.

**206421 Simulation** 3(3-0)
Pre : 206321
Stochastic simulation, Monte Carlo techniques, random number generation techniques, verification of simulation model, and computer application to simulation problems.

**206422 Industrial Quality Assurance** 3(3-0)
Pre : 206322
Quality assurance principles, market and customer needs and requirements, product development and management, sourcing and supplier relation, quality assurance in manufacturing process, customer service and relations, product liability and warranty, consumer protection, quality cost and information system, quality audit.

**206423 Experimental Design for Engineers** 3(3-0)
Pre : 206221
Analysis of relationship between factors in industrial and human machine systems, the statistical analysis and design of industrial control systems; emphasis on the use of advanced mathematical models, design of experiments and multiple regression.
206424  Quality Engineering  3(3-0)
Pre : 206322
Quality engineering concepts, product design and specification, process design and planning, engineering process control, inspection and gauging, metrology technologies and calibration, measurement system analysis, engineering quality improvement, applications of computer in quality engineering.

206425  Operations Research for Engineers II  3(3-0)
Pre : 206321
Techniques for solving non-linear programming problems: binary programming, integer programming, geometric programming, dynamic programming, branch and bound technique; project management problem: critical path method, traveling salesman problem and chinese postman problem; techniques for solving probabilistic problems: Markov chain and simulation model.

206431  Industrial Management  3(3-0)
Industrial organization and management concepts and theories of management, problem analysis and problem solving process, organizational theories, function of management, controlling and performance evaluation, motivational tools, leadership, ethics and responsibility of engineers, behaviour modification and interpersonal skills.

206432  Management Information System for Engineers  3(3-0)
Pre : 206361
The role of the information system in the management and decision making process, detailed development of management information systems through planning, design and implementation, introduction to information theory, the value of information, the information system and changes in the organization, examples and applications.

206441  Production Planning and Control  3(3-0)
Pre : 206321
Production planning and control system, forecasting techniques, inventory management, cost and profitability analysis for decision making, production scheduling, production control, modern technique in production planning and control.

206442  Industrial Plant Design  3(3-0)
Pre : 206341
Industrial plant design and layout techniques: plant location, product analysis, factors and causes influencing new layout; data collection and analysis; developing and presentation of layout considering employees, equipment, supporting system, material handling system, storage, and environmental surrounding.

206443  Ergonomics  3(3-0)
Pre : 206341
Concepts of products and services designs, process design, injury prevention and workplace design; principles of anthropometry, human sensory, physiology and psychology of human being emphasis on customers and blue-and white-collar workers in organizations.

206444  Industrial Forecasting  3(3-0)
Pre : 206221
General approaches to forecasting and analysis of industrial trends, quantitative and statistical methods, industrial projects development, case study and forecasting simulation.

206445  Inventory Control  3(3-0)
Study of inventory systems: deterministic and probabilistic models, fixed versus variate reorder interval, dynamic and multistage models, statistical forecasting of demands and lead times, effects on the inventory models.

**206446 Value Engineering** 3(3-0)  
Pre : 206311
Introduction to value engineering methodology, applications of value engineering methodology to product analysis, product design and manufacturing processes, study of material costs in order to achieve cost improvement without loss of product value, case studies and problems discussion.

**206447 Productivity Measurement and Management** 3(3-0)  
Pre : 206341
Concepts, tools, and techniques for productivity measurement at the organizational, functional and individual levels; measure index, information grouping and reporting, information analysis for decisions and improvement. Integrating productivity with performance measurement: profitability, quality, quality of work life, innovation, effectiveness, and efficiency.

**206448 Shop Floor Control** 3(3-0)  
Pre : 206341
Concepts of modern production control, production control system, techniques and process of production planning and control with emphasis on manufacturing scheduling.

**206451 Industrial and Commercial Laws** 3(3-0)  
Pre : 206341
The relationship between laws and business, the laws relating to industrial and commercial operation: factory laws, hazard-material laws, labor laws, environmental laws, laws of production and industrial product standards, and laws relating to engineering profession.

**206452 Industrial Cost Analysis** 3(3-0)  
Pre : 206351
Basic concepts of financial accounting; financial analysis and cost accounting; cost concepts: traditional costing and activity - based costing; cost planning: cost estimation, cost-volume-profit analysis, master budgeting, and capital budgeting; cost system: job costing, process costing, and cost allocation; operational control by flexible budgeting and standard costing.

**206453 Industrial Project Feasibility Study** 3(3-0)  
Pre : 206351
Basic knowledge for preparation, analysis and appraisal of industrial projects feasibility study in various aspects in marketing, techniques, management, financing, economic, impacts and other related aspects with emphasis on quantitative and qualitative approaches.

**206461 System Engineering** 3(3-0)  
Pre : 206221
Applications of life-cycle or concurrent engineering for system design for products, services, and management-based systems, a design process, operational requirements, maintenance and support policies, design for system reliability, maintainability, logistic support, human factors, economic feasibility, produce-ability, and retirement, design management issues risk, and supply - and consumer - chain.

**206462 Logistics System Design and Management** 3(3-0)  
Pre : 206321
Analysis of the physical and non-physical flows for the supplier – producer – customer chain and for the functional units in a producer organization, understanding of system life-cycle, roles and importance of logistics, design and planning for implementing a logistic, ability to analyze logistic problems for corrective and preventive decision making.

### Maintenance Engineering

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>206471</td>
<td>Maintenance Engineering</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 206221</td>
<td></td>
</tr>
</tbody>
</table>

Maintenance concepts, failure statistics and causes analysis, preventive maintenance system, planning and control of maintenance activities, spare parts controls, human resources for maintenance works, maintenance performance measurement and system appraisal for improvement.

### Industrial Engineering Laboratory II

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>206481</td>
<td>Industrial Engineering Laboratory II</td>
<td>1(0-3)</td>
</tr>
<tr>
<td></td>
<td>Pre : 206311</td>
<td></td>
</tr>
</tbody>
</table>

Laboratory experiments on the use of computer control automatic equipment for planning and controlling of production processes.

### Selected Topics in Industrial Engineering

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>206496</td>
<td>Selected Topics in Industrial Engineering</td>
<td>1-3</td>
</tr>
</tbody>
</table>

Selected topics in industrial engineering at the bachelor degree level. Topics are subject to change each semester.

### Seminar

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>206497</td>
<td>Seminar</td>
<td>1</td>
</tr>
</tbody>
</table>

Presentation and discussion on current interesting topics in industrial engineering at the bachelor degree level.

### Special Problems

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>206498</td>
<td>Special Problems</td>
<td>1-3</td>
</tr>
</tbody>
</table>

Study and research in industrial engineering at the bachelor degree level and compiled into written reports.

### Industrial Engineering Project

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>206499</td>
<td>Industrial Engineering Project</td>
<td>2(0-6)</td>
</tr>
</tbody>
</table>

Projects of practical interest in various fields of industrial engineering.

### MECHANICAL ENGINEERING (208XXX)

### Engineering Drawing

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>208111</td>
<td>Engineering Drawing</td>
<td>3(2-3)</td>
</tr>
</tbody>
</table>

Lettering technics; applied geometry drawing; orthographic drawing; orthographic dimensioning; pictorial drawing; pictorial dimensioning; section drawing; reference planes; lines and principal planes; auxiliary views; points, lines and planes; rotation; intersection of figures; development; use of computer in drawing.

### Geometric Modeling for Mechanical Engineering Application

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>208211</td>
<td>Geometric Modeling for Mechanical Engineering Application</td>
<td>3(2-3)</td>
</tr>
<tr>
<td></td>
<td>Pre : 208111</td>
<td></td>
</tr>
</tbody>
</table>

System for industrial CAD; basic software usage in CAD; principles and application of modeling; model annotation; piping, welding, fastener specification, tolerancing, surface texture; detail and assemble drawing.

### Engineering Mechanics I

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>208221</td>
<td>Engineering Mechanics I</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 417167</td>
<td></td>
</tr>
</tbody>
</table>

Force analysis; equilibrium, application of equilibrium equation to frames and machines, centroid; theorem of Pappus, beams, fluid mechanics, friction, virtual work, stability of equilibrium, area moment of inertia.

### Engineering Mechanics II

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>208222</td>
<td>Engineering Mechanics II</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 208221</td>
<td></td>
</tr>
</tbody>
</table>
Mass moment of inertia, mechanics of particle and rigid body in plane motion, principle of impulse and momentum, principle of work and energy, impact, fundamental of space motion.

208241  **Thermodynamics I**  3(3-0)
Pre : 417167
Properties of pure substances; work and heat; first and second laws of thermodynamics; entropy; ideal gases.

208261  **Mechanics of Solids**  3(3-0)
Pre : 208221
Stress and strain analysis; stress-strain relation; Mohr’s circle; material properties; theorem of Castigliiano; analysis of members resisting axial, torsion, bending and bulking loads; pressure vessel; combined stresses; stresses concentration; strain energy.

208281  **Workshop Practice**  1(0-3)
Practice in work-piece measuring, machine tools, bench works, sheet metal works, gas and electric welding.

208321  **Mechanics of Machinery**  3(3-0)
Pre : 208222
Mechanisms and the analysis of displacements, velocity and acceleration of their members; analysis of forces and motions in machines; balancing of rotation and reciprocation masses.

208322  **Mechanical Vibrations**  3(3-0)
Pre : 417461
Theory of free and forced vibration of systems with one and more than one degree of freedom, application to unbalance rotating, whirling of shaft; vibration measuring instruments, vibration isolation and absorption, industry application.

208331  **Internal Combustion Engines**  3(3-0)
Pre : 208341
Engine types; operation, engine design an operating parameter, combustion theory, properties of working substances, engine cycles, gas exchange processes, spark-ignition engines fuel system, gas motion within the cylinder, compression in spark-ignition and compression-ignition engines, pollutant formation and control.

208332  **Automotive Engineering I**  3(3-0)
Pre : 208222
Power required for propulsion; resistant of motions; acceleration, gear ratio, engine performances, vehicle stability on horizontal and vertical plane, equation of motions of vehicle, dynamics stability; steering response.

208341  **Thermodynamics II**  3(3-0)
Pre : 208241
Irreversibility and availability, power cycle and refrigeration cycles, thermodynamics relationship, mixtures and solution, chemical reaction, chemical equilibrium, fundamentals of compressible flow.

208342  **Fluid Mechanics**  3(3-0)
Pre : 417168
Fluid properties; fluid statics; floating; momentum equation; energy equation; moment of momentum and its application to turbomachinery; dynamics of incompressible and inviscid flow; dimensional analysis and similitude; incompressible and viscous flow; boundary layer, fluid measurements; compressible flow.

208351  **Heat Transfer**  3(3-0)
Pre : 417267
Principles of heat transfer by conduction, convection and radiation; steady and unsteady state condition in one, two or three dimensional heat transfer; fundamental of heat flow and mass transfer; heat exchanger.

208352  **Refrigeration I**  3(3-0)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>208361</td>
<td>Machine Design I</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Analysis and design of machine components using the principles involved in engineering mechanics; mechanics of materials and properties of materials.</td>
<td></td>
</tr>
<tr>
<td>208381</td>
<td>Mechanical Engineering Laboratory I</td>
<td>1(0-3)</td>
</tr>
<tr>
<td></td>
<td>Experimental work in the areas of mechanics of machinery, automatic control, engineering materials, thermodynamics and internal combustion engines.</td>
<td></td>
</tr>
<tr>
<td>208411</td>
<td>CAD/CAM for Mechanical Engineering I</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Hardware and software for CAD/CAM, commands for creating three dimensional models, detail drawing and dimensioning, assembly and bill of materials, CAM for basic milling functions.</td>
<td></td>
</tr>
<tr>
<td>208412</td>
<td>CAD/CAM for Mechanical Engineering II</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Complex solid and surface modeling, sheet metal design, finite element modeling and analysis for structure and plastic flow, CAM for CNC wire-cutting and CNC turning machines, advanced CAM for CNC milling machine, sheet metal manufacturing.</td>
<td></td>
</tr>
<tr>
<td>208413</td>
<td>CAD/CAM for Mechanical Engineering II</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Application of CAD/CAM/CAE for mechanical components design, jig and fixture design for polymers and sheet metal, CAE for stress-strain and vibration analysis, prediction of in-process material behavior for polymer and sheet metal.</td>
<td></td>
</tr>
<tr>
<td>208414</td>
<td>Design and Manufacturing Processes for Metal Products</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Types and properties of metal; metal forming process by machining, metal casting and forging; sheet metal design; machines for sheet metal production; design criteria for metal products; mold and die designs for metal forming processes; rapid tooling.</td>
<td></td>
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<tr>
<td>208415</td>
<td>Product Development</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Product development process from design to commercialization; design criteria for manufacturing and assembly; proper design, prototyping and manufacturing technologies; machines, tool and material for manufacturing; quality control; testing standards; product development cost.</td>
<td></td>
</tr>
<tr>
<td>208416</td>
<td>Design and Manufacturing Processes for Polymer Products</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Types and properties of polymer; polymer forming process by injection, blow, and compression; design criteria for polymer products; molds and machines for product; molds and material; industrial standard testing; rapid tooling.</td>
<td></td>
</tr>
<tr>
<td>208421</td>
<td>Biomechanics Engineering</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Mechanics and dynamics of body motion, muscle, joints and heart; analysis of force, stress and strain of bone, muscle and tissue; applications of biomechanics engineering to medical equipment and instrument.</td>
<td></td>
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<tr>
<td>208422</td>
<td>Engineering Measurements</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Measuring of engineering quality in electrical signal for control, study and display; measurement of motion, pressure, temperature, strain, fluid flow, forces and torques, dynamically response of measuring devices.</td>
<td></td>
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<tr>
<td>208431</td>
<td>Power Plant Engineering</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 208341</td>
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</tr>
</tbody>
</table>
The variable load problem; power plant economics; steam power plant; internal combustion engine power plant; gas turbine power plant; hydro-electric power plant; nuclear power plant.

**208432 Automotive Engineering II**  
3(3-0)
Ignition system; fuel system; lubricating system and cooling system of engine.

**208433 Automotive Engineering III**  
3(3-0)
Power drive system; suspension system, steering system; braking system, frame, wheels and tires.

**208434 Automotive Engineering IV**  
Pre : 208432  
3(2-3)
Trouble shooting of all systems of car.

**208435 Construction Machinery**  
Pre : 208321  
3(3-0)
Basic machine components, tractors and related equipment; excavating equipment; scrapers; trucks, grading and compacting equipment, compressors and drills, selection of construction equipment, planning and management.

**208436 Combustion**  
Pre : 208341  
3(3-0)
Chemical reaction, reacting gas flow, premixed gas flames, detonation, diffusion flames, ignition, combustion in rockets, combustion of coal, environmental effects.

**208437 Lubrication**  
Pre : 208342  
3(3-0)
Viscosity, Reynolds equation, hydrodynamic lubrication, pad bearing, journal bearing, hydrostatic lubrication, elastohydro dynamics lubrication.

**208438 Equipment Management**  
Pre : 208341  
3(3-0)
Principles of equipment management, planning, control and evaluation of equipment utilization, maintenance and repair, spare parts control.

**208441 Fluid Machinery**  
Pre : 208342  
3(3-0)
Theory of turbomachinery; characteristics, performance and application of fans blowers compressors and pumps; introduction to gas turbine, hydraulics and pneumatic systems.

**208442 Energy Management and Economics**  
Pre : 208241 or 202221 And 205201 or 205211  
3(2-3)
Energy situation and concepts of energy conservation, energy audits, calculation of the overall thermal transfer value and the roof thermal transfer value, energy conservation in thermal and electrical system, energy management in buildings and industry, energy economics analysis and energy usage environment.

**208443 Gas Engineering**  
Properties of gases and distillation system, gas separation and process, gas compression; gas measurement, calculation of gas flow in pipe.

**208444 Introduction to Solar Engineering**  
Pre : 208351  
3(3-0)
Renewable energy, solar radiation data, collector absorption, theory of plane collector and performance; energy storage, conversion to mechanical energy.

**208445 Gas Turbine**  
Pre : 208341  
3(3-0)
Types of engine and working, gas turbine cycle, improve of gas turbine performance, gas turbine for airplane, gas turbine accessory.

**208446 Thermal System Design**  
Pre : 208351  
3(3-0)
Basic concepts of thermodynamics; application of first and second law of thermodynamics with thermal systems; heat transfer; workable design of heat engines, heat pumps,
steam turbine, condensers and reciprocating engines: economic analysis; equation fittings; modeling thermal equipment; system simulation and optimized design.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>208447</td>
<td>Gas Dynamics</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 208341</td>
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<tr>
<td></td>
<td>Compressible flow; isentropic flow; normal shock wave; flow with friction; flow with heat transfer; generalized one, two and three dimensional flow; oblique shock waves.</td>
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<tr>
<td>208451</td>
<td>Air Conditioning</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 208352</td>
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</tr>
<tr>
<td></td>
<td>Basic concepts in air conditioning, psychrometry, calculation of cooling load, design of air duct and air distribution, air ventilation, noise and vibration control, control of air conditioning system, air conditioning in building.</td>
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<tr>
<td>208452</td>
<td>Refrigeration II</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 208352</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cold storage; food preservation by cooling; low temperature refrigeration and cryogenic; absorption, thermal-electric, steam jet refrigeration system, air cycle and vortex tube; design of refrigeration system and installation.</td>
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<tr>
<td>208453</td>
<td>Practice in Refrigeration and Air Conditioning</td>
<td>3(2-3)</td>
</tr>
<tr>
<td></td>
<td>Pre : 208241</td>
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<tr>
<td></td>
<td>Use of instruments, installation practice, operation and maintenance, compilation into written reports.</td>
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<tr>
<td>208454</td>
<td>Control Elements in Air Conditioning System</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 208451</td>
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<tr>
<td></td>
<td>Function of control variable; control purpose; control methods; control of liquid flow, air flow; temperature, humidity; control elements in air conditioning system.</td>
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<tr>
<td>208455</td>
<td>Plumbing System Design</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 208211</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plumbing code and standards, plumbing system for building, increasing water head in plumbing system, guiding rule for finding the circulator, drainage system and vent pipe design, design of hot-water pipe line, fire protection system.</td>
<td></td>
</tr>
<tr>
<td>208456</td>
<td>Optimization in air Conditioning System</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 208352</td>
<td></td>
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<tr>
<td></td>
<td>Engineering design, principle of system simulation, expressing performance data in equation form, component simulation, optimization.</td>
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<tr>
<td>208457</td>
<td>Industrial Ventilation</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 208451</td>
<td></td>
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<tr>
<td></td>
<td>Principle of ventilation, dilution ventilation, ventilation for heat control, hood design, specific operations, design procedure, make-up and recirculated air, construction specifications, testing of ventilation systems, air cleaning devices.</td>
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<tr>
<td>208458</td>
<td>Clean Room</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 208451</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Controlling room environment, principle of air filtration, selection and application of air filter, introduction to clean room, environment pollution, clean room type, clean room design, energy savings, control of air flow, biological clean room, countermeasures for biological hazards.</td>
<td></td>
</tr>
<tr>
<td>208461</td>
<td>Machine Design II</td>
<td>3(2-3)</td>
</tr>
<tr>
<td></td>
<td>Pre : 208361</td>
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</tr>
<tr>
<td></td>
<td>Analysis and design of complex element of machinery.</td>
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<tr>
<td>208462</td>
<td>Principles of Fire Protection</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 208462</td>
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</tr>
<tr>
<td></td>
<td>Principles of fire protection, fire classifications and selection of extinguishers, human behavior in fires, safety to life from fire, principles of passive and active fire protection, fundamental of fire suppression systems, building fire safety design, fire safety planning, fire safety inspection, fire hazard analysis.</td>
<td></td>
</tr>
<tr>
<td>208463</td>
<td>Building Codes and Fire Codes</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 208462</td>
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</tbody>
</table>
Building codes and fire codes, analysis of the purpose and enforcement of building codes, analysis of international and local fire codes, regulations and local laws relating to building codes, development of building codes and fire codes in Thailand.

**208464 Theory and Design of Automatic Fire Suppression Systems** 3(3-0)
Pre: 208462
Theory and approval standards of automatic fire suppression systems; analysis and selection of automatic sprinkler systems and their components; design of automatic sprinkler systems, gaseous fire suppression systems, foam and dry chemical fire suppression systems.

**208465 Fire Alarm and Smoke Control System** 3(3-0)
Pre: 208462
Principle of fire alarm system and smoke/fire detectors, analysis of fire alarm circuits and their components, standards and design of fire alarm system, principles and design of smoke control and air pressurized systems, fire alarm and smoke control system related to other fire safety systems.

**208466 Risk Analysis in Fire Protection Engineering** 3(3-0)
Theory and concept of risk analysis in fire protection engineering, risk identification and measurement, risk management by insurance method, risk tools, risk engineering methods, preparation for loss adjustments, risk management analysis and planning.

**208471 Automatic Control** 3(3-0)
Pre: 417461
Modeling of physical system; transfer function and block diagram, on-off control and PID control; normal state operation, tolerance and coefficient of tolerance, solution of ordinary differential equation using Laplace transformation and analog computer, time variable response, analysis of system stability by root-path method, frequency response and data display, improvement of control system efficiency, state-space method, control system with multi input-output.

**208472 Computer Methods for Mechanical Engineering** 3(3-0)
Pre: 417267
Numerical methods in engineering problems, root of polynomials using Newton’s method, data interpolation, numerical integration and differentiation, numerical solution to ordinary differential equations, error and stability of each method, computer-aids analysis of mechanical systems.

**208473 Practical electronics in Mechanical Engineering** 3(3-0)
Pre: 205301
Electrical instruments in mechanical systems; characteristics diodes, LED, and transistors; fundamental concepts of filters, time comparators and digital circuits; application and design us operational amplifiers, integrated circuits, relays, transduce interfacing and servomechanism; principles of robotic system.

**208474 Fluid Power** 3(2-3)
Pre: 208342
Fluid power systems, basic theory and symbols in fluid power systems, hydraulic systems and circuit design, pneumatic systems and circuit design, trouble shooting and maintenance in fluid power systems.

**208475 CNC Machine and Programming** 3(3-0)
Pre: 208341
Type of CNC machines, manufacturing process and planning, metal cutting technology, CNC programming for turning and milling machines.

**208481 Mechanical Engineering laboratory II** 1(0-3)
Pre: 208341
Experimental work in the areas of heat transfer, refrigeration, air conditioning, power plant engineering, energy conversion, fluid mechanics, and internal combustion engines.

**208495 Mechanical Engineering Projects Preparation** 1(0-3)
Preparation of project proposal, literature review and progress report.
208496  Selected Topics in Mechanical Engineering  1-3
Interesting topics in mechanical Engineering.
208497  Seminar  1
Presentation and discussion of current topics of interest in mechanical engineering.
208496  Special Problem  1-3
Study and research in the Bachelor's degree level and compiled into written reports.
208499  Mechanical Engineering Projects  1(0-3)
Pre : 208495
Projects of practical interest in various fields of mechanical engineering.

WATER RESOURCES ENGINEERING
(209XXX)

209211  Fluid Mechanics  3(3-0)
Pre : 417168
Properties of fluid, fluid statics, continuity, momentum and energy equations, dimensional analysis and similitude of fluid flow, steady incompressible flow through pipes and open channels.
209212  Laboratory for Fluid Mechanics  1(0-3)
Pre : 209211
Laboratory for Fluid Mechanics 209211.
209241  Hydrology I  3(3-0)
Hydrologic cycle, climatology, precipitation, evaporation and transpiration, streamflow, flood runoff, erosion and sedimentation, reservoir, groundwater.
209321  Flow in Open Channel  3(3-0)
Pre : 209211
Basic concepts of fluid flow, the energy and momentum principle in open channel flow, critical flow, uniform flow, non-uniform flow, steady flow, hydraulic design of open channel, computation of water surface profile with mathematical models, water control structures in open channel.
209322  River and Coastal Engineering  3(3-0)
Pre : 209321
River morphology, sediment movement and bed protection, river training and bank protection, inland waterways and navigation locks. Wave generation, deep water wave forecasting, shallow water effects, refraction, shoaling and wave breaking, mechanism of coastal erosion and sediment movement, engineering design of breakwater and revetment.
209342  Hydrology II  3(2-3)
Pre : 209241
Watershed and watershed characteristics, data verification, data extrapolation, hydrological statistics, frequency analysis, design storm, design peak flows and low flow, flow routing.
209343  Water Resources Engineering I  3(3-0)
Pre : 209241
Components of water resources development, types of water resources development projects, principles for planning of water resources development projects, principles and criteria for project evaluation, water resources institutions, water resources
policies, laws related to water resources development, evaluation of water supply and
demand.

209344 Water Resources Engineering II 3(3-0)
Pre: 209343
Concepts for planning of water resources development projects; water resources development project alternatives design; evaluation of water resources development project in engineering, economics, financial socio-economic, and environmental aspects; phasing of water resources development project; basin planning; case studies.

209361 Water Resources Engineering and Environment I 3(3-0)
Environmental impact on water resources engineering projects; physical, chemical and biological properties of water; constituents of natural and polluted waters; water quality standards; contamination in surface water and groundwater; hydrologic and water quality effects of land-use change.

209423 Hydraulic Engineering 3(3-0)
Pre: 209211
Open channel flow and design, sediment transportation in stream, reservoirs and dams, spillways, stilling basins, conveyance, drainage, flow measurement, pipe network analysis, water hammer, turbines and pumps, hydraulic models.

209424 Design of Hydraulic Structures 3(3-0)
Pre: 209321
Application of hydrology, hydraulics, structures and soil mechanics for design of headwork; dams, weir, barrages, appurtenant structures; and for design of conveyance structures; use of mathematical model for design of hydraulic structures, practical problems, principles for system operation and maintenance.

209425 Design of Hydraulic Structures in Closed Conduit System 3(2-3)
Pre: 209211
Application of hydraulics and structures for design of close conduit and pipe network, design of piping system and its appurtenances, use of mathematical model for analysis of sizing pipe, flow measurement in close conduit, pump selection, configuration and instrumentation of pump station, sump pumps, structures for water hammer protection, hydraulic and structural design of pump station, practical problems, principles for system operation and maintenance.

209426 Urban Drainage Engineering Design 3(3-0)
Pre: 209241 and 209321
Urban drainage engineering, hydrological effects of urbanisation, urban rainfallrunoff models, computing method and computer aided design in urban drainage engineering works, design of urban drainage networks, measurement and verification in urban drainage networks.

209427 Municipal Hydraulics 3(3-0)
Pre: 209321
Municipal engineering, city management, regulations and permits, wastewater collection and treatment, estimates of amounts of wastewater, hydraulics of sewer flows, design of wastewater collection systems, open channel flows and hydraulics of treatment processes, operation and maintenance of wastewater collection system and treatment plant.

209428 CAD for Water Resource Engineering 3(3-0)
Pre: 208111
CAD system fundamental in 2-D, International standard drawing for
hydraulic structures, head works, water distribution, building system, piping system and topographic map, drawing specification, material schedules, drawing inspection, submission and presentation via internet networks.

209429 Water Resources Development for Water Supply 3(3-0)
Pre: 209343
Sources of water supply, quality and quantity requirements, water quality standards, population prediction, water consumption and flow variation, design of water distribution systems, design of water treatment plant, planning, specification for bidding and tender, construction planning and inspection.

209445 Information Technology for Water Resources Engineering 3(3-0)
Pre: 209241 and 209343
Information technology, software engineering, data information in water resources engineering works, water resources database management systems, automated data acquisition and transmission, information systems, geographic information systems for water resources engineering, case studies of application of information technology in water resources engineering works.

209446 Groundwater 3(3-0)
Pre: 209241
Groundwater occurrences, characteristics and hydraulics of groundwater movement, groundwater flow analysis, groundwater investigation, well hydraulics, well drilling techniques, well design, groundwater contamination and protection, groundwater recharge.

209447 Water Power Engineering 3(3-0)
Pre: 209343
Hydropower development, preliminary investigation and design, hydraulic turbines, hydraulic conveyance design, powerhouse design and cost estimation, hydropower plant operation and maintenance.

209448 Surface Water Hydrology 3(3-0)
Pre: 209342
Surface water hydrology, rainfall analysis, rainfall design, runoff analysis, peak runoff model, continuous runoff model, hydrologic runoff routing, hydraulic runoff routing, hydrologic simulation models and watershed analysis, flood hydrograph package, storm sewer design, design of detention and retention facilities.

209462 Water Resources Engineering and Environment II 3(3-0)
Pre: 209361
Characteristics of contaminants and their effects to water resources, contaminant movement in streams, lakes, and reservoirs, water quality assessment and management practices, use of mathematical model for contaminant movement analysis, case studies.

209463 Water Resources Management I 3(3-0)
Pre: 209344
Water resources management problems, principles of water resources management, water management in irrigation projects, water resources projects for domestic and industrial uses, urban drainage projects, and for water quality.

209464 Water Resources Management II 3(3-0)
Pre: 209463
Water management data measurement and analysis, storage system, optimization, integrated water resources management, case studies of integrated water resources management in various countries.
<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>209465</td>
<td>Water Resources Invention and Innovation</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Invention and innovation of water resources engineering, applications of invention and innovation for water resources project, development of invention and innovation in appropriate technology manner, applications of internet for development of water resources project, future trend of development and technology for water resources engineering, concepts in water resources development.</td>
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<tr>
<td>209466</td>
<td>Operation and Maintenance of Headworks and Water Transport Systems</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 209344 Water transport systems through open channels and pipes; principles in operation and control; system operators; needs for operation and maintenance; regulators; water transport plans; system inspection and testing; cleaning and maintenance methods; rehabilitation of pipeline, channel and regulator; safety procedures.</td>
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<tr>
<td>209467</td>
<td>Urban Drainage and Wastewater Collection Systems Operation and Maintenance</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 209321 Drainage and wastewater collection system, drainage and wastewater collection system operator, needs for good collection system operation and maintenance, safety procedures for operation and maintenance, inspection and testing systems, pipeline cleaning and maintenance methods, underground repair.</td>
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<tr>
<td>209468</td>
<td>Basic Optimization for Water Resources Engineering</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 209343 Standard form of linear optimization, graphical solutions, simplex method, network analysis, sensitivity analysis, water resources management using optimization methods, case study.</td>
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<tr>
<td>209494</td>
<td>Water Resources Engineering Field Trip</td>
<td>1(0-3)</td>
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<tr>
<td></td>
<td>Field trip to water resources project sites both under construction and under operation, a report is required.</td>
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<tr>
<td>209495</td>
<td>Water Resources Engineering Project Preparation</td>
<td>1(0-3)</td>
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<tr>
<td></td>
<td>Preparation of project proposal, literature review and progress report.</td>
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<tr>
<td>209496</td>
<td>Selected Topics in Water Resources Engineering</td>
<td>1-3</td>
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<tr>
<td></td>
<td>Selected topics in water resources engineering at the bachelor degree level.</td>
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<tr>
<td>209497</td>
<td>Seminar</td>
<td>1</td>
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<td></td>
<td>Presentation and discussion on current interesting topics in water resources engineering at the bachelor degree level.</td>
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<tr>
<td>209498</td>
<td>Special Problems</td>
<td>1-3</td>
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<tr>
<td></td>
<td>Study and research in water resources engineering at the bachelor degree level and compiled into a report.</td>
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<tr>
<td>209499</td>
<td>Water Resources Engineering Project</td>
<td>2(0-6)</td>
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<td></td>
<td>Pre : 209495 Project of practical interest in various fields of water resources engineering.</td>
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</tbody>
</table>

**ENVIRONMENTAL ENGINEERING**

(210XXX)

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>210211</td>
<td>Chemistry of Water and Wastewater</td>
<td>4(3-3)</td>
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<tr>
<td></td>
<td>Basic calculation in environmental engineering, mass balance, characteristics</td>
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</table>
of water and wastewater, analysis of water and wastewater in laboratory.

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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>210212</td>
<td>Microorganisms in Water and Wastewater</td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Factors affecting the growth of microorganism, relation to environment and role in biodegradation of organic matter, application to wastewater treatment, concepts of microbial control in treatment process, laboratory analysis of microbial wastewater parameters.</td>
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<tr>
<td>210311</td>
<td>Applied Mathematics in Environmental Engineering</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Differential equations, integral theorem, power series, finite difference method, weighted residual method, finite element method, applications of numerical methods in formulating mathematical models.</td>
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<tr>
<td>210312</td>
<td>Unit Operations for Environmental Engineering I</td>
<td>3(3-0)</td>
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<td></td>
<td>Criteria for process selection in water and wastewater treatment, sedimentation, floatation, mixing, coagulation, gas transfer, filtration, ion exchange, absorption, chemical precipitation, disinfection.</td>
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<tr>
<td>210313</td>
<td>Unit Operations for Environmental Engineering II</td>
<td>3(3-0)</td>
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<tr>
<td>210314</td>
<td>Environmental Engineering Laboratory</td>
<td>3(1-6)</td>
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<td></td>
<td>Pre : 210211</td>
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<td></td>
<td>The study of coagulation, filtration, chemical precipitation, chlorination, biological treatment processes analysis in laboratory.</td>
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<tr>
<td>210315</td>
<td>Design of Sewerage and Pumping System</td>
<td>3(2-3)</td>
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<td>Pre : 209211</td>
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<td>Hydraulics in sewerage system, estimation of design water quantity, design of wastewater collection and stormwater drainage system, components of drainage system, design of wastewater pumping station.</td>
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<tr>
<td>210316</td>
<td>Building Sanitation</td>
<td>3(3-0)</td>
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<td>Pre : 209211</td>
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<td></td>
<td>Fundamentals of building sanitation systems, law and regulations, cold water supply systems, hot water supply systems, drainage and vent systems, fire protection, storm water drainage, wastewater treatment and solid waste management for individual building.</td>
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<tr>
<td>210411</td>
<td>Water Supply Engineering Design</td>
<td>3(2-3)</td>
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<td></td>
<td>Pre : 210312</td>
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<td></td>
<td>Water quality standards, concepts for selection of water treatment processes, design of raw water conveyance systems, design of mixing tanks, flocculation tanks, sedimentation tanks, filtration tanks, chlorination systems, design of water distribution systems.</td>
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<tr>
<td>210412</td>
<td>Wastewater Engineering Design</td>
<td>3(2-3)</td>
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<td></td>
<td>Pre : 210312 and 210313</td>
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<td></td>
<td>Effluent standards, characteristics of wastewater from different sources, criteria for selection of wastewater treatment system, design of screening, sedimentation tank, aeration tank, activated sludge process, aerated lagoon, trickling filter, waste stabilization ponds, rotating biological contactors.</td>
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<td>210421</td>
<td>Air Pollution and Control</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Theory of combustion, exhaust gas and emission particle, chemical</td>
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</tbody>
</table>
characteristics of emission, effects to health and environment, dispersion of air pollutants, sampling and analysis, control of particle emission and gas, control techniques of air pollution.

210422 Solid and Hazardous Waste Management 3(3-0)
Physical and chemical characteristics of municipal solid waste; solid waste collection and transportation system; solid waste treatment processes, sanitary landfill and composting; solid waste reduction and recycling; types and characteristics of hazardous wastes, toxicology, treatment processes, stabilization and solidification, landfill disposal, incineration and site remediation.

210423 Industrial Pollution and Control 3(3-0)
Industrial pollution problems, air quality and industrial effluent standards, design criteria for water and air pollution control, guidelines for noise and vibration control, toxic substance and hazardous waste management, wastewater treatment processes for industries.

210431 Environmental System Management 3(3-0)
Environmental pollution problems, priority ranking of environmental pollution problems, monitoring of environmental quality, organizations and institutes related to environmental management, laws and standard values related to environmental pollution, standard system for environmental management, environmental risk analysis and assessment, an analysis for decision making in environmental problem protection, case studies.

210432 Environmental Impact Assessment 3(3-0)
Guidelines for environmental impact assessment, processes in environmental study and impact assessment, environmental mitigation measures and monitoring programs, case studies on environmental impact assessment of development projects.

210433 Water Quality Management 3(3-0)
Effect of wastewater disposal on aquatic ecosystem and water quality, relation between water quality and land uses, predirection of pollutants dispersion by using by mathematical models, concepts of water quality control and management, water quality management by using on optimization method.

210434 Ecological Engineering 3(3-0)
Terrestrial and aquatic ecosystems; waste management by ecological systems, integrated farming, utilization of waste and nightsoil in aquaculture, composting system, biogas production from waste treatment, case study on waste management using ecological engineering concept.

210435 Pollution Prevention 3(3-0)
Laws and regulations regarding industrial wastes; approaches for waste minimization; waste recycling and reuse; clean technology application; materials life cycle assessment, economic benefit from pollution prevention.

210495 Environmental Engineering Project Preparation 1(0-3)
Study on environmental engineering project, literature review, preliminary testing, presentation of environmental engineering project proposal.

210496 Selected Topics in Environmental Engineering 1-3
Selected topics in environmental engineering at the bachelor degree level. Topics are subject to change each semester.

210497 Seminar 1
Presentation and discussion on current interesting topics in environmental engineering at the bachelor degree level.

210498 Special Problems 1-3
Study and research in environmental engineering at the bachelor degree level and compiled into a written report.

**210499 Environmental Engineering Project**  
Pre : 210495  
Interesting projects in environmental engineering.

**ELECTROMECHANIC MANUFACTURING ENGINEERING**  
*(211XXX)*

**211231 Conventional and NC Machines**  
Pre : 208281  
Conventional machines: turning, drilling, tapping, milling, grinding, cutting, punching, boring and bending machines, cutting speed, feed and depth of cut, safety precaution, machine installation and site preparation, lubrication and maintenance, NC machines and programming, cutting tool application and technology, CNC machines and programming.

**211311 Introduction to CAD/CAM**  
Pre : 208111 and 211231  
CAD/CAM systems for production engineering, hardwares and softwares for CAD/CAM systems, wireframe, surface and solid design, three dimension CAD functions: protrusion, sweep, blend, revolve, cut, copy, pattern, shell and relation, assembly design and detail drawing, dimensioning, section view and bill of material.

**211322 Instruments and Precision Measurement**  
Pre : 208371  
Industrial instrument characteristics and applications, instruments for length, depth, height, surface, roughness, flatness, parallelism, straightness, and roundness. force and torque measurement in machine tools, temperature and pressure measurements in injection molding process, calibration process, laser instrument, non-contact measurement, CNC coordinate measuring machine, measuring standard, control environment for precision measurement.

**211323 Instruments and control Systems Laboratory**  
Laboratory experiments on topics covered in instrument and control systems.

**211331 CNC Machine Technology I**  
Pre : 211231  
CNC turning and milling machines, machine components and operation, cutting tool and tool holder standards, safety precaution, turning and milling operations, feed, speed and depth of cut determination for selected cutting tool and materials, G and M codes programming.

**211361 Mold and Die**  
Pre : 206311  
Machine for mold and die, limitation and structure of machines, basic operation of injection machine and punching machine, components for mold and die, standard moldbases, injection mold and die design, finishing processes, selection of materials and their properties.

**211411 Computer Aided Design**  
Pre : 211311  
Advanced CAD functions: advanced sweep and non-parallel blends, surface design, advanced assembly and sheet metal design, CAD file conversion.

II-145
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Pre-Requisites</th>
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<tbody>
<tr>
<td>211412</td>
<td>Computer Aided Manufacturing</td>
<td>3(2-3)</td>
<td>Pre : 211311</td>
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<tr>
<td></td>
<td>Application of CAM for turning, drilling, milling,</td>
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<tr>
<td></td>
<td>mill-turn, four and five axis milling, two and</td>
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<td>four axis wirecut and sheetmetal working,</td>
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<td>machining sequences, pre and post processing for</td>
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<td>each application, CAM and CNC machines</td>
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<td></td>
<td>interfacing.</td>
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<tr>
<td>211431</td>
<td>Machine Part Design</td>
<td>3(3-0)</td>
<td>Pre: 208361 and 211311</td>
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<tr>
<td></td>
<td>Basic theory of machine design, static and</td>
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<td></td>
<td>dynamic characteristics of machinery, vibration</td>
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<td>and fatigue of machines and components, machine</td>
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<td>tool structure and design, basic concepts and</td>
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<td>techniques of using CAD in parts design, use of</td>
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<td>CAD, finite element modeling and finite element</td>
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<td></td>
<td>analysis and optimization.</td>
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<td>211432</td>
<td>CNC Machine Technology II</td>
<td>3(2-3)</td>
<td>Pre : 211331</td>
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<tr>
<td></td>
<td>Advanced CNC machine technology, CNC surface</td>
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<td>and cylindrical grinding, high speed machining,</td>
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<td>CNC horizontal machining center, CNC mill-turn</td>
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<td>machine, CNC wire EDM, CNC turret punching, CNC</td>
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<td>laser cutting, and CNC sheet metal machines,</td>
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<td>safety precaution, precision machining, jig and</td>
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<td>fixture design, hydraulic and pneumatic clamping</td>
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<td>devices.</td>
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<tr>
<td>211433</td>
<td>Robotics</td>
<td>3(3-0)</td>
<td>Pre : 208371 and 211331</td>
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<tr>
<td></td>
<td>History of industrial robots and application,</td>
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<tr>
<td></td>
<td>various robotics systems, kinematics and dynamics</td>
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<td>of robots, tolerances and load capacities, robot</td>
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<td>control, sensor and vision, control language and</td>
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<td>commands, development of robot for the future.</td>
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<td>211434</td>
<td>CNC Machine Retrofitting and Controller Design</td>
<td>3(3-0)</td>
<td>Pre : 208371</td>
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<tr>
<td></td>
<td>CNC controllers fundamentals, functions and</td>
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<td>operations of CNC machines, electrical components</td>
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<td>, feedback control stability and performance</td>
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<td>analysis, frequency domain methods, state-space</td>
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<td>representations, PID controllers, modern control</td>
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<td>design, system identification, robustness analysis,</td>
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<td></td>
<td>control design using software tools, digital</td>
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<td>control and digital signal processing, multi-axis</td>
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<td>motion control.</td>
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<td>211441</td>
<td>Introduction to Flexible Manufacturing Systems</td>
<td>3(3-0)</td>
<td>Pre : 211341 and 211432</td>
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<tr>
<td></td>
<td>Components in Flexible Manufacturing Systems,</td>
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<td>automated systems, cell, Flexible Manufacturing</td>
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<td>Systems and Computer Integrated Manufacturing,</td>
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<td>workpiece management and scheduling, communication</td>
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<td>systems and interface between computer and</td>
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<tr>
<td></td>
<td>machines.</td>
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<td>211442</td>
<td>Principles of Operation and Production</td>
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<tr>
<td></td>
<td>Procedure of operation and production, general</td>
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<td>management, statistics procedure and quantity</td>
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<td>measurement, production planning and operation,</td>
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<td>materials management, production management, stock</td>
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<td>management, quality control and productivity</td>
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<td>improvement.</td>
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<tr>
<td>211457</td>
<td>Industrial Materials</td>
<td>3(3-0)</td>
<td>Pre : 206311 and 213211</td>
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<tr>
<td></td>
<td>Metallic and plastic materials and their</td>
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<td>processing, composite material, engineering</td>
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<td>ceramics and plastics, steel, alloy steel and</td>
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<td>cast irons, steel and its heat treatment, material</td>
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<td>for different kinds of manufacturing processes,</td>
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<td>material properties and</td>
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measurements, material failures, non-destructive testing, property changes for post processing.

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<thead>
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<th>Course Code</th>
<th>Course Title</th>
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<tr>
<td>211471</td>
<td>Products Design</td>
<td>3(3-0)</td>
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<td></td>
<td><strong>Pre:</strong> 211311 and 211431</td>
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<tr>
<td></td>
<td>Procedure of product and process design, artistic design, design communication, mechanical and industrial considerations, quality control, industrial processes to meet user needs, human factors, design for manufacturability and packaging design, use of CAD and rapid prototyping machine for visualization and function testing, choice of material and design characteristics of each material, investment cost estimation.</td>
<td></td>
</tr>
<tr>
<td>211496</td>
<td>Selected Topics in Electromechanic Manufacturing Engineering</td>
<td>1-3</td>
</tr>
<tr>
<td></td>
<td>Selected topics in electromechanic manufacturing engineering at the bachelor degree level. Topics are subject to change each semester.</td>
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</tr>
<tr>
<td>211497</td>
<td>Seminar</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Presentation and discussion on current interesting topics in electromechanics manufacturing engineering at the bachelor degree level.</td>
<td></td>
</tr>
<tr>
<td>211498</td>
<td>Special Problems</td>
<td>1-3</td>
</tr>
<tr>
<td></td>
<td>Study and research in electromechanic manufacturing engineering at the bachelor degree level and compiled into a written report.</td>
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</tr>
<tr>
<td>211499</td>
<td>Electromechanic Manufacturing Engineering Project</td>
<td>3(0-9)</td>
</tr>
<tr>
<td></td>
<td>Project of practical interest in various fields of electromechanic manufacturing engineering.</td>
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</tr>
</tbody>
</table>

**MATERIALS ENGINEERING (213XXX)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>213211</td>
<td>Materials Science for Engineers</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Relationships between processes, structure, properties and performance of engineering materials, phase equilibrium diagrams and their interpretation, micro and macrostructure related to properties of engineering materials, material properties testing and analysis, corrosion and degradation of materials, materials selection and design.</td>
<td></td>
</tr>
<tr>
<td>213212</td>
<td>Introduction to Materials Industry</td>
<td>1(0-3)</td>
</tr>
<tr>
<td></td>
<td>Roles of materials science and materials engineering industry, applications and productions of engineering materials with reference to Thai industries, plant visits.</td>
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<tr>
<td>213213</td>
<td>Physical Chemistry for Materials Engineer</td>
<td>5(4-3)</td>
</tr>
<tr>
<td></td>
<td><strong>Pre:</strong> 403111 and 403112</td>
<td></td>
</tr>
<tr>
<td>213221</td>
<td>Manufacturing Processes for Materials Engineers</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td><strong>Pre:</strong> 213211</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Manufacturing processes, metal forming processes: foundry, machining and joining processes, surface treatment and coating; polymer forming processes: injection, extrusion and compression moulding; ceramic forming processes: mixing, casting, sintering; cost analysis.</td>
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</tr>
<tr>
<td>213222</td>
<td>Physical Metallurgy Laboratory</td>
<td>1(0-3)</td>
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<td></td>
<td><strong>Pre:</strong> 213211</td>
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</tr>
</tbody>
</table>

II-147
Sample preparation for macro structure and microstructure analysis of ferrous and non-ferrous metals, microstructure analysis by image analyzer and electron microscope, mechanical properties, heat treatment.

213231  Physical Metallurgy 3(3-0)
Pre : 213211
Metal structure and crystallization, crystalline imperfection, dislocation and plastic deformation, nucleation and solidification, equilibrium phase diagram, heat treatment, phase transformation, strengthening mechanism, diffusion in solid, properties and application of ferrous and non-ferrous alloys.

213321  Thermodynamics and Phase Relation in Materials Systems 4(4-0)
Pre : 213211
Thermodynamics of closed and open systems, chemical potentials and equilibrium in heterogeneous systems, the stability and composition of coexisting phases, roles of gases and gas mixtures, systems with variable compositions, manipulations of thermodynamic quantities, order and disorder phase, mass and energy balance, phase transformations, applications of Gibbs energy diagrams, phase equilibrium and diagrams in engineering materials, phase transformation on microstructures, case study in phase relations.

213322  Transport Phenomena in Materials Processing 3(3-0)
Pre : 213321
Heat, fluid, and mass flow in materials processing; viscosity; laminar and turbulent flow; mass and energy balance; thermal conduction, convection, and radiation.

213323  Kinetics in Materials Processing 3(3-0)
Pre : 213321
Kinetic theories applied to materials engineering and mineral processing, thermodynamics of rate equations, collision theory, activation energy, chemical kinetics, and interphase mass transfer.

213324  Materials Processing Laboratory 1(0-3)
Pre : 213211
Laboratory experiments on materials processing: metal, ceramics, and polymers.

213325  Metal Forming 3(3-0)
Pre : 213211
Theory and modern development of foundry processes, standard and new methods, gating system design, pattern design, finishing and inspection of casting, source and elimination of design limitation, theory and practice of rolling, forging, extrusion, drawing, source and elimination of defects.

213326  Ceramics Processing 3(3-0)
Pre : 213322
Characteristics of ceramic materials: particle size and shape, density, pore structure and specific surface area; deflocculants and flocculants, sintering, particle mechanics, particle size distribution, and rheology, mixing, forming, post-forming processes, and industrial ceramics processing.

213327  Polymer Technology 3(3-0)
Pre : 213331
Polymer rheology: Newtonian and non-Newtonian flow behaviors, measurements of rheological properties, factors affecting flow properties, elastic effects in polymer melt flow, elongation flow behaviors of polymer melt, additives in polymer
compounding, instrumentation for polymer processing, polymer processing, composite materials processes.

**213328 Wood and Wood Composite Materials for Engineers**  
**Pre : 213211**  
Wood materials; structural, physical, and mechanical properties of wood; adhesion of wood composite; application of structural analysis equations; type of wood composite and manufacturing process.

**213331 Polymeric Materials**  
**Pre : 213211**  
Types of polymerization reactions, chemical structure of polymers, molecular weight and molecular weight distribution, type and molecular structure of polymers, crystalline and amorphous polymers, additives, copolymer and polymer blend, polymer processing and testing, polymer rheology, rubber technology, polymer recycling, selection and application of polymeric materials in engineering designs.

**213332 Introduction to Ceramics**  
**Pre : 213211**  
Types of ceramics, ceramics raw materials, structures of ceramics and chemical compositions, oxide and non-oxide ceramics, types of engineering ceramics, properties of engineering ceramics, structures of silicates and glasses and glaze applications, firing, sintering and vitrification of ceramics, types and properties of refractories and cement.

**213333 Powder Metallurgy**  
**Pre : 213231**  
Powder metal production techniques, powder characterization, mixing and shaping methods, powder compaction, sintering theory, heat treatment, finishing operations, metallurgy of sintered part, powder metal part design, products and applications, special processes.

**213334 Materials Properties Analysis Laboratory**  
**Pre : 213211**  
Laboratory experiments on analysis of mechanical, physical and chemical properties of metals, ceramics and polymeric materials.

**213335 Rubber Technology**  
**Pre : 213211 and 213331**  
Classification of rubber materials and their applications, chemistry and technology of vulcanization, the physical properties of raw and vulcanized rubbers, materials for compounding and reinforcement, rubber mixing processes, rubber manufacturing processes engineering design of rubber products, rubber testing.

**213336 Composite Materials**  
**Pre : 213211**  
Reinforced fiber in composite, manufacturing of polymer matrix composites, applications, anisotropic property of reinforced fiber in composites; mechanics of composites : performances of composites : fatigue, impact, and environmental effects, interfacial phenomena, design considerations and joining methodologies of polymer, ceramic and metal matrices composite, fabrication methods.

**213341 Materials Characterization**  
**Pre : 213211**  
Principles of material characterization, vacuum systems, crystallography, production and detection of X-ray, diffraction of powder samples, chemical microanalysis.
by spectroscopy, surface analysis technique, electron microscopy, analysis base on sputtering and scattering phenomena, thermal analysis techniques.

**213351 Mechanical Properties of Materials** 3(3-0)
Pre: 208261
Mechanical behavior of materials, mechanical properties testing, dislocation theory, strengthening and toughening mechanisms, plastic deformation of single and polycrystalline materials, deformation of non-crystalline materials, high temperature deformation of crystalline materials, fatigue of engineering materials, fracture and fracture mechanics.

**213352 Corrosion** 3(3-0)
Pre: 213211
Principles of corrosion, corrosion measures and rate calculation by electrochemical techniques, forms of corrosion, corrosion testing, corrosion in specific environment, corrosion at high temperature, case study of materials failure in service due to corrosion, principles of materials selection and design, corrosion inhibitors, anodic and cathodic protection, surface preparation and maintenance coating.

**213353 Alloys Engineering** 3(3-0)
Pre: 213211
Structure and properties of metals and alloys; iron-carbon system, aluminum alloys, copper alloys, titanium alloys, nickel alloys, cast irons, and tool materials and metals for high-temperature service.

**213354 Metallurgy of Metal Joining** 3(3-0)
Pre: 213211
Metal joining, soldering, brazing and welding; wetting properties of soldering and brazing metal, strength of joints, weld ability of metals and alloys, analysis of problems due to metallurgical phenomena microstructure of welded metal, prevention and correction of residual stress and distortion, pre-and post treatment, destructive and non-destructive testing of welded metal.

**213421 Solidification and Casting** 3(3-0)
Pre: 213321
Fundamentals and applications of solidification in casting processes, conventional and emerging near net shape casting, mechanism of various quality problems, and optimization of controlled casting processes.

**213422 Chemical Metallurgy** 3(3-0)
Pre: 213321
Principles of pyrometallurgy, hydrometallurgy, and electrometallurgy for extracting metal from mineral, thermodynamics and kinetics of each process, calcination, roasting, decomposition, reduction reaction, reaction at slag-metal interfaces, leaching and ion exchange mechanism and efficiency of ion transfer in electrochemical cell, refining process, iron and steel making.

**213431 Advanced Ceramics** 3(3-0)
Pre: 213332
Mechanisms of defects in engineering ceramics: brittle fracture, crack propagation and creep fracture elasticity, plasticity, strength and pseudo plastic strength and toughness/toughening transformation electronic ceramic materials, fiber and whisker reinforced ceramics, bioceramics, magnetic ceramics, nanotechnology in ceramics, case study.

**213432 Electrical, Optical, and Magnetic Properties of Materials** 3(3-0)
Pre: 213211
Electronic structures of materials: quantum theory and energy levels, electron transport properties of metals; fundamental of semiconductors, dielectric and optical properties of materials, optoelectronics devices, magnetic materials.

213433  **Solid State Devices**  3(3-0)
Pre : 213432
Fundamental of solid state devices, principle of semiconductor in electronic materials, fabrication techniques of electronic devices, surface effects on electronic properties, techniques for control surface properties, defect and failure analysis of semiconductor devices.

213434  **Coating Technology**  3(3-0)
Pre : 213211
Coating processes, analysis surface of coating, physical vapour deposition and chemical deposition, polymer coating, electroplating and electroless plating, plasma spraying.

213451  **Failure Analysis**  3(3-0)
Pre : 213211
Causes of failure, mechanical testing, non-destructive testing, ductile and brittle fracture, fracture mechanism, failure due to fatigue, creep, corrosion and environment, defects due to heat treatment, weld decay, failure in ceramics and glass, failure in polymeric materials.

213493  **Materials Selection and Design**  3(3-0)
Pre : 213211
Design processes, engineering materials and their properties, materials selection chart, materials selection with and without consideration of shape, materials selection by multiconstraints process selection, source of materials properties data, aesthetics and industrial design, trend and factors of materials selection, case study.

213495  **Materials Engineering Project Preparation**  1(0-3)
Discussion and researches on recent technological advances and problems in materials technology in order to aid the students in preparing for their materials engineering project including submission and presentation.

213496  **Selected Topics in Materials Engineering**  1-3
Selected topics in materials engineering at the bachelor degree level. Topics are subject to change each semester.

213497  **Seminar**  1
Presentation and discussion on current interesting topics in materials engineering at the bachelor degree level.

213498  **Special Problems**  1-3
Study and research in materials engineering at the bachelor degree level and compiled into a written report.

213499  **Materials Engineering Project**  3(0-9)
Pre : 213495
Research pertaining to proposal made in materials engineering project preparation course and presentation to the general public.
### AEROSPACE ENGINEERING  
*(215XXX)*

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>215211</td>
<td>Aerospace Engineering Statistics</td>
<td>2(2-0)</td>
</tr>
<tr>
<td></td>
<td>Concepts of probability; principles of statistics; statistical analysis in aerospace engineering.</td>
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<tr>
<td>215212</td>
<td>Computational Methods in Aerospace Engineering</td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Pre : 417267</td>
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<tr>
<td></td>
<td>Data interpolation, Fourier series and analysis; root of polynomials using Newton's method; numerical integration and differentiation; numerical solution to ordinary differential equations; boundary-value and eigen-value problems; computer programming for numerical analysis.</td>
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<tr>
<td>215213</td>
<td>Aerospace Engineering Laboratory I</td>
<td>1(0-3)</td>
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<tr>
<td></td>
<td>Pre : 215261</td>
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<tr>
<td></td>
<td>Laboratory in basic aerospace structures, aerodynamics, and propulsion.</td>
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<tr>
<td>215221</td>
<td>Aircraft Structures I</td>
<td>3 (3-0)</td>
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<tr>
<td></td>
<td>Pre : 417167</td>
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<tr>
<td></td>
<td>The engineering concepts of stress and strain; material properties; diagrams of internal loading for straight and curved beams; modulus of elasticity; generalized Hooke’s law; stiffness and flexibility; Poisson’s ratio; strain energy; stress-strain behavior of ductile and brittle materials; statically indeterminate structures; stress concentration; torsion; moment area method; eccentrically loaded short columns; buckling and stability; fatigue; failure theory; life and endurance limit.</td>
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<tr>
<td>215231</td>
<td>Aerothermodynamics</td>
<td>3(3-0)</td>
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<td></td>
<td>Pre : 417167</td>
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<tr>
<td></td>
<td>Concepts and definitions; energy, heat and work; properties of pure substances; ideal gases; the first and second laws of thermodynamics; entropy, irreversibility and availability.</td>
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<tr>
<td>215232</td>
<td>Aerothermodynamics in Aircraft Engines</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 215231, 417168</td>
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<tr>
<td></td>
<td>Gas and vapor power cycles, thermodynamic relations, jet propulsion and thrust, propeller engines, turbojet engines, turboprop and turboshaft engines, thermodynamics of compressible flow.</td>
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<tr>
<td>215241</td>
<td>Fluid Mechanics in Aerospace Engineering</td>
<td>3(3-0)</td>
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<td>Pre : 417168</td>
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<tr>
<td></td>
<td>Fluid mechanics; fluid statics; kinematics of fluid motion; conservation laws; Bernoulli’s equation; incompressible irrotational flows; dimensional analysis; viscous internal flows; viscous external flows; compressible flows; computational fluid dynamics.</td>
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<tr>
<td>215242</td>
<td>Low-Speed Aerodynamics</td>
<td>3(3-0)</td>
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<td></td>
<td>Pre : 215241</td>
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<tr>
<td></td>
<td>Properties of air and atmosphere; fundamental equations of airflow; irrotational incompressible flow; thin airfoil theory; panel methods; finite wing theory; effect of viscosity; drag estimation; aspect of wing design and flow control; computational tools for aircraft aerodynamics design.</td>
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<tr>
<td>215261</td>
<td>Introduction to Aerospace Engineering</td>
<td>1(0-3)</td>
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<tr>
<td></td>
<td>Basic knowledge and industrial visiting education in aerospace engineering.</td>
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<tr>
<td>215311</td>
<td>Aerospace Engineering Laboratory II</td>
<td>3(2-3)</td>
</tr>
</tbody>
</table>
Pre : 215213  
Laboratory in experimental design of aerospace structure, aerodynamics, propulsion, aircraft component fabrication tooling and processes, flight dynamics, control and space flight.

215321 Aircraft Structures II 3(3-0)  
Pre : 215221  
Principles of stressed skin construction, bending, shear and torsion of opened and closed thin walled tubes, multi-cell tubes, axial constraint, introduction to composite materials.

215323 Aircraft Vibration 3(3-0)  
Pre : 417267  
Free and forced vibration for systems with one degree and multidegrees of freedom; vibration from rotation; lumped mass analysis; frequency response function; time and frequency domain; step and impulse analysis; flutter analysis; introduction to random vibration.

215331 Design of Aircraft Propulsive Systems 3(3-0)  
Pre : 215232  
Gas turbine engines, propeller design, turbomachinery, inlet and exhaust nozzle design, chemical reactions, combustor designs.

215341 High-Speed Aerodynamics 3(3-0)  
Pre : 215241  
Steady one-dimensional isentropic flows; normal shock waves; oblique shock/expansion waves; one-dimensional flows with friction; one-dimensional flows with heat transfer; two-dimensional compressible flows; airfoils in compressible flows; wing, fuselage, and wing-fuselage systems in compressible flows; numerical techniques for compressible flow problems.

215351 Aircraft Design I 3(3-0)  
Pre: 215242461  
Requirements and standards in aircraft design; application of aerodynamics, structures, propulsion, performance, stability, and control to preliminary design of aircraft; weight and balance, computer aided design.

215352 Aircraft Design II 3(3-0)  
Pre : 215351  
Design for manufacturing; aircraft loads; material selection and corrosion control; fasteners and structural joints; buckling and stability; cut-out; wing, empennage, and fuselage structures; undercarriages; engine mounts; advance composite structures; fatigue and damage tolerance design; fail safe design; weight control and balance.

215353 Manufacturing Processes for Aircraft Materials 3(3-0)  
Pre : 213211 and 215221  
Fundamentals of manufacturing processes; aircraft materials selection and manufacturing processes; advanced composite materials used in aircraft components; manufacturing systems; types and standards of fasteners and joining systems; evaluation of material quality and strength; uses of commercial material standards, specifications, and codes.

215354 CAD/CAM/CAE in Aerospace Engineering 3(3-0)  
Concepts of CAD/CAM/CAE, solid design, surface design, 3D parametric variational modeler, feature-based design, part stress analysis, drafting, assemble modeling, functional dimensioning and tolerancing, dynamic simulation.

215361 Flight Mechanics I 3(3-0)
Pre : 208222
Standard atmosphere; pitot-static systems; cruise, climb, and descent performance; turning performance; take-off and landing performance; aircraft performance measurement; longitudinal, directional, lateral static stability and control.
215362 Flight Mechanics II 3(3-0)
Pre : 215361
General equations of motion of rigid aircraft; stability derivatives; longitudinal, directional, and lateral motion; aircraft response to movement controls; response to atmospheric conditions; feed back control.
215371 Aerospace Organization Management 3(3-0)
Environment and dynamic in aerospace industry; evolution of management theory; globalization and aerospace industry; ethics and social responsibility in organizational management; planning and controlling, organizing, and leading the organization in aerospace industry; decision making process; managing change and innovation; international management in aerospace industry.
215372 Aerospace Organization Behavior 3(3-0)
Pre : 215371
Organizational behavior in aerospace industry; diversity and individual differences; perception and learning in aerospace organization; motivation, work performance and stress; group and team behavior; power and politics, conflict and negotiation; leadership, communication, job design, and aerospace organizational culture.
215373 Airport Operations 3(3-0)
Airport mission and functions; operations inside and outside flight operation areas: operations in passenger and cargo buildings, airport safety, security and emergency, technical services in airports, airport access, environmental control, performance assessment, and airport readiness.
215381 Space Flight 3(3-0)
Pre : 417267
Basic concepts of space flight; discipline of astronautics; calculation and analysis of orbits and trajectories of space vehicles operating under the influence of gravitational forces; entry of space vehicles into the earth’s atmosphere, entry trajectory and aerodynamic heating of the vehicles.
215421 Computational Structural Mechanics 3(3-0)
Pre : 215212
Computer programming, numerical and finite element analysis, application to aerospace engineering problems.
215422 Structural Dynamics 3(3-0)
Pre : 215421
Energy methods in dynamics, vibration of discrete and continuous systems, finite element representation of structures, aerodynamics forces, divergence and flutter.
215441 Computational Fluid Dynamics 3(2-3)
Pre : 215212 and 215241
Partial differential equations, finite differential method, finite differential techniques in computational fluid dynamics; basic concept of panel method, solutions for 2-D inviscid in compressible flow; panel method for viscous flows; panel method for 3-D flows; advanced computer programming for numerical analysis.
215451 Aircraft Component Design 3(3-0)
Pre : 215321
Synthesis of component design; documentation control procedures for operation and maintenance; the effect of tooling; aircraft materials and manufacturing process on design; detail design; design of aircraft components; design for fatigue; maintenance; aircraft manufacturing methods and their influences in-service on component design consideration.

215452 Aircraft Component Manufacture Practice 2(1-3)
Aircraft component, strip, measuring and rebuilt, basic sheet metal fabrication, machining and component fabrication, welding and brazing, aircraft component assembly and testing, composite materials and manufacture of composite structures.

215461 Automatic and Flight Control I 3(3-0)
Pre: 215212
Analysis and design of feedback control system using both frequency and time domain techniques; application to analog and digital automatic flight control systems.

215462 Aircraft Instrument 3(3-0)
Various aircraft instruments; methods of grouping instruments in aircraft; theories; instruments concept; interpretation of instruments; errors and corrections, designs to fit usage.

215463 Aircraft Systems 3(3-0)
Operation, locating and maintenance of hydraulic system; fuel system; avionic system; electrical system; environmental system; the effects of one system on the overall design of the aircraft and on other systems.

215464 Aircraft Air Conditioning and Pressurization Systems 3(3-0)
Pre: 215331
New technology in air conditioning and pressurization systems of commercial aircraft, psychrometry; thermodynamics of heating and cooling; the systems of air conditioning and pressurization of aircraft, maintenance and operations of air conditioning and pressurization systems in airline industry; air quality control in passenger cabin, safety in air conditioning and pressurization of commercial aircraft based on international regulations.

215469 Automatic and Flight Control II 3(3-0)
Pre: 215461
PID control systems and the limitations of the systems, multi-variable control, robust control, adaptive control, computer-based control.

215471 Aircraft Maintenance Management 3(3-0)
Pre: 215371
Maintenance concept, regulations and requirement, reliability analysis, operation and planning, organization; computer-based aids to maintenance management, defect and accident, economics and cost of maintenance, technology and future of aircraft maintenance.

215472 Airline Industry Management 3(3-0)
Pre: 215371
Regulations and associations of airline industry, structure of airline industry, economic characteristics of the airlines, management and organization, marketing, principles of airline scheduling, fleet planning, financing, labor relations in the airline industry.

215473 Airport Management 3(3-0)
The operation management, airport organization, aviation service
management, ground services, passenger and cargo services, airport maintenance management, building and area management, safety and security management, customer relations management, financial and ownership management, airport pricing policy.

**215474  Aerospace Industry Strategy**  
**Pre:** 215371  
The imperative of strategy in aerospace industry, industrial environment scanning, strategy formulation, strategy implementation, and strategy renewal in aerospace industry.

**215475  Airport Planning**  
**Pre:** 215372  
Airport planning system, planning types and level, planning processes, types and processes of planning study, financial planning, airport master plan, local airport planning.

**215476  Principles of Airport Design**  
Aircraft characteristics related to airport design, capacity and delay, systems design in airport, pavement design concept, airport terminal area design, safety and security consideration in airport design, environmental impacts, air traffic forecasting for airport design.

**215481  Space Mission Analysis and Design**  
**Pre:** 215381  
Orbit design; effects of space environment to space missions, defining and sizing space payloads, design of spacecraft systems, design of ground station, design of spacecraft sub systems.

**215495  Aerospace Engineering Project Preparation**  
**Pre:** 215495  
Preparation for project proposal, project plan, literature review and preparing project; and progress report.

**215496  Selected Topics in Aerospace Engineering**  
Selected topics in aerospace engineering at the bachelor degree level. Topics are subject to change each semester.

**215497  Seminar**  
Presentation and discussion on current interesting topics in aerospace engineering at the bachelor degree level.

**215498  Special Problems**  
Study and research in aerospace engineering at the bachelor degree level and complied into a written report.

**215499  Aerospace Engineering projects**  
**Pre:** 215495  
Project of practical interest in various field of aerospace engineering.

**SURVEY ENGINEERING AND GEOGRAPHIC INFORMATION (218xxx)**

**218211  Surveying for Mapping**  
Basic concepts of surveying, theory of errors, distance measurements, plane-table surveying, compass surveying, theodolites and angle measurements, precise determination of azimuth, horizontal control surveys by traversing and triangulation, plane
coordinate system, vertical control surveys by levelling, computation and adjustment of field work data, topographic surveying, topographic mapping.

218212 Surveying Field Practice
   Pre : 218211
   Field practice for surveying for mapping. Practice not less than 170 hours.

218213 Route Surveying
   Pre : 218211
   Reconnaissance and preliminary surveys for route location and design, general standard and specifications, alignment layout, leveling and topographic surveys, earth work and mass diagram, route construction surveys, horizontal and vertical curves, principles of highway safety and design.

218311 Engineering Surveying
   Pre : 218211
   Engineering project; details, accuracy and specification; planning and scheduling for construction surveying of engineering projects; construction surveying; hydrographic surveying; underground surveying; mine surveying; field trip required.

218312 Practical Astronomy
   Pre : 218211
   Solid geometry and spherical trigonometry; celestial sphere and its coordinate systems; special star positions; variations in the celestial coordinates; time systems; star almanac; determination of astronomic azimuth, latitude and longitude.

218321 Photogrammetry I
   Pre : 218211
   Principles of photogrammetry, cameras and photography, photographic coordinate system, geometry of photographs, stereoscopic viewing, stereoscopic parallax, flight planning, controls for aerial photography, aerial photo mosaics, tilted photographs and rectification, stereoscopic plotting, orthophotography, terrestrial photogrammetry, coordinate transformations.

218331 Geodesy I
   Pre : 218211
   Historical development of geodesy, figure and gravity field of the earth, geodetic reference systems, methods of measurement in geodesy, global geodesy, geometric properties of reference ellipsoid, computations on reference ellipsoid.

218332 Cartography and Map Projection
   Pre : 218211
   Concepts of cartography, specification and accuracy, cartographic production process, semiology and cartographic symbolization, introduction to computer-assisted cartography, coordinate systems and transformation formulae, fundamental of map projection, types of map projection, construction and selection of map projection, applications of map projection for surveying.

218333 Cadastre
   Pre : 218211
   Land system, land management and administration, land use control, property laws, land registration, cadastral mapping system, land boundary surveying, land reformation, fiscal cadastre, multipurpose cadastre, land valuation, real estate management.

218341 Adjustment Computation
   Pre : 206221 and 218211
   Concepts of observation and mathematical mode; statistical concepts;
statistical properties of observations; principle and techniques of propagation; method of least squares; least squares adjustment; general model and least squares solution, method of observation equations, method of condition equations; non-linear equation problem; error ellipse and orthogonal transformation; interpolation; numerical and statistical considerations in adjustment.

218411  Geodetic Surveying  2(1-3)
   Pre : 218341
   Principles of geodetic surveying; geodetic instruments; precise surveying, triangulation, precise traversing and precise levelling; horizontal and vertical control networks; specification; principles of adjustment of geodetic control network.

218412  Satellite Surveying  3(2-3)
   Pre : 218331 and/or in concurrent to 218411
   Fundamental of satellite surveying; positioning; satellite systems in surveying; global positioning system; orbit; signal structure; antennas and receivers; observation equations; errors; practical aspects of satellite surveying, field operation and data processing.

218413  Electronic Surveying  2(1-3)
   Pre : 218211
   Concepts of electronic surveying; instruments and geometry of electronic surveying; data collection, transferring and processing; new techniques currently used in surveying.

218421  Photogrammetry II  3(2-3)
   Pre : 218321
   Analytical photogrammetry; comparators, analytical plotters, point marking and transferring devices; photographic coordinate system; photo coordinate measurement and refinement; relative orientation; object-photo coordinate relationship; photogrammetric control extension, strip and block adjustment; computer programming and data processing.

218422  Remote Sensing  3(2-3)
   Pre : 218321
   Fundamentals of remote sensing technology; theory of electromagnetic wave, energy sources, radiation, reflectance and emission of energy for objects on earth; sensors; digital interpretation for satellite imageries; digital image processing; data receiving system; applications of remote sensing for engineering and other aspects.

218431  Geodesy II  3(3-0)
   Pre : 218331
   Geometric geodesy, ellipsoid parameters, geodetic datum, three dimensional geodesy, physical geodesy.

218432  Geographic Information System  3(2-3)
   Pre : 204112, 218321 and 218332
   Concepts of geographic information system (GIS); spatial data structure; database management system, data collection, data input, data processing, data analysis, data output and presentation; GIS applications for engineering aspect; system development; internet map server; data standard.

218441  Surveying for Regional and Urban Planning  3(3-0)
   Principles, theories and concepts in surveying for regional and urban planning; levels and processes of planning; relationship between planning and physical and socio-economic elements; processes and methodologies in surveying for regional and urban planning.
urban planning; infrastructure and transportation planning; surveying for resources and environmental management.

218495  Project Preparation of Survey Engineering and Geographic Information  1(0-3)

Preparation of project proposal, literature review and reference, presentation of progress report.

218496  Selected Topics in Survey Engineering and Geographic Information  1-3

Selected topics in survey engineering and geographic information at the bachelor degree level. Topics are subject to change each semester.

218497  Seminar  1

Presentation and discussion on current interesting topics in survey engineering and geographic information at the bachelor degree level.

218498  Special Problems  1-3

Study and research in survey engineering and geographic information at the bachelor degree level and compiled into a written report.

218499  Survey Engineering and Geographic Information Project  2(0-6)
Pre : 218495

Project of practical interest in various fields of survey engineering and geographic information.

SOFTWARE AND KNOWLEDGE ENGINEERING
(219XXX)

219211  Software Development Training Camp  1(0-3)
Pre : 204214

Program development skill enhancement camp, at least 48 person-hours.

219212  Programming Languages  3(3-0)
Pre : 204212

Programming paradigms, formal aspects of syntax and semantics, syntactic and semantic analysis, and code generation, data structures, data abstraction, and storage management, control flow, subroutines, exception handling, and concurrency, programming environments.

219221  Computer Organization and Architecture  3(3-0)

Basic computer organization and architecture, registers, arithmetic-logic unit, control unit, machine representation of data and instructions, machine language, assembly language, input/output system, computer evolution, CPU architecture, instruction sets, ALU design, hardwired and microprogrammed control, memory hierarchies, virtual memory, cache memory.

219241  Object-Oriented Modeling and Programming  3(3-0)

Object concepts, object-oriented design and analysis, object-oriented analysis relating to developing conceptual models of the problem domain of a software product, object-oriented design relating to developing models of the software solution to the problem clarified during analysis, constructing programs that implement models, evaluation and improvement of object-oriented models and code, languages and tools for developing models and programming.

219311  Operating Systems for Software and Knowledge Engineer  3(3-0)
Pre : 204313

Basic concepts of interfacing between large-scale software and operating
systems, software and hardware interfacing, process management and scheduling, input/output management, memory management, file systems, computer system security.

219321 Internet Technology 3(3-0)
Techniques for Internet application development, web proxy, web cache, load balancing, web-service efficiency, dynamic web content, database access via web, server-side application development, electronic commerce, large-scale web server design, data security, data security protocol, scripting languages.

219322 Electronic Commerce Engineering 3(3-0)
Electronic commerce technology, Electronic commerce system development and implementation, networking technologies and their future directions, database technologies, database-web connectivity, security-related issues, electronic payment systems, business intelligence, trust management, trading agents, privacy, information products and copy protection, digital divide.

219323 Probability and Statistics for Software and Knowledge Engineer 3(3-0)
Probability; conditional probability; expectation and common probability distributions; sample distributions; statistical interference; regression analysis; analysis of variance and their applications.

219324 Data Communication and Computer Networks for Software and Knowledge Engineer 3(3-0)
Data communication networks; data transmission; data link controls; local area network and wide area network; communication architecture and protocols; TCP/IP protocol suite; routing protocol; Internetworking with TCP/IP; network management.

219331 Knowledge Management 3(3-0)
Knowledge, learning and performance in the knowledge economy, knowledge cycle, varieties of knowledge work, knowledge management opportunities in large enterprise, mechanics of knowledge management, relations between organizational culture and knowledge management, knowledge management implementation.

219332 Data Warehouse 3(3-0)
Fundamentals of data warehousing, project planning, business requirement definition, dimensional modeling, technical architecture, physical configuration options, project selection, physical database design, data staging process, data staging techniques, target user applications, deployment of data warehouse, system growth management.

219333 Introduction to Data Mining 3(3-0)
Basic concepts of data mining, data mining applications, techniques and models, ethics and privacy issues, data mining software suite, data mining methodologies, decision tables, decision trees, classification rules, clustering, statistical modeling, and linear models.

219334 Transaction Processing 3(3-0)
Transactions and their properties, resource managers and transaction managers, transaction processing models, benefits of using transactional versus non-transactional communications, applications that process transactions via the Web, transaction processing monitor, electronic payment transaction, server side applications, transaction services, currently deployed transaction servers.

219341 Software Specification and Design 3(3-0)
Pre: 219241
Development of software specifications; architecture and design of software analysis; software architecture; design patterns; architectural design and detailed design.
219342 Software Process and Quality Assurance 3(3-0)
Pre : 219241
Software life-cycle process model; process standards: definition, implementation, measurement, management, change and improvement of software process; software quality concepts and standards; software quality processes.

219343 Software Validation and Verification 3(3-0)
Pre : 219341
Principles and elementary techniques to ensure the quality of software product; systematic testing of software systems; prediction and analysis of software reliability.

219344 Computer System Project Management 3(3-0)
Methodologies for the management of computer system projects; software and hardware technology selection; computer system development practices for estimating, tracking and controlling; team organization and roles; risk management; computer system configuration management.

219345 Software and Knowledge Engineering Economics 3(3-0)
Value of currency and investment versus temporal changes, fundamentals and techniques for analyzing software and knowledge engineering projects in economical aspects; investment estimation, break-event analysis, depreciation, return on investment and taxes.

219361 Decision Support System 3(3-0)
Management support systems, decision making process, characteristics and components of decision support system, modeling and model management, group decision support system.

219362 Machine Learning 3(3-0)
Techniques and algorithms underlying machine learning, inductive process of decision trees, parametric-based Bayesian learning approach, hidden Markov models, non-parametric methods, discriminant functions, neural networks, stochastic methods, genetic algorithms, unsupervised learning, data clustering.

219363 Knowledge Representation 3(3-0)
Knowledge representation and its reasoning tasks, basic principle of knowledge representation, advantage and limitations of rule-based systems, frame-based systems and logic-based systems; predicate calculus; semantic networks; ontology of knowledge representation; fuzzy representation.

219364 Knowledge Discovery 3(3-0)
Pre : 204461 and 219362
Principles of knowledge discovery, automated scientific discovery, inductive reasoning, knowledge discovery processes, knowledge mining algorithms and tools.

219365 Knowledge Engineering 3(3-0)
Pre : 204461 and 219363
Knowledge characteristics, knowledge acquisition concept, knowledge sources, the process of acquiring knowledge, architecture of knowledge-based system, knowledge engineering tools.

219371 Information Technology for Managing Knowledge 3(3-0)
Traditional information processing systems; the development of information systems; management information systems and information technology for knowledge management; information technology for knowledge development; information technology for knowledge storage; search engines; searching algorithms and
methodologies; knowledge representation; artificial intelligence and knowledge management; knowledge management applications.

**219372 Innovation Management** 3(3-0)

Definition and types of technological innovation, characteristics and innovation management, paradigm shifts in innovation theory and process models, malfunctions in managing an innovation process, strategic and operative conditions facilitating innovation, dynamics of linking innovation strategies to technology cycles and managing innovation streams, implementing innovation strategies through business process redesign, managing knowledge in the organization and motivating human creativity, innovation networks and strategic technology alliances, benchmarking innovation efficiency.

**219381 Multimedia Data Engineering** 3(3-0)

Multimedia systems technology, data formats and standards, compression standards, input/output and storage technologies, user interface, multimedia database, multimedia communications, and distributed multimedia systems.

**219411 Computer Systems Security** 3(3-0)

Computer security, as access control, authentication, authorization, cryptography, system safety, system backup and recovery, security policies.

**219412 Formal Languages** 3(3-0)

Pre : 204213

Analysis, comparison, and design of programming languages, formal description of syntax and semantics, programming techniques, structured programming, debugging, verification of programs and compilers, and proofs of correctness.

**219451 Web Services Technology** 3(3-0)

Problems in analyzing and designing web applications from small-scale to large-scale; enterprise applications; applications distributed across corporate intranets, extranets, and internet; web standard protocols and interfaces; web security; web engineering methodology; web architectures and web components; electronic-commerce infrastructures; database and web integration; web services standards and technologies; web-based application development.

**219481 Multimedia Content Analysis** 3(3-0)

Fundamental concepts, theories and algorithms for pattern recognition of multimedia data, computer vision, signal processing, speech recognition, multimedia feature extraction, Bayes decision theory, parametric and non-parametric learning, dimension reduction, characteristics of important contents of multimedia data.

**219482 Hypermedia Presentation** 3(3-0)

Hypermedia technology, graphic presentation, animation, video image, audio, perception psychology, multimedia presentation techniques, hypermedia-linked information, presentation design, advertisement, public announcement, hypermedia presentation on the web and Internet.

**219483 Digital Arts** 3(3-0)

Hardware component for graphic systems, fonts, icons, black-white graphic, gray-scale graphic, interactive graphic, line drawing, curve drawing, two-dimensional transformation, clipping, raster and vector, three-dimensional graphic, surface, three-dimensional transformation, hidden surface removal, shading and shadowing, graphic file standard, moving picture creation, applications of digital arts in advertising and video games.

**219490 Co-operative Education** 9

Internship, at least 800 person-hours.
219491 **Basic Research Methodology in Software and Knowledge Engineering** 3(3-0)

Principles and methodology software and knowledge engineering research, identification of research problems, formulation of research objectives and hypotheses, collection of data, construction of questionnaire, data analysis and interpretation, application of statistics for research, report writing and presentation.

219495 **Software and Knowledge Engineering Individual Project** 3(3-0)

Individual project on interesting topic in software and knowledge engineering.

219496 **Selected Topics in Software and Knowledge Engineering** 3(3-0)

Selected topics in software and knowledge engineering at the bachelor degree level, topics are subject to change each semester.

219497 **Seminar** 1

Presentation and discussion on interesting topics in software and knowledge engineering at the bachelor degree level.

219498 **Special Problems** 1-3

Study and research in software and knowledge engineering at the bachelor degree level and compile into a written report.

219499 **Software and Knowledge Engineering Group Project** 3(3-0)

Pre : 219490 and 219495

Workgroup project on interesting topic in software and knowledge engineering.

**AVIATION TECHNOLOGY**

(225xxx)

225111 **Statistical Analysis in Aviation** 3(2-3)

Concepts of probability, principles of statistics, aviation statistical data analysis, and statistical analysis laboratories.

225141 **Aeronautical Science I** 3(3-0)

Theory of flight, flight operations and safety, aircraft weight and limitations, take-off runway, climb performance, and landing runway requirements, and speed limitations.

225142 **Aeronautical Science II** 3(3-0)

Pre : 225141

Aircraft systems, aircraft weight and balance, payload calculations, load sheet preparation, balance and longitudinal stability, moment and balance, structural aspects of aircraft loading.

225143 **Aviation Meteorology** 2(2-0)

Wind and pressure, development of depressions and anticyclones, air fronts, airflow over mountains and ridges, stability in the atmosphere, formation of clouds, visibility, weather maps and forecasts, and meteorological services for international air navigation.

225144 **Air Navigation** 2(2-0)

Air navigation maps, International Civil Aviation Organization navigation requirement and procedures, international aeronautical telecommunication services, radio communication theory, radio navigation services, and automated navigation services.

225151 **Aviation Drafting and Blueprint Reading** 1(0-3)
Practices in aviation drafting and blueprint reading of aviation electrical, mechanical, hydraulic, and pneumatic systems.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>225211</td>
<td>Quantitative Analysis in Aviation</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 225111</td>
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<tr>
<td></td>
<td>Linear programming, problem solving in linear programming, air transportation model, aviation assignment problems, applications to operations in aviation.</td>
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<tr>
<th>Course Code</th>
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<th>Credits</th>
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<tbody>
<tr>
<td>225212</td>
<td>System Analysis in Aviation</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 226112</td>
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<tr>
<td></td>
<td>Concept of systems in aviation, system definition, dynamics dimensions of systems, life cycle analysis, system design, system approach</td>
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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>225231</td>
<td>Aviation Safety</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 226113</td>
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<tr>
<td></td>
<td>Personal and organizational safety procedures, safety philosophies, accident report, principles of accident investigation, accident prevention, transport of dangerous goods, emergency and abnormal situations.</td>
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<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>225232</td>
<td>Human Factors in Aviation</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 225111</td>
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<tr>
<td></td>
<td>Work systems and safety, human factors and errors, work performance and safety.</td>
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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>225251</td>
<td>Aviation Mechanics and Machinery</td>
<td>3(2-3)</td>
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<td></td>
<td>Pre: 225111</td>
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<tr>
<td></td>
<td>Equilibrium of rigid body, friction, structures and machines, aviation mechanical components, safety in workplace, and workshop practices.</td>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>225252</td>
<td>Aviation Hydraulics and Pneumatics</td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Pre: 225211</td>
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<tr>
<td></td>
<td>Properties of fluids, hydraulic and pneumatic components, hydraulic and pneumatic systems, landing gear systems.</td>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>225253</td>
<td>Aviation Electricity</td>
<td>3(2-3)</td>
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<td></td>
<td>Pre: 225211</td>
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<tr>
<td></td>
<td>Fundamentals of electricity and magnetism, electric measuring instruments, aviation electrical components, wiring diagrams, power distribution systems, and aviation electrical systems.</td>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>225254</td>
<td>Aviation Electronics</td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Pre: 225111</td>
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<tr>
<td></td>
<td>Fundamentals of electronics, electrical control devices in aviation, digital circuits, microprocessors, and aviation digital systems.</td>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>225271</td>
<td>Air Traffic Control Systems</td>
<td>3(3-0)</td>
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<td></td>
<td>Pre: 226112</td>
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<tr>
<td></td>
<td>Air space, flight rules, air traffic control requirements, aeronautical information services, alerting services, and communication services.</td>
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<tr>
<th>Course Code</th>
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<th>Credits</th>
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<tbody>
<tr>
<td>225321</td>
<td>Management Information Systems in Aviation</td>
<td>3(3-0)</td>
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<td></td>
<td>Pre: 226112</td>
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<td></td>
<td>Database concept, data independence, integrity and reliability, data organizations, data models, data normalization, data dictionary, query tools, file organization and security, database management systems in aviation.</td>
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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>225322</td>
<td>Control in Aviation</td>
<td>3(3-0)</td>
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<td>Pre: 225111</td>
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<td></td>
<td>Concepts of quality control, quality planning, statistical quality control, reliability, aeronautical quality standards, technical documentation in aviation.</td>
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<tr>
<th>Course Code</th>
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<th>Credits</th>
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<tbody>
<tr>
<td>225323</td>
<td>Inventory Control in Aviation</td>
<td>3(3-0)</td>
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<td></td>
<td>Pre: 225211</td>
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<tr>
<td></td>
<td>Concepts of inventory control, inventory systems in aviation, inventory models, forecasting of demands and lead times, technical documentation for aeronautical inventory control, and inventory management.</td>
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<th>Course Code</th>
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<tr>
<td>225341</td>
<td>Flight Operations and Planning</td>
<td>3(3-0)</td>
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</table>
Pre : 225142
Flight planning charts and tables, calculation of flight time and fuel consumption, route selection, documentation in flight operations, flight monitoring, flight equipment failures, emergency situations, and flight monitoring resources.

225351 Aviation Materials and Processes  3(2-3)
Materials and hardware, heat treating and hardness testing, selection and installation of hardware, corrosion control, aircraft cleaning, selection of cleaning chemicals and processes.

225352 Sheet Metal and Composite Materials  3(2-3)
Properties of metal and composite materials, uses of sheet metal and composite materials in aviation, inspection techniques, fabrication and repair processes.

225353 Aircraft Propulsion Systems  3(2-3)
Pre : 225142
Reciprocating engines, turbine engines, installation, inspection and maintenance of aircraft propulsion systems.

225381 Private Pilot Flight  3(2-3)
Basic knowledge for private pilot test and flight training required for private pilot practical test.

225421 Database Systems in Aviation  3(3-0)
Pre : 225321
Database concepts, data independence, integrity and reliability, data organizations, data models, data normalization, data dictionary, query tools, file organization and security, database management systems in aviation.

225481 Commercial Pilot Flight I  3(2-3)
Pre : 225381
Advanced flight knowledge required for commercial pilot test, cross-country flying, night flying, and multi engine flying.

225482 Commercial Pilot Flight II  3(0-9)
Pre : 225381
Commercial flying practice to build proficiency required for commercial pilot practical test.

225483 Instrument Flying  3(2-3)
Pre : 225381
Basic knowledge in flight instrument, preparation for instrument pilot tests and instrument flight training required for an instrument flying practical test.

225496 Selected Topics in Aviation Technology  1-3
Selected topics in aviation technology at the bachelor’s degree level. Topics are subjected to change each semester.

225497 Seminar  1
Presentation and discussion on current interesting topics in aviation technology at the bachelor’s degree level.

225498 Special Problems  1-3
Selected topics in aviation technology at the bachelor’s degree level and compiled into a written report

225499 Aviation Technology Project  3(0-9)
Project of practical interest in various fields of aviation technology
## AVIATION MANAGEMENT

(226xxx)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>226111</td>
<td><strong>Introduction to Aviation Industry</strong></td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>History of aviation, roles and structure of aviation industry, introduction to air transport system, industrial members and interrelations.</td>
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<tr>
<td>226112</td>
<td><strong>Aviation Organization Management</strong></td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Environment and dynamic in aviation industry; evolution of management theory; globalization and aviation industry; ethics and social responsibility in organizational management; planning, controlling, organizing, and leading the organization in aviation industry; decision making process; management innovation; international management in aviation industry.</td>
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<tr>
<td>226113</td>
<td><strong>Aviation Law and Regulations</strong></td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Certification of operations, international aviation law and regulations, authority, responsibility, and functions of the air transportation organizations, operation manuals.</td>
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<tr>
<td>226151</td>
<td><strong>Aviation Terminology I</strong></td>
<td>1(0-3)</td>
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<tr>
<td></td>
<td>Computer-based practices in aviation general terminology</td>
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<tr>
<td>226152</td>
<td><strong>Aviation Terminology II</strong></td>
<td>1(0-3)</td>
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<tr>
<td></td>
<td>Computer based practices in aviation technical terminology.</td>
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<tr>
<td>226153</td>
<td><strong>Aviation Terminology III</strong></td>
<td>1(0-3)</td>
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<tr>
<td></td>
<td>Computer based training in aviation terminology for cabin crews.</td>
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<tr>
<td>226211</td>
<td><strong>Air Transportation Systems</strong></td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Principles of transportation modes, air transportation system, organizations in air transportation, economics of air transportation, problems and trends in air transportation industry.</td>
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<tr>
<td>226212</td>
<td><strong>Aviation Organization Behavior</strong></td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 226112</td>
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<td></td>
<td>Organizational behavior in aviation industry; diversity and individual differences; perception and learning in aviation industry; motivation, work performance and stress; group and team behavior; power and politics, conflict and negotiation; leadership, communication, job design, and aviation organizational culture.</td>
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<tr>
<td>226221</td>
<td><strong>Aviation Economics</strong></td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Principles of macro and micro economics in air transportation, economics and market systems, aviation supply and demand, aviation market structure, significant elements in air transportation and its relationship in economic systems.</td>
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<tr>
<td>226231</td>
<td><strong>Aviation Marketing</strong></td>
<td>3(3-0)</td>
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<td></td>
<td>Principles of marketing and implication on aviation organization, aviation marketing concepts, consumer and passenger behavior, marketing strategy analysis and formulation in aviation industry.</td>
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<tr>
<td>226251</td>
<td><strong>Aviation Professional Development I</strong></td>
<td>3(3-0)</td>
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<td></td>
<td>Individual and group activities in interpersonal skill and personal development.</td>
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<tr>
<td>226311</td>
<td><strong>Aviation Management and Strategy</strong></td>
<td>3(3-0)</td>
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<td></td>
<td>Pre : 131211 and 226112</td>
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<td>Strategy in aviation industry, business environment analysis, strategy formulation, strategy implementation, and strategy evaluation in aviation industry.</td>
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<td>Course Code</td>
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<td>Credits</td>
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<tr>
<td>226312</td>
<td>Modern Management Tools in Aviation</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Management tools and organization, management tool evolution, modern management tool concepts, modern management tool implementation processes</td>
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<tr>
<td>226341</td>
<td>Aviation Operations Management</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Concepts of operations management in aviation, operation strategy, process analysis, aviation enterprise resource planning, business process reengineering in aviation industry.</td>
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<tr>
<td>226342</td>
<td>Aviation Logistics and Supply Chain Management</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Supply chain and logistics management concepts in aviation industry, materials handling system, aviation inventory management, capacities planning, locating distribution centers of air transportation.</td>
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<tr>
<td>226343</td>
<td>Aviation Project Management</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Concepts of project management in aviation, project life cycle, project management processes, project management tools, case study in aviation project management.</td>
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<tr>
<td>226351</td>
<td>Aviation Human Resource Management</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Importance of human resource management in aviation organizations, careers in aviation industry, law and regulations in aviation works, human resource planning, job analysis, recruitment, reward system, performance evaluation, human resource development in aviation organizations.</td>
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<tr>
<td>226352</td>
<td>Aviation Professional Development II</td>
<td>1(0-3)</td>
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<tr>
<td></td>
<td>Individual and group activities in team and team work development.</td>
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<tr>
<td>226353</td>
<td>Aviation Professional Development III</td>
<td>1(0-3)</td>
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<tr>
<td></td>
<td>Individual and group activities in leadership and managerial professional development.</td>
<td></td>
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<tr>
<td>226361</td>
<td>Airline Operations</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Airline history, regulations and, airline operation processes, relationship between airline and related aviation operations.</td>
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<tr>
<td>226362</td>
<td>Industry Management</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Airline industry and environment, airline organization, airline operation management, development trends in airline business.</td>
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<tr>
<td>226363</td>
<td>Airline Finance</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Principles of airline industry finance, financial report, airline financial performance indicators, airline financial planning and appraisal, airline financial sources and activities.</td>
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<tr>
<td>226364</td>
<td>Airline Marketing Management</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Air transport market, passenger behavior, airline marketing strategy, airline marketing management, airline marketing communication, airline marketing plan.</td>
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<tr>
<td>226365</td>
<td>Air Cargo Operations and Management</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Economic importance of air cargo services, air cargo operations and management, document system, rate and tariff, operation problems, competition and future of air cargo business.</td>
<td></td>
</tr>
<tr>
<td>226371</td>
<td>Airport Operations</td>
<td>3(3-0)</td>
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</tr>
</tbody>
</table>
Airport mission and functions, operations inside and outside flight operation areas, operations in passenger and cargo buildings, airport safety, security and emergency, technical services in airports, airport access, environmental control, performance assessment, and airport readiness.

226372  Airport Management 3(3-0)
Pre : 226371

Airport operation management, airport organization, aviation service management, ground services, passenger and cargo services, airport maintenance management, building and area management, safety and security management, customer relations management, financial and ownership management, airport pricing policy.

226441  Aviation Maintenance Management 3(3-0)
Pre : 226341

Concepts of aviation maintenance management, aviation maintenance system, maintenance planning, logistics management, quality assurance, safety, reliability, human factors, labor management.

226461  Airline Fleet Planning 3(3-0)
Pre : 131211 and 226231

Fleet life cycle and planning, current airline strategy and fleet planning, economic factors analysis, marketing analysis, aircraft selection, investment appraisal.

226462  Airline Revenue Management 3(3-0)
Pre : 131211 and 226231

Strategic concepts for airport revenue development, business activities in airport, sale and revenues in airport business, airline and airport revenues interrelation, relationship management, market research for airport business development.

226471  Airport Planning and Development 3(3-0)
Pre : 226371

Airport planning system, planning types and levels, planning processes, types and processes of planning study, financial planning, airport master plan, local airport planning.

226472  Airport Commercial Revenue Development 3(3-0)
Pre : 226231 and 226371

Strategic concepts for airport revenue development, business activities in airport, sale and revenues in airport business, airline and airport revenues interrelation, relationship management, market research for airport business development.

226496  Selected Topics in Aviation Management 1-3

Selected topics in aviation management at the bachelor’s degree level. Topics could be changed in each semester.

226497  Seminar 1

Presentation and discussion on current interesting topics in aviation management at the bachelor’s degree level.

226498  Special Problem 1-3

Study and research in aviation management at the bachelor’s degree level and comply into a written report.

226499  Aviation Management Project 3(0-9)

Research project in various interesting areas of aviation management.
FACULTY OF ARCHITECTURE
(240XXX - 241XXX)

ARCHITECTURE
(240XXX)

240111 Design Fundamentals 2(2-0)
Characteristics and relationships of visual art work: basic elements, principles and
techniques in the arrangement of composition in two, three and four dimensions, from spaces
and structure through natural forms, and the design philosophy of designers in various branches
of art in brief.

240112 Architectural Design Fundamentals 2(2-0)
An introduction to architectural design, human dimensions, horizontal and vertical
movement, human behavior in habitation and living space requirements; basic influences and
development of vernacular and domestic architecture; the study of design concepts,
programming and principles of design for domestic architecture.

240113 Studio in Design 4(0-8)
Projects on the design of visual art works, composition of forms and spaces in two,
three or four dimensions, design applicable to arts, architecture, industrial design and landscape
architecture.

240114 Architectural Design I 4(0-8)
Pre: 240113
Practice in basic architectural design with the employment of human proportion and
behavior in designing architectural elements of residential building, site planning and space
arrangements of a building appropriate for a tropical environment, building structure and
aesthetics.

240115 Architectural Drawing 2(1-3)
An introduction to instruments and materials used in architectural drawing; the
representation of objects by various methods, including the orthographic, isometric and
axomometric projections, sciagraphy to acquaint the students to the methods of presentation of
architectural forms through light, shade and shadow of simple and complex geometrical forms;
the theory and practice of perspective drawing of various forms used in architectural
presentation, including the search for basic techniques and methods of drawing exterior and
interior perspective, shade and shadow of architectural forms from natural and artificial sources
of light; problems dealing with various methods and techniques of architectural perspective
presentation.

240116 Architectural Presentation 2(1-3)
Techniques of drawing with pencil, ink and water color or other presentation media,
practice sketching of buildings, both interior and exterior, drawing of products, art works and
natural sconces in order to develop ability in architectural and artistic presentation.

240121 Wood Construction 3(2-3)
Basic wood construction and building components, wood properties, applications,
details, construction techniques and methods, drawings, model making and small wood buildings.
240122  Concrete Construction 3(2-3)
   Basic concrete construction and building components, concrete properties, applications, details, integration of concrete, wood and steel in construction, drawings, model making and small concrete buildings.

240131  Structural Mechanics in Architecture 2(2-0)
   Fundamental concepts based on static equilibrium of materials under external force, the strength of materials: internal stresses, power performance: deformation of materials under force.

240211  Architectural Design Criteria and Concepts I 2(2-0)
   Pre : 240112
   Influences and concepts of architectural design in the past; design criteria in various environment: design process and systematic design development: spaces and forms including analysis of composition in architecture.

240213  Architectural Design II 4(0-8)
   Pre : 240114
   Practice in basic architectural design adding the complexity of functions and contexts, house and small public buildings, design concepts, site planning and space arrangements of a building suitable for a tropical environment with the concern of structure, aesthetics and utility system of buildings.

240214  Architectural Design III 4(0-8)
   Pre : 240213
   Practice in basic architectural design adding the complexity of functions and contexts, small public buildings; design concepts, site planning of buildings and landscape and space arrangements of a building suitable for a tropical environment with the concern of structure, aesthetics and utility system of buildings.

240217  Architectural Sketch Design I 2(0-6)
   Practice in architectural sketch design at level I to train design and expression of fundamental design concepts; the design of architectural elements, temporary building, small scale building, landscape architectural elements, interior and graphic work, suitable for limited working time.

240218  Architectural Sketch Design II 2(0-6)
   Pre : 240217
   Practice in architectural sketch design at level II to train design and expression of fundamental design concepts, the design of Architectural elements, temporary building, small scale building, landscape architectural elements, interior and graphic work suitable for limited working time.

240221  Building System Integration 3(2-3)
   Basic technological System for residential and public buildings. Procedures, selection, installation, maintenance and integration of electrical, air – conditioned and sanitary systems in architectural design construction.

240222  Building Materials 3(2-3)
   Pre : 240121 and 240122
   Types of construction materials in small-scale residential and public buildings; material properties, selection, installation and maintenance. Standard of architectural drawings related to engineering systems. Practice required.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>240231</td>
<td>Structural System in Architecture</td>
<td>2(2-0)</td>
<td>Pre: 240131</td>
</tr>
<tr>
<td></td>
<td>Concepts in designing and selecting architectural structure, including principles of force, materials, shape and deformation resulting from the force.</td>
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<tr>
<td>240232</td>
<td>Timber and Steel Design for Architecture</td>
<td>2(2-0)</td>
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<tr>
<td></td>
<td>Mechanics and properties of timbers, design of beams, compression member, tension member, member under combined stress and joints; steel design code and specifications, design of beam, compression members, tension members, member under combined stress and welding joints.</td>
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<tr>
<td>240241</td>
<td>Thai Architecture</td>
<td>2(2-0)</td>
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<tr>
<td></td>
<td>The origin of the elements of traditional Thai architecture; rudiment and concepts of traditional Thai patterns; characteristics and development of various traditional Thai house. Meanings and interpretation of traditional Thai architecture; application of Thai architecture to contemporary architecture. Field study required.</td>
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<tr>
<td>240243</td>
<td>History of Architecture I</td>
<td>3(3-0)</td>
<td>Pre: 452211</td>
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<tr>
<td></td>
<td>History and developments of ancient architecture in the near eastern region and civilization in prehistoric period, origin of vernacular architecture and settlements of various important civilization centers in Europe, Africa and Asia; architectural history in Southeast Asia; Thai architecture since prehistoric times to the Rattanakosin period. Field trip required.</td>
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<tr>
<td>240244</td>
<td>History of Architecture II</td>
<td>3(3-0)</td>
<td>Pre: 240243</td>
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<tr>
<td></td>
<td>History and developments of architectural in various civilization of the world since the early Christian period until industrial revolution. Origin and development of modern architecture until contemporary architecture; development of contemporary architecture in Thailand. Application of history in architectural design. Field trip required.</td>
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<tr>
<td>240261</td>
<td>Design for Tropical Environment</td>
<td>2(2-0)</td>
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<td></td>
<td>Man and environment. Climate and geographical zoning, comfort zone, annual analysis:- selection of building form, and orientation, solar controls, wind controls. Daily data analysis:- thermal control climatical approach to the selection of forms, materials and structural details. Site layout, rain, deterioration noise, lighting and pest control in the tropics, sequence and design process in the tropics.</td>
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<tr>
<td>240271</td>
<td>Computer Applications in Architecture</td>
<td>2(1-2)</td>
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<td></td>
<td>The requirements for hardware and software for architectural design, the use of other related softwares: word processor, illustrator; the making of artwork, graphic, the making of two-dimension drawing and three-dimension visualization; the integration of different basic knowledges in use of software in order to prepare architectural portfolio; the making of homepage to display architectural work.</td>
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<tr>
<td>240311</td>
<td>Architectural Design Criteria and Concepts II</td>
<td>2(2-0)</td>
<td>Pre: 240211</td>
</tr>
<tr>
<td></td>
<td>Design processes, design theories in a comparative study of works of leading architects; development of concepts and trends of architecture from the late nineteenth century until present and future; application of Thai architecture into the contemporary design.</td>
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<tr>
<td>240313</td>
<td>Architectural Design IV</td>
<td>4(0-8)</td>
<td>Pre: 240214</td>
</tr>
</tbody>
</table>
Practice in the architectural design at moderate complex level, small public building, design process and concepts, material and complicated structure, site planning and space arrangement of appropriate building for a tropical climate concerning aesthetics and utility system of building.

**240314 Sustainable Architectural Design I**
- 4(0-8)
- **Pre**: 240313

Practice in architecture design development at level of moderate complex. Sustainable architectural design concepts related to materials, structure, site planning, aesthetics and utility system. Integration of landscape architecture and computer sciences.

**240317 Sketch Design III**
- 2(0-6)
- **Pre**: 240218

Practical in sketch design at level III to train thinking processes, design and expression of fundamental design concepts, the design of Architectural elements, temporary building, small scale building, landscape architectural elements, interior and graphic work through various media, suitable for limited working time.

**240319 Site Planning and Architectural Survey**
- 2(1-3)

Site planning method, data collection in architectural survey, topography, and site grading, site planning design that respond to the environment, different approaches to site planning design and case study analysis.

**240321 Light and Acoustic in building**
- 3(2-3)
- **Pre**: 240222


**240322 Building Materials and Enclosures**
- 3(2-3)
- **Pre**: 240222


**240331 Reinforced Concrete Design for Architecture**
- 2(2-0)

Properties of concrete and reinforcing steel: behavior of reinforced concrete beams at various conditions of loading: working and ultimate strength design methods: analysis and of rectangular beams and T-beams with tension and compression, reinforcement; design to two-way slabs; concentrically and eccentrically loaded columns, footings.

**240341 Interior Architecture**
- 2(1-3)

Considerations of interior space volume harmonizing to furniture planning, convenient to the architectural design for high efficiency of function.

**240361 Landscape Architecture**
- 2(1-3)

Brief history of Landscape architecture, man-made and natural landscape characteristics, basic design criteria, outdoor spatial design, plant materials and structures in landscape architecture.

**240371 Advanced Computer Applications in Architecture**
- 2(1-2)
- **Pre**: 240271

The use of software for three - dimension visualization different methods of three dimension viewing, rendering, texture, light and shadow. The animation technique for walking
through or fly around the building. The integration of all techniques to create advanced architectural homepage with animation and sound.

240413 Sustainable Architectural Design II 4(0-8)
Pre: 240314
Practice in sustainable architectural design. Designing a moderate to highly complex public buildings and group of buildings in response to physical environment. Appropriate selections of materials and building technology. Integration of sciences in landscape architecture and computer.

240414 Sustainable Architectural Design III 4(0-8)
Pre: 240413
Practice in sustainable architectural design. Designing highly complex group of buildings or community. Appropriate selections of materials and building technology. Integration of sciences in urban planning and environment, landscape architecture and computer.

240421 Advanced Building System Integration 3(2-3)
Pre: 240221
Integration of complex building systems. Electrical, sanitary, air-conditioned, fire-protection systems in building and automatic building control system. Building design standard for disabled, structural, and vertical and horizontal transportation systems. Field study required.

240422 Building Codes and Architectural Documentation 3(2-3)

240441 Sustainable Urban Design and Planning 2(2-0)
Settlement and urban pattern evolution. Urban composition focusing on sustainable urban design and planning, process of thinking, creating, implementing, and maintenance in sustainable urban design and planning. Physical urban analysis in the environments of Thailand at community, city, region, and nation levels.

240451 Architectural Project Management I 3(3-0)
Construction industry organization in various example. To start a construction as a team leaders architect. Feasibility study and cashflow.

240452 Architectural Project Management II 3(3-0)
Pre: 240451
Office management and construction project planning for the highest target. Study method of improvement and various management and/or planning theories.

240453 Quantity Survey and Cost Estimation 2(1-2)

240461 Sustainable Architecture 3(3-0)
The quest for sustainability due to environmental crises. Sustainable development which lead to sustainable architecture. The lessons from vernacular architecture. Sustainable architecture strategy includes climate concern, energy conscious and renewable energy, water and material efficiency, environmental friendly building materials, and users health concern. Ecological approach for landscape, community and urban planning, including sustainable landuse and transportation. Case study provided.
240462  Energy Conservation in Architecture  3(3-0)
Pre : 240461
The energy conscious design including both passive and active methods, the analysis and management of energy use in large scale building

240491  Basic Research Techniques in Design  2(1-2)
Principles and methods in Architecture research, identification of research problems, formulation of research objectives and hypotheses, collection of data, construction of questionnaire, data analysis and interpretation, application of statistics for research, report writing and presentation.

240496  Selected Topics in Architecture  1-3
Selected topics in architecture at the bachelor’s degree level. Topics are subject to change each semester.

240498  Special Problems  1-3
Study and research in Architecture at the bachelor’s degree level and compile into a written report

240511  Museum Exhibition Planning and Design  3(2-2)

240542  Art, Architecture and City  2(2-0)
The relationship between arts, architecture and city. The role of architects to the city. Creating art and urban architecture, and urban development.

240543  Conservation of Art and Architecture  2(2-0)
The Importance of conservation and management of art and architecture; characteristics of construction materials and techniques for architectural conservation, community and surroundings. Field study required.

240561  Evaluation of Building Environment  2(2-0)
Pre : 240414 and 240441
Basic of building environment evaluation relating to the design regarding the value of balance. Between environment and architectural work, to complete the architectural design responding sustainable. Use in parallel with the value; generally giving to urban and Environment.

240581  Aesthetics of Vernacular Architecture and Landscape  2(2-0)
Aesthetics and local wisdom of cultural ecology in Southeast Asia; ontological relationship and dynamic of ecological system, physical and socio-cultural environment, economic, houses and communities, lifestyles and beliefs of locality; aesthetics of ethical adaptability within local conditions in Thailand, techniques and methods for field research and participation within a locality. Field study is required.

240591  Thesis Proposal  3(1-4)
Pre : 240414 and 240421
Intensive research based on interests of each student leading to scope of thesis and design with the consideration of environment, project feasibility, regulations and building construction law, site selection, comparative studies of similar projects, environmentally sustainable managements and design. Stipulation of project details and concepts of architecture, engineering and environment. A comprehensive thesis report is required and approved by the Faculty’s Thesis Committee.
LANDSCAPE ARCHITECTURE
(241XXX)

240597 Seminar 2(1-2)
Issues relating to design profession: graphical presentation, oral presentation, sequence of presentation, portfolio design, media in design representation, writing effective resume.

240599 Thesis 9
Pre: 240591
Establishment of criteria and concept, and practice in a highly complex architectural design based on thesis proposal of each student under the guidance of thesis committee. Presentation of architectural design through architectural drawings, models and other media. A comprehensive thesis report required.

241211 Landscape Architectural Design I 4(0-8)
Pre: 240213
Practice in fundamental level of landscape architectural design with the employment of natural form, fundamental design theories and human behavior in designing small environments.

241212 Landscape Architectural Sketch Design I 1(0-3)
Pre: 240217
Practical studio work at fundamental level in small environment by applying fundamental design theories and natural form. Conveying ideas into graphic presentation in designated time.

241231 Landscape Architectural Construction Design I 3(2-3)
Pre: 240121

241232 Landscape Architectural Construction Design II 3(2-3)
Pre: 241231
Site survey and construction design in site planning. Grading, designing surface and underground drainage systems.

241241 History of Landscape Architecture 3(3-0)
Evolution and development of landscape architecture in various cultures under influences of geography, history, society, philosophy, believes, and architectural expression from the ancient time to the 19th century. Comparative analysis in design concepts, appearances, and influences of styles. Field trips required.

241311 Landscape Architectural Design II 4(0-8)
Pre: 241211
Practice in fundamental level of landscape architectural design in uncomplicated environment. Collecting data for site and user analysis. Designing circulation system and environment for institute, academic institute, commercial project, community center, community park and industrial project. Design principles in tropical environment.

241312 Landscape Architectural Design III 4(0-8)
Pre: 241311
Practice in intermediate level of landscape architectural design in complicated environment. Circulation system design, grading, drainage design, housing project planning, laws, regulations and model of land subdivision layout. Special requirements in designing and planning resort, golf course, sport complex, theme park, zoological park, botanical garden, arboretum, airport and mass transit station.

241313 Landscape Architectural Sketch Design II 1(0-3)
Pre : 241212
Practical studio work at fundamental level. Designing and planning landscape details in uncomplicated environment: institute, academic institute, commercial project, community center, community park and industrial project. Conveying ideas into graphic presentation in designate time.

241314 Landscape Architecture Sketch Design III 1(0-3)
Pre : 241313
Practical studio work at intermediate level. Designing and landscape details in complicated environment: planning and designing landscape elements: housing project, resort, golf course, sport complex, theme park, zoological park, botanical garden, arboretum, airport and mass transit station. Conveying ideas into graphic presentation in designate time.

241315 Spaces in Landscape Architecture 3(3-0)
Construction of spaces with particular meaning by landscape architectural elements. Basic art elements. Use of construction materials, plants, and installation techniques.

241331 Landscape Architectural Construction Design III 3(2-3)
Pre : 241232
Construction design of infrastructure: irrigation system for landscape architecture, electrical and lighting systems, construction of pond, fountain, cascade, and roof garden.

241332 Landscape Architectural Construction Design IV 3(2-3)
Pre : 241331
Design of landscape architectural construction: retaining wall, stairs, ramp, finishing work, circulation system. Soil structure and quality. Land improvement.

241361 Site Analysis 3(2-3)

241362 Landscape Ecology 3(3-0)
Structure, functioning and change of a heterogeneous of ecosystem: forests, wetlands, fields, corridors and villages. Focus on spatial patterns; flow of fauna, flora, energy, mineral nutrient and water among ecosystems; and ecological changes in the landscape mosaic over time.

241363 Landscape Analysis Techniques 3(2-3)
Concepts and skills of reading, interpreting, and making maps. Applications of aerial photography, satellite imageries and global positioning system for landscape architecture.

241371 Computer Applications in Landscape Architecture 2(1-2)
Pre : 240271
Microcomputer for landscape architectural design, landform modeling, 3-d modeling, landscape construction and engineering, and cost estimation.

241411 Landscape Architectural Design IV 4(0-8)
Pre : 241312
Practice in intermediate level of landscape architectural design. Site analysis conforms to landscape ecology approach. Geographic information system for decision making. Sustainable design, visual landscape quality analysis and assessment. Designing and planning of regional landscape, green open space system, highway landscape, national park and forest park. Coastal conservation, agricultural land conservation, degraded land rehabilitation, and planning for eco-tourism.

**241412 Landscape Architectural Design V**  
*Pre : 241411*  
Practice in advanced level of landscape architectural design. Designing and planning urban landscape, waterfront landscape and historical area. Visual landscape quality analysis and assessment. Conservation, restoration and rehabilitation of urban environment following sustainable development concept.

**241413 Landscape Architectural Sketch Design IV**  
*Pre : 241314*  

**241414 Landscape Architectural Sketch Design V**  
*Pre : 241413*  
Practical studio work at advanced level. Designing and planning landscape details of urban landscape, waterfront landscape, and landscape in urban rehabilitated area. Conveying ideas into graphic presentation in a designated time.

**241415 Plant and Design**  
*Pre : 241241*  
Design theory and plant material in composition mass, form, color, and texture. Specific use of plant and influence on ecological system. Planting plan, technical specification and landscape construction as related to plant material.

**241416 Garden Design**  
Theory and practice in garden design. History and evolution of garden design, knowledge of horticulture, plant material selection, landscaping technique and garden maintenance.

**241441 Concepts in Landscape Architecture**  
*Pre : 241241*  
Theory and concept formation in landscape architecture, arts, architecture, urban planning, ecology, geography from 19th century until present.

**241442 Historical Landscape Architecture Conservation**  
Conservation and restoration of historical and cultural landscape architecture. The important laws, regulations, and international conventions including organizations involving in conservation activities.

**241443 Community Planning and Design**  
Theory and practice in community planning and design. Physical, economic and social factors. Site analysis for project establishment.

**241444 Vernacular Landscape Architecture**  
Origins of concepts, philosophies, and styles in vernacular landscape architectures of Thailand and Southeast Asian countries. Comparison and analysis of influences of environment, society, belief, religion, and culture affecting to images and expression of landscape architecture in each locale.
Principles and methods of cost estimation for landscape architectural projects in the process of preparation, design and construction. Calculation of material, labor, equipment, tax, profit, construction and miscellaneous expense.

Professional practice, professional ethics, environmental concerns, laws and orders, office arrangement. Contract, bidding and construction document preparations, project management and research.

The exploration of natural sites. The significance of ecosystem and biodiversity to landscape architecture.

Designing and planning environment with landscape ecology approach. Land potential, potential natural resource and human need.

Visual landscape quality and applications of analytical process conforming to the context of physical, cultural and social environment. Principles, theories and techniques in visual quality analysis and assessment.

Principles and theories in landscape architectural planning and design for tourism in natural area. Aesthetic, economic, social and ecosystem factors including environmental impacts.

Concept and application of geographic information system. Management, analysis and presentation of data for planning and designing in landscape architecture.

Selected topics in landscape architecture at the bachelor’s degree level. Topics are subject to change each semester.

Presentation and discussion on current interesting topics in landscape architecture at the bachelor’s degree level.

Study and research in landscape architecture at the bachelor’s degree level and compiled into a written report.

Project and site selection. Project requirement and scope of work. Project feasibility, laws and regulations and case studies. Data analysis and conclusion.

Landscape architectural design criteria and concepts from the conclusion of prerequisite course: 241598 Thesis Proposal. Design and submit final work to the committee under thesis regulations.
251101 General Aquaculture  2(2-0)
   History of aquaculture; general information on breeding and cultivation of
   fishes and other aquatic animals including pond construction, fertilization, feeding and
   related problems.
251211 Principles of Aquaculture  3(3-0)
   Introduction to aquaculture of the world; history and present status of
   aquaculture in Thailand; information on soils, water, fertilizers, and feed as related to
   aquaculture; and species suitable for culturing purpose.
251321 Breeding and Nursing of Freshwater Animals  3(2-2)
   Pre : 251211
   Breeding of freshwater animals. Principles and methods for freshwater
   animal breeding, nursing techniques, marketing aspects of freshwater animal seed
   supply.
251322 Breeding and Nursing of Marine Animals  3(2-2)
   Pre : 251211
   Principles and method on breeding, spawning, and nursing of marine shrimp,
   crab, fish, and other economic marine species. Field trip required.
251323 Freshwater Animal Culture  3(2-2)
   Pre : 251211
   Culturing methods for freshwater animals; production, harvesting,
   transportation, and problems related to commercial scale culture of other freshwater
   animals. Field trip required.
251324 Mariculture  3(3-0)
   Pre : 251211
   Culturing methods for marine shrimp, crab, mollusc, fish, seaweed and other
   economic marine species. Field trip required.
251351 Water Quality for Aquaculture  3(2-2)
   Pre : 251211, 403111
   Water quality for aquaculture, nutrient cycle, and relationship between water
   quality and aquatic animal pond productivity.
251371 Aquatic Animal Feed  2(2-0)
   Pre : 251211, 403221
   Nutrition and utilization of aquatic animal feed, raw materials, completed
   feed processing and nutrient requirement of aquatic animals.
251372 Laboratory in Aquatic Animal Feed  1(0-3)
   Pre : 251371 or together
   Techniques for proximate analysis of aquatic animal feed for quality
   evaluation.
251421 Ornamental Fish and Aquatic Plants  3(2-2)
   Pre : 251321
   Ornamental fish and aquatic plants. Breeding, nursing and culturing
   technique. Field trip required.
251441 Aquaculture Genetics 2(2-0)  
Pre : 416311, 416312  
Application of genetics to aquaculture, qualitative and quantitative traits and  
genetic improvement of aquaculture stocks, cytogenetics and chromosome-set  
manipulation, genetic engineering, population genetics and broodstock management.

251442 Laboratory in Aquaculture Genetics 1(0-3)  
Pre : 251441 or together  
Inheritance of qualitative characters, analysis of quantitative traits.  
Chromosome-set manipulation techniques. Application of molecular genetic techniques  
to aquaculture.

251452 Water Analysis 3(2-2)  
Pre : 251351  
Theories, instruments and methods for water analysis. Interpretation of water  
quality data and its application for aquaculture.

251462 Aquaculture Pond Construction 3(2-2)  
Pre : 251211  
Site selection, surveying and design for aquaculture ponds and culturing  
facilities.

251471 Aquatic Animal Feedstuffs and Quality Evaluation 3(2-2)  
Pre : 251371  
Feedstuffs for aquatic animal feed preparation, chemical compositions, toxic  
substances and feed ingredient evaluation.

251491 Research Methods in Aquaculture 3(3-0)  
Pre : 422311  
Principles and methods in aquaculture research, identification of research  
problems, formulation of research objectives and hypotheses, collection of data,  
construction of questionnaire, data analysis and interpretation, application of statistics for  
research, report writing and presentation.

251496 Selected Topics in Aquaculture 1-3  
Selected topics in aquaculture at the bachelor’s level. Topics are subject to  
change each semester.

251497 Seminar 1  
Presentation and discussion on current interesting topics in aquaculture at the  
bachelor’s level.

251498 Special Problems 1-3  
Study and research in aquaculture at the bachelor’s degree level and complie  
into report.

251499 Practicum 2  
Specific practicum on aquaculture.

**FISHERY BIOLOGY**

(252XXX)

252331 Fish Taxonomy 4(3-3)  
Pre : 299215 and 299216  
History, systematic and unit, terminology and scientific nomenclature.  
Preservation of fishers. Fish characters and methods in sample collection. Classification  
of fish by literature review and plates. Principles in fish drawing and taxonomic report.
252351 Principles of Aquatic Ecology 3(2-2)
Pre : 299112
Interaction of natural factors among aquatic organisms. Field trip required.

252352 Wetlands for Fishery Biology 3(3-0)
Pre : 299112

252371 Diseases and Parasites of Aquatic Animals 3(2-2)
Pre : 299211 and 299212
Diseases and parasites of aquatic animals. Treatment and prevention strategies.

252421 Phycology 3(2-3)
Pre : 299213 and 299214
Morphology, distribution, utilization and classification of algae. Field trip required.

252431 Physiology of Aquatic Animals 3(2-3)
Pre : 299215 and 299216
Physiology and osmoregulation of aquatic animals functional of organ systems and their relations.

252441 Fishery Biology 3(2-2)
Pre : 299215 and 422111
Population biology, population dynamics of aquatic animals. Fisheries and effect of fisheries on aquatic animal population. Field trip required.

252442 Planktonology 3(2-2)
Pre : 299213 and 299214
Taxonomy of phytoplankton and zooplankton in waters. Samples collection and laboratory analyses. Basic concepts in plankton productivity. Field trip required.

252451 Limnology 3(2-2)
Pre : 403111 and 403112
Physical, chemical and biological environments in freshwater.

252452 Environmental Impact Assessment in Fisheries 3(3-0)
Pre : 299112

252491 Research Methods in Fishery Biology 3(3-0)

252496 Selected Topics in Fishery Biology 1-3
Selected topics in fishery biology at the bachelor’s level. Topics are subject to change each semester.

252497 Seminar 1
Presentation and discussion on current interesting topics in fishery biology at the bachelor’s level.
252498 Special Problems 3(0-9)  
Study and research in fishery biology at the bachelor’s level and compile into a report.

252499 Practicum 1,1  
Specific practicum on fishery biology.

FISHERY MANAGEMENT  
(253XXX)

253211 Fisheries Law and Regulations 3(3-0)  
Fishery law and regulations in general. Law of fisheries rights in Thai waters. Law on fish marketing organization and wholesale activities, International law on fisheries.

253312 Computer for Fishery Management 3(2-2)  
Computer system, computer network, software packages, multimedia and internet searching for fishery management.

253381 Principles of Aquafarm Management 3(3-0)  

253383 Fisheries Business Management 3(3-0)  

253411 Fishery Extension 3(3-0)  
Pre : 299111  
Principles on fishery extension. Planning and evaluation of extensional projects. Audio-visual aids for extension works. Field trip required.

253412 International Law of the Sea 3(3-0)  
Pre : 253211  
Theory, concept and background of fishery resource use. Fishing zone and international law of the sea.

253413 Remote Sensing for Fishery Resource Management 3(2-2)  
Theory of remote sensing, photographs and satellite imagery, visual interpretation of such data is given, the digital image techniques, for obtain of fisheries activities and phenomena for fisheries planning and resource management.

253414 Introductory Geographical Information System for Fishery Management 3(2-2)  
The characteristic of geographical information and maps. Geographical information system, the spatial analysis for fisheries planning and management.

253421 Inland Water Manipulation for Conserving of Fishery Resources 3(3-0)  
Pre : 299112
Principles of natural resources conservation. Aquatic ecology and the use of fishery resources in inland waters of Thailand. Issue verification on resources deterioration and manipulation measures for conserving of fishery resources in fresh water bodies.

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tr>
<td>253422</td>
<td>Water Resource Management for Fisheries</td>
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<td>Cycle and hydrology of water resources. Control and management of water resources for fisheries.</td>
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<tr>
<td>253481</td>
<td>Principles of Fishery Economics</td>
<td>3(3-0)</td>
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<td>Pre : 102181</td>
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<td></td>
<td>Importance of fishery resources to the economy. Economic principles on fishery resource management. Basic informations on fish marketing and fish price analysis. Field trip required.</td>
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<tr>
<td>253482</td>
<td>Principles of Fishery Management</td>
<td>3(3-0)</td>
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<td>Pre : 252443</td>
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<tr>
<td>253483</td>
<td>Fishery Project Planning</td>
<td>3(2-2)</td>
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<td>Preparation, planning, control and evaluation on fishery projects. The use of microcomputer in fishery project planning.</td>
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<tr>
<td>253491</td>
<td>Research Methods in Fishery Management</td>
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<td>Research methods and issue analysis on fishery management.</td>
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<tr>
<td>253496</td>
<td>Selected Topics in Fishery Management</td>
<td>1-3</td>
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<td>Selected topics in fishery management at the bachelor's level. Topics are subject to change each semester.</td>
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<td>Presentation and discussion on current interesting topics in fishery management at the bachelor’s level.</td>
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<tr>
<td>253498</td>
<td>Special Problems</td>
<td>1-3</td>
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<tr>
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<td>Study and research in fishery management at the bachelor’s level and complie into a report.</td>
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<tr>
<td>253499</td>
<td>Practicum</td>
<td>2</td>
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<td></td>
<td>Specific practicum on fishery management.</td>
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**FISHERY PRODUCTS**

(254XXX)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>254211</td>
<td>Principles of Technology in Fishery Products</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 403221</td>
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<td></td>
<td>Utilization of fishery resources and their by-products; chemical composition of fish; biochemical and microbiological changes in fish post-mortem; handling and sanitation; basic principles of fish preservation; fish inspection and quality control. Field trip.</td>
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<tr>
<td>254311</td>
<td>Fishery Microbiology</td>
<td>3(2-3)</td>
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<td>Pre : 419214</td>
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<td></td>
<td>Micro-organisms in fresh water; their activities related to the aquatic animals; classification of some bacteria isolated from fresh water and aquatic animals.</td>
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<tr>
<td>254371</td>
<td>Fish Preservation</td>
<td>2(2-0)</td>
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</tbody>
</table>
Pre : 254211 or together
Principles of fish preservations. Factors affecting qualities of raw materials and finished products.

254411 Microbiology of Fishery Products 3(2-3)
Pre : 254311
Micro-organisms affecting to fish processing and fishery products. Coliform bacteria and other bacteria which relating to hygiene and standard of fishery products. Field trip required.

254421 Fishery Products Analysis I 3(2-2)
Pre : 403115, 420119
Principles and procedure in analyzing the composition of fishery products by chemical and physical methods.

254422 Fishery Products Analysis II 3(2-3)
Pre : 254421
The chemical and sensory evaluation of fishery products; vitamin, amino acids analysis and the evaluation of biological value proteins in fishery products.

254423 Quality Control of Fishery Products 3(2-3)

254461 Fish Processing Machines 3(2-3)
Fish processing machines and parts. Principles of machine operations. Fish processing plant design. Field trip required.

254471 Refrigeration of Aquatic Products 3(3-0)
Pre : 420119, 419214
Principles of refrigeration, equipment and machinery, freezing/thawing process of aquatic products and others, cold storage design and load calculation, handling, and factors affecting quality changes, sanitation and standards, field trip to freezing plants.

254472 Fish Processing I 3(2-3)
Pre : 254371
Principles of fish processing. The use of chemical preservative, salting, drying, fermentation and irradiation in fish preservation. Field trip required.

254473 Fish Processing II 3(2-3)
Fish preservation by thermal processing. Principles of food packaging. Field trip required.

254496 Selected Topics in Fishery Products 1-3
Selected topics in fishery products at the bachelor’s level. Topics are subject to change each semester.

254497 Seminar 1
Presentation and discussion on current interesting topics in fishery products at the bachelor’s level.

254498 Special Problems 1-3
Study and research in fishery products at the bachelor’s level and compile into a report.

254499 Practicum 1,1
Practicum on fishery products.
MARINE SCIENCES
(255XXX)

255341  Marine Biology 3(2-2)
  Pre : 299211 and 299212
  Biology of marine animals and plants, their environments and utilization of marine resources. Field trip required.

255351  Meteorology 2(2-0)
  Atmospheric structure. Thermodynamics and heat balance, condensation hydrometers, air masses, weather fronts.

255352  General Oceanography 3(3-0)
  Origin and nature of the oceans, physical and chemical properties of seawater and its role to biology. Field trip required.

255353  Basic SCUBA Diving 3(2-2)
  Pre : 175132

255361  Fishing Gear 3(2-2)
  Types of fishing gears and operation method. Field trip required.

255411  Marine Microbiology 3(2-2)
  Pre : 419214
  Morphology and identification of marine microorganisms and plankton.

255421  Marine Biotechnology 3(3-0)
  Pre : 403221 and 419211
  Utilization of marine organisms or their parts by chemical, biochemical, microbiological processes and genetic engineering. Applications of marine biotechnology in mariculture. Chemical and pharmaceutical productions and marine pollution control.

255431  Natantia 3(2-2)
  Pre : 299211 and 299212
  Taxonomy, ecology and culture of natantia, emphasis on economic local species. Field trip required.

255432  Reptantia 3(2-2)
  Pre : 299211 and 299212
  The classification, ecological aspects of reptantia, emphasized on Thai economic species. Field trip required.

255433  Marine Molluscs 3(2-2)
  Pre : 299211 and 299212
  General characters, classification, evolution and ecological aspects of marine molluscs, including their economically important. Field trip required.

255434  Marine Fish Larvae 3(2-2)
  Pre : 252331
  General information, taxonomy and ecology of marine fish larvae. Field trip required.

255441  Biology of Brackishwater 3(2-2)
  Pre : 255341
  Classification estuaries, origin and its evolution, analysis of estuaries systems chemistry, physics, geology and biology including survey of characteristics and treatment of estuarine pollutions. Field trip required.

255442  Natural History of Marine Animals 3(2-2)
Pre : 255341
Life history and distribution of marine animals. Field trip required.

255443 Marine Pollution 3(2-2)
Pre : 255352
Kinds and sources of pollutants, their transportation and dispersion in water, sediment and marine organisms. Ecological effects on primary producer, consumers and man. Field trip required.

255445 Coral Reef Ecology 3(3-0)
Pre : 299112
Development of coral reefs, environmental factors affecting reefs; physical, chemical and biological processes on coral reefs; reef morphology and zonation, the life of the reefs, worldwide geographical distribution of coral reefs; the distribution of coral reefs in Thailand, utilization of the reefs, reefs and tourism, reef research, reef management, field trip.

255446 Introduction to Marine Benthic Community 3(2-2)
Pre : 299211 or 423411
The classification of marine environments, organisms in marine benthic community, major groups in the community, related environmental factors, and basic research methods in marine benthic community.

255447 Marine Ecology 3(2-2)
Pre : 299112
Principles of marine ecology, relationships between marine organisms and their environment, bioenergetic, food web and their productivity, important coastal habitats. Estuary, coral reef, mud flat, sandy beach and rocky shore. Field trip required.

255448 Marine Chemical Ecology 3(2-2)
Pre : 299112 and 403111
Role and biological activities of secondary metabolites from marine organisms for defenses, reproduction, feeding, symbiosis, colony and space competition. Relation between secondary metabolites and environmental factors controlling their lives, behavior, population, community structure and evolution of marine organisms. Field trip required.

255451 Chemical Oceanography 3(2-2)
Pre : 255352 and 403111
Composition of seawater, changes in composition, chemical properties and analytical methods.

255452 Physical Oceanography 3(2-2)
Pre : 255352
Physical properties of the oceans and their circulations.

255453 Marine Geology 3(2-2)
Pre : 255352
Transformation of crust, continental shelf and coast, types of sediment and distribution, marine natural resources. Field trip required.

255461 Coastal Navigation 3(2-2)
Pre : 255352
Study of navigation instruments, position finding direction, deviation and deviation error. Field trip required.

255462 Instruments and Methods in Oceanography 3(2-2)
Pre : 255352
Types of instruments and operation methods in oceanography. Field trip required.

**255491 Research Methods in Marine Science**  3(3-0)
Principles and methods in marine science research, identification of research problems, formulation of research objectives and hypotheses, collection of data, construction of questionnaire, data analysis and interpretation, application of statistics for research, report writing and presentation.

**255496 Selected Topics in Marine Science**  1-3
Selected topics in marine science at the bachelor’s level. Topics are subject to change each semester.

**255497 Seminar**  1
Presentation and discussion on current interesting topics in marine science at the bachelor’s level.

**255498 Special Problems**  1-3
Study and research in marine science at the bachelor’s level and compile into a report.

**255499 Practicum**  1,1
Practicum on marine science.

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**CENTER COURSES**

*(299XXX)*

**299111 General Fisheries**  3(3-0)
General fisheries information. Fisheries resources, fishing, aquaculture, processing, marketing and socio-economics. Problems and solutions, agreement, organizations concerned in fisheries. Field trips.

**299112 Water Resources and Aquatic Ecosystem**  3(3-0)
Hydrological properties and cycle. Type, formation, evolution of water bodies and aquatic ecosystems. Important water bodies in Thailand. Utilization, management and conservation of water bodies for fisheries. Field trips.

**299211 Aquatic Invertebrates**  2(2-0)
Pre : 424112
Biology, taxonomy, habitat, ecological roles and potential utilization of aquatic invertebrates.

**299212 Laboratory in Aquatic Invertebrates**  1(0-3)
Pre : 299211
Laboratory experiments on fundamental biology, body compartments and basic taxonomic classification of aquatic invertebrates.

**299213 Algae and Aquatic Plants for Fisheries**  2(2-0)
Pre : 424112
General description, taxonomy, distribution, biology, ecology, ecological role of algae and aquatic plants pertinent of fisheries. Potential utilization.

**299214 Laboratory in Algae and Aquatic Plants for Fisheries**  1(0-3)
Pre : 299213
Laboratory experiments on classification of algae and aquatic plants pertinent to fisheries. Important taxonomic characteristics for identification.

**299215 Ichthyology**  3(3-0)
Pre : 424112
Morphology and anatomy of fishes, biology, life history ecology and taxonomic classification.

**299216 Laboratory in Ichthyology** 1(0-3)
Pre: 299215
Laboratory in morphology and anatomy of fishes and identification.

**299390 Cooperative Education Preparation** 1(1-0)

**299490 Cooperative Education** 6
On the job training as a temporary employee according to the assigned project including report writing and presentation.
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<tr>
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<tr>
<td>301111</td>
<td>Principles of Natural Resource Conservation</td>
<td>2</td>
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<td>301201</td>
<td>Resource and Environmental Conservation</td>
<td>3</td>
<td>(3-0)</td>
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<td>301411</td>
<td>Natural Resource Conservation Policy</td>
<td>2</td>
<td>(2-0)</td>
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<tr>
<td>301421</td>
<td>Principles of Watershed Management</td>
<td>3</td>
<td>(2-3)</td>
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<td>301422</td>
<td>Field Watershed Management</td>
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<td>301423</td>
<td>Applied Watershed Management</td>
<td>3</td>
<td>(2-3)</td>
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<tr>
<td>301424</td>
<td>Watershed Analysis</td>
<td>2</td>
<td>(1-3)</td>
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<tr>
<td>301461</td>
<td>Forest Hydrology</td>
<td>3</td>
<td>(2-3)</td>
</tr>
<tr>
<td>301462</td>
<td>Micrometeorology</td>
<td>3</td>
<td>(2-3)</td>
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Concept, principles and methods for the conservation of natural and man-made resources. Interrelationship of resources in their natural state. Current problems of management practices and utilization. Impact of the application of science and technology on resources and environment. Conservation per se and the national economic development. Field trip required.

An overview of national policy for the conservation of natural resources. Current problems of resource administration for social and economic needs. Frameworks for administrative policy formulation.


Field practices in the application of theory and principles of watershed management. Inventory of a watershed and analysis of data in order to initiate management recommendations. This course is offered during summer camp.


Inventory, data collection, and analysis of watershed area. Application of the system analysis method in determining the area’s multiple use management. Field trip required.

Principles and processes in hydrology. Measurement of evapotranspiration, water and soil losses, soil water, streamflow, and sedimentation. Effects of forest on hydrological characteristics.
Theory of radiation, absorbability, and transmissibility. Transfer of heat, temperature, atmospheric moisture, and wind near the ground and in the forest. Energy balance near the earth’s surface. Climate in vertical condition.

**301471 Principles of Land Use**  
2(1-3)  
Pre : 009111, 304331 or 304431  
Concepts and objectives of land use. Techniques in land use classification by aerial photo and remote sensing. Steps in land evaluation and land capability mapping. Field trip required.

**301472 Land Use Planning**  
3(2-3)  
Pre : 301471  
Definition and process of land use planning. Application of aerial photo, soil and geologic maps, and socioeconomic data to land use planning. Environmental impact assessment of land use. Future trend of land use planning.

**301481 Forest Environment Management**  
3(3-0)  
Principles of forest environment. The interrelationship of environmental components. Methods for assessing value of forest environment in order to guide management decision. Field trip required.

**301482 Environment Conservation Extension**  
3(3-0)  
Identification of target population or community for extension. Field trip required.

**301483 Forest Influence to Environment**  
3(3-0)  
Influence of forest on climate, soil, hydrology, environmental pollution control, wildlife management and living of man in the ecosystem. Assessment and use of forest in mitigation environmental impacts from development projects. Field trip required.

**301491 Research Methods in Conservation**  
2(2-0)  
Planning and process of research. Methods of presenting research results. Research topics and projects in conservation and environment.

**301496 Selected Topics in Conservation**  
1-3  
Interesting topics in conservation. Topics change for each semester.

**301497 Seminar**  
1  
Seminar and presentation of topics in conservation

**301498 Special Problems**  
1-3  
Independent studies in conservation at the undergraduate level. Report is required.

**FORESTRY BIOLOGY**  
(302XXX)

**302111 Dendrology**  
2(1-2)  
Technical terms used in tree description; systematic relationships and identification of tree species using leaves, flowers and twigs; distribution and economic significance of the trees in Thailand.

**302112 Field Dendrology I**  
1  
Pre : 302111  
The major tree species representative of each forest type of Thailand, with practical experience in collecting identifying and preserving botanical material. This course is offered during summer camp.
302221  Forest Ecology 2(2-0)
   Relationship between organisms and their environments, ecological structure and dynamics of biotic communities, ecosystem components, energy flow and nutrient cycling, limiting factors, dynamics and development of forest ecosystems.

302222  Field Forest Ecology 1
   Pre : 302221
   Field study and practical experience in forest ecology. This course is offered during summer camp.

302313  Field Dendrology II 1
   Pre : 302112
   Major tree species representative of each forest type of Thailand, with practical experience in collecting, identifying and preserving botanical materials. This course is offered during summer camp.

302331  Forest Entomology 2(1-3)
   Pre : 423113
   Morphology, classification, file history and habit of insects injurious to forest trees. Principles of forest insect control. Field trip required.

302332  Forest Pathology 2(1-3)
   Pre : 302111
   Principles of forest pathology. Important diseases affecting trees in natural forest and forest plantations. Symptomatology, classification, prevention and control of diseases. Field trip required.

302341  Wildlife Biology and Management 3(2-3)
   Principles of wildlife biology, adaptations to survive in various environmental conditions, reproductive processes natural section, behavioral development and energy requirement. Principles of management, practices and problems in habitat, population and status of wildlife management in Thailand.

302342  Introduction to Wildlife Management 2(2-0)

302411  Field Forest Biology 1
   Field study and practical experience in forest ecology, including forest plant identification, forest pests, and distribution and behavior of wild animals. This course is offered during summer camp.

302412  Forest Plants Systematics 3(2-3)
   Principles of forest plant classification. Nomenclature and identification of forest plants. Field trip required.

302413  Medicinal Plants 3(3-0)
   Pre : 302412
   Morphology, anatomy and distribution of essential medicinal plants. Plant parts and chemical constituents used for traditional medicine and scientific medicine.

302421  Ecology of Tropical Forest 2(2-0)
   Ecology of major tropical forest communities. Application of ecological principles to utilization and management. Field trip required.

302422  Biodiversity Conservation 2(2-0)
   Pre : 302221
Biodiversity concepts at various levels. Genetic diversity, species diversity, ecosystem diversity. Methods for biodiversity estimation, values and conservation, of biological resources.

302431  **Insect Pests of Forest Trees and Products**  
Pre : 302331 or 015241
Classification of insect pests of forest trees and forest products, abundance and importance, types and damages, environmental factors, inventory, prevention and control, species and life history of insect pests of forest trees and forest products. Field trip required.

302432  **Management and Conservation of Butterflies**  
Pre : 302331
Origin and evolution, importance, morphology, growth and metamorphosis, biology and ecology, defenses, study and surveys, identification and abundance, environmental factors, roles on ecosystem, management and conservation, butterfly farming and utilization. Field trip required.

302433  **Forest Products Pathology**  
Pre : 302332
Defects of logs and sawn timber control, with emphasis on wood durability, lumber discoloration and decay of forest products.

302434  **Myrmecology**  
Pre : 302331 or 015241
Evolution, abundance, importance, biology, ecology, behavior, communication, survey, preservation, identification in Thailand, symbiosis between ants and other organisms, ant groups, and application of myrmecology. Field trip required.

302440  **Field Wildlife and Range Science**  
Pre : 302221
Field practices on wildlife resource and range studies, wildlife survey and census, range production estimation, field wildlife identification, grass identification and wildlife and range management techniques in the field. This course is offer during summer semester.

302441  **Forest Ornithology**  
Pre : 302341
Structure, identification, distribution, behavior and habits of significant birds of Thailand. Roles of birds to forestry and agriculture. Field trip required.

302442  **Forest Mammalogy**  
Pre : 302341
Structure, identification, distribution, behavior and habit of significant mammals. Values of mammals to forestry and agriculture. Field trip is required.

302443  **Wildlife Ecology**  
Pre : 302443
Environment at species, population and community levels. Influence of environmental factors on wild animals and their behavior. Roles of wild animals on the ecosystem and their socio-economic importance.

302444  **Techniques in Wildlife Studies**  
Pre : 302443
Techniques in wildlife research. Determination of species, age, sex and habitat of wild animals. Collection and analysis of data. Field trip required.

302445  **Principles of Wildlife Management**  
Pre : 302342
Scope, objectives, and benefits of wildlife management. Current problems and appropriate practices for the well-being of wildlife. National policy of wildlife management in order to serve social and economic need.

302446  Ecology and Conservation of Wildlife in Tropics 3(3-0)
Pre : 302341
Environmental factors of wildlife habitats in tropical zone especially on the terrestrial habitats. Various types of wild animals, adaptation to occupy each kind of forest type, seasonal adaptation and their special needs, decimating factors, wildlife habitats and population conservation techniques. Field trips required.

302447  Wildlife Management Techniques 3(2-3)
Pre : 302341
Techniques for inventory of wildlife species, populations, and habitats. Data processing and tools for wildlife management. Field trip required.

302448  Wildlife Law and International Conventions 3(3-0)
Pre : 302441 or 302341
History and present wildlife laws in various developing countries, wildlife laws of Thailand, the Wildlife Preservation and Protection Act 2535 B.E., sub-articles, Ministry Rules and Royal Forest Department Regulations. Other acts concerning with wildlife resources and international conventions such as Biodiversity Convention, CITES, and Ramsar Convention.

302451  Anatomy of Trees 3(2-3)
Pre : 401114
Structure, component, function, growth and development of parts trees and other forest plants. Techniques in the study of cells, tissues and organs.

302452  Physiology of Trees 3(2-3)
Pre : 401114
Function, internal conditions and physiological processes of forest trees.

302453  Physiology of Forest Tree Seedling 3(2-3)
Pre : 401114
Application of the principles of plant physiology to promote the establishment, growth and development of forest tree seedlings. The management of the related factors suitable for producing mass of forest tree seedling, applying the chemicals to promote and retard growth, effect of media and container on growth and the quality of seedlings. Physiology of microorganism in promoting growth or damaging the seedlings, control methods for pest and diseases in the nursery.

302454  Forest Genetics 3(2-3)
Pre : 401114
Principles of heredity. Application of forest genetics to species and provinance trials and to forest tree improvement.

302472  Biotechnology for Forest Tree Seedling Production 3(2-3)
Application of biotechnology, tissue culture techniques for producing good quality, faster growth, more tolerance and high survival rate of forest tree seedlings when planting under stress conditions. Management for mass seedling production in commercial scale.

302482  Range Science 2(2-0)
Characteristics and type of rangeland. Morphological and physiological characteristics of range plants. Inventory and assessment of range and forage resources value. Optimum multi-purpose use of rangeland.

302483  Range Ecology 3(3-0)
Environmental components and limiting factors of range ecosystem. The interrelationship of plant animal and environment in range ecosystems. Rangeland succession, range condition and trend. Animal species and population dynamics. Ecological response due to animal grazing.

302485 **Principles of Range Management**

Pre : 302482

Theory and principles of rangeland management. Management of plants and animals in a range ecosystem. Improvement and development of range resource. Guidelines for rangeland management in Thailand on the development of unproductive forest and open woodland for livestock production along with other products.

302486 **Range Utilization**

Pre : 302482

Principles of range utilization. Quality of herbage and range nutrition. Grazing systems and common use by different species of animal. Grazing capacity guidelines for development of abandoned areas for grazing.

302491 **Research Methods in Forest Biology**

Pre : 302482

Principles and methods of research in forest biology.

302496 **Selected Topics in Forest Biology**

Interesting topics related to forest biology. Topic changes for each semester.

302497 **Seminar**

Seminar and presentation of topics in forest biology.

302498 **Special Problems**

Independent studies in forest biology at the undergraduate level. Report is required.

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**FOREST ENGINEERING**

*(303XXX)*

303111 **Technical Drawing in Forestry**

Applied geometry, orthographic drawing, pictorial drawing, auxiliaries, sectioning, dimension drawing of simple structures and constructions in forestry.

303221 **Forest Surveying I**

Distance measurement, chain surveying, leveling, contouring, angle and direction measurement staid surveying, traverse, plane tabling, surveying and mapping for forestry.

303222 **Forest Surveying Practice**

Pre : 303221

Field practice in traversing, leveling, contouring and mapping. This course is offered during summer camp.

303311 **General Forest Engineering**

Pre : 420119 and 303221

Building materials, timber engineering, construction of simple structured buildings, construction of forest roads and bridges, minor engineering works in forestry.

303321 **Forest Surveying II**

Pre : 303221

Errors and adjustments, traverse, triangulation, determination of meridian, precise leveling, route location survey, curves and earthworks.
303331  Soil Engineering in Forestry  
Pre : 420119 and 009111  
Necessary soil engineering background required in logging road design and forest engineering work planning. Basic laboratory and field testing procedures to predict soil engineering condition. Soil survey and site investigation for forest construction works.

30332  Forest Road Engineering  
Pre : 303222  
Forest road classification, route location, geometric design of roads, road-making materials, pavement design, road drainage structures, earthwork, cost estimation, road construction, special works, maintenance.

30333  Field Forest Road Engineering  
Pre : 30332  
Practices on route location, geometric design of forest roads, curves, earthwork, cost estimation, This course is offered during summer camp.

303341  Logging  
Pre : 303361  
Introduction to logging, techniques and equipment used in felling and bucking, terrain transportation, long distance transportation safety and ergonomics in logging

303342  Field Logging I  
Pre : 303361  
Field practice in felling, bucking, animal skidding, power skidding, truck hauling and maintenance of logging machines.

303361  Forest Machinery I  
Basic knowledge of machinery applied to forest operations, principles of benzene and diesel engines, power transmission system, steering and braking system, hydraulic system, machine maintenance.

303421  Principle of Geographic Information System  
Pre : 303421  
Principles of Geographic Information System (GIS) components of GIS, data structure, data management, data management, data analysis and spatial modeling, GIS hardware and software. application of GIS in planning and management of natural resources.

303422  Applied Geographic Information System in Forest Engineering  
Pre : 303421  
Application of GIS in logging area analysis, planning of optimum logging area, selection of optimum landing, skidding distance, optimum forest road density, forest road network, planning, and modeling.

303431  Soil Erosion Control Engineering  
Pre : 301421 and 303331  
Application of basic engineering theories and principles of watershed management to analysis and design of simple engineering structure for soil erosion control in forest areas using local materials.

303441  Logging Transportation  
Pre : 303342  
Modes of logging transportation, human power skidding, animal skidding, skidding by farm tractor, skidders and crawler tractor, road transportation, rail transportation, water transportation, choices of appropriate transportation methods, cost calculation of transportation.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>303442</td>
<td>Field Logging II</td>
<td>1</td>
<td>Field practices in time studies and cost calculation of felling bucking, animal skidding, power skidding and truck hauling.</td>
</tr>
<tr>
<td>303443</td>
<td>Ergonomics in Forestry</td>
<td>3(2-3)</td>
<td>Health and nutrition in forestry works, workload and rest pauses, vibration, noise, safety in forestry work, working methods and productivities, labour legislation.</td>
</tr>
<tr>
<td>303444</td>
<td>Logging Plan</td>
<td>2(2-0)</td>
<td>Logging systems, selection of logging systems, factors affecting selection of logging systems, selection of logging equipment, production estimates and cost calculation of logging operations, impact of logging on environment, case studies.</td>
</tr>
<tr>
<td>303445</td>
<td>Logging Production Planning and Control</td>
<td>3(3-0)</td>
<td>Standards preparing in logging, factors affecting production and costs in logging, production planning and control in logging, machinery replacement and machine rates, inventory control.</td>
</tr>
<tr>
<td>303446</td>
<td>Forest Plantation Harvesting Analysis</td>
<td>3(2-3)</td>
<td>Collection of necessary data for forest plantation harvesting, business economics analysis of forest plantation, Principle’s of Linear Programming, operation of planning, harvesting schedule, cost tracking calculation, evaluation of forest plantation harvesting, case study.</td>
</tr>
<tr>
<td>303447</td>
<td>Forest Work Study</td>
<td>3(2-3)</td>
<td>Worker and physical working, physiology of work, work load, workplace, noise and vibration problems in forestry, work study and time study in forestry, forest work accidents.</td>
</tr>
<tr>
<td>303451</td>
<td>Computer Applications in Forestry</td>
<td>3(2-3)</td>
<td>Algorithms, flowcharts, basic programming concepts, typical examples in computer programming, problem solving with microcomputer in forestry.</td>
</tr>
<tr>
<td>303461</td>
<td>Forest Machinery II</td>
<td>3(2-3)</td>
<td>Machines and their accessories used in forest operations, productivity and cost calculation of forest machines, evaluation of machine efficiency and maintenance.</td>
</tr>
<tr>
<td>303491</td>
<td>Research Methods in Forest Engineering</td>
<td>2(2-0)</td>
<td>Principles and method of research in forest engineering.</td>
</tr>
<tr>
<td>303496</td>
<td>Selected Topics in Forest Engineering</td>
<td>1-3</td>
<td>Interesting topics in forest engineering. Topic changes for each semester.</td>
</tr>
<tr>
<td>303497</td>
<td>Seminar</td>
<td>1</td>
<td>Seminar and presentation of topics in forest engineering.</td>
</tr>
<tr>
<td>303498</td>
<td>Special Problems</td>
<td>1-3</td>
<td>Independent studies in forest engineering at the undergraduate level. Report is required.</td>
</tr>
</tbody>
</table>
### FOREST MANAGEMENT

**(304XXX)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>304111</td>
<td>Introduction to Forestry</td>
<td>2(2-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>General forestry, history and development of the subject. Aims and objectives of forestry. Forest and general land use including their interrelationship.</td>
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<tr>
<td>304112</td>
<td>Field Forestry</td>
<td>1</td>
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<tr>
<td></td>
<td>Pre : 304111</td>
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<tr>
<td></td>
<td>Field studies in general forestry. Direct and indirect benefits of forest resources in terms of commodities, services, and other social and cultural benefits. Management and protection of forest resources. This course is offered during summer camp.</td>
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<tr>
<td>304221</td>
<td>Forest Mensuration I</td>
<td>1</td>
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<tr>
<td></td>
<td>Use of various instruments in the measurement of logs, converted timber and fuel wood; measurement of individual trees and forest stands. Volume measurement of stems and measurement of trees for the compilation of volume tables. This course is offered during summer camp.</td>
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</tr>
<tr>
<td>304321</td>
<td>Forest Mensuration II</td>
<td>2(1-3)</td>
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<tr>
<td></td>
<td>Pre : 304221</td>
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<tr>
<td></td>
<td>Principles and practice of forest mensuration. Preparation of converted timber tables from log data; stand tables; and taper tables. Measuring and estimating increment and production of timber stands; factors affecting increment of trees, increment of trees in size and form.</td>
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<tr>
<td>304331</td>
<td>Photogrammetry and Photo-Interpretation</td>
<td>3(2-3)</td>
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</tr>
<tr>
<td></td>
<td>Principles and practice of aerial photogrammetry and aerial photo-interpretation. Use of aerial photos in compilation of forest maps, in measurement of trees and forest stands, in estimating diameters and volumes, in forest inventory, in the control of field inventory, and in forest management.</td>
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<tr>
<td>304351</td>
<td>Natural Resource Sampling Methods</td>
<td>2(2-0)</td>
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<tr>
<td></td>
<td>Pre : 422111</td>
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<tr>
<td></td>
<td>Forest survey and sampling techniques employed in natural resources management. Analysis and interpretation of the data.</td>
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<tr>
<td>304352</td>
<td>Field Forest Resource Inventory I</td>
<td>1</td>
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<tr>
<td></td>
<td>Pre : 304351</td>
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<tr>
<td></td>
<td>Practice in forest inventory for the compilation of forest management plans; using principles already studied; field work planning; gathering of information and statistics in the field; compilation of data and final report. This course is offered during summer camp.</td>
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<tr>
<td>304353</td>
<td>Field Forest Resource Inventory II</td>
<td>1</td>
<td></td>
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<tr>
<td></td>
<td>Pre : 304351</td>
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<tr>
<td></td>
<td>Practice in forest inventory. This course is offered during summer camp.</td>
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<tr>
<td>304411</td>
<td>Principles of Forest Management</td>
<td>2(2-0)</td>
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<tr>
<td></td>
<td>Meaning, objective and limit of forest management, sites, yield and yield tables, increment, regression of yield, determination of cut and rotation, organization and the management of forests.</td>
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<tr>
<td>304412</td>
<td>Natural Resource Policy</td>
<td>2(2-0)</td>
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<tr>
<td></td>
<td>Evaluation of forest and related natural resources policy. Policy formulation and execution of the policy.</td>
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<tr>
<td>304413</td>
<td>Forest Working Plan</td>
<td>2(2-0)</td>
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<tr>
<td></td>
<td>Pre : 304352</td>
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</tbody>
</table>
Compilation of forest working plans; description of terrain and local conditions; consideration from the ecological and economic viewpoints. Regulations for future management, control of yield operation plan, revision of plan.

304414  Forest Law and Administration  
Important forest laws and problems in forest-related laws. Principles of forest administration, related rules and regulations.

304421  Forest Biometry  
Pre : 422111
Use of statistics and mathematics-in forestry and forest research.

304431  Principles of Remote Sensing  
Principles and methods of satellite imagery interpretation for use as guidelines in resource management, mapping measurement and analysis of environment and topography including soils, water, air, minerals and plants.

304432  Instrumentation in Photogrammetry and Photo-Interpretation  

304433  Land Use Cartography  
Principles of mapping land uses: grid system, map projection, scaling, legend, map production and revision.

304441  Forest Resource Economics  
Pre : 102181
Application of economic principles in the analysis of forestry economic problems. Demand, supply and price of timber and other forest products. Economic theories and analysis of forest products and conservation.

304442  Forest Valuation  
Pre : 102181
Objectives and economic principles in forest management. Valuation of forest lands, growing stock and stands, including various types of damage, Appraisal of stumpage, standing timber, logs and lumber. Interest and investment, applications of compounding and discounting formular in forest business.

304445  Forest Marketing  
Role of marketing in forest development, principles of marketings, analyzing marketing problem, wood and non-wood forest products, forest industries; demand and supply for forest produces, marketing mix strategy of forest produces, forest marketing researches, control and evaluation of marketing performance.

304446  Forest Business Management  
Forest business management, production, marketing and finance in forest business. human resources management, uncertainty and risk in forest business.

304461  Public Relations in Natural Resource Management  
Principles and methods in public relations to enhance awareness of the public regarding natural resources management.

304491  Research Methods in Forest Management  
Principles and methods of research in forest Management.

304496  Selected Topics in Forest Management  
Interesting topics in forest management. Topic changes for each semester.

304497  Seminar  
Seminar and presentation of topics in forest management.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>304498</td>
<td>Special Problems</td>
<td>1-3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Independent studies in forest management at the undergraduate level. Report is required.</td>
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<tr>
<td><strong>FOREST PRODUCTS</strong> (305XXX)</td>
<td></td>
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<tr>
<td>305111</td>
<td>Anatomy and Identification of Wood</td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>An anatomy of tree, wood, cell and tissues in the tree and wood. The use of hand lens for wood identify, including the related structure of mark, properties and wood utilization.</td>
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<tr>
<td>305112</td>
<td>Wood Technical Drawing</td>
<td>2(1-3)</td>
<td></td>
</tr>
<tr>
<td>305322</td>
<td>Harvesting and Utilization of Forest Products</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Principle and methods in harvesting, wood processing, productions and basic knowledge concerning industry using forest products for raw materials.</td>
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<tr>
<td>305323</td>
<td>Wood Products Deterioration</td>
<td>3(2-3)</td>
<td>305111</td>
</tr>
<tr>
<td>305331</td>
<td>Chemical Properties of Wood</td>
<td>3(3-0)</td>
<td>403221</td>
</tr>
<tr>
<td></td>
<td>Structure and properties of cellulose, hemicellulose, lignin and cellulose derivatives. Wood extractives. Distribution of cell wall components. chemical utilization of wood.</td>
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<tr>
<td>305333</td>
<td>Adhesives and Theory of Adhesion</td>
<td>3(3-0)</td>
<td>403221</td>
</tr>
<tr>
<td></td>
<td>The adhesion theory of adhesives, effect of the adhesives adhesion due to the property and component of the wood include the processing of various adhesives Moreover, the course include the property, chemical reaction of synthesis adhesives, synthesis adhesives process, synthesis reaction control, quality of adhesive property, investigation of the adhesives for the wood industry and other, Field trip required.</td>
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<tr>
<td>305351</td>
<td>Physical Properties of Wood</td>
<td>3(2-3)</td>
<td>420112</td>
</tr>
<tr>
<td></td>
<td>Basic property of wood concern the moisture, heat, electricity, the flow of fluids, heat and water vapor of wood. The relationship among the physical property and other properties include the wood structure.</td>
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<tr>
<td>305352</td>
<td>Mechanical Properties of Wood</td>
<td>3(2-3)</td>
<td>420112</td>
</tr>
<tr>
<td></td>
<td>Mechanical behavior of wood, factors affecting the strength of wood, standard method of mechanical property test, the basic stress and working stress of wood.</td>
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<tr>
<td>305353</td>
<td>Design and Manufacturing of Wood Furniture</td>
<td>3(2-3)</td>
<td>305352</td>
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<tr>
<td></td>
<td>Pre : 305352</td>
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</tbody>
</table>
Principles of esthetic, functional and strength design of furniture. Drafting of
furniture structures. Types of wood furniture. Materials for furniture manufacturing.
Manufacturing processes and machines. Design of industrial production systems and plant
layout. Quality inspections and performance testing.

305371 Wood Machining Processes 3(2-3)
The primary of log processing and, industry wood processing, lumber grading,
principle of processing and finishing. The use and maintenance of processing and finishing
machines. Field trip required.

305372 Wood Drying Technology 3(2-3)
Pre : 305351
Wood properties in general construction, the relationship between the wood and
the fluid. Determining of moisture, shrinkage, stresses and degradation of timber. Principle
of wood drying, wood seasoning, instrument and kiln drying, drying schedule. Field trip
required.

305373 Wood Finishing 3(2-3)
Pre : 305351
Chemical and physical properties of coating materials, proving test and property
test, processing in coating of wood and wood-based products. Field trip required.

305422 Wood Products Quality Protection 2(1-3)
Pre : 305323
Preservation chemicals. Various processes for improving durability of wood and wood
products. Economic importance aspect of wood preservation. Practical preservation. Health
safety and the environment.

305441 Quality and Production Control in Wood Industries 3(3-0)
Pre : 206221
Application of statistical methods in controlling quality in manufacturing
processes of wood industries and wood component of products.

305442 Wood Processing Models 3(3-0)
Application of digital computers to analysis of feasibility judgements in
industrial development, with reference to raw material supply, markets, transportation, and
labor supply.

305443 Operations Research in Production Management 3(3-0)
Pre : 417168
Application of operations research in production planning, scheduling and
inventory control in wood using industries.

305444 Manufacturing Management in Wood Industries 3(3-0)
Production management, production activity analysis and the increasing efficient
production in wood industry.

305445 Ergonomics in Wood Industries 3(3-0)
Ergonomic problems in wood industries, the level of noise, factory health care
and ventilation, accident and risk in physical work.

305446 Wood Products Marketing 3(3-0)
Basic knowledge of marketing, marketing management and wood products
marketing, philosophy or ideology of marketing management, marketing strategies, wood
market institution, marketing research, policy of the products, planning and forecasting.

305451 Structural Engineering of Tropical Wood 3(2-3)
Pre : 305352
Basic principles in the structural engineering theories application for the analysis and the design of structures built with tropical wood, various design serve the compression, tension, bending, the joint design, simple building design include technology in employing glued-laminated lumber for construction.

**305452  Structural Engineering of Tropical Wood II**  
Pre : 305451  
3(3-0)  
Applications of structural-engineering theories to the analysis and design of some complicated structures built with tropical woods, such as plate structures, shell structures, timber bridges, structures in packaging and materials handling, and furniture design.

**305461  Practice in Wood Industries**  
2(0-6)  
Practice in industries using wood for raw material.

**305472  Plywood and Laminated Wood**  
Pre : 305331 and 305352  
3(2-3)  
Manufacture of veneer, plywood, laminated wood and related products, with emphasis on adhesives used; principles of glued wood construction; properties, characteristics and used of glued products, equipment and plant layout.

**305473  Manufacture and Properties of Particleboard**  
Pre : 305331 and 305352  
3(2-3)  
Classification of particleboards. Types, properties and characteristics of raw materials. Production machinery, manufacturing processes and plant layouts. Product properties and uses. Its sale and distribution. The importance of this industry from the standpoints of economy and forest resource conservation. Field trip required.

**305474  Manufacture and Properties of Fiberboard and Mineral-Bonded Composite Products**  
Pre : 305352  
3(2-3)  
Classification of fiberboard and mineral-bonded composite products. Types, properties and characteristics of raw materials. Production machinery, manufacturing processes and plant layouts. Product properties and uses. Its sale and distribution. The importance of this industry from the standpoints of economy and forest resource conservation. Field trip required.

**305481  Instrumentation in Wood Science and Technology**  
Pre : 420112  
3(2-3)  
Theories, design and uses of various types of electrical and electronic instruments, emphasizing applications in wood science and technology.

**305491  Basic Research Methods in Wood Science and Technology**  
2(2-0)  
Principles and methods in wood science and technology research, identification of research problems, formulation of research objectives and hypotheses, collection of data, construction of questionnaire, data analysis and interpretation, application of statistics for research, report writing and presentation.

**305496  Selected Topics in Wood Science and Technology**  
1-3  
Selected topics in wood science and technology at the bachelor’s degree level. Topics are subject to change each semester.

**305497  Seminar**  
1  
Presentation and discussion on current interesting topic in wood science and technology at the bachelor’s degree level.

**305498  Special Problems**  
1-3  
Study and research in wood science and technology at the bachelor’s degree level and compiled into a written report.
SILVICULTURE
(306XXX)

306111 Silvics 2(2-0)
Environmental factors and their effects on forest vegetation. Silvical characteristics, reproduction, growth and development. Interrelationships between genetic, physiological, and environmental factors.

306221 Forest Plantation 2(2-0)
Pre : 306111
History of forest plantation. Seedling production and nursery management. Planting, tending, and evaluation of man-made forests.

306222 Field Silviculture I 1
Pre : 306221
Field works in nursery and plantation techniques. This course is offered during summer camp.

306311 Silvicultural Systems 2(2-0)
Pre : 306111
Theory and techniques of silvicultural system, methods of reproduction cutting and intermediate cutting. The treatments of stands for forest management and wood utilization purposes.

306421 Field Silviculture II 1
Pre : 306222
Field work on practical silviculture in plantations of various forest organizations and government agencies. This course is offered during summer camp.

306422 Forest Tree Seeds 2(1-3)
Pre : 306222
Biology of forest tree seed. Seed technology and techniques of seed and seeding production.

306423 Urban Silviculture 2(2-0)
Choice of species, techniques in planting and maintenance of trees in public areas for amenity purpose.

306431 Forest Protection 2(2-0)
Effects of biological, physical, and chemical injuries on forest resources. Methods of control and protection.

306432 Introduction to Forest Fire 2(2-0)
Importance and definition of forest fire, characteristics of forest fire, forest fire behavior, fire and ecology, classification of forest fuel, fire danger rating, prevention of forest fire, organization and management of forest fire control system, use of fire in forest land management.

306441 Forest Soils 3(2-3)
Pre : 015261
Physical, chemical and biological properties of forest soils. Interrelationships between forest soils and tree growth. Field trips required.

306442 Forest Tree Nutrition 2(2-0)
Pre : 015261
Sources, roles, and cycling of mineral nutrition influencing tree growth. Diagnosis and improvement of forest soil fertility.
<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>306491</td>
<td>Research Methods in Silviculture</td>
<td>2(2-0)</td>
</tr>
<tr>
<td></td>
<td>Principles and methodology of research in silviculture.</td>
<td></td>
</tr>
<tr>
<td>306496</td>
<td>Selected Topics in Silviculture</td>
<td>1-3</td>
</tr>
<tr>
<td></td>
<td>Interesting topics in silviculture. Topic changes for each semester.</td>
<td></td>
</tr>
<tr>
<td>306497</td>
<td>Seminar</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Seminar and presentation of topics in silviculture.</td>
<td></td>
</tr>
<tr>
<td>306498</td>
<td>Special Problems</td>
<td>1-3</td>
</tr>
<tr>
<td></td>
<td>Independent studies in silviculture at undergraduate level. Report is required.</td>
<td></td>
</tr>
</tbody>
</table>

**SOCIAL FORESTRY**

*(307XXX)*

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>307311</td>
<td>Introduction to Social Forestry</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>History and role of forestry in the Thai economy; forestry in land use planning and rural development; community forestry production systems, tree species of special importance in social forestry, small-scale forest industries and rural development, forestry extension in rural communities, Case studies.</td>
<td></td>
</tr>
<tr>
<td>307312</td>
<td>Field Social Forestry I</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Introduction to consumption studies and social surveys in rural communities; field studies in land use planning and forest village settlement. This courses is offered during summer camp.</td>
<td></td>
</tr>
<tr>
<td>307313</td>
<td>Field Social Forestry II</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Applied biology of intercropping; practical field study of agroforestry systems; field trials demonstrations. This course is offered during summer camp.</td>
<td></td>
</tr>
<tr>
<td>307421</td>
<td>Principles of Agroforestry</td>
<td>2(2-0)</td>
</tr>
<tr>
<td></td>
<td>Concepts of land-use systems and agroforestry. Evolution of cash crops, animals, and forest crops. Socio-economic aspects of multiple land-use systems.</td>
<td></td>
</tr>
<tr>
<td>307422</td>
<td>Agricultural Components of Social Forestry</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 307421</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Husbandry and ecology of annual and perennial crops intercropped with forest trees in agroforestry systems. Study of selected smallholder enterprises based on livestock, fish and insect species. Culture and production of minor forest products as raw materials for forest-based cottage industries.</td>
<td></td>
</tr>
<tr>
<td>307423</td>
<td>Applied Agroforestry</td>
<td>3(2-3)</td>
</tr>
<tr>
<td></td>
<td>Pre : 307421</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Intercropping and grazing in agroforestry, factors dealing with the management of woody perennials and annual crops, including grazing. The eco-physiological relationships of mixed plant communities and the effects of agroforestry on the environment. Field trip required.</td>
<td></td>
</tr>
<tr>
<td>307424</td>
<td>Management of Agroforestry</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 307421</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Modeling, quantitative analysis, and evaluation of agroforestry practices aiming to maximize land use on the bases of ecological and socioeconomic aspects.</td>
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<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
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<tr>
<td>307431</td>
<td>Forestry Extension</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Institutional aspects of extension in rural development; forestry as a factor in social change; planning and execution of forestry extension and mass-communication programs; application of extension principles to social forestry, conservation and recreation in Thailand.</td>
<td></td>
</tr>
<tr>
<td>307441</td>
<td>Economic Analysis of Social Forestry Projects</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 102181, 307312 and 307313</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Formulation of social forestry projects. Identification of project costs and benefits. Financial and economic aspects of project analysis. Project evaluation by comparing project costs and benefits and applying discounted measures of project worth. Case studies.</td>
<td></td>
</tr>
<tr>
<td>307451</td>
<td>Small-scale Forest Products Industries</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Principles of processing technology applied to small-scale forest products industries; raw materials, types of products and forest products industries in Thailand; principles of investment planning and wood machining technology; forest products for construction, furniture, packaging, sports goods and musical instruments, wood crafts and other product, production of charcoal, gums, resins soil conditioner and other products.</td>
<td></td>
</tr>
<tr>
<td>307491</td>
<td>Research Methods in Social Forestry</td>
<td>2(2-0)</td>
</tr>
<tr>
<td></td>
<td>Principles and methods of research in social forestry.</td>
<td></td>
</tr>
<tr>
<td>307496</td>
<td>Selected Topics in Social Forestry</td>
<td>1-3</td>
</tr>
<tr>
<td></td>
<td>Interesting topics in social forestry. Topic changes for each semester.</td>
<td></td>
</tr>
<tr>
<td>307497</td>
<td>Seminar</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Seminar and presentation of topics in social forestry.</td>
<td></td>
</tr>
<tr>
<td>307498</td>
<td>Special Problems</td>
<td>1-3</td>
</tr>
<tr>
<td></td>
<td>Independent studies in social forestry at the undergraduate level. Report is required.</td>
<td></td>
</tr>
</tbody>
</table>

**PARKS AND RECREATION (308XXX)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>308311</td>
<td>Introduction to Outdoor Recreation</td>
<td>2(2-0)</td>
</tr>
<tr>
<td>308312</td>
<td>Recreation Behavior</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 308311</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Relationships between social-psychological factors and use of leisure and participation in recreation activities; Principles of and methodology for recreation behavior studies.</td>
<td></td>
</tr>
<tr>
<td>308321</td>
<td>Landscape Analysis and Design</td>
<td>3(2-3)</td>
</tr>
<tr>
<td></td>
<td>Pre: 308311</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Basic concepts and approaches in landscape analysis and design for park and recreation area development and use.</td>
<td></td>
</tr>
</tbody>
</table>
Data collection and inventory of recreation resources and current problems in recreation area management in the areas such as a city park, arboretum, botanical garden, forest park, national park, and other recreational and resort areas. This course is offered during summer semester.

Basic concepts, planning process and vital planning techniques, monitoring and evaluation, constraints affecting planning of parks and recreation areas. Field trip required.

Principles of site design for facility development in parks and recreation areas, including site and human behavior analysis affecting site design

Concepts and process of ecotourism management planning; Examining user behaviors and their needs, resources needed, marketing strategy, local participation and income distribution.

Structure and elements of park and recreation area management. Critical analysis of current problems in management. Policy and administrative recommendations for park and recreation areas. Field trip required.

Analysis and assessment of policies, laws, and regulations concerning uses of recreation resources and administration of parks and recreation areas.

Concepts and techniques of natural resources and environmental interpretation. Interpretive program and media selection to suit the natural setting and visitor groups in park and other outdoor areas.

Process and methods for conducting research in parks management and recreation, problem analysis, planning and design, data collection, analysis, interpretation, and scientific report presentation.

Interesting topics in parks and recreation. Topic changes for each semester.

Seminar and presentation of topics in parks and recreation.

Independent studies in parks and recreation at under graduate level. Report is required.
## PULP AND PAPER TECHNOLOGY
### (310XXX)

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Pre-Requisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>310211</td>
<td>Introduction to Pulp and Paper Technology</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td>310231</td>
<td>Wood Chemistry</td>
<td>3(3-0)</td>
<td>Pre : 403221</td>
</tr>
<tr>
<td></td>
<td>Structure and chemical properties of cellulose, hemicellulose, lignin and extractive of wood. Distribution of cell wall components. Reaction mechanism between wood chemical composition and pulping chemical. Industry of wood chemical utilization.</td>
<td></td>
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</tr>
<tr>
<td>310341</td>
<td>Pulping and Bleaching Technology</td>
<td>4(3-3)</td>
<td>Pre : 310211</td>
</tr>
<tr>
<td></td>
<td>Preparation of raw materials for pulping and bleaching. Chemical and mechanism of reactions in pulping and bleaching. Pulp properties and their application. By-products and chemical recovery in pulping and bleaching. Field trips required</td>
<td></td>
<td></td>
</tr>
<tr>
<td>310351</td>
<td>Stock Preparation and Papermaking</td>
<td>4(3-3)</td>
<td>Pre : 310341</td>
</tr>
<tr>
<td>310411</td>
<td>Pulp and Paper Production Management</td>
<td>3(3-0)</td>
<td>Pre : 310351</td>
</tr>
<tr>
<td></td>
<td>Planning for establishment and management of pulp and paper mills, management of products, processes, raw materials, manpowers, quality, finance and marketing. Field trips required.</td>
<td></td>
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</tr>
<tr>
<td>310412</td>
<td>Pulp and Paper Unit Operations</td>
<td>3(1-4)</td>
<td>Pre : 202311</td>
</tr>
<tr>
<td></td>
<td>Engineering units for pulp and paper industry; pulp and paper processes; calculations of raw materials, chemicals, water, energy and costs of pulp productions; chemical recovery; pulp bleaching and paper production; expenses for control and treatments of pollution. Field trips required.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>310421</td>
<td>Paper Structure and Properties</td>
<td>3(3-0)</td>
<td>Pre : 420112</td>
</tr>
<tr>
<td></td>
<td>Formation of paper, internal and surface strength, mechanical properties.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>310451</td>
<td>Operation of Fourdrinier Paper Machine</td>
<td>3(3-0)</td>
<td>Pre : 310351</td>
</tr>
<tr>
<td></td>
<td>Main separate sections of the Fourdrinier paper machine and their function in paper manufacturing. Operation aspects and various factors affecting paper qualities. Production control in paper manufacturing. Field trips required.</td>
<td></td>
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</tr>
<tr>
<td>310461</td>
<td>Paper Coating</td>
<td>3(2-3)</td>
<td>Pre : 310351</td>
</tr>
<tr>
<td></td>
<td>Coating materials, coating equipment and their applications.</td>
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<td></td>
</tr>
<tr>
<td>310462</td>
<td>Paper Printing Technology</td>
<td>3(3-0)</td>
<td>Pre : 310351</td>
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</tbody>
</table>
Printing processes, platemaking, specialty printing, printing ink properties and
types, printing ink transfer on paper and paper properties required for printing. Field trips
required.

310463  Industrial Technology of Wood Cellulose  3(3-0)
Pre : 310341
Production and properties of dissolving pulp, cellulose modifying processes
and utilizations. Field trips required.

310471  Introduction to Biotechnology in Pulp and Paper Manufacture  3(3-0)
Pre : 310351
Cell wall degradation, biopulping, enzyme-bleaching, waste treatment. Field
trips required.

310472  Fresh Water Treatment and Pollution Control in Pulp and Paper Industries  3(2-3)
Pre : 310341
Fresh water, water properties, fresh water treatment, wastewater treatment and
reuse, wastewater disposal, air pollution from wood pulping, emission control technology of
pulp and paper mill. Field trips required.

310481  Pulp and Paper Process Control Systems  3(3-0)
Pre : 310351
Pulp and paper process control, measurements and analysis of pressure,
temperature, flow, and moisture content. Measurement and control of basis weight, freeness,
specific gravity, density and machine speed. Fundamental control circuit by computer in pulp
and paper mills. Field trips required.

310482  Stock Preparation Machines  3(3-0)
Pre : 310351
Pulper and components, heavy and light reject separators, thickener, pulp
deflaker and refiner, stock consistency control, valve selection and other machines. Field trips
required.

310496  Selected Topics in Pulp and Paper  1-3
Interesting topics in pulp and paper. Topics are subjected to change in each
semester.

310497  Seminar  1
Presentation and discussion of current topics of interest in pulp and paper
technology.

310498  Special Problems  1-3
Study and research in pulp and paper technology and complied into writing
reports.

310499  Pulp and Paper Technology Project  3(0-9)
Projects assigned to students for investigating and solving problems in pulp and
paper as well as integrated industry. A report and presentation are required.
COOPERATIVE EDUCATION
(349xxx)

349390  Cooperative Education Preparation  1(1-0)

349490  Cooperative Education  6
On the job training as a temporary employee according to the assigned project including report writing and presentation.
### FACULTY OF HUMANITIES
(350xxx – 399xxx)

### COMMUNICATION ART
(352xxx)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>352111</td>
<td>General Principles of Communication Arts</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Principles and theory of Communication. Roles and related effects from communication between an individual and the public. Mass communication forms in society. Influence and responsibility of mass communication toward society.</td>
<td></td>
</tr>
<tr>
<td>352141</td>
<td>Introduction to Journalism</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Roles, functions and evolution of the newspaper. Its meaning, structure and components. Different social influences affecting the newspaper. Newspapers’ rights, freedom and responsibilities.</td>
<td></td>
</tr>
<tr>
<td>352212</td>
<td>Introduction to Speech Communication</td>
<td>3(2-3)</td>
</tr>
<tr>
<td></td>
<td>Basic knowledge and skills for effective speaking and listening. Speech preparation and presentation for various purposes. Principles of meaningful listening and speaking in public and in group discussions, interviews, lectures and debates.</td>
<td></td>
</tr>
<tr>
<td>352213</td>
<td>Persuasive Communication</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>The method of persuasion the target audience by utilizing the communication media.</td>
<td></td>
</tr>
<tr>
<td>352214</td>
<td>Computer for Communication Arts</td>
<td>3(2-3)</td>
</tr>
<tr>
<td></td>
<td>Computer applications in mass communications: print, newspapers, magazines and other publications. Graphics, multimedia, video recorders, slides, picture, characters and some software programs for mass media.</td>
<td></td>
</tr>
<tr>
<td>352221</td>
<td>Public Relations I</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Definition, history, development and importance of public relations. The roles, the objective, the influence and the responsibility of public relations which affect society and target audience.</td>
<td></td>
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<tr>
<td>352231</td>
<td>Advertising I</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>The definition, objective, method of advertising and advertising media. The function, responsibility, theory and methods of advertising. The influence of advertising on social and economic system. Law and ethics in advertising.</td>
<td></td>
</tr>
<tr>
<td>352241</td>
<td>Reporting and News Writing</td>
<td>3(2-3)</td>
</tr>
<tr>
<td>352242</td>
<td>Photojournalism</td>
<td>3(2-2)</td>
</tr>
<tr>
<td></td>
<td>Basic principles of press photography. The use of camera equipment and film, including the processes of developing, printing, enlarging, selecting and presenting photographs to the public. Field trips required.</td>
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<tr>
<td>352243</td>
<td>Typography</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Principles and processes of typography. Design and production of publications. Typographical tools. The importance and roles of typography on individual and society.</td>
<td></td>
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<tr>
<td>352251</td>
<td>Introduction to Broadcasting</td>
<td>3(3-0)</td>
</tr>
</tbody>
</table>
Basic knowledge of radio and television broadcasting systems and equipment. Historical background and evolution both inside and outside the country. Roles and influence, functions and responsibilities of broadcasting in society. Basic production techniques.

352261  Introduction to Films  
3(3-0)  
History and evolution of motion pictures. Basic principles of the film production process. Planning the use of film production equipment and techniques in setting up lights and sound. Film psychology and technical terms. Film editing and film script writing.

352311  Mass Communication Law  
3(3-0)  
Pre : 352111  
Mass Communication right and liberty. Law concerned with mass media laws concerned with freedom of the mass media.

352312  Art for Mass Communication  
3(2-2)  
Pre : 352111  
Theory and practice on art for mass communication in order to communicate the intended message to the target audience.

352313  Organizational Communication  
3(3-0)  
Roles and importance of organizational communication structure, functions, various types and characteristics of communication in the organization. Establishment of effective communication for the advancement of the organization.

352314  Communication and Public Opinion  
3(3-0)  
Meaning and characteristics of the formation of public opinion. Role of communications and mass media in forming and changing public opinion. Public opinion survey. Propaganda techniques. Thought reforms and psychological warfare.

352315  Theories of Mass Communication  
2(2-0)  
Contemporary theories and concepts of role, duty, and influence of mass communication on society and individuals, and their application of these to explain impact of mass communications on society.

352316  Target Audience Analysis in Mass Communication  
3(3-0)  
Pre : 352111  
Target audience analysis according to social structure, psychology, politics and culture. Perception process and behavior of target audience relevant. Mass media exposure.

352321  Public Relations II  
3(3-0)  
Pre : 352221  
The public relation process in any organization: Government organization, non government organization, and non profit organization. Role and function of the public relations to their own agencies and society. Image building to all relevant people including all kinds of agencies together with any problem and trend of public relation in Thailand.

352322  Public Relations Techniques  
3(3-0)  
All types of media for public relations. The good and the limitation of each type. Methods of creating effective forms of public relations communication. Utilization and evaluation of the effects of the media for public relation.

352323  Writing for Public Relations  
3(2-2)  
Pre : 352221  
Theory and practice of the form of writing and how to gather the data and the events for public relation. How to write press release, script and speech.
352331  **Art and Advertising Design**  3(2-2)  
**Pre : 352231**  
Basic principle of commercial art. Accomplished designs in attracting interests convincing the target audience of the advertisement.  

352332  **Advertising Creativity and Production**  3(2-2)  
**Pre : 352331**  
The steps of creativity process which will create picture and content in advertising. The principle and special techniques in advertising in film production, radio, television and printed media.  

352341  **Editorial and Critical Writing**  3(3-0)  
**Pre : 352241**  
Theory and principles of writing editorials, column, analysis commentaries, and features. Analysis and criticism of editorial, analysis, commentaries, and features from newspaper and magazine.  

352351  **Radio Program Production I**  3(2-2)  
**Pre : 352251**  
Components and process in radio program production. Duties and responsibilities of the personnel involved. Use and care of equipment. Preparing and producing radio programs.  

352352  **Radio and Television News Reporting**  3(2-2)  
**Pre : 352241**  
Writing radio and television news. Differences among radio news, television news and newspaper news. Editing radio news and television news from the manuscript. Practice presenting news programs on radio and television.  

352353  **Scriptwriting for Radio, Television and Films**  3(2-2)  
**Pre : 352251 and 352261**  
Format and guideline for writing radio, television, film, drama and advertising script. Analyze and critic on radio, television and film in the present.  

352354  **Television Program Production I**  3(2-2)  
**Pre : 352251**  
Systems by which radio and television signals are originated and transmitted. Responsibilities of the personnel involved in production. Components of and factors retted to production. Communication of meaning through images and sounds. Operation and care of equipment. Using television equipment inside studio and field production. Short television program production.  

352411  **Development Communication**  3(3-0)  
**Pre : 352111**  
Roles and functions of mass communication media in social and national development.  

352412  **Ethics of the Mass Media**  2(2-0)  
Principles and concepts concerning freedom and ethics of mass media in a democratic society. Decision making process and norms of the citizens. Case studies in mass media role in Thai society.  

352413  **Communication Planning and Evaluation**  3(3-0)  
**Pre : 352111, 352141, 352251**  
Mass communications planning, evaluation and management. Principles of economies in planning and
management. Determining form and operational plans. Project evaluation. Writing project proposals and reports.

**352421 Public Relations Planning** 3(3-0)
- Pre: 352321
- Concept, fundamental and the process of planning for public relation which suits with the objective and policy of organization.

**352431 Advertising II** 3(3-0)
- Pre: 352231
- The process of planning on advertising campaign is the main topic. How to utilize many kinds of media for advertising by applying it with principle and theory of advertising.

**352434 Advertising Writing** 3(2-2)
- Pre: 352231
- Practice writing advertisements for newspapers and other printing materials advertisement posters, radio, television and film scripts.

**352441 Magazine Editing** 3(2-3)
- Pre: 352241
- Principles of producing and planning the production of various types of magazines publication format, current trends in contents, copy preparation, proofreading, article writing, typing, graphing, illustrating, layout and copy filling. Basic distribution methods.

**352442 Newspaper Management** 3(3-0)
- Pre: 352141
- Systems and techniques in managing newspaper publication. Policies in marketing, finance and distribution of the newspapers at present.

**352451 Radio Program Production II** 3(1-4)
- Pre: 352351

**352452 Radio and Television Management** 3(3-0)
- Pre: 352251
- Systems and techniques in managing radio and television broadcasting stations, public relations, personnel, programming distribution, advertisements and general policies.

**352454 Television Program Production II** 3(1-4)
- Pre: 352354
- Processes and techniques of television production. Target group analysis, production planning, program evaluation, problem solving in radio and television production, and development of relevant radio and television program production skills.

**352491 Research Methods in Mass Communication** 3(3-0)
- Pre: 352111
- Concepts and principles of research, type of research and report writing. Suitable and essential research for mass communication.

**352497 Seminar** 1
- Presentation and discussion on current interesting topics in mass communication at the bachelor.

**352498 Special Problems** 1
- Study and research in mass communication at the bachelor’s degree level and compiled into a report.
352499  Internship
Internship in mass communication.

DRAMA
(353xxx)

353111  Principles and arts of speaking and performing  3(3-0)

353214  Introduction to Play Production  3(2-2)
Acting techniques and practice in the fundamentals of play production, stage direction, costumes, makeup, lighting and sound.

353231  Acting I  3(1-4)
Acting practice in the classroom of unrehersed plays and reviews, to stimulate imagination and creativity, and 5-10 minutes sketches to study the roles of the characters.

CAMBODIAN LANGUAGE
(354xxx)

354311  Khmer I  3(3-0)
The sound system of Khmer. Comparison of the Khmer and the Thai sound systems. Reading and writing Khmer script. Khmer grammar. Basic listening, speaking, reading and writing skills with a vocabulary of 400 words used in everyday life.

354312  Khmer II  3(3-0)
Pre : 354311
Levels of formality, listening speaking, reading, and writing with a vocabulary of 600 new Khmer words. Conversations on everyday life topics.

354411  Khmer III  3(3-0)
Pre : 354312
Listening, speaking, reading, and writing skills with a vocabulary of 1,200 Khmer words and idioms. Telling stories. Expressing views.

ENGLISH LANGUAGE
(355xxx)

355111  Foundation English I  3(3-0)
Exposure to significant structures of the English language as the basis of developing language abilities: listening, speaking, reading and writing through language skill integration with emphasis on communicative competence.

355112  Foundation English II  3(3-0)
Pre : 355111
Exposure to significant structures of the English language as the basis of developing language abilities: listening, speaking, reading and writing through language skill integration with emphasis on communicative competence on a higher level.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>355113</td>
<td>Foundation English III</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>Pre: 355112</td>
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</tr>
</tbody>
</table>

- Exposure to significant structures of the English language as the basis of developing language abilities: listening, speaking, reading and writing through language skill integration with emphasis on communicative competence at a more complex level.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>355114</td>
<td>English for Pre-Medical Students I</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>Pre: 355113</td>
<td></td>
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</tr>
</tbody>
</table>

- Practice reading articles on medical science from textbooks, technical documents, journals and other related publications using reading techniques relevant to each type of article. Practice writing and summarizing articles.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>355115</td>
<td>English for Pre-Medical Students II</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>Pre: 355114</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Practice reading comprehension, looking for main ideas, and note-taking. Study language structures. Practice writing summaries and compositions.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>355201</td>
<td>Fundamental English Reading</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>Pre: 355113</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Silent reading for direct comprehension in English without resorting to mental or verbal translation into Thai. The art of reading aloud and techniques for vocabulary expansion.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>355202</td>
<td>Fundamental English Writing</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>Pre: 355113</td>
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<td></td>
</tr>
</tbody>
</table>

- Writing from models using appropriate structure and vocabulary.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>355211</td>
<td>Basic English Structure</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>Pre: 355113</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Structure analysis of written language based on articles or excerpts at the intermediate language level to gain an insight into the relationships of the elements within the sentence structure and those between sentences. This is to serve as a fundamental basis leading towards development in reading, writing and translation abilities.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>355212</td>
<td>Intermediate English Structure</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>Pre: 355211</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Structure analysis of written language based on articles or excerpts at a more complex language level to gain an insight into the relationships of the elements within the sentence structure and those between sentences. This is to serve as a fundamental basis leading towards development in reading, writing and translation abilities.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>355221</td>
<td>Basic English Reading</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>Pre: 355113</td>
<td></td>
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</tbody>
</table>

- Dictionary skills, vocabulary enrichment silent reading for direct comprehension.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>355222</td>
<td>Intermediate English Reading</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>Pre: 355221</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Silent reading and grasping main ideas. Vocabulary, idioms and reference terms. Speed reading.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>355223</td>
<td>Reading for Mass Communications in English</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>Pre: 355113</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Reading mass media materials such as news, advertisements, newspaper and magazine articles, teletype news and proofing. Emphasis is given to reading.
techniques to comprehend main ideas, vocabulary, idiomatic expressions and news and feature writing styles.

355224  **Technical English**  
**Pre : 355113**  
Practicing reading skill in order to familiarize the students with technical terms found in technical textbooks of various fields, periodicals and other printed matters.

355225  **Reading Authentic English Materials**  
**Pre : 355113**  
Practice reading different types of authentic material using several different techniques relevant to each type of materials. Study the characteristics and purposes of various kinds of authentic material, for example, information in manuals or guidebooks, notices and posters, brochures of various types, advertisements, tables and itineraries, letters, memos, cards for various occasions (greeting cards, invitation cards, etc.), news articles, etc. Study the vocabulary, language functions and structures existing in each.

355231  **Basic English Writing**  
**Pre : 355113**  
Types of sentences, paragraph organization. Writing single-paragraph compositions.

355232  **Intermediate English Writing**  
**Pre : 355231**  
Organization of paragraphs. Writing different kinds of multi-paragraph compositions.

355233  **English Correspondence**  
**Pre : 355113**  
Writing of various types of letters with emphasis on form, vocabulary and idiomatic and conventional expressions, including how to write letters of application and prepare resumes.

355234  **Report Writing in English**  
**Pre : 355113**  
Writing official reports, means of locating and collecting data from various sources; methods of compiling and collecting data for the writing of a finished report.

355235  **English for standardized Tests: TOEFL**  
**Pre : 355113**  
Practicing listening comprehension, structure and written expression, reading comprehension and vocabulary that are suitable for non-native speakers of English who want to prepare themselves for standardized tests to further their studies abroad.

355241  **Basic English Listening-Speaking**  
**Pre : 355113**  
Listening and speaking with emphasis on the sound system, stress, intonation, rhythm and word grouping. Conversations in different situations with an awareness of appropriate usage as well as pronunciation.

355242  **Intermediate English Listening-speaking**  
**Pre : 355241**  
Conversations in different situations at the intermediate level with emphasis on vocabulary and expressions appropriate for each situation.

355243  **Communicative English Through Video**  
**Pre : 355113**
Practice in listening and speaking dialogues in daily life with emphasis on exploitation of video materials such as news programmes, variety shows, advertising films, weather report programmes, feature films and plays.

355244  English Through Songs 3(3-0)
Pre : 355113
Practice in listening and speaking skills by focusing on songs and music as means of communication. Besides listening comprehension enhancement, learning new vocabulary, idioms and correct pronunciation including stress, rhythm and intonation will improve verbal and non-verbal communication abilities.

355245  English through Dramatic Techniques 3(3-0)
Pre : 355241
English language skill development through dramatic techniques.

355251  Communicative English for Careers 3(3-0)
Pre : 355113
Vocabulary and expressions used in many career areas. Memos, advertisements, telegrams, schedules, and other career documents.

355252  English for Athletes and Referees 3(3-0)
Pre : 355113
Vocabulary and idioms used in textbooks, articles and other documents concerning athletics and competitions. Uses of English as referees and officials.

355253  English for Exporting 3(3-0)
Pre : 355113
Practice reading for comprehension; speaking and discussion including telephone conversations about export; writing telexes, export business correspondence, agenda and minutes.

355254  English for Ground and In-flight Attendants 3(3-0)
Pre : 355113
Vocabulary and expressions concerning services. Listening, speaking, reading and writing English required to perform the tasks of ground and in-flight attendants.

355256  Introduction to English for Mass Communication 3(3-0)
Pre : 355113
Basic skills and strategies in English for mass communication.

355262  English for Tourist Guides 3(3-0)
Pre : 355113
Vocabulary and expressions used by tourist guides concerning religion, culture, customs, traditions, geography, history, arts and Thai life style.

355311  Advanced English Structure 3(3-0)
Pre : 355212
Structure analysis of written language at an advanced level to gain an insight into the language system and mechanisms used in communicating ideas, the variety of syntactic possibilities in conveying a certain notion, and also “registers” in appropriate language use.

355321  Advanced English Reading 3(3-0)
Pre : 355222
Reading academic articles, newspapers, magazines, and other printed materials. Expressions and styles of writing. Discussion and summarization.

355322  Critical Reading in English 3(3-0)
Pre : 355321
Introduction to principles of criticism, practice in making criticism and writing critical reports on interesting unsimplified texts written at an appropriate advanced language level.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>355331</td>
<td>Advanced English Writing</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 355232</td>
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<tr>
<td></td>
<td>Writing compositions in different styles at an advanced level.</td>
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<tr>
<td>355332</td>
<td>Critical Reading and Writing in English</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 355331</td>
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<tr>
<td></td>
<td>Critical reading and writing based on various written materials.</td>
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<tr>
<td>355333</td>
<td>Report Writing in English</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 355232</td>
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<tr>
<td></td>
<td>Writing formal reports: locating and collecting data from various sources, compiling data, and writing a finished report.</td>
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<tr>
<td>355334</td>
<td>Business Writing in English</td>
<td>3(3-0)</td>
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<td></td>
<td>Pre: 355113</td>
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<tr>
<td></td>
<td>Vocabulary, structures, and styles in writing business correspondence, proposals, and report.</td>
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<tr>
<td>355341</td>
<td>Advanced English Listening-Speaking</td>
<td>3(3-0)</td>
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<td></td>
<td>Pre: 355242</td>
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<tr>
<td></td>
<td>Listening to lectures for main ideas, giving opinions and discussions. Oral presentation.</td>
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<tr>
<td>355342</td>
<td>Public Speaking in English</td>
<td>3(3-0)</td>
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<td></td>
<td>Pre: 355341</td>
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<tr>
<td></td>
<td>Public speaking: delivering speeches, debates, holding panel discussions and interviews.</td>
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<tr>
<td>355343</td>
<td>Listening and Speaking for Business</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 355341</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Development of listening and speaking skills for effective communication in business.</td>
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<tr>
<td>355348</td>
<td>English for Master of Ceremonies</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 355241</td>
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<td></td>
<td>English for master of ceremonies, the public speaking theories: verbal communication, non-verbal communication and personality development, and putting the theories into practice.</td>
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<tr>
<td>355351</td>
<td>English for Employment</td>
<td>3(3-0)</td>
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<td></td>
<td>Pre: 355241</td>
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<tr>
<td></td>
<td>Listening, speaking, and writing based on the components of language necessary for job application for various careers and professions including strategies and techniques for job interviews and the completion of application forms.</td>
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<tr>
<td>355352</td>
<td>English for Journalism</td>
<td>3(3-0)</td>
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<td></td>
<td>Pre: 355256</td>
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<tr>
<td></td>
<td>English in newspapers and periodicals. Writing news stories and articles.</td>
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<tr>
<td>355353</td>
<td>English for Public Relations and Advertising</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 355256</td>
<td></td>
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<tr>
<td></td>
<td>English in public relations documents, advertisements in newspapers and magazines. Writing advertisements and public relations announcements.</td>
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<tr>
<td>355354</td>
<td>English for Television and Radio Communication</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 355256</td>
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<tr>
<td></td>
<td>English language skills in television and radio broadcast.</td>
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</tbody>
</table>
355361  English for Tourism I  
Pre : 355211 and 355241  
Vocabulary, idiomatic expressions and structures to give basic information about travel and hotel industry.  
355362  English for Tourism II  
Pre : 355361  
Technical expressions focusing on the language and professional skills required to perform effectively in the travel and hotel industry.  
355371  English for Hotel Studies I  
Pre : 355211 and 355241  
Vocabulary, idiomatic and technical expressions for oral and written communication in hotel industry and restaurants with the emphasis on developing listening and speaking skills.  
355372  English for Hotel Studies II  
Pre : 355371  
Application of language usage from textbooks, documents, articles concerning the hotel and restaurant businesses to effective communication and administration within and outside the hotel management. Exposure to a variety of accents.  
355381  English for Secretarial Science I  
Pre : 355211 and 355242  
Vocabulary, idiomatic and technical expressions used in textbooks, documents, articles concerning office business with the purpose of developing skills in listening, speaking, reading, and writing.  
355382  English for Secretarial Science II  
Pre : 355381  
Practice writing business correspondence on different occasions and practice using formats common to business activities in general. Included is practice in verbal communication in business and use of communication equipment.  
355390  Cooperative Education Preparation  
355431  Advanced Integrated English Language Skills I  
Pre : 355311 and 355332  
Integration of the four language skills: listening, speaking, reading and writing at an advanced level in the form of role simulation or a project proposal, or research proposal on a certain topic that needs study research, discussion, oral reporting and term paper writing.  
355432  Advanced Integrated English Language Skills II  
Pre : 355431  
Integration of the four language skills: listening, speaking, reading and writing at a more complex level, to further develop language proficiency.  
355451  Advanced Business English  
Pre : 355251  
Reading and analyzing business documents from various media and sources. Writing summaries and presentation of summaries. Writing meeting agendas and minutes. Writing business reports.  
355452  Projects for Mass Communication  
3(2-2)
Pre : 355352 or 355353 or 355354
Projects in journalism, radio and television, public relations or advertising.

355461 English for Tourism III 3(3-0)
Pre : 355362
Integration of four language skills: listening, speaking, reading and writing at advanced level to communicate and solve problems concerning with travel and hotel industry in the four of role simulations to perform as a tour guide, a receptionist and an officer clerk in travel agency or an airline industry.

355471 English for Hotel Studies III 3(3-0)
Pre : 355372
Vocabulary, idiomatic and technical expressions used in textbooks, documents, articles concerning management, hotel business administration, hotel industry, and restaurants. Strengthening skills in discussion and reporting.

355490 Cooperative Education 6
Pre : 355390
On the job training as a temporary employee according to the assigned project, including report writing and presentation.

FRENCH LANGUAGE (356xxx)

356111 Elementary French I 3(2-3)
Presentation of significant structures of the French language. Practice in listening, speaking, reading and writing.

356112 Elementary French II 3(2-3)
Pre : 356111
Presentation of structures of the French language. Practice in listening, speaking, reading and writing at a higher level.

356113 Elementary French III 3(2-3)
Pre : 356112
Presentation of language structure and grammatical rules of the French language, vocabulary, idioms in listening, speaking, reading and writing at a higher level.

356114 Elementary French IV 3(2-3)
Pre : 356113
Presentation of language structure and grammatical rules of the French language, with emphasis on reading, writing and abstracting main ideas from what has been read.

356115 Foundation French I 3(2-3)
Study of language structure and grammatical rules of the French language as the basis of developing skills: listening, speaking, reading and writing.

356116 Foundation French II 3(2-3)
Pre : 356115
Study of structures of the French language at an advanced level as the basis of developing language skills: listening, speaking, reading and writing.

356211 French Structure I 3(3-0)
Pre : 356114 or 356116
French structure, relationships of elements within sentence and sentence patterns.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits (Hours)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>356212</td>
<td>French Structure II</td>
<td>3(3-0)</td>
<td>French structure, analysis of sentence patterns found in books and magazines.</td>
</tr>
<tr>
<td>356221</td>
<td>French Reading I</td>
<td>3(3-0)</td>
<td>Basic reading techniques, expansion of French vocabulary and expressions. Practice in reading of various types of texts.</td>
</tr>
<tr>
<td>356222</td>
<td>French Reading II</td>
<td>3(3-0)</td>
<td>Reading of French texts at a more complex language level. Identifying important points. Expansion of vocabulary and expressions. Analyzing relationships among the parts of texts.</td>
</tr>
<tr>
<td>356231</td>
<td>French Studies</td>
<td>3(3-0)</td>
<td>Characteristics, history and way of life of French people from the past until now.</td>
</tr>
<tr>
<td>356241</td>
<td>French Listening - Speaking I</td>
<td>3(3-0)</td>
<td>Listening and speaking in various situations of everyday life.</td>
</tr>
<tr>
<td>356242</td>
<td>French Listening - Speaking II</td>
<td>3(3-0)</td>
<td>Listening. Retelling, summarizing, and expressing opinions about stimuli presented through various instructional media.</td>
</tr>
<tr>
<td>356311</td>
<td>French Structure III</td>
<td>3(3-0)</td>
<td>Higher level written French structure found in books and magazines. Sentence pattern analysis. Intrasequence and intersentence relationships.</td>
</tr>
<tr>
<td>356321</td>
<td>French Reading III</td>
<td>3(3-0)</td>
<td>French reading utilizing structural analysis and interpretation to understand content and important points.</td>
</tr>
<tr>
<td>356322</td>
<td>Critical Reading in French</td>
<td>3(3-0)</td>
<td>French reading with emphasis on critical thinking, insight into the author’s purposes, differentiation between fact and opinion, and appreciation of the aesthetic of language.</td>
</tr>
<tr>
<td>356331</td>
<td>French Writing I</td>
<td>3(3-0)</td>
<td>Practice in writing grammatically correct sentences, and the ability to write short texts.</td>
</tr>
<tr>
<td>356332</td>
<td>French Writing II</td>
<td>3(3-0)</td>
<td>Writing compositions in different styles at a more complex level.</td>
</tr>
<tr>
<td>356341</td>
<td>French Conversation I</td>
<td>3(3-0)</td>
<td>Conversation, discussion and expressing opinions on various subjects.</td>
</tr>
<tr>
<td>356342</td>
<td>French Conversation II</td>
<td>3(3-0)</td>
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</tr>
</tbody>
</table>
Conversations, discussions on current issues and events of the present world.

### French Translation I
- **Code:** 356351
- **Pre:** 356212
- **Credits:** 2(2-0)
- Principles of translation, practice in translating short texts from Thai into French and vice versa.

### French Composition Writing
- **Code:** 356431
- **Pre:** 356332
- **Credits:** 3(3-0)
- Principles of writing compositions, outline writing and complete composition writing.

### French Report Writing
- **Code:** 356432
- **Pre:** 356431
- **Credits:** 3(3-0)
- Principles of report writing, information research and complete report writing.

### French Translation II
- **Code:** 356451
- **Pre:** 356351
- **Credits:** 2(2-0)
- Translation of articles and short stories from Thai into French and vice versa.

### Specialized French Translation
- **Code:** 356452
- **Pre:** 356451
- **Credits:** 2(2-0)
- Translation of articles, addresses, documents and novels from Thai into French and vice versa.

### French for Tourism
- **Code:** 356461
- **Pre:** 356241
- **Credits:** 3(3-0)
- Practice in the French language as used in travel and tourism business. Field trip included.

### French for Hotel Studies
- **Code:** 356471
- **Pre:** 356241
- **Credits:** 3(3-0)
- Practice in French language as used in hotel management. Field trip included.

### French for Secretarial Science
- **Code:** 356481
- **Pre:** 356241
- **Credits:** 3(3-0)
- French language for secretarial work with emphasis on the spoken and written language of business. Field trip included.

### Seminar
- **Code:** 356497
- **Credits:** 1
- Presentation and discussion on current interesting topics in French at the bachelor's degree level.

### GERMAN LANGUAGE (357xxx)

### Elementary German I
- **Code:** 357111
- **Credits:** 3(2-3)
- Presentation of significant structures of the German language. Practice in listening, speaking, reading and writing.

### Elementary German II
- **Code:** 357112
- **Pre:** 357111
- **Credits:** 3(2-3)
- Presentation of significant structures of the German language. Practice in listening, speaking, reading and writing at a higher level.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisite(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>357113</td>
<td>Elementary German III</td>
<td>3(2-3)</td>
<td>Pre : 357112</td>
</tr>
<tr>
<td></td>
<td>Presentation of language structure and grammatical rules of the German language, vocabulary, idioms. Practice in listening, speaking, reading, and writing at a higher level.</td>
<td></td>
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</tr>
<tr>
<td>357114</td>
<td>Elementary German IV</td>
<td>3(2-3)</td>
<td>Pre : 357113</td>
</tr>
<tr>
<td></td>
<td>Presentation of language structure and grammatical rules of the German language, with emphasis on reading, writing, and abstracting main ideas from what has been read.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>357115</td>
<td>Foundation German I</td>
<td>3(2-3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Study of language structure and grammatical rules of the German language as the basis of developing language skills; listening, speaking, reading and writing.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>357116</td>
<td>Foundation German II</td>
<td>3(2-3)</td>
<td>Pre : 357115</td>
</tr>
<tr>
<td></td>
<td>Study of structures of the German language at an advanced level as the basis of developing language skills: listening, speaking, reading and writing.</td>
<td></td>
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</tr>
<tr>
<td>357211</td>
<td>German Structure I</td>
<td>3(3-0)</td>
<td>Pre : 357114 or 357116</td>
</tr>
<tr>
<td></td>
<td>German structure, relationships of elements within sentence and sentence patterns.</td>
<td></td>
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</tr>
<tr>
<td>357212</td>
<td>German Structure II</td>
<td>3(3-0)</td>
<td>Pre : 357211</td>
</tr>
<tr>
<td></td>
<td>German structure, analysis of sentence patterns found in books and magazines.</td>
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<tr>
<td>357213</td>
<td>German Word Structure and Sound System</td>
<td>3(3-0)</td>
<td>Pre : 357116</td>
</tr>
<tr>
<td></td>
<td>Basic knowledge in linguistics: sounds, words, sentences and meaning with an emphasis on German sound system and articulatory phonetics, German morphology and word building.</td>
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<tr>
<td>357217</td>
<td>German through Multimedia</td>
<td>3(3-0)</td>
<td>Pre : 357114 or 357116</td>
</tr>
<tr>
<td></td>
<td>Listening, speaking, reading and writing skills in advanced German. Project work on German cultures by mean of multimedia.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>357221</td>
<td>German Reading I</td>
<td>3(3-0)</td>
<td>Pre : 357114 or 357116</td>
</tr>
<tr>
<td></td>
<td>Basic reading techniques, expansion of German vocabulary and expressions. Practice in reading of various types of texts.</td>
<td></td>
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</tr>
<tr>
<td>357222</td>
<td>German Reading II</td>
<td>3(3-0)</td>
<td>Pre : 357221</td>
</tr>
<tr>
<td></td>
<td>Reading of German texts at a more complex language level. Identifying important points. Expansion of vocabulary and expressions. Analyzing relationships among the parts of texts.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>357231</td>
<td>German Studies</td>
<td>3(3-0)</td>
<td></td>
</tr>
</tbody>
</table>

II-222
**Pre : 357114 or 357116**
Study about Germany: its geography, modern history (after World War II) and its influence on politics, economy, society and the German way of life.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>357232</td>
<td>Introduction to German Art and Music</td>
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<tr>
<td></td>
<td>German art and music from the beginning to the present.</td>
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<tr>
<td>357241</td>
<td>German Listening – Speaking I</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 357114 or 357116</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Listening and speaking in various situation of everyday life.</td>
<td></td>
</tr>
<tr>
<td>357242</td>
<td>German Listening – Speaking II</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 357241</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Listening, retelling, summarizing and expressing opinions about stimuli presented through various instructional media.</td>
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</tr>
<tr>
<td>357251</td>
<td>Communicative German for Careers</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 357114 or 357116</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Practice German listening, speaking, reading and writing skills needed for communication in various careers.</td>
<td></td>
</tr>
<tr>
<td>357311</td>
<td>German Structure III</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 357212</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Higher level written German structure. Sentence pattern analysis.</td>
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<tr>
<td>357321</td>
<td>German Reading III</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 357222</td>
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</tr>
<tr>
<td></td>
<td>German reading utilizing structural analysis and interpretation to understand content and important points.</td>
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</tr>
<tr>
<td>357322</td>
<td>Critical Reading in German</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 357321</td>
<td></td>
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<tr>
<td></td>
<td>German reading with emphasis on critical thinking, insight into the author’s purposes, differentiation between fact and opinion, and appreciation of the aesthetics of language.</td>
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<tr>
<td>357331</td>
<td>German Writing I</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 357212</td>
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</tr>
<tr>
<td></td>
<td>Practice in writing grammatically correct sentences and the ability to write short text.</td>
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<tr>
<td>357332</td>
<td>German Writing II</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 357331</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Writing composition in different styles at a more complex level.</td>
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<tr>
<td>357341</td>
<td>German Conversation I</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 357242</td>
<td></td>
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<tr>
<td></td>
<td>Conversation, expressing opinions and discussion on various subjects.</td>
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<tr>
<td>357342</td>
<td>German Conversation II</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 357341</td>
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<tr>
<td></td>
<td>Conversations, discussions on current issues and events of the present world.</td>
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<tr>
<td>357351</td>
<td>German translation I</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 357212</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Principles of translation, practice in translating short texts, dialogues, advertisements, news from German into Thai and vice versa with an emphasis on grammatical differences and expressions.</td>
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<tr>
<td>357352</td>
<td>German translation II</td>
<td>3(3-0)</td>
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</table>
Pre : 357351
Translation of articles, addresses, documents and literary works from
German into Thai and vice versa.

357361  German through Computer  3(2-2)
Pre : 357114 or 357116
The German language by means of language-teaching software and
gathering information from websites in German-speaking countries.

357362  The German Language in Mass Media  3(3-0)
Pre : 357114 or 357116
The language used in German-language newspaper, radio, television and
films.

357390  Cooperative Education Preparation  1
Principles, concepts and processes of cooperative education. Related rules
and regulations. Basic knowledge and techniques in job application, working,
communication and human relations. Personality development. Quality management

357431  German Composition Writing  3(3-0)
Pre : 357332
Principles of writing compositions, outline writing and complete
composition writing.

357432  German Report Writing  3(3-0)
Pre : 357431
Principles of report writing, information research and complete report
writing.

357441  German Speaking for Business  3(3-0)
Pre : 357342
Speaking skills, vocabulary, idioms and different styles of panel-
discussions, negotiation, reports, presentation, discussions and opinions expressing in
business.

357451  German Translation II  2(2-0)
Pre : 357351
Translation of articles and short stories from German into Thai and vice
versa.

357452  Specialized German Translation  2(2-0)
Pre : 357451
Translation of articles, addresses, documents and novels from Thai into
German and vice versa.

357461  German for Tourism  3(3-0)
Pre : 357241
Practice in German language as used in travel and tourism business. Field trips included.

357471  German for Hotel Studies  3(3-0)
Pre : 357241
Practice in German language as used in hotel management. Field trips included.

357481  German for Secretarial Science  3(3-0)
Pre : 357241
German language for secretarial work with emphasis on the spoken and
written language of business. Field trips included.
357490  Cooperative Education 6
Pre : 357390
On the job training as a temporary employee according to the assigned project, including report writing and presentations.

357497  Seminar 1
Pre : 357432
Presentation and discussion on current interesting topics in German at the bachelor’s degree level.

357498  Special Problems 2
Pre : 357432
Study and research on interesting topics at the bachelor’s degree level and compile into a written report in German.

**JAPANESE LANGUAGE**

*(358xxx)*

358111  Elementary Japanese I 3(5-0)
Introduction to language structure, language skills: listening, speaking, reading and writing based on elementary language level. Study of Hiragana, Katakana and Kanji orthography.

358112  Elementary Japanese II 3(5-0)
Pre : 358111
Introduction to language structure, language skills: listening, speaking, reading and writing based on elementary language level. Further study of Kanji orthography.

358113  Elementary Japanese III 3(5-0)
Pre : 358112
Listening, speaking, conversing, and writing based on elementary language level, with emphasis on helping words and auxiliary verbs in the sentence structure. Further study of Kanji orthography.

358211  Intermediate Japanese I 3(5-0)
Pre : 358113
Study of sentence structure and the relationships of the elements within the sentence structure; language skills: listening, speaking, reading and writing. Further study of Kanji orthography.

358212  Intermediate Japanese II 3(5-0)
Pre : 358211
Study of sentence structure and sentence pattern analysis at a complex language level; language skills: listening, reading and writing. Further study of Kanji orthography.

358221  Elementary Japanese Reading I 3(3-0)
Pre : 358112
Reading of short texts with the purpose of studying the functions of words and phrases in complex sentences, vocabulary and idiomatic expressions.

358222  Elementary Japanese Reading II 3(3-0)
Pre : 358221
Reading of texts at a higher language level with the purpose of acquiring vocabulary, idiomatic expression and complex language structure.

358231  Elementary Japanese Writing I 3(3-0)
Pre : 358112
Writing of grammatically correct sentences at an elementary level.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
<th>Description</th>
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<tbody>
<tr>
<td>358232</td>
<td>Elementary Japanese Writing II</td>
<td>3(3-0)</td>
<td>Practice in gramatically correct sentence writing and paragraph writing.</td>
</tr>
<tr>
<td>358241</td>
<td>Elementary Japanese Listening-Speaking I</td>
<td>2(3-0)</td>
<td>Conversations on simple daily-life topics; practice in listening to tapes in the language sound lab.</td>
</tr>
<tr>
<td>358242</td>
<td>Elementary Japanese Listening-Speaking II</td>
<td>2(3-0)</td>
<td>Conversations on simple daily-life topics; practice in listening to tapes in the language sound lab.</td>
</tr>
<tr>
<td>358311</td>
<td>Advanced Japanese I</td>
<td>3(3-0)</td>
<td>Practice in language structure analysis at a more complex level; language skills: listening, speaking, reading and writing. Further study of vocabulary and Kanji orthography.</td>
</tr>
<tr>
<td>358312</td>
<td>Advanced Japanese II</td>
<td>3(3-0)</td>
<td>Study of sentence patterns and language structure analyses at a more complex level, the relationships of the elements within the sentence structure and those between sentences; language skills: listening, speaking, reading and writing. Further study of vocabulary and Kanji orthography.</td>
</tr>
<tr>
<td>358313</td>
<td>Japanese Structure</td>
<td>3(3-0)</td>
<td>Japanese structure at the word, phrase and sentence levels.</td>
</tr>
<tr>
<td>358321</td>
<td>Intermediate Japanese Reading I</td>
<td>3(3-0)</td>
<td>Reading of articles, short texts or excerpts with a view to grasping main themes and essential ideas, acquiring synonyms, vocabulary and idiomatic expressions.</td>
</tr>
<tr>
<td>358322</td>
<td>Intermediate Japanese Reading II</td>
<td>3(3-0)</td>
<td>Reading of articles, short texts or excerpts at a more complex language level with a view to grasping main themes and essential ideas, acquiring synonyms, vocabulary and idiomatic expressions.</td>
</tr>
<tr>
<td>358331</td>
<td>Intermediate Japanese Writing I</td>
<td>3(3-0)</td>
<td>Writing of short compositions concerning daily-life events.</td>
</tr>
<tr>
<td>358332</td>
<td>Intermediate Japanese Writing II</td>
<td>3(3-0)</td>
<td>Descriptive writing at a more complex language level.</td>
</tr>
<tr>
<td>358341</td>
<td>Intermediate Japanese Listening-Speaking I</td>
<td>2(3-0)</td>
<td>Practice in listening, narrating stories, discussing and expressing opinions.</td>
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<td>358342</td>
<td>Intermediate Japanese Listening-Speaking II</td>
<td>3(3-0)</td>
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<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
<td>Prerequisites</td>
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<tr>
<td>358421</td>
<td>Advanced Japanese Reading I</td>
<td>3(3-0)</td>
<td>Pre : 358322</td>
</tr>
<tr>
<td></td>
<td>Practice in listening, describing, discussing and expressing opinions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>358422</td>
<td>Advanced Japanese Reading II</td>
<td>3(3-0)</td>
<td>Pre : 358421</td>
</tr>
<tr>
<td></td>
<td>Reading at a more complex language level for comprehension, vocabulary, idiomatic expression and authors’ viewpoints.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>358423</td>
<td>Critical Reading in Japanese I</td>
<td>3(3-0)</td>
<td>Pre : 358322</td>
</tr>
<tr>
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<td>Introduction to principles of criticism, reading of articles and short texts for practice in criticism.</td>
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<tr>
<td>358424</td>
<td>Critical Reading in Japanese II</td>
<td>3(3-0)</td>
<td>Pre : 358423</td>
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<tr>
<td></td>
<td>Reading at a more complex language level of articles and short texts for practice in criticism.</td>
<td></td>
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<tr>
<td>358431</td>
<td>Advanced Japanese Writing I</td>
<td>3(3-0)</td>
<td>Pre : 358332</td>
</tr>
<tr>
<td></td>
<td>Writing criticisms on articles, documents and other publications.</td>
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<tr>
<td>358432</td>
<td>Advanced Japanese Writing II</td>
<td>3(3-0)</td>
<td>Pre : 358431</td>
</tr>
<tr>
<td></td>
<td>Writing criticisms at a higher language level.</td>
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<tr>
<td>358433</td>
<td>Japanese Written Communication I</td>
<td>3(3-0)</td>
<td>Pre : 358332</td>
</tr>
<tr>
<td></td>
<td>Introduction to formats and methods of correspondence writing, report writing; study of different registers.</td>
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<tr>
<td>358434</td>
<td>Japanese Written Communication II</td>
<td>3(3-0)</td>
<td>Pre : 358433</td>
</tr>
<tr>
<td></td>
<td>Practice in different kinds of writing to gain more writing skill.</td>
<td></td>
<td></td>
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<tr>
<td>358441</td>
<td>Advanced Japanese Listening-Speaking I</td>
<td>3(3-0)</td>
<td>Pre : 358342</td>
</tr>
<tr>
<td></td>
<td>Practice in narrating accounts on given topics or impromptu, proposing of opinions and discussing the matters concerned.</td>
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<tr>
<td>358442</td>
<td>Advanced Japanese Listening-Speaking II</td>
<td>3(3-0)</td>
<td>Pre : 358441</td>
</tr>
<tr>
<td></td>
<td>Reporting orally and discussing given topics.</td>
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<tr>
<td>358443</td>
<td>Japanese Simultaneous Translation I</td>
<td>3(3-0)</td>
<td>Pre : 358342</td>
</tr>
<tr>
<td></td>
<td>Practice in listening to and interpreting simple texts from Japanese into Thai and vice versa.</td>
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<tr>
<td>358444</td>
<td>Japanese Simultaneous Translation II</td>
<td>3(3-0)</td>
<td>Pre : 358443</td>
</tr>
<tr>
<td></td>
<td>Practice in listening to and interpreting texts at a complex language level from Japanese into Thai and vice versa.</td>
<td></td>
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<tr>
<td>358451</td>
<td>Japanese Translation I</td>
<td>3(3-0)</td>
<td>Pre : 358212</td>
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</table>
Translation of simple sentences, compound sentences, complex sentences, essays, poems, idioms, proverbs, business letters, articles, cartoons and short stories from Japanese into Thai and from Thai into Japanese.

358452 Japanese Translation II 3(3-0)
Pre : 358451
Translation of academic articles, news, radio programmes, plays and fiction from Japanese into Thai and from Thai into Japanese.

358461 Japanese for Tourism 3(3-0)
Pre : 358211
Practice in language as used in travel and tourism business. Field trips included.

358471 Japanese for Hotel Studies 3(3-0)
Pre : 358211
Practice in language as used in hotel management. Field trips included.

358481 Japanese for Secretarial Science 3(3-0)
Pre : 358211
Practice in language for secretarial work with emphasis on language for business communications and hospitality services for different occasions.

PALI LANGUAGE
(359xxx)

359311 Pali I 3(3-0)
Principles of reading and writing Pali ; 500 words vocabulary ; basic grammar ; translation of simple sentences.

359312 Pali II 3(3-0)
Pre : 359311
Addition of 500 words to the vocabulary ; grammar ; translation from Pali to Thai ; composing short sentences.

359411 Pali III 3(3-0)
Pre : 359312
Addition of 500 words to the vocabulary; composition of short texts ; more advanced translation.

SANSKRIT LANGUAGE
(360xxx)

360311 Sanskrit I 3(3-0)
Basic grammar; 500 words vocabulary; translation of simple sentences; reading and writing with the Devenagari alphabet.

360312 Sanskrit II 3(3-0)
Pre : 360311
Addition of 500 words to the vocabulary ; grammar ; translation of short sentences and texts from Sanskrit to Thai and from Thai to Sanskrit.

360411 Sanskrit III 3(3-0)
Pre : 360312
Addition of 500 words to the vocabulary ; grammar ; composition of short texts ; reading and translation of selections from Sanskrit literary works.
THAI LANGUAGE  
(361xxx)

<table>
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<th>Course Title</th>
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<tr>
<td>361111</td>
<td>Introductory Thai Usage</td>
<td>3(3-0)</td>
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<td>Efficient listening and reading. Speaking to introduce oneself and to present one’s work. Writing summaries and reports.</td>
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</tr>
<tr>
<td>361131</td>
<td>Thai Practical Writing</td>
<td>3(3-0)</td>
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<td>Paragraph writing. Writing responses to questions. Writing essays, governments documents, business letters, and minutes meeting</td>
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<tr>
<td>361211</td>
<td>Introduction to Pali and Sanskrit</td>
<td>3(3-0)</td>
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<td>A brief history of Pali and Sanskrit, reading and writing Pali and Sanskrit words, the structure of Pali and Sanskrit.</td>
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<tr>
<td>361212</td>
<td>Linguistics for Thai Language Study</td>
<td>3(3-0)</td>
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<td>Introduction to linguistic concept, analysis of the Thai language by linguistic approach.</td>
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<tr>
<td>361213</td>
<td>Principles of the Thai Language</td>
<td>3(3-0)</td>
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<td>Characteristics of the Thai language. The Thai sound system, word, word classes. Construction of words, phrases, and sentences. Types of sentences according to traditional grammar.</td>
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<tr>
<td>361221</td>
<td>Principles and Art of Reading</td>
<td>3(3-0)</td>
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<td>Principles and art of reading aloud, delivered naturally, meaningfully and expressively with proper stress, rhythm, pause and poise.</td>
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<tr>
<td>361222</td>
<td>Thai Critical Reading</td>
<td>3(3-0)</td>
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<tr>
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<td>Principles of skimming reading, principles of criticism, practice of skimming reading and critical reading.</td>
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<tr>
<td>361231</td>
<td>Communicative Writing</td>
<td>3(3-0)</td>
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<td>Analysis of samples of good, written language analysis of sentence structure, sentence relationships, dictions, organization of ideas, events. Practices in developing good effective writing skill in Thai.</td>
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<tr>
<td>361232</td>
<td>Thai Language Writing in Mass Communicative Work</td>
<td>3(3-0)</td>
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<td>Good skill in Thai writing for mass communication works.</td>
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<tr>
<td>361233</td>
<td>Non-Fiction Writing</td>
<td>3(3-0)</td>
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<td>Pre: 361131</td>
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<tr>
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<td>Principles and method in different types of non-fiction writing, emphasizing on the components and structure, analysis of readers’ interests, and the art of capturing and holding readers’ interest.</td>
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<tr>
<td>361241</td>
<td>Principles and Art of Speaking</td>
<td>3(3-0)</td>
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<tr>
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<td>General knowledge concerning principles and art of speaking, speech preparation, delivery, practice and evaluation. Basic Knowledge for listening.</td>
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<tr>
<td>361242</td>
<td>Speaking for Specific Objectives</td>
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<td>Principles and practice in speaking for specific objectives: ceremony, discussion, seminar, public address, broadcasting speaking and television speaking. Field trips required.</td>
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<tr>
<td>361311</td>
<td>Pali and Sanskrit Loanwords</td>
<td>3(3-0)</td>
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<td></td>
<td>Pre: 361131</td>
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<tr>
<td></td>
<td>Form, sound, meaning and usage of Pali and Sanskrit loanwords in Thai in comparison with their form, sound, meaning in the original languages.</td>
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<tr>
<td>Course Code</td>
<td>Course Title</td>
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<tr>
<td>361312</td>
<td>Foreign Language Influences on Thai</td>
<td>3(3-0)</td>
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<td>Terms and expressions from foreign language in Thai; their adaptation to Thai. Change in Thai phonology, syntax and semantics influenced by foreign languages.</td>
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<tr>
<td>361313</td>
<td>Sounds and Sound Systems in Thai</td>
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<td>Traditional and modern approaches to Thai sounds and sound systems.</td>
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<tr>
<td>361314</td>
<td>Words and Sentences in Thai</td>
<td>3(3-0)</td>
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<tr>
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<td>Traditional and modern approaches to Thai words and sentences.</td>
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<tr>
<td>361315</td>
<td>Thai Language Skills in Secretarial Work</td>
<td>3(3-0)</td>
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<tr>
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<td>Listening, speaking, reading, and writing Thai language skills in secretarial work.</td>
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<tr>
<td>361321</td>
<td>Terminology of Various Fields</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Selected words and expressions used in religion law, politics, business, sports, and games found in the media.</td>
<td></td>
</tr>
<tr>
<td>361322</td>
<td>Literary Language</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Concept and theory concerning aesthetic analysis artistically in Thai language. Analysis of artistically written prose and verse. Artistic value in literary works.</td>
<td></td>
</tr>
<tr>
<td>361331</td>
<td>Spoken and Written Language</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Analysis of characteristics of spoken and written languages; their distinctions in terms of pronunciation, sound systems, structures, words and expressions; practice in producing different style of language and in changing the spoken to the written style.</td>
<td></td>
</tr>
<tr>
<td>361332</td>
<td>Prose Writing</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Principles of prose writing, types of prose composition; summary writing; writing prose paragraph of verse.</td>
<td></td>
</tr>
<tr>
<td>361339</td>
<td>Cooperative Education Preparation</td>
<td>1</td>
</tr>
<tr>
<td>361411</td>
<td>Thai Semantics</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Meaning in the Thai language; the components of meaning; meaning at different levels of linguistic form: word, sentence, and discourse.</td>
<td></td>
</tr>
<tr>
<td>361412</td>
<td>Introductory Thai Dialects</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>The difference between language and dialects. The history of and methodology for studying Thai dialects. Comparative study of the sound, phonology and meaning of words of different Thai dialects. Filed trips required.</td>
<td></td>
</tr>
<tr>
<td>361413</td>
<td>Thai Language in Different Periods</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Comparison of Proto-Tai and the Thai language in the Sukhothai, Ayutthaya, and Rattanakosin period in terms of sound systems, words, and sentences.</td>
<td></td>
</tr>
<tr>
<td>361414</td>
<td>Cultural Aspects of the Thai Language</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Thai language in Thai culture, including customs and traditions, arts, the performing arts, and other relevant topics.</td>
<td></td>
</tr>
<tr>
<td>361431</td>
<td>Short Story Writing</td>
<td>3(3-0)</td>
</tr>
</tbody>
</table>
Principles of short story writing; analysis of short stories; principles for appraising short stories; writing short stories.

**361432 Novel Writing**  
Principles of novel writing; analysis of novels, principles for appraising novels; writing novels.

**361433 Poetry Writing**  
Principles of prosody; prosodic analysis, principles for appraising verse; poetry writing.

**361434 The Use of the Thai Language in Advertising and Public Relations Work**  
The use of the Thai language in advertising and public relations work in the print and the electronic media.

**361451 Translation from a Foreign Language into Thai**  
Practice in analysis of texts in a foreign language in terms of vocabulary, idioms and semantic interpretation, prior to accurately translation into appropriate and understandable style in Thai.

**361490 Cooperative Education**  
Pre: 361390  
On the job as temporary employee according to the assigned project including report and presentation.

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**CHINESE LANGUAGE (362XXX)**

**362111 Elementary Chinese I**  
Chinese phonetics on the Pinyin system; basic rules in writing and practice of Chinese characters; basic Chinese sentence patterns and expressions used in daily life.

**362112 Elementary Chinese II**  
Pre: 362111  
Chinese phonetics (Pinyin); conversations of everyday use in higher level. Basic sentence patterns. Elementary expressions and idioms for everyday communication.

**362113 Elementary Chinese III**  
Pre: 362112  
Simple short texts emphasis on basic idioms for everyday use. Reading aloud. More grammar constructions.

**362114 Foundation Chinese I**  
Pre: 362114  
Beijing standard pronunciation and Pinyin, the Chinese phonetic alphabet system. Introduction to Chinese characters. Vocabulary, idioms and fundamental grammar in conversations.

**362115 Foundation Chinese II**  
Pre: 362114  

**362116 Foundation Chinese III**  
Pre: 362115 or 362113
Reading articles and short stories about modern Chinese social life, with emphasis on vocabulary, idioms, phrases and more complicated sentence structures. Reading aloud and reading comprehension.

362213 Chinese Computer Program 3(2-2)
Pre: 362116
Utilizing Chinese computer program, producing documents by Chinese programs. Information searching via internet system for self-access learning.

362221 Chinese Reading I 3(3-0)
Pre: 362115 or 362113
Developing reading skills through short stories, fables, classical poetry. Origin of Chinese idioms, proverbs and sayings.

362222 Chinese Reading II 3(3-0)
Pre: 362221
Reading to capture the man ideas of texts. Expressing opinions.

362231 Chinese Writing I 3(3-0)
Pre: 362115 or 362113
Writing short essays about everyday life using appropriate sentence structures and idioms.

362232 Chinese Writing II 3(3-0)
Pre: 362231
Writing resumes, letters and invitations for various occasion, with emphasis on appropriate forms, word and idioms.

362233 Chinese Calligraphy 3(3-0)
Pre: 362115 or 362113

362241 Chinese Listening-Speaking I 3(3-0)
Pre: 362115 or 362113
Simple conversations in situations of everyday life.

362242 Chinese Listening-Speaking II 3(3-0)
Pre: 362241
Listening to conversations and short dramas presented via several media. Expressing opinions with the proper words and idioms.

362281 Chinese Civilization 3(3-0)
Pre: 362221
Chinese civilization from the ancient period to the present.

362311 Principles of Chinese Grammar 3(3-0)
Pre: 362221
Structure of Chinese grammar: words, phrases, sentences, and sentence analysis.

362312 Foundation Classical Chinese 3(3-0)
Pre: 362222

362313 Intermediate Classical Chinese 3(3-0)
Pre: 362312
Reading classical Chinese in a higher level. Expansion of vocabulary and reading ability. General knowledge on ancient Chinese culture.

362321 Reading Chinese Newspaper I 3(3-0)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>362322</td>
<td>Reading Chinese Newspaper II</td>
<td>3(3-0)</td>
<td>Reading Chinese newspapers. Vocabulary and expressions used in Chinese newspaper. Pre: 362321. Reading Chinese newspapers in a higher level. Reading news and documentary articles from Chinese newspapers. Reading for comprehension and summarizing.</td>
</tr>
<tr>
<td>362323</td>
<td>Chinese Reading on Society and Culture</td>
<td>3(3-0)</td>
<td>Reading selected texts on modern Chinese society and Chinese art and culture. Pre: 362321.</td>
</tr>
<tr>
<td>362324</td>
<td>Chinese Reading on Economics and Politics</td>
<td>3(3-0)</td>
<td>Reading selected texts on economic and political condition of modern China. Pre: 362321.</td>
</tr>
<tr>
<td>362325</td>
<td>Chinese Reading on Science and Technology</td>
<td>3(3-0)</td>
<td>Reading selected texts on scientific and technological condition of modern China. Pre: 362321.</td>
</tr>
<tr>
<td>362326</td>
<td>Chinese Reading on Agriculture</td>
<td>3(3-0)</td>
<td>Reading selected texts on modern Chinese agriculture. Pre: 362321.</td>
</tr>
<tr>
<td>362331</td>
<td>Chinese Composition</td>
<td>3(3-0)</td>
<td>Writing descriptive, expository, argumentative, critical, and comparative compositions. Pre: 362321.</td>
</tr>
<tr>
<td>362341</td>
<td>Chinese Business Conversation</td>
<td>3(3-0)</td>
<td>Vocabulary and expressions used in actual business meeting. Pre: 362241.</td>
</tr>
<tr>
<td>362342</td>
<td>Chinese News Listening</td>
<td>3(3-0)</td>
<td>Vocabulary and expressions used in radio and television news. Pre: 362241.</td>
</tr>
<tr>
<td>362413</td>
<td>Chinese for the Standardized Test</td>
<td>3(3-0)</td>
<td>Vocabulary and expressions, grammatical structures, listening, reading and writing skill for the standardized test. Pre: 362311.</td>
</tr>
<tr>
<td>362421</td>
<td>Chinese Philology</td>
<td>3(3-0)</td>
<td>History and development of Chinese philology. Pre: 362311.</td>
</tr>
<tr>
<td>362451</td>
<td>Translation from Chinese into Thai</td>
<td>3(3-0)</td>
<td>Fundamental principles and techniques in translating Chinese into Thai. Pre: 362311.</td>
</tr>
<tr>
<td>362452</td>
<td>Translation from Thai into Chinese</td>
<td>3(3-0)</td>
<td>Fundamental principles and techniques in translating Thai into Chinese. Pre: 362311.</td>
</tr>
<tr>
<td>362461</td>
<td>Chinese for Tourism in Thailand</td>
<td>3(3-0)</td>
<td>Vocabulary and expressions concerning traveling and tourist attractions in Thailand. Field trip required. Pre: 362311.</td>
</tr>
<tr>
<td>362462</td>
<td>Chinese for Tourism in China</td>
<td>3(3-0)</td>
<td>Vocabulary and expressions concerning traveling and tourist attractions in China. Pre: 362311.</td>
</tr>
<tr>
<td>362463</td>
<td>Chinese for Hotel Studies</td>
<td>3(3-0)</td>
<td>Vocabulary and expressions used in hotel business. Field trip required. Pre: 362311.</td>
</tr>
<tr>
<td>362464</td>
<td>Chinese for Secretarial Science</td>
<td>3(3-0)</td>
<td>Vocabulary and expressions used in secretarial science. Field trip required. Pre: 362311.</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
<td>Description</td>
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</tr>
<tr>
<td>362471</td>
<td>Elementary Chinese for Business</td>
<td>3(3-0)</td>
<td>Reading business texts. Writing business letters, contracts, advertisement, notice, facsimile, and brochure.</td>
</tr>
<tr>
<td>362472</td>
<td>Chinese for International Business</td>
<td>3(3-0)</td>
<td>Vocabulary and expressions concerning International business.</td>
</tr>
<tr>
<td>362471</td>
<td>Sinology</td>
<td>3(3-0)</td>
<td>Development of philosophy, literature, history and wisdom of the ancient Chinese.</td>
</tr>
<tr>
<td>362471</td>
<td>Selected Topics in Chinese</td>
<td>3(3-0)</td>
<td>Interesting topics in Chinese at the bachelor’s degree level. Topics to change in each semester.</td>
</tr>
<tr>
<td>362497</td>
<td>Seminar</td>
<td>3(3-0)</td>
<td>Presentation and discussion on current interesting topics in Chinese at the bachelor’s degree level.</td>
</tr>
<tr>
<td>362498</td>
<td>Special Problems</td>
<td>3(3-0)</td>
<td>Research in Chinese at the bachelor’s degree level and compiled into a report.</td>
</tr>
</tbody>
</table>

**LAOTIAN LANGUAGE**  
*(366xxx)*

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>366311</td>
<td>Laotian I</td>
<td>3(3-0)</td>
<td>The sound system of Laotian. Comparison of the Laotian and the Thai sound systems. Reading and writing Laotian script. Laotian grammar. Basic listening, speaking, reading and writing skills with a vocabulary of 400 words used in everyday life.</td>
</tr>
<tr>
<td>366312</td>
<td>Laotian II</td>
<td>3(3-0)</td>
<td>Levels of formality. Listening, speaking, reading and writing skills with a vocabulary of 600 new Laotian words. Conversations on everyday life topics.</td>
</tr>
<tr>
<td>366411</td>
<td>Laotian III</td>
<td>3(3-0)</td>
<td>Listening, speaking, reading and writing skills with a vocabulary of 1,200 Laotian words and idioms. Telling stories. Expressing views.</td>
</tr>
</tbody>
</table>

**MYANMAR LANGUAGE**  
*(367xxx)*

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>367311</td>
<td>Myanmar Language I</td>
<td>3(3-0)</td>
<td>The sound system of Myanmar. Comparison of the Myanmar and the Thai sound systems. Reading and writing Myanmar script. Myanmar grammar. Basic listening, speaking, reading and writing skills with a vocabulary of 400 words used in everyday life.</td>
</tr>
<tr>
<td>367312</td>
<td>Myanmar Language II</td>
<td>3(3-0)</td>
<td>Levels of formality. Listening, speaking, reading and writing skills with a vocabulary of 600 new Myanmar language words. Conversations on everyday life topics.</td>
</tr>
</tbody>
</table>
**Myanmar Language III**

Pre : 367312

Listening, speaking, reading and writing skills with a vocabulary of 1,200 Myanmar language words and idioms. Telling stories. Expressing views.

**KOREAN LANGUAGE**

(368xxx)

**Korean I**

Pre : 368311

The sound system of Korean. Comparison of the Korean and the Thai sound systems. Reading and writing Korean script. Korean grammar. Basic listening, speaking, reading and writing skills with a vocabulary of 400 words used in everyday life.

**Korean II**

Pre : 368311

Levels of formality. Listening, speaking, reading and writing skills with a vocabulary of 600 new Korean language words. Conversations on everyday life topics.

**Korean III**

Pre : 368312

Listening, speaking, reading and writing skills with a vocabulary of 1,200 Korean language words and idioms. Telling stories. Expressing views.

**VIETNAMESE LANGUAGE**

(369xxx)

**Vietnamese I**

The sound system of Vietnamese language. Comparison of the Vietnamese and the Thai sound systems. Reading and writing Vietnamese script. Vietnamese grammar. Basic listening, speaking, reading and writing skills with a vocabulary of 400 words used in everyday life.

**Vietnamese II**

Pre : 369311

Levels of formality. Listening, speaking, reading and writing skills with a vocabulary of 600 new Vietnamese words. Conversations on everyday life topics.

**Vietnamese III**

Pre : 369312

Listening, speaking, reading and writing skills with a vocabulary of 1,200 Vietnamese words and idioms. Telling stories. Expressing views.

**LIBRARY SCIENCE**

(371xxx)

**Use of Library Resources**

Library resources, use of search tools, writing references.

**Documentary Investigation and Bibliography**

Theory, principles, and techniques of investigating and compiling bibliographies in subject fields.
371421  Technical Research Writing  3(2-2)
Characteristic of articles; article and research report writing method; use of
language; table, graph and abstract writing.

LINGUISTICS
(372xxx)

372101  English Phonetics  3(3-0)
  Recognition and production of consonants, vowels, and intonation of the
  English language. This course is designed for Thai students in general. It emphasizes
  problem sounds for Thai learners studying English so that they will be able to recognize
  and produce English sounds correctly.

372201  Word Structure in English  3(3-0)
  Bound and free morphemes, affixes and their meanings, bound roots with
  their meanings, and the analysis of English word structure.

372202  Words and Meanings in English  3(3-0)
  Words and meanings, word structure, vocabulary used in various fields,
  semantic fields, collocations, meaning of proverbs and idioms.

372203  Language in Media  3(3-0)
  Analysis of language used in mass media and the Internet.

372204  Language and Identity  3(3-0)
  Relationship between language and the perception or the performance
  of social groups: minorities, age, gender, profession, social stratification. Language
  choice to express the identity of the group.

372205  Foreign Language Learning Techniques  3(3-0)
  Factors effecting foreign language learning, influence of mother tongue,
  foreign language learning processes, foreign language learning techniques.

372206  Special Communication Systems  3(3-0)
  World view of the vision impaired, and the audible impaired, Braille,
  sign language and applications.

372207  Vietnamese Language and Culture  3(3-0)
  Skills in listening, speaking, reading and writing basic Vietnamese
  as a medium for understanding Vietnamese society and culture, the study of Vietnamese
  language in relation to socio-cultural context.

372211  Man and Language  3(3-0)
  Study of the importance of language as a means of discriminating human
  beings from other creatures by studying the nature of human language, the learning and
  application of language by human beings, the sociological aspects of the role of language,
  the relationship of language and conception, and language as a means for communicating
  ideas, meaning and for molding human ideas.

372212  Introduction to Linguistics  3(3-0)
  Introduction to the theories and basic principles in the study of language,
  observing and learning about the important components of linguistics and the relationship
  between linguistics and other fields of study.

372213  Articulatary Phonetics  3(3-0)
  Pre : 372212
The vocal mechanism, speech sounds and their symbols. Practice pronunciation of sounds represented by the phonetic symbols of the International Phonetic Association and the transcription of phonemes of natural languages. A brief look at the difference between phonetics and phonemics.

372221  Introduction to Linguistics for Translation 3(3-0)
Background knowledge concerning language and linguistics. Linguistic terms and theories used as a basis for more advanced courses, principles useful to translation.

372222  Principles of Translation 3(3-0)
Basic knowledge in linguistics. Principles of translation, literal and meaning based translation. Syntactic, semantic, pragmatic, and contextual factors relevant to translation. A basic comparative study between languages.

372311  Morphological and Syntactical Analysis 3(3-0)
Pre : 372212
Main concepts used in translation theory, examining in particular concepts of translation equivalence, units of translation and levels of interpretation. Translation will be considered both within a linguistic framework and also within the wider framework of semiotics.

372321  Linguistic Approach to Translation 3(3-0)
Pre : 372221 or 372212
Study of approaches used in the description of language at the levels of morphology, syntax and discourse and their relationship to theories of semantics and pragmatics relevant to the study of translation.

372324  Introduction to Contrastive Analysis of Thai and English for Translation 3(3-0)
Pre : 372221 or 372212
Contrastive analysis theory. Contrastive analysis of Thai and English at the microlinguistic level bases on generative syntactic theory. Application to translation.

372411  Language in Cultural Context 3(3-0)
Pre : 372212
Linguistic diversity in society. Linguistic variation. Language change. The accomplishment or failure in communication or conveying meanings. The right understanding which has language and culture as the important factors. The close relationship between language and culture.

372423  Advanced Contrastive Analysis of Thai and English for Translation 3(3-0)
Pre : 372324
An analysis of differences in the structure of spoken and written forms in Thai and English at morpheme, word, phrase, sentence and discourse levels. Figures of speech, concept of cohesion, and stylistic variations will be compassed in both languages. The relevant cultural systems and attitudes towards the linguistic forms are also included.

372431  Word and Meaning 3(3-0)
Pre : 372212
Study of the semantic structure of words, their meaning in relation to the other words and to the whole sentence. Study of changes in meaning is also included.

372441  French Sound System 3(3-0)
Pre : 372212
Study of the way in which speech sounds are articulated by the vocal organs. Also practice in pronunciation and transcription of French sounds.

372451  German Sound System 3(3-0)
Pre : 372212
Study of the way in which speech sounds are articulated by the vocal organs. Also practice in pronunciation and transcription of German sounds.

ENGLISH LITERATURE
(373xxx)

373111 Introduction to Literature 3(3-0)
Primary principles in reading and criticizing various genres of literature.

373201 Understanding Fiction 3(3-0)
Literary elements, devices, and techniques; interpretation of fiction.

373202 Interpreting Literature 3(3-0)
Important concepts of literature: poetry, fiction and drama.

373203 Literature and Popular Culture 3(3-0)
The relationship between literature and popular culture. The links between high and popular culture. Cultures and subcultures. Popular culture in literature, media, and material culture.

373204 Outstanding Literary Figures 3(3-0)
Outstanding figures from classical mythology, Scandinavian legends, Medieval legends, the Bible, and literature of different periods.

373211 Backgrounds for Literary Studies 3(3-0)
Major stories from Greek and Roman mythology and the Bible. Western concepts and traditions influential to literature.

373221 Evolution of English Literature 3(3-0)
The evolution of English literature from the beginning to the present. The lives and distinguished works of major authors as well as historical, religious, philosophical and social background of each period.

373311 Introduction to Poetry 3(3-0)
Pre : 355113
Prosody, reading poetry. Content, devices, and technique of poetry from the earliest pieces through contemporary poetry.

373312 Introduction of Drama 3(3-0)
Pre : 355113
The structure of plays. Dramatic terms. History and development of Western drama from the Greek period to the early 19th century. Study of certain portions of various distinguished plays from each period.

373313 Introduction to Fiction 3(3-0)
Pre : 355113
Study of the structure and elements of fiction through selected short stories and novels.

373314 Western Literature and Art 3(3-0)
Pre : 355113
Relationship between Western literature and art with emphasis on literary and artistic movements.

373321 Eighteenth Century English Novel 3(3-0)
Pre : 355113
Distinguishing characteristics of the early English novel and its evolution. Reading and criticizing works by Defoe, Swift, Fielding, and other major authors.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>373322</td>
<td>Nineteenth Century English Novel</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 355113</td>
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<td></td>
<td>Distinguishing characteristics of the 19th century English novel. Reading and criticizing works of Dickens, Bronte, Eliot, and other major authors.</td>
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<tr>
<td>373323</td>
<td>Sixteenth Century English Poetry</td>
<td>3(3-0)</td>
</tr>
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<td></td>
<td>Pre : 373111 or 373311</td>
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<td></td>
<td>Distinguishing characteristics of Elizabethan poetry. Reading and criticizing poetry of Spenser, Jonson, Marlowe, Shakespeare, and other major poets.</td>
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<tr>
<td>373324</td>
<td>Romantic Poetry</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 373111 or 373311</td>
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<tr>
<td></td>
<td>Characteristics of Romantic poetry. Philosophical concepts as seen in distinguished poems of Wordsworth, Coleridge, Shelley, Keats and other leading poets.</td>
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<tr>
<td>373325</td>
<td>Victorian Poetry</td>
<td>3(3-0)</td>
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<td></td>
<td>Pre : 373111 or 373311</td>
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<tr>
<td></td>
<td>Distinguishing characteristics and concepts of Tennyson, Browning, Arnold, Hopkins and other major poets.</td>
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<tr>
<td>373326</td>
<td>Introduction to Shakespeare</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>The life, works, both plays and poems, and thought of Shakespeare as a poet and playwright. The theatre in the time of Shakespeare. Study of some of the poems and plays.</td>
<td></td>
</tr>
<tr>
<td>373331</td>
<td>Evolution of American Literature</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 355113</td>
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</tr>
<tr>
<td></td>
<td>The evolution of American literature from the beginning to the present. The lives and important works of leading authors and the historical, religious, philosophical and social background of each period.</td>
<td></td>
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<tr>
<td>373332</td>
<td>Nineteenth Century American Literature</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 355113</td>
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<tr>
<td></td>
<td>The distinguished characteristics of American literature of the 19th century. Reading and criticizing novels, poetry and plays of leading writers.</td>
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<tr>
<td>373333</td>
<td>Early Australian Literary Works</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Australian literary works from the pioneer through the modern periods presenting significant historical and social themes.</td>
<td></td>
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<tr>
<td>373341</td>
<td>The Short Story</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 355113</td>
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<tr>
<td></td>
<td>Reading and criticizing highly respected short stories of England, American and other countries to study forms, themes, and philosophical concepts.</td>
<td></td>
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<tr>
<td>373342</td>
<td>Literary Criticism I</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 355113</td>
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</tr>
<tr>
<td></td>
<td>Critical theories from the age of Aristotle to the late 19th century.</td>
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<tr>
<td>373421</td>
<td>Seventeenth and Eighteenth Century English Poetry</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 373111 or 373311</td>
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<tr>
<td></td>
<td>The poetry and thought of John Donne and other metaphysical poets of the 17th century and Dryden and other Neoclassical poets. Study of their major works.</td>
<td></td>
</tr>
<tr>
<td>373422</td>
<td>Shakespeare’s Plays</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Reading and criticism of selected tragedies, comedies, and histories of Shakespeare.</td>
<td></td>
</tr>
<tr>
<td>373424</td>
<td>The Modern Novel</td>
<td>3(3-0)</td>
</tr>
</tbody>
</table>
Pre : 355113
Distinguishing features of the 20th century novel. Reading and criticism of works by Forster, Lawrence, Joyce, Hemingway and other leading novelists.

373425 Modern Drama 3(3-0)
Pre : 355113
Western plays and dramatic theories from the mid 19th century to the present. Study of some outstanding plays in detail.

373431 Black American Literature 3(3-0)
The life, thought and behavior of Black Americans as seen in literary works of Black or White American authors.

373432 Fiction and Film 3(3-0)
Comparison of narrative techniques in fiction and film and the influence of each art form upon the other.

373433 Contemporary Australian Literary Works 3(3-0)
Contemporary Australian literary works presenting socially and culturally important themes.

373441 Literary Criticism II 3(3-0)
Pre : 373342
Fields of knowledge and theories which figure prominently in literary criticism. New trends in literary criticism. Study of works by Ransom, Empson, Trilling and other major critics.

373442 Twentieth Century English and American Novel 3(3-0)
Reading and criticizing the novels of James, Conrad, Hemingway, Steinbeck, Faulkner, and other leading novelists.

373443 Twentieth Century English and American Poetry 3(3-0)
Pre : 373111 or 373311
Reading and criticism of the poetry of Yeats, Dickinson, Eliot and other major poets.

373444 Comparative Study of Short Stories 3(3-0)
Pre : 373111 or 373341
Criticizing and comparing short stories from both Western and Eastern countries in terms of form, themes and concepts.

373445 Comparative Literature 3(3-0)
Pre : 373111 or 373211
Comparison of the literature of different nations with emphasis on history, philosophy, psychology and aesthetics.

373446 Contemporary Literary Works 3(3-0)
Pre : 373221 or 373331
Works of poets and writers of Britain, America, and other nations since World War II.

373447 Nobel Prize Literary Works 3(3-0)
Works awarded the Nobel Prize with a particular emphasis on their genres and essential concepts.

373448 Masterpieces of World Literature 3(3-0)
Major works of Homer, Dante, Goethe, Tolstoy and other leading authors of the world.

373497 Seminar 1(1-0)
Presentation and discussion on current interesting topics in English Literature at the bachelor’s degree level.
373498  **Special Problems**  1-2

Study and research in English Literature at the bachelor level and compile into a report.

**FRENCH LITERATURE**  
(374xxx)

374211  **History of French Literature I**  3(3-0)  
Pre : 356211

A study of French Literary history from the Middle Ages to the Seventeenth Century through distinguished works of different genres in each period.

374311  **History of French Literature II**  3(3-0)  
Pre : 374211

A study of French Literary history from the Eighteenth Century to the present through distinguished works of different genres in each period.

**JAPANESE LITERATURE**  
(375xxx)

375411  **History of Japanese Literature I**  3(3-0)  
Pre : 358222

History of Japanese literature from the Nara period to the late Heian period and their outstanding works.

375412  **History of Japanese Literature II**  3(3-0)  
Pre : 375411

History of Japanese literature from the Kamakura period to the Edo period and their outstanding works.

**THAI LITERATURE**  
(376xxx)

376101  **Literature and Life**  3(3-0)

Analytical reading of literary works to assess meanings and value to life by studying works of Thai literature and world literature.

376111  **Thai Society in Literature**  3(3-0)

Relationship of literature to society including lifestyles, culture, and social values found in Thai literature from the Sukhothai period to the present.

376211  **Thai Literature and Nature Studies**  3(3-0)

Poets’ concern of nature and reality which forms a convention of Thai literature. Development of ideas concerning nature found in Thai literature.

376212  **Literary Criticism**  3(3-0)

Theories and approaches of Thai and Western literary criticism. Practice in applying theories in Thai literature.

376221  **Literature of the Sukhothai Period**  3(3-0)

Literature and selected inscriptions of the Sukhothai Period.

376222  **Literature of the Ayutthaya Period**  3(3-0)

Selected major literary works of the Ayutthaya Period.
376223  Literature of the Rattanakosin Period 3(3-0)  
Prose and poetry from the first to the sixth reigns of the Rattanakosin Period: study of background, content, and form to reveal their distinguishing characteristics and the evolution of literary works of the Rattanakosin Period; reading of important works in detail.

376311  Evolution of Thai Literature 3(3-0)  
History of Thai literature from the Sukhothai Period through the Ayutthaya, Thonburi and Rattanakosin Periods. Emphasis on evolution of form, content and concept.

376312  Thai Literature and the Arts 3(3-0)  
Relationship between Thai literature and arts with emphasis on painting, sculpture, and architecture.

376313  Evolution of Thai Song Lyrics 3(3-0)  
Evolution of the lyrics of folk, classical, country, and modern Thai song focusing on form, content, concepts, artistic devices, as well as the social and cultural roles of song lyrics.

376321  Modern Literary Works 3(3-0)  
Critical approaches to Thai literature from the King Rama V period to the present in evolution, form, content, and concept.

376331  Literary Works of Major Poets 3(3-0)  
Works of major Thai poets such as Phra Maha Ratchakhru, Sri Prat, Sri Mahosot, and Phraya Trang.

376341  Jataka and Folk Tales 3(3-0)  
The study of selected principal Jataka and folk tales in source, characteristic, form, content, and concept.

376342  Literature of the Performing Arts 3(3-0)  
Evolution, characteristics, conventions, and techniques in literature of performing arts.

376343  Didactic Literature 3(3-0)  
Concepts, lifestyles, culture, and social values found in didactic literature in both direct and indirect presentation.

376344  Literary Works Occasioned by Tradition 3(3-0)  
Literary works presented in or concerning traditional such as Ong Kan Chaeng Nam, Chan Dusadi Sangwwoei, and Phra Ratcha Piti Sip Song Duan.

376345  Eulogies for Kings 3(3-0)  
Exploration of eulogies for Kings in various periods.

376346  Literary Works in Nirat Genre 3(3-0)  
Background and the evolution of content and form of literary works in Nirat genre; detailed studies of selected works.

376347  Local Literary Works 3(3-0)  
Literature and languages of various parts of Thailand.

376411  The Works That Affect Thai Language Development 3(3-0)  
Works of Phraya Sri Sunthorn Vohan (Noi Acharayangkun), Phraya Upakit Silapasan, Phraya Anumanratchathon, Phra Saraprasoet, and Prince Narathip which have affected the expansion and development of the Thai language.

376412  Comparative Literature 3(3-0)  
Comparative theories and practices on source, theme, genre, and period between Thai and other countries' literature.

Pre : 376311

Comparative theories and practices on source, theme, genre, and period between Thai and other countries' literature.
<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tr>
<td>376413</td>
<td><strong>Indology in Thai Literature</strong></td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Ancient Indian civilizations as they appear in Thai literature.</td>
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<tr>
<td>376414</td>
<td><strong>Literature and Other Disciplines</strong></td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Relationship of literature of other disciplines with emphasis on history, philosophy, psychology, and sociology.</td>
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<td>376415</td>
<td><strong>Thai Versions of Foreign Literary Works</strong></td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Thai literary works derived from foreign sources focusing on changes in content, form, and artistic devices.</td>
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<tr>
<td>376431</td>
<td><strong>Literary Works of Prince Thammathibet</strong></td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Selected distinguished works of Prince Thammathibet.</td>
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<tr>
<td>376342</td>
<td><strong>Literary Works of Chao Phraya Phra Khlang (Hon)</strong></td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Chao Phraya Phra Khlang (Hon)’s distinguished works.</td>
<td></td>
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<tr>
<td>376433</td>
<td><strong>Poetical Works of Sunthorn Phu</strong></td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Sunthorn Phu’s major Nirats and tales.</td>
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<tr>
<td>376434</td>
<td><strong>Literary Works of Prince Paramanuchit</strong></td>
<td>3(3-0)</td>
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<td></td>
<td>Selected major works including essays and poetry of Prince Paramanuchit.</td>
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<tr>
<td>376435</td>
<td><strong>Literary Works of King Rama VI</strong></td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Selected distinguished works including essays, poetry and drama of King Rama VI.</td>
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<tr>
<td>376436</td>
<td><strong>Literary Works of Prince Bidyalongkorn</strong></td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Selected important works including essays and poetry of Prince Bidyalongkorn.</td>
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<tr>
<td>376441</td>
<td><strong>Buddhist Literature</strong></td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Buddhist literature in Thai such as Triphum, Maha Chat Kham Luang and Pathom Somphot.</td>
<td></td>
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<tr>
<td>376442</td>
<td><strong>Folklore</strong></td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Theories and forms of folklore such as songs, games and tales characterized by various Thai groups.</td>
<td></td>
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<tr>
<td>376443</td>
<td><strong>Modern Literature in Translation</strong></td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Thai literary works derived form foreign sources focusing on changes in content, form, and artistic devices.</td>
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<tr>
<td>376444</td>
<td><strong>Adaptations of Literary Works to the Performing Arts</strong></td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Comparison of literary works and adaptations to them of film, television, and the stage.</td>
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<tr>
<td>376497</td>
<td><strong>Seminar</strong></td>
<td>1</td>
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<tr>
<td></td>
<td>Presentation and discussion on current interesting topics in Thai Literature at the bachelor’s degree level.</td>
<td></td>
</tr>
<tr>
<td>376498</td>
<td><strong>Special Problems</strong></td>
<td>1-2</td>
</tr>
<tr>
<td></td>
<td>Study and research in Thai Literature at the bachelor’s degree level and compile into a report.</td>
<td></td>
</tr>
</tbody>
</table>

**GERMAN LITERATURE**

(377xxx)

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>377211</td>
<td><strong>History of German Literature I</strong></td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Introductory German literary history from the Early Middle Ages to the end of the Classical period based on selected examples of each period.</td>
<td></td>
</tr>
</tbody>
</table>
377213 Introduction to German Literature 3(3-0)
Pre : 357211
Introductory reading and criticism of literature in different genres.

377311 History of German Literature II 3(3-0)
Pre : 377211
Introductory German literary history from the Pose-Classical period to the present based on selected examples of each period.

377312 Reading of German Literary Work I 3(3-0)
Pre : 377311
Reading and criticizing the works of leading authors of the “Aukflaerung”, “Sturm und Drang” and “Klassik”.

377411 Reading of German Literary Work II 3(3-0)
Pre : 377311
Reading and criticizing the works of leading authors of the Romantic and “Vormaerz” Periods.

377412 Reading of German Literary Works III 3(3-0)
Pre : 377311
Reading and criticizing the works of leading authors of the Realism, Naturalism, Expressionism. “Post-World War II” Periods.

CHINESE LITERATURE
(378xxx)

378311 History of Chinese Literature I 3(3-0)
History of Chinese literature from pre-Qin period to the Tang Dynasty.

378312 History of Chinese Literature II 3(3-0)
Pre : 378311
History of Chinese literature from the Song Dynasty to the regime change.

378313 Modern Chinese Novel and Short Story 3(3-0)
Modern Chinese novels and short stories after the regime change to the Cultural Revolution.

378314 Classical Chinese Romance and Short Story 3(3-0)
Classical Chinese romances and short stories from the Ming dynasty to the Qing dynasty.

378315 Chinese Poetry 3(3-0)
Chinese poetry from the pre-Tang period to the present.

THAI MUSIC
(385xxx)

385112 Introduction to Thai Music I 1(0-2)
Playing Thai melodies as a foundation for basic-level study.

385113 Introduction to Thai Music II 1(0-2)
Playing Thai melodies as a foundation for higher basic-level study.

385114 Introduction to Thai Music III 1(0-2)
Playing Thai melodies with added techniques as a foundation for higher basic-level study.

385115 Introduction to Thai Music IV 1(0-2)
Playing Thai melodies as a foundation for performing more advanced pieces.

385116  **Introduction to Thai Music V**  
Playing Thai melodies as a foundation for study on a second instrument.  
1(0-2)

385117  **Introduction to Thai Music VI**  
Playing Thai melodies as a foundation for study on a third instrument.  
1(0-2)

385121  **Theory of Thai Music I**  
The Thai musical scale. Components of Thai music: sound, melody, rhythm, forms. Classification and classification of Thai songs. Thai musical terminology.  
3(3-0)

385131  **Thai Instrumental Studies I**  
Study of the major Thai instrument or voice. Playing or singing basic melodies in groups.  
3(2-2)

385132  **Thai Instrumental Studies II**  
Pre : 385131  
Playing the major instrument or singing basic ceremonial or lullaby melodies in groups.  
3(2-2)

385212  **Principles of Thai Ensembles**  
Principles for combining instruments in ensembles. The function and individual characters of instruments in string ensembles, wind and percussion ensembles, and mixed string, wind, and percussion ensembles.  
3(3-0)

385213  **Reading and Writing Thai Music Notation**  
Reading and Writing Thai notation. Writing Thai music in Western notation. Sound qualities of Thai instruments.  
2(1-2)

385214  **Form and Analysis of Thai Music**  
3(3-0)

385223  **History of Thai Music**  
History of Thai music in the Pre-Sukhothai, Sukhothai, Ayutthaya, Thonburi, and Rattanakosin Period.  
2(2-0)

385224  **Northern and North Eastern Thai Folk Music**  
Northern and North-Eastern Thai Folk musical instruments in ensembles. Music played on various occasions i.e. folk dances and folk song.  
3(3-0)

385225  **Southern and Central Thai Folk Music**  
Southern and Central Thai Folk musical instruments in ensembles. Music played on various occasions i.e. folk dances and folk song.  
3(3-0)

385231  **Thai Instrumental Studies III**  
Pre : 385132  
Playing on the major instrument or singing basic in groups Phleng Kraw, or Phleng Tab, or Phleng Peuang.  
3(2-2)

385232  **Thai Instrumental Studies IV**  
Pre : 385231  
Playing on the major instrument or singing basic in groups small Phleng Thao, or Phleng Tab, or Phleng Reuang.  
3(2-2)

385233  **Thai Ensembles I**  
Practice playing simple Thai classical song in string ensembles, wind and percussion ensembles, and mixed string, wind, and percussion ensembles.  
1(0-2)

385234  **Thai Ensembles II**  
Pre : 385233  
1(0-2)
Practice playing moderate Thai classical song in string ensembles, wind and percussion ensembles, and mixed string, wind, and percussion ensembles.

**385263 Classical Thai Singing**
Principle of classical Thai singing. Singing Thao and Tap. Singing to accompany Khon and Lakhon dramatic performances.

**385264 Advanced Classical Thai Singing**

**385265 Thai Music Field Studies**
Field study on Thai music through trips to such places as the homes of Thai musicians, Thai music stores, musical instrument factories, and museums.

**385266 Classical Thai Singing**
Principle of classical Thai singing. Singing Thao and Tap. Singing to accompany Khon and Lakhon dramatic performances.

**385267 Advanced Classical Thai Singing**

**385268 Thai Music Field Studies**
Field study on Thai music through trips to such places as the homes of Thai musicians, Thai music stores, musical instrument factories, and museums.

**385269 History and Development of Thai Instruments**
The history and development of Thai musical instruments, their structure components, and development.

**385315 Form and Analysis of Advanced-level Thai Melodies**

**385321 History and Development of Thai Instruments**
History and background of Thai musical instruments, their structure components, and development.

**385316 Evolution of Thai Music**
The history and development of Thai music from the Sukhothai Period to the present. The development of singing. The influence of Western music on Thai music.

**385322 Compositions of Prominent Thai Composers**
The lives and works of prominent royal, noble, and commoner composers.

**385331 Thai Instrumental Studies V**
Playing the major instrument or singing in groups of Phleng Se-Pha, or Phleng Thao, or Phleng Yon, or Phleng La.

**385332 Thai Instrumental Studies VI**
Playing the major instrument or singing in groups Phleng Na-Phat for the drama, or Phleng Yon, or other special melodies for certain occasions.

**385333 Thai Ensembles III**
Practice playing complicated Thai classical song in string ensembles, wind and percussion ensembles, and mixed string, wind, and percussion ensembles.

**385334 Thai Ensembles IV**
Practice playing advanced complicated Thai classical song in string ensembles, wind and percussion ensembles, and mixed string, wind, and percussion ensembles.

**385381 Thai Music in Classical Drama**
Vocal music in battle scenes and movements and gestures and to express love, anger, joy, sorrow, and other emotions in Khon dramatic performances.

**385382 Thai Music in Religious Ceremonies**
Music performed as part of various Thai religious ceremonies.

**385383 Maintenance of Thai Musical Instruments**
Caring for, maintaining, tuning, repairing, and making Thai instruments.

**385384 Thai Music and Thai Literature**
Thai music as it figures in Thai literature. Musical settings for literary works.

**385385 Comparative Music**
Pre: 385321
The music of various nations of the East and the West: comparison of their musical instruments structure, types of ensembles, and types of musical works.

**385386 Thai Music and the Fine Art**
The relation of Thai music to fine arts, painting, sculpture, architecture, literature, and drama.

**385431 Thai Classical Music Composition**
Pre: 385321
Form and characteristics of Thai compositions. Constructing “sentences.” Elaboration and abbreviation of melodies. Analysis of simple and complex compositions of various periods.

**385432 Teaching of Major Instruments**
Training the major instruments or singing, particularly considering the characteristics of the instrument and selection of pieces suited to the learner.

**385433 Thai Instrumental Studies VII**
Pre: 385332
Playing the major instrument or singing Phleng Diao (solo)-type pieces.

**385434 Advanced Classical Thai Music Composition**
Pre: 385431

**385481 Thai Music and Computer**
Computer components. Application of the computer to music education. Other types of music-related programs.

**385491 Composing**
Composing and Recomposing Thai music.

**385492 Research in Modern Thai Music**
Research on approaches and methods for adapting Thai music to the conditions of modern Thai society. Exchange of ideas, demonstration of new pieces, and production of a report.

**385494 Music Research Methodology**
Principles and methods of conducting research and writing research reports on music.

**385495 Independent Thai Music Studies**
Study of a specific topic of interest and writing of a report.

**385497 Seminar**

**385498 Special Problems**
Study and research at the bachelor’s degree level and compile into writing reports.
<table>
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<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Pre-requisites</th>
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<tr>
<td>386111</td>
<td>Music Theory I</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>General theory of music, intervals, clefs, key signatures, harmony, cadences, ear-training and transposition.</td>
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<tr>
<td>386112</td>
<td>Music Theory II</td>
<td>3(3-0)</td>
<td>386111</td>
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<tr>
<td></td>
<td>Chords, figure bass, basic 4 parts harmony methods and cadences.</td>
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<tr>
<td>386121</td>
<td>Music Appreciation</td>
<td>3(3-0)</td>
<td></td>
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<tr>
<td></td>
<td>Characteristics of Thai and Western music of various periods, categories of musical instruments, musical terminology, principles of listening to Thai music, classical music, and jazz.</td>
<td></td>
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<tr>
<td>386141</td>
<td>Introduction to Western Music I</td>
<td>1(0-2)</td>
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<tr>
<td></td>
<td>Elementary knowledge of a selected or secondary instrument, major scales and transposition.</td>
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<tr>
<td>386142</td>
<td>Introduction to Western Music II</td>
<td>1(0-2)</td>
<td>386141</td>
</tr>
<tr>
<td></td>
<td>Elementary knowledge of a selected or secondary instrument, minor scales, sight-reading.</td>
<td></td>
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<tr>
<td>386151</td>
<td>Beginning Piano I</td>
<td>1(0-2)</td>
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<tr>
<td></td>
<td>Elementary knowledge of the piano, major scales and transposition.</td>
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<tr>
<td>386152</td>
<td>Beginning Piano II</td>
<td>1(0-2)</td>
<td>386151</td>
</tr>
<tr>
<td></td>
<td>Minor scales, sight-reading, transposition.</td>
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<tr>
<td>386161</td>
<td>Chorus I</td>
<td>2(2-0)</td>
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<tr>
<td></td>
<td>Reading music, methods of vocalization and harmonization for males and females.</td>
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<tr>
<td>386162</td>
<td>Chorus II</td>
<td>2(2-0)</td>
<td>386161</td>
</tr>
<tr>
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<td>Reading more difficult music, methods of vocalization and harmonization.</td>
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<tr>
<td>386171</td>
<td>Principal Instrumental Studies I</td>
<td>3(2-2)</td>
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<tr>
<td></td>
<td>Elementary knowledge of principal instrument or voice, staff, rhythm, counting, note values, major and minor scales, compositions of various composers.</td>
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<tr>
<td>386172</td>
<td>Principal Instrumental Studies II</td>
<td>3(2-2)</td>
<td>386171</td>
</tr>
<tr>
<td></td>
<td>Elementary knowledge of principal instrument or voice, staff, rhythm, counting, note values, major and minor scales, more advanced compositions of various composers.</td>
<td></td>
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<tr>
<td>386181</td>
<td>Piano Accompaniment in Music of the Baroque Period</td>
<td>1(0-2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Structure of music in the Baroque period and the role of the piano as an accompaniment to the soloist.</td>
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</tr>
</tbody>
</table>
Structure of music in the Classical period and the role of the piano as an accompaniment to the soloist.

Structure of music in the Romantic period and the role of the piano as an accompaniment to the soloist.

Structure of music in the Twentieth century and the role of the piano as an accompaniment to the soloist.

Chords, figure bass, intermediate 4 parts harmony methods and cadences.

Chords, figure bass, advance 4 parts harmony methods, cadences and modulation.

Ancient instruments, components of music in the Eastern countries, musical instruments, comparison of music among different countries.

Development of Western music from the Middle Ages to the Renaissance period, church and secular music.

More techniques on a selected or secondary instrument, major scales, transposition.

Major and minor scales, sight-reading, transposition.

Key signatures, major scales and arpeggios, transposition.

Major and minor scales, arpeggios, transposition, sight-reading.

Principal instrument or voice at an intermediate level, major and minor scales, arpeggios, modulation and transposition.

Principal instrument or voice at an intermediate level, major and minor scales, more difficult arpeggios, more advance compositions, modulation and transposition.

Ear-training and sight-reading, clap and sing the given rhythm, sing a single note and intervals.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
</tr>
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<tr>
<td>386282</td>
<td>Musicianship II</td>
<td>1(0-2)</td>
<td>Pre: 386281</td>
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<td>Clap a more complex rhythm, sing scales and dictation.</td>
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<tr>
<td>386311</td>
<td>Pop and Jazz Music Arranging</td>
<td>2(2-0)</td>
<td>Pre: 386212</td>
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<td>Form, harmonic progression and harmonic arrangement in Pop and Jazz music.</td>
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<tr>
<td>386321</td>
<td>History of Western Music II</td>
<td>2(2-0)</td>
<td>Pre: 386222</td>
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<td></td>
<td>Development of Western music from the Baroque period to the Classical period including composers and important work.</td>
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<tr>
<td>386322</td>
<td>History of Western Music III</td>
<td>2(2-0)</td>
<td>Pre: 386321</td>
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<td></td>
<td>Development of Western music from the Romantic period to the Twentieth century including composers and important work.</td>
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<tr>
<td>386341</td>
<td>Intermediate Western Music I</td>
<td>1(0-2)</td>
<td>Pre: 386242</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Scales, musical terminology, arpeggios, sight-reading</td>
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<tr>
<td>386342</td>
<td>Intermediate Western Music II</td>
<td>1(0-2)</td>
<td>Pre: 386341</td>
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<td>Individual study of a selected or secondary instrument, study of assigned pieces.</td>
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<td>386351</td>
<td>Secondary Piano III</td>
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<td>Scales, musical terminology, arpeggios, sight-reading.</td>
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<td>Secondary Piano IV</td>
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<td>Individual study of the piano, study of assigned pieces.</td>
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<td>Ensemble I</td>
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<td>A performance of a classical chamber music at a beginning level, grouped as duet, trio, quartet or ensemble group.</td>
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<td>386362</td>
<td>Ensemble II</td>
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<td>A performance of a classical chamber music at an intermediate level, grouped as duet, trio, quartet or ensemble group.</td>
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<td>Ensemble III</td>
<td>1(0-2)</td>
<td>Pre: 386362</td>
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<td>A performance of a classical chamber music at an early advance level, grouped as duet, trio, quartet or ensemble group.</td>
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<td>1(0-2)</td>
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<td>A performance of a classical chamber music at an advance level, grouped as duet, trio, quartet or ensemble group.</td>
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<td>386365</td>
<td>Computer Technology in Music</td>
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<td>386366</td>
<td>Marching Band</td>
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<td></td>
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<td>History, managing and conducting of Marching Band, rehearsal discipline and development of musical skill.</td>
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<td>386371</td>
<td>Principal Instrumental Studies V</td>
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<tr>
<td></td>
<td>Pre : 386272</td>
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<td>A performance, at an advanced level, on a selected instrument or voice, study of more complex compositions.</td>
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<td>386372</td>
<td>Principal Instrumental Studies VI</td>
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<td>Pre : 386371</td>
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<td>A performance, at an advanced level, on a selected instrument or voice, study of more complex compositions and compositions by important composers.</td>
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<td>386381</td>
<td>Music for Children I</td>
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<tr>
<td></td>
<td>Pre : 386381</td>
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<tr>
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<td>Music for young children and guidance of music studies.</td>
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<td>386382</td>
<td>Music for Children II</td>
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<tr>
<td></td>
<td>Pre : 386381</td>
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<td>Music for children and techniques used to enhance the musical knowledge of children.</td>
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<td>386383</td>
<td>Music for Children III</td>
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<tr>
<td></td>
<td>Pre : 386382</td>
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<td>Music for children and the use of advanced techniques to teach music to children.</td>
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<td>386384</td>
<td>Keyboard Pedagogy</td>
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<td></td>
<td>Pre : 386272</td>
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<td>History keyboard instrument. Principles of practice and etude analysis for improving keyboard instrumental skill.</td>
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<td>386385</td>
<td>String Pedagogy</td>
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<td></td>
<td>Pre : 386272</td>
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<td>History string instrument. Principles of practice and etude analysis for improving string instrumental skill.</td>
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<td>386386</td>
<td>Wind Pedagogy</td>
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<td></td>
<td>Pre : 386272</td>
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<td>386387</td>
<td>Percussion Pedagogy</td>
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<td></td>
<td>Pre : 386272</td>
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<td>History percussion instrument. Principles of practice and etude analysis for improving percussion instrumental skill.</td>
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<td>386388</td>
<td>Vocal Pedagogy</td>
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<tr>
<td></td>
<td>Pre : 386272</td>
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<td>Vocal literature, principles of practice and etude analysis for improving in voice skill.</td>
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<td>386461</td>
<td>Basic Conducting</td>
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<td>Basic methods of conducting, elementary knowledge of musical scoring for different instruments.</td>
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<td>386462</td>
<td>Conducting</td>
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<tr>
<td></td>
<td>Pre : 386441</td>
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<td>Conducting, methods of conducting for successful rehearsal and performance.</td>
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386471  **Principal Instrumental Studies VII** 3(2-2)
Pre : 386372
A repertoire, selected from the work of well-known composers.

386481  **Popular Music I** 2(2-0)
Thai and Western popular vocal and instrumental music including rock
and roll since 1950, characteristics of composition.

386482  **Popular Music II** 2(2-0)
Thai and Western popular vocal and instrumental music and the
characteristics of its composition.

386483  **Popular Music III** 2(2-0)
Thai and Western popular vocal and instrumental music and the
characteristics and trends in its composition.

386484  **Form and Analysis** 2(2-0)
Forms in music; such as, sonata, rondo, variations and fugue.

386485  **Musical Composition** 2(2-0)
Structure of various types of melodies, and compositions of chamber and
orchestral music.

386486  **Counterpoint I** 2(2-0)
Contrapuntal forms and part writing techniques up to intermediate level,
analysis and written exercises and studying of variety compositions.

386487  **Orchestration** 2(2-0)
Instruments used in the orchestra, techniques of orchestration.

386489  **Counterpoint II** 2(2-0)
Pre : 386486
Advance contrapuntal forms and part writing techniques, studying and
analysis of variety compositions.

386491  **Professional Training** 3(1-4)
Pre : 386372
Professional training in music; teaching, sound recording in studio and
concert management.

386493  **Composition for Motion Pictures and Television** 2(1-2)
Pre : 386485
Composition for motion pictures and television, methods used in the
entertainment field and editing.

386497  **Seminar** 1
Presentation and discussion on current interesting topics in western music
at the bachelor’s degree level.

386498  **Special Problems** 2(2-0)
Study and research in Western music at the bachelor’s degree level and
compile into a written report.

386499  **Senior Recital** 3(1-4)
A preparation for a senior recital required for graduation.
### PHILOSOPHY

(387xxx)

<table>
<thead>
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<th>Course Code</th>
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<tbody>
<tr>
<td>387101</td>
<td>The Art of Living with Others</td>
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<td>The art of living well with others. Thai and international etiquette. Self-cognition for self-improvement. Training in mental development.</td>
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<tr>
<td>387102</td>
<td>General Philosophy</td>
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<td>Meaning, scope and problems of philosophy. Important philosophical ideas. Application of philosophy to life and society.</td>
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<tr>
<td>387111</td>
<td>Introduction to Philosophy</td>
<td>3(3-0)</td>
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<tr>
<td>387121</td>
<td>Introduction to Logic</td>
<td>3(3-0)</td>
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<tr>
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<td>Process of thought. Thought related in forms of deductive and inductive reasoning. The role of logic in scientific explanation and in language in general.</td>
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<tr>
<td>387211</td>
<td>History of Western Philosophy I</td>
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<tr>
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<td>History of ideas in Greek and medieval philosophies.</td>
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<tr>
<td>387212</td>
<td>History of Western Philosophy II</td>
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<td>Pre : 387211</td>
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<td>History of ideas in the modern and contemporary philosophy.</td>
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<tr>
<td>387213</td>
<td>Oriental Philosophy Before the Age of the Buddha</td>
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<td>Sources and nature of important oriental philosophies from the beginning up to the age of the Buddha.</td>
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<tr>
<td>387221</td>
<td>Indian Philosophy I</td>
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<td>Pre : 387102 or 387111</td>
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<td>Origin and general characteristics of Indian Philosophy. Differences between Indian and Western thought. Astika and Nastika philosophies.</td>
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<tr>
<td>387222</td>
<td>Indian Philosophy II</td>
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<td></td>
<td>Pre : 387221</td>
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<td></td>
<td>Concepts in the thought of prominent Indian philosophers of the 19th–20th centuries and their influence upon today’s world.</td>
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<td>387223</td>
<td>Chinese Philosophy</td>
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<td></td>
<td>Pre : 387102 or 387111</td>
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<tr>
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<td>General characteristics of Chinese philosophy. Thought of the prominent philosophers and trends in the present time.</td>
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<tr>
<td>387321</td>
<td>Epistemology</td>
<td>3(3-0)</td>
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<td></td>
<td>Pre : 387102 or 387111 and 387121</td>
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<td>Theories of sources and scope of knowledge. Methods of approaching knowledge. Eastern and Western criteria of true knowledge.</td>
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<tr>
<td>387322</td>
<td>Ethics</td>
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<td>387323</td>
<td>Aesthetics</td>
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<td>Meaning, scope and problems of aesthetics. Theories of beauty and art. Relationships among beauty, art and reality.</td>
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<td>387324</td>
<td>Metaphysics</td>
<td>3(3-0)</td>
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</table>
Pre: 387102 or 387111
Meaning, scope, problems, and methods of metaphysics. Important metaphysical theories.

387331 Theravada Buddhist Philosophy 3(3-0)
Pre: 387102 or 387111
Concepts of Theravada Buddhist metaphysics, epistemology and axiology.

387332 Mahayana Buddhist Philosophy 3(3-0)
Pre: 387102 or 387111
Concepts of Mahayana Buddhist metaphysics, epistemology and axiology.

387333 Marxist Philosophy 3(3-0)
Pre: 387102 or 387111
History of Marxism and philosophical concepts in Marxist philosophy.

387334 Rationalism 3(3-0)
Pre: 387102 or 387111 and 387121
Methods and important ideas of rationalism from its beginning to the present time.

387335 Empiricism 3(3-0)
Pre: 387102 or 387111 and 387121
Methods and important ideas of empiricism from its beginning to the present time.

387341 Philosophy of Religion 3(3-0)
Pre: 387121 and 388111

387431 Pragmatism 3(3-0)
Pre: 387102 or 387111
Methods and ideas of Pragmatism from its beginning to the present time.

387432 Existentialism 3(3-0)
Pre: 387102 or 387111
History and theories of existentialism emphasising Kierkegaard, Nietzsche, Heidegger and Sartre.

387441 Philosophy in Thai Literature 3(3-0)
Pre: 387102 or 387111
Meaning and scope of philosophy in literature. Philosophical thought in important works of Thai literature.

387442 Social and Political Philosophy 3(3-0)
Pre: 387102 or 387111
Meaning and scope of political philosophy. Important social and political theories. Philosophical analysis of Thai society and politics.

387443 Philosophy of Language 3(3-0)
Pre: 387102 or 387111 and 387121

387444 Philosophy of Sciences 3(3-0)
Pre: 387102 or 387111 and 387121
Meaning and scope of philosophy of science. Comparison of scientific and philosophical methods. The aims of science and philosophy. Philosophical analysis of scientific theory and thought.

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<tr>
<th>Code</th>
<th>Course</th>
<th>Credits</th>
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<td>387445</td>
<td>Philosophy of Law</td>
<td>3(3-0)</td>
<td>Pre: 387121 and 387322</td>
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<td>Meaning and scope of philosophy of law. History of law. Righteous characteristics of law. Law and morality.</td>
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<td>387446</td>
<td>Christian Philosophy</td>
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<td>Pre: 387102 or 387111</td>
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<td>Concepts of Christian metaphysics, epistemology and ethics.</td>
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<td>387447</td>
<td>Islamic Philosophy</td>
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<td>Concepts of Islamic metaphysics, epistemology and ethics.</td>
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<td>387497</td>
<td>Seminar</td>
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**REligion**

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<td>Introduction of Religion</td>
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<td>Meaning, origin and kinds of religion. Relation between religion and other disciplines. Moral systems and beliefs of living religions. Role and importance of religion to life, society and the environment.</td>
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<td>Buddhist Ethics</td>
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<td>Nature, scope, motive, processes and purposes of Buddhist ethics; its relation to life and social problems.</td>
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<td>History of Religions</td>
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<td>388221</td>
<td>Theravada Buddhism</td>
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<td>Origin and important doctrines of Buddhism. Spread and development. The relation of Theravada Buddhism to life, science and present-day society.</td>
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<td>Buddhism and the Environment</td>
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<td>General characteristics of Buddhism and the environment. The current environmental problems and their solution. Buddhist teachings concerning the environment. Important roles of Buddhists in conservation of natural resources and development of the environment.</td>
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<td>Christianity</td>
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<td>The nature and origin of Christianity. The Christian Bible. Doctrines, practices, rites and feasts. Role of Christianity in today’s world.</td>
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<td>388241</td>
<td>Islam</td>
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<td>388311</td>
<td>Religious Experience</td>
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<td>The nature of the religious experience in various religions. Important famous mystics. Religious experience and reality.</td>
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<td>Mahayana Buddhism</td>
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<td>Origin, doctrinal system and practice of Mahayana Buddhism. Spread and development. Prominent Mahayana sects.</td>
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<td>388322</td>
<td>Buddhism in Thailand</td>
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<td>History of Buddhism in Thailand from the beginning to the present time. Its role and significance in Thai arts, culture and society. The Buddhist monastic institution in Thailand.</td>
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<td>388323</td>
<td>Buddhist Meditation</td>
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<td>Principle and method of both tranquility and insight spiritual training, with emphasis on tranquility in living.</td>
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<td>388324</td>
<td>Buddhism and Thai Society</td>
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<td>Buddhist social teaching. Their influence upon various aspects of Thai social life from the past to the present. Buddhism and social change in present Thai society.</td>
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<td>Christianity in Thailand</td>
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<td>History of Christianity in Thailand from the beginning to the present time. Its role in culture, education, economy, politics and society.</td>
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<td>Islamic Law</td>
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<tr>
<td></td>
<td>History of Islamic Law. Jurisprudence and the process of judgment on cases. Thai law concerning Thai muslims.</td>
<td></td>
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</tr>
<tr>
<td>388401</td>
<td>Ethics and Life</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Meaning and significance of ethics. The relationship of ethics with life and society, ethical moral systems of religions ethics in conducting one’s life and in solving social problems of the present, with special emphasis on Thai ethics.</td>
<td></td>
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</tr>
<tr>
<td>388411</td>
<td>Comparative Religion</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 388111</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Comparison of histories, doctrines, ceremonies, and philosophies of life of various religions. Relations between religions. Influence on and relation to life and society.</td>
<td></td>
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</tr>
<tr>
<td>388421</td>
<td>Buddhism in Asia</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>History of Buddhism. Its significant doctrines and spread of Buddhism to Asian countries.</td>
<td></td>
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</tr>
<tr>
<td>388441</td>
<td>Islam in Thailand</td>
<td>3(3-0)</td>
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</tr>
<tr>
<td></td>
<td>History of Islam in Thailand from the beginning to the present time. Its role in education, economy, society and politics.</td>
<td></td>
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</tr>
<tr>
<td>388442</td>
<td>Religion and Politics in the Middle East</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Historical and religious background of the Arabs in the pre-Islamic period, the Arabs in the Islamic period, politics and government in Al- Qur’an, Islam and present day problems of politics and government in the Middle East.</td>
<td></td>
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<tr>
<td>388497</td>
<td>Seminar</td>
<td>1(1-0)</td>
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<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
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</tr>
<tr>
<td>389211</td>
<td>Introduction to Translation</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 355211</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Principles of language analysis and interpretation of messages in the original text. Transferring them into another language while still maintaining the author’s style and intent.</td>
<td></td>
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</tr>
<tr>
<td>389311</td>
<td>General Translation from English into Thai II</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 389211</td>
<td></td>
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<tr>
<td></td>
<td>Translation of English texts of approximately 200-250 words at higher level of language difficulty to gain further experience with various translation techniques.</td>
<td></td>
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<tr>
<td>389312</td>
<td>General Translation from Thai into English I</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 389211</td>
<td></td>
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<tr>
<td></td>
<td>Comparison of grammatical and lexical differences between the Thai and the English languages. Practice in interpreting the Thai words, phrases, sentences for translating into appropriate English.</td>
<td></td>
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</tr>
<tr>
<td>389321</td>
<td>Introductory Specialized Translation from English into Thai</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 389211</td>
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<tr>
<td></td>
<td>Translation of English texts of 250-500 words illustrating different styles of writing containing examples of dissimilarities between the two languages that give rise to problems in translation. Introduction to the special registers related to specialized translation.</td>
<td></td>
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</tr>
<tr>
<td>389331</td>
<td>Translation in Mass Communications from English into Thai I</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 389321</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Translation of English texts in mass communications, with the emphasis on precise translation equivalence and appropriate style in Thai.</td>
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<tr>
<td>389333</td>
<td>Translation in Mass Communications</td>
<td>3(3-0)</td>
<td></td>
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<tr>
<td></td>
<td>Pre : 389211</td>
<td></td>
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<tr>
<td></td>
<td>Translation of texts in mass communications, with the emphasis on precise translation and appropriate style.</td>
<td></td>
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<tr>
<td>389341</td>
<td>Translation in Commerce from English into Thai I</td>
<td>3(3-0)</td>
<td></td>
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<tr>
<td></td>
<td>Pre : 389321</td>
<td></td>
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<tr>
<td></td>
<td>Translation of English texts in commerce, with the emphasis on precise translation equivalence and appropriate style in Thai.</td>
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<tr>
<td>389343</td>
<td>Translation in Commerce</td>
<td>3(3-0)</td>
<td></td>
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<tr>
<td></td>
<td>Pre : 389211</td>
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<tr>
<td></td>
<td>Translation of texts in commerce, with the emphasis on precise translation and appropriate style.</td>
<td></td>
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<tr>
<td>389351</td>
<td>Translation in Science from English into Thai I</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 389321</td>
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<tr>
<td></td>
<td>Translation of English texts in science, with the emphasis on precise translation equivalence and appropriate style in Thai.</td>
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<tr>
<td>389353</td>
<td>Translation in Science</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 389211</td>
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<tr>
<td></td>
<td>Translation of texts in science, with the emphasis on precise translation and appropriate style.</td>
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<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
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<tr>
<td>389361</td>
<td>Translation in Law from English into Thai I</td>
<td>3(3-0)</td>
<td></td>
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<tr>
<td></td>
<td>Pre : 389321</td>
<td></td>
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<tr>
<td></td>
<td>Translation of English texts in law, with the emphasis on precise translation equivalence and appropriate style in Thai.</td>
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<tr>
<td>389363</td>
<td>Translation in Law</td>
<td>3(3-0)</td>
<td></td>
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<tr>
<td></td>
<td>Pre : 389211</td>
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<tr>
<td></td>
<td>Translation of texts in law, with the emphasis on precise translation and appropriate style.</td>
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<tr>
<td>389373</td>
<td>Translation of Cultural Documents</td>
<td>3(3-0)</td>
<td></td>
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<tr>
<td></td>
<td>Pre : 389211</td>
<td></td>
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<tr>
<td></td>
<td>Translation of articles and documentaries on ways of life, culture and the arts, with the emphasis on precise translation and appropriate style.</td>
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<tr>
<td>389412</td>
<td>General Translation from Thai into English II</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 389312</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Translation of Thai texts on various topics in English.</td>
<td></td>
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<tr>
<td>389422</td>
<td>Academic Translation from Thai into English</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 389211 or 389221 and 389231</td>
<td></td>
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<tr>
<td></td>
<td>Translate excerpts from technical and academic documents in Thai into English.</td>
<td></td>
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</tr>
<tr>
<td>389431</td>
<td>Translation in Mass Communications from English into Thai II</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 389331</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Advanced translation of English texts in mass communications to develop translating skills, with the emphasis on precise translation equivalence and appropriate style in Thai.</td>
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<tr>
<td>389441</td>
<td>Translation in Commerce from English into Thai II</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 389341</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Advanced translation of English texts in commerce to develop translating skills, with the emphasis on precise translation equivalence and appropriate style in Thai.</td>
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<tr>
<td>389451</td>
<td>Translation in Science from English into Thai II</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 389351</td>
<td></td>
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<tr>
<td></td>
<td>Advanced translation of English texts in science to develop translating skills, with the emphasis on precise translation equivalence and appropriate style in Thai.</td>
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<tr>
<td>389461</td>
<td>Translation in Law from English into Thai II</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 389361</td>
<td></td>
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<tr>
<td></td>
<td>Advanced translation of English texts in law to develop translating skills, with the emphasis on precise translation equivalence and appropriate style in Thai.</td>
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<tr>
<td>389491</td>
<td>Translation Project</td>
<td>3(1-6)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 389321</td>
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<tr>
<td></td>
<td>Translation project in a specific skill and interest area affording the opportunity to carry out detailed analysis of translation in terms of meaning, usage and idiom, to analyze errors, and to make corrections.</td>
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</tbody>
</table>
# TOURISM

## 390xxx

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>390111</td>
<td><strong>Tourism Industry</strong></td>
<td>3(3-0)</td>
<td>Evolution, meaning, significance, trends, characteristics, and major and supporting components of the tourism industry. The impact of tourism. Tourism planning and development concepts. Roles and policies of the state in tourism development. National and international tourism organizations.</td>
</tr>
<tr>
<td>390221</td>
<td><strong>Tour Guiding</strong></td>
<td>3(3-0)</td>
<td>Roles, duties, responsibilities, personal qualities, and ethics of guides. Procedures, methods, and techniques of conducting tours. Human relations for tour guiding; recreation; first aid; accident prevention and safety precautions for tourists. Relevant laws; immigration regulations. Problem solving. Field trips and practical training required.</td>
</tr>
<tr>
<td>390231</td>
<td><strong>Thai Heritage</strong></td>
<td>3(3-0)</td>
<td>The Thai way of life; social structure; culture; government; Buddhism; visual arts; classical dancing; music; literature; handicrafts; food; Thai knowledge and skill; traditions and festivals. Field trips required.</td>
</tr>
<tr>
<td>390232</td>
<td><strong>Physical Tourism Resources</strong></td>
<td>3(3-0)</td>
<td>Types and characteristics of physical tourism resources. The balance of nature; conservation and management of physical tourism resources; principles of eco-tourism. Natural interpretation techniques. Application of ecological and geographical information to routing and conducting tours in natural tourist destinations in Thailand and foreign countries. Field trips required.</td>
</tr>
<tr>
<td>390233</td>
<td><strong>Thai Cultural Tourist Destinations</strong></td>
<td>3(3-0)</td>
<td>Meaning and types of cultural tourist destinations. Cultural tourism routes in Thailand. History: architectural, artistic and community characteristics of major cultural and historical destinations of Thailand. Field trips required.</td>
</tr>
<tr>
<td>390311</td>
<td><strong>Tourist Behavior</strong></td>
<td>3(3-0)</td>
<td>Motivation for travel. Tourist needs and behavior classified by purposes of travelling, culture, demographic characteristics and socio-economic factors.</td>
</tr>
<tr>
<td>390321</td>
<td><strong>Organization of Tours</strong></td>
<td>3(3-0)</td>
<td>Types and components of tours. Principles and procedures of organizing tours. Methods and techniques of route surveying and mapping. Techniques of coordination with agencies concerned. Costing and pricing tours. Itinerary writing techniques. Practical training required.</td>
</tr>
<tr>
<td>390322</td>
<td><strong>Tourist Publications</strong></td>
<td>2(2-0)</td>
<td>Classification of tourist publications in tourism industry organizations. Writing and format of various types of tourist publications. Organizational structures and personnel involved in production and distribution.</td>
</tr>
<tr>
<td>390331</td>
<td><strong>Tourist Destination Development</strong></td>
<td>3(3-0)</td>
<td>Background and trends of tourist destination development. Types, characteristics and evaluation of destinations. Principles and procedures of tourist</td>
</tr>
</tbody>
</table>
destination development planning. Sustainable tourism development. Roles and collaboration of government and private agencies.

**390341 Tour Business Operation** 3(3-0)
Types and organizational structures of tour businesses. Establishment; operations; automation systems; production planning; marketing; personnel and financial management of tour companies.

**390342 Tourism Marketing Planning and Development** 3(3-0)

**390343 Mass Media for Tourism and Hotel** 3(3-0)
Types and characteristics of media. Media selection; planning and management of media for advertising and public relations in the domestic and international tourism and hotel businesses.

**390351 Tourism in the National Economy** 3(3-0)
Tourist activities and expenditures. Evaluation of the value of tourism and its impact on the economy and other industries. Assessment of domestic and international tourism. Data sources for tourism statistics and statistical measures used in tourism analysis.

**390352 Tourism Information Systems** 3(3-0)
Types and characteristics of tourism information. Methods of acquiring, selecting and analyzing information; filing and systemizing information. Applying tourism information to tourism planning, management, and administration in the public and private sectors.

**390451 Human Resource Management in the Tourism Industry** 3(3-0)
Problems of human resource management in the tourism industry.

**390452 Tourism Industry Development Project Management** 3(3-0)
Factors influencing the development of the tourism industry. Feasibility analysis in tourism development. Levels, principles and procedures of formulating of tourism industry development projects; estimation of financial and human resources for development. Project implementation, control, and evaluation.

**390453 Tourism and Hotel Law** 3(3-0)
Analysis of important regulations and laws concerning the tourism and hotel businesses; problem solving on the basis of laws. Case studies.

**390491 Basic Research Methods in Tourism** 3(3-0)
Research principles and methodology, problem selection, research format design, setting up objectives and hypothesis, questionnaire construction; sampling, data collection, tabulation and analysis of findings, evaluation and writing.

**390497 Seminar**
Presentation and discussion on current interesting topics in tourism.

**390498 Special Problems** 1-3
Study and research in tourism at the bachelor’s degree level and compiled into a report.
HOTEL STUDIES
(391xxx)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>391111</td>
<td>Service Industry Psychology</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Social behavior of individuals. Learning, motivation, and social values in work and relaxation. Adapting psychological theories to work and service.</td>
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</tr>
<tr>
<td>391201</td>
<td>Public Relations Arts</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Principles and techniques for succeeding in work. Factors which influence the attitudes of Thais and foreigners. The arts of communication and human relations.</td>
<td></td>
</tr>
<tr>
<td>391211</td>
<td>Introduction to Lodging and Food Service Business</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Evolution, trends and operation of lodging and food service businesses. Concepts and principles of management applied in the lodging and food service business. Organizational structure and operation of each department. Field trips required.</td>
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<tr>
<td>391221</td>
<td>Housekeeping</td>
<td>3(2-2)</td>
</tr>
<tr>
<td></td>
<td>Operation of the housekeeping department. Housekeeping reports and other documents. Solving problems in the housekeeping department. Cooperation with other departments in the hotel. Field trips required.</td>
<td></td>
</tr>
<tr>
<td>391222</td>
<td>Front of the House and Accommodation</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Structure and management of front of the house and accommodation. Reservations; room assignment; reception; registration; luggage handling and information services. Methods of payment. Coordination with other departments, travel agents, and airlines. Field trips required.</td>
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</tr>
<tr>
<td>391331</td>
<td>Management of Restaurant and Bar Service</td>
<td>3(2-2)</td>
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<tr>
<td></td>
<td>Types of catering businesses. Types of food and beverages. Drink mixing. Menu planning and costing. Food and beverage service patterns for various occasions. Techniques and procedures for setting tables and taking orders in the food and beverage department. Table clearing. Banquets. Solving problems that arise during service. Field trips required.</td>
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</tr>
<tr>
<td>391341</td>
<td>Hotel Marketing Planning and Development</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>391342</td>
<td>Hotel Business Planning and Development</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>391351</td>
<td>Convention and Exhibition Management</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Evolution of the convention and exhibition business. Types of conventions and exhibitions. Planning processes, operations, management, marketing and post-event evaluation.</td>
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</tr>
<tr>
<td>391451</td>
<td>Personality Development in Careers</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Etiquette, socialization as well as dressing codes and speech formality with diverse groups of listeners in various places and occasions. Speech training and personality improvement beneficial for careers. Field trips required.</td>
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</tr>
</tbody>
</table>
### Basic Research Methods in Hotel Business

Roles and significance of research to hotel business. Types and scopes of research. Research process. Writing research proposals. Defining research objectives and hypotheses. Data collection and analysis. Presentation of research findings.

### Seminar

Presentation and discussion on current interesting topics in hotel business.

### Special Problems

Study and research in hotel business at the bachelor’s degree level and compile into a report.

### SECRETARIAL

*(392xxx)*

#### Thai - English Typing

Elementary touch typing. Typing techniques. Developing typing speed and accuracy. Typing business letters, agendas, minutes, research papers, and business documents.

#### Thai - English Shorthand

Patterns and techniques of Thai and English shorthand and decoding. Applying shorthand to recording business secrets.

#### Secretarial Work Operation


#### Public Relations for Secretarial Work

Roles of public relations for administrative offices in management and business contacts. Public relations planning for offices. Factors affecting public relations operations and management. Procedures, activities and media for public relations. Image formulation for administrators. Establishing internal and external relations.

#### Relation Arts for Secretaries

Human relations and personality development. Working as a team. Social etiquette. Business contact and negotiation with people of other cultures.

#### Communicative Skill Development for Secretaries

Communication for secretaries. Writing skills for secretaries. Writing notes, business letters, minutes, plans, projects and speeches. Speaking skills for secretaries. Speaking for business contact and coordination, presentations, speaking as a master of ceremonies or moderator.

#### Computers for Secretarial Work

Application of software to production of business documents, project planning, data processing and analysis for management decision making.

#### Document Work Administration


#### Administrative Office Management

Administrative office categories and structures. Office system design. Application of automatic office equipment to office development. Setting the office
environment. Office equipment and supply budgeting and administration. Internal communication and personnel development in administrative offices.

392341  Information Systems for Secretarial Work  3(3-0)
Categories and characteristics of information used for operations and management. Methods of acquiring, selecting and analyzing information. Filing and systemizing information. Applying information to operations, decision-making, planning, and problem solving in administrative offices.

392421  Dummy Office Operation  3(1-4)
Practice in setting the office environment and systems, managing document systems, allocating and assigning jobs, managing job rotation, planning the budget of office equipment and supplies and organizing meetings and travel.

392431  Executive Secretarial Sciences  3(3-0)
Pre : 392223

392491  Basic Research Methods for Secretaries  3(3-0)
Roles and significance of research to secretarial administration. Types and scope of research. Research process. Writing research proposals. Defining research objectives and hypotheses. Data collection and analysis. Presentation of research findings.
### FACULTY OF SCIENCES  
(400XXX – 449XXX)

#### BOTANY  
(401xxx)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>401114</td>
<td>General Botany</td>
<td>3(2-3)</td>
<td></td>
</tr>
<tr>
<td>401115</td>
<td>Principles of Botany</td>
<td>3(2-3)</td>
<td></td>
</tr>
<tr>
<td>401201</td>
<td>Plants, Man and Environment</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td>401341</td>
<td>Principles of Plant Taxonomy</td>
<td>3(2-3)</td>
<td>Pre: 401114</td>
</tr>
<tr>
<td>401351</td>
<td>Introductory Plant Physiology</td>
<td>3(2-3)</td>
<td>Pre: 401114 and 403221</td>
</tr>
<tr>
<td>401411</td>
<td>Plant Anatomy</td>
<td>3(2-3)</td>
<td>Pre: 401114</td>
</tr>
<tr>
<td>401412</td>
<td>Morphology of Lower Plants</td>
<td>3(2-3)</td>
<td>Pre: 401114</td>
</tr>
<tr>
<td>401413</td>
<td>Morphology of Vascular Plants</td>
<td>3(2-3)</td>
<td>Pre: 401114</td>
</tr>
<tr>
<td>401414</td>
<td>Seed Biology</td>
<td>3(2-3)</td>
<td>Pre: 401114</td>
</tr>
<tr>
<td>401422</td>
<td>Bryology</td>
<td>3(2-3)</td>
<td>Pre: 401114</td>
</tr>
</tbody>
</table>

- General principles of plant morphology, anatomy, physiology, ecology, classification and evolution. Uses of plants.
- General principles of plant structure, function and diversity. Relationship between plants and environment. Influence of plants to human and animals.
- Plants in response to environment. Utilization of plants and plant products in agriculture, commerce, medicine and industry with awareness of keeping balance between sustainable development and nature conservation. Field trip required.
- Plant diversity, classification system, nomenclature, identification, taxonomic characters, distribution and phylogeny. Field trip required.
- Basic knowledge in plant physiology: growth and development, metabolism, plant-water relations and mineral nutrition.
- Internal structures of plant cells and tissues, ontogeny and evolutionary development of structural features of higher plants.
- Reproductive processes; seed development and associated physiological process, ecology, classification, and identification. Field trip required.
- Morphology, physiology, life cycle, evolution and ecology of Bryophytes. Field trip required.
401423 Ferns 3(2-3)
Pre : 401114

401424 Medicinal Plants 3(2-3)
Pre : 401341
Medicinal plant. Morphology and taxonomy. Parts used and their applications, active constituents, relationship and distribution of active constituents in plant groups. Preliminary screening. Field trip required.

401425 Biology of Ornamental Flower Plants 3(2-3)
Pre : 401351
Botanical characteristics, distribution, mechanism of flower bud initiation, flower bud development, flower coloration and management of some ornamental flower plants. Field trip required.

401431 Plant Microtechniques 3(1-6)
Pre : 401114
Practical laboratory techniques in preparing plant materials for microscopy study.

401442 Aquatic Plants 3(2-3)
Pre : 401114
Botanical structure, ecology, classification and economic significance of aquatic plants. Field trip required.

401451 Plant Physiology I 3(2-3)
Pre : 401351
Plant physiology emphasizing plant metabolic processes, growth and development.

401452 Plant Physiology II 3(2-3)
Pre : 401351
Plant physiology emphasizing mineral nutrition and water relations to plant growth and development, some important methods of study, improvement of the techniques and management for cultivation.

401453 Analysis of Plant Nutrient 3(1-6)
Pre : 401351
Role of essential elements, techniques and methods of plant analysis.

401454 Plant Reproductive Physiology 3(2-3)
Pre : 401351

401461 Field Botany 3(2-3)
Pre : 401114
Survey and analysis of vegetation with the emphasis on physiological and ecological relationship. Plant management. Field trip required.
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<th>Course Title</th>
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<td>401462</td>
<td>Economic Botany</td>
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<tr>
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<td>History, botanical structure, geographic</td>
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<td>distribution, production and economic</td>
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<td></td>
<td>significance of plants yielding carbohydrate,</td>
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<td></td>
<td>protein, oil, fiber, dye and beverage. Medicinal</td>
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<td>plant and spices, horticultural crops and</td>
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<td>economic forest. Field trip required.</td>
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<td>401464</td>
<td>Computer Applications and Modeling in Botany</td>
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<td>Models, simulation analysis, computer programming,</td>
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<td>and statistical analysis in botany.</td>
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<tr>
<td>401472</td>
<td>Introductory Plant Molecular Biology</td>
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<td>Molecular biology of plant cell structure, plant</td>
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<td>regulating growth and development of plant</td>
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<td>organs. Emphasis upon the practical applications.</td>
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<td>401473</td>
<td>Methodology in Plant Tissue Culture</td>
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<td>Principle and methodology in plant cell, tissue</td>
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<td>and organ culture.</td>
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<td>401481</td>
<td>Plant Ecology</td>
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<td>Ecological structure, vegetation analysis,</td>
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<td>environmental relationships, and dynamics of</td>
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<td>vegetation. Field trip required.</td>
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<tr>
<td>401491</td>
<td>Research Methods in Plant Physiology</td>
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<tr>
<td>Pre: 401351</td>
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<td>Basic methods in physiological research.</td>
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<td>Laboratory and field approaches.</td>
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<td>Literature survey.</td>
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<td>401492</td>
<td>Reading in Botany</td>
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<td>Critical reading in botanical research literature.</td>
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<td>401496</td>
<td>Selected Topics in Botany</td>
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<td>Interesting topics in Botany may vary in each</td>
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<td>degree level and compile into a written report.</td>
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<tr>
<td>401499</td>
<td>Botany Practicum</td>
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<tr>
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<td>Technical and/or professional experience on or</td>
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<td>off campus.</td>
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**BIOCHEMISTRY**  
*(402xxx)*

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<thead>
<tr>
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<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>402311</td>
<td>Biochemistry I</td>
<td>2(2-0)</td>
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<tr>
<td>Pre: 403211</td>
<td>or concurrence to 403224</td>
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</table>
Structure, properties, sources and importance of carbohydrates, proteins, nucleic acids, lipids, enzymes, coenzymes and other compounds of biochemical importance, including introduction to metabolism, some chemistry concepts involved in biological systems.

402312 Laborotary in Biochemistry I 1(0-3)
Pre : concurrence to 402311
Laboratory in Biochemistry I

402313 Biochemistry II 3(3-0)
Pre : 402311 and 402312
Approaches to the understanding of enzyme and enzyme catalysis, patterns of biological degradation and synthesis of carbohydrates, lipids, nucleic acids, proteins and nitrogen containing compounds and photosynthesis.

402314 Laboratory in Biochemistry II 1(0-3)
Pre : concurrence to 402313
Biochemical laboratory on properties, chemical reactions and metabolism of principal biomolecules, kinetics of enzyme catalysed reactions, molecular mechanism of vital biochemical processes.

402321 Quantitative Biochemical Analysis 3(2-3)
Pre : concurrence to 402313

402411 Biochemistry III 3(3-0)
Pre : 402313
Energy in biological systems, control mechanisms through cell membrane, hormonal control, signal transduction, principles and molecular mechanisms of metabolic regulation, gene regulation and genetic engineering.

402421 Techniques in Biochemistry I 3(1-6)
Pre : 402313
Important basic techniques in general experimental and analytical biochemistry including centrifugation, spectrophotometry, chromatography, electrophoresis and techniques in enzyme isolation and purification.

402422 Techniques in Biochemistry II 2(1-3)
Pre : 402421
Special techniques in biochemical methods of analysis, techniques in radioisotope, tissue and cell culture and recombinant DNA technology.

402423 Physical Biochemistry 3(3-0)
Pre : 402313
Principles and applications of techniques in physical biochemistry relevant to the study of molecular structure, qualitative and quantitative analysis of biomolecules and analysis of mechanisms involved in various processes vital to the living cells.

402441 Enzymology 3(3-0)
Pre : 402313
Nature, function, mechanism of enzyme catalysed reaction and kinetics of enzymes. Purification and characterization of enzymes and applications of enzyme techniques.

**402451 Animal Biochemistry**
3(3-0)
Pre : 402313
Metabolic processes in some important organs and tissues and their controls.

**402461 Plant Biochemistry**
3(3-0)
Pre : 402313
Metabolism of important compounds in plants. Processes by which plants derive energy from light and photosynthesis. Metabolism and metabolic control of compounds involved in plant systems.

**402471 Nutritional Biochemistry**
3(3-0)
Pre : 402313
Biochemical aspects of metabolism, requirement, deficiency, absorption, transport and excretion of various nutritional significant substances include the major nutrients, vitamins and essential minerals.

**402481 Biochemical Technology**
3(3-0)
Pre : 402313
Biochemical bases of technologies in bioprocesses for the production of enzymes and various vital substances. Principles and techniques of the production are included.

**402482 Agricultural Biochemistry**
3(3-0)
Pre : 402313
Biochemistry relating to agriculture, including production, pest control, post harvest and analytical techniques of important agricultural materials.

**402496 Selected Topics in Biochemistry**
3(3-0)
Selected topics in biochemistry at the bachelor’s degree level. Topics are subject to change each semester.

**402497 Seminar**
1
Presentation and discussion on current interesting topics in biochemistry at the bachelor’s degree level.

**402498 Special Problems**
3
Study and research in biochemistry at the bachelor’s degree level and complied into a written report.

**CHEMISTRY / INDUSTRIAL CHEMISTRY**

**403111 General Chemistry**
4(4-0)
Atoms and electrons in atoms, periodic system, chemical bonds, chemical reactions, gases, liquids and solids, solutions, fundamental thermodynamics, chemical kinetics, chemical equilibria, electrolytes and their ionization, acids and bases, ionic equilibria, electrochemistry.

**403112 Laboratory in General Chemistry**
1(0-3)
Pre : 403111 or concurrence
Laboratory work for General Chemistry.

403113 General Chemistry I  3(3-0)
Matters and energy, atoms and their structures, periodic system, chemical
bonds, chemical reactions, fundamental thermodynamics, chemical equilibria, gases,
liquids, solids, solutions, electrolytes and their ionization, acids and bases.

403115 General Chemistry II  3(3-0)
Pre : 403113
Chemical kinetics, ionic equilibria, electrochemistry, elements and their
compounds, nuclear chemistry, introduction to organic chemistry.

403118 Basic Chemistry Laboratory  1(0-3)
Pre : 403115 or concurrence
Laboratory work for general chemistry I and general chemistry II.

403134 Basic Chemical Analysis  5(3-6)
Pre : 403111 or 403115
The role of analytical chemistry, units of concentrations, solutions, theory of
dissociation, determination of equilibrium constants for ionized species, principles and
reaction involving separation and testing of inorganic substances, analysis of cations and
anions by semimicro methods, gravimetric analysis, volumetric analysis with acid-base
titration, precipitation titration, complexometric titration and oxidation-reduction titration,
introduction to absorption spectroscopy.

403221 Organic Chemistry  4(4-0)
Pre : 403111 or 403115
Theoretical organic chemistry, classification of organic compounds, chemical
reactions and mechanisms, stereochemistry, chemistry of aliphatic hydrocarbons, alkyl
halides, aromatic hydrocarbons, structural determination of organic compounds by
spectroscopic methods, properties and reactions of alcohols, ethers, phenolic compounds,
aldehydes, ketones, carboxylic acids, derivative of carboxylic acids, amines and other
nitrogen compounds, lipids, carbohydrates, amino acids, proteins and nucleic acids.

403222 Laboratory in Organic Chemistry  1(0-3)
Pre : 403111 or 403115 and 403221 or concurrence
Laboratory work for Organic Chemistry.

403223 Organic Chemistry I  4(3-3)
Pre : 403111 or 403115
Theories in organic chemistry, classification of organic compounds, chemical
reaction and basic mechanism of compounds, stereochemistry, chemistry of aliphatic
hydrocarbon, alkyl halide, conjugated diene and ultraviolet spectroscopy.

403224 Organic Chemistry II  4(3-3)
Pre : 403223
Properties and chemical reactions of organic compounds i.e. aromatic
compounds, alcohol, phenol, ether, amine, aldehyde, ketone, carboxylic and derivatives,
chemistry of carbohydrate, amino acid, peptide, protein, lipid and synthetic polymer.

403231 Chemical Quantitative Analysis  2(2-0)
Pre : 403111 or 403115
Principles and process in chemical analysis, statistics in analytical methods, theory in quantitative analysis, gravimetric analysis, titrimetric analysis; acid-base, precipitation, complexation and redox titrations; basic principles of absorption spectrophotometry.

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<td>Laboratory in Chemical Quantitative Analysis</td>
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<td>403241</td>
<td>Physical Chemistry for Engineers</td>
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<td>403244</td>
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<td>403291</td>
<td>Chemical Literature</td>
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<td>403321</td>
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<td>403322</td>
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<td>403323</td>
<td>Organic Chemistry Laboratory</td>
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<td>403325</td>
<td>Fundamental of Natural Products</td>
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<td>403326</td>
<td>Organic Reactions and Mechanisms</td>
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<td>Instrumental Analysis I</td>
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<td>403343</td>
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<td>403344</td>
<td>Nuclear Chemistry and Radio Chemistry</td>
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<tr>
<td>403345</td>
<td>Computer Simulation in Chemistry and Chemical Engineering</td>
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<tr>
<td>403354</td>
<td>Basic Principles in Chemical Technology</td>
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</table>
Chemical engineering calculations, physical properties of gases, vapors and liquids, phases, material balances, energy balances, material and energy balances in processes.

**403355 Industrial Chemical Process Equipment**  
3(3-0)  
Pre: 403221 or 403224  
Principal equipments used in industry especially in the production of chemicals.

**403364 Introduction to Polymer Chemistry**  
3(3-0)  
Pre: 403243  
Basic concepts of polymer science, polymerization reactions and mechanisms, copolymerizations, kinetics, polymerization conditions and polymer reactions, measurement of molecular sizes, some properties of commercial polymers.

**403382 Chemistry of Gem and Identification I**  
3(1-6)  
Pre: 403111 or 403115  
Gem identification methods, determination of optic, physical, chemical, spectroscopic properties. Observation of inclusion and inside features of gemstones.

**403385 Introduction to Ceramics**  
3(3-0)  
Pre: 403111 or 403115  
History, nature of ceramic raw material, general operation processes and structure of the ceramics industry.

**403411 Inorganic Analysis**  
3(1-6)  
Pre: 403111 or 403115  
Analysis of trace elements, rare earth and transition elements, electrolytic and chromatographic separation of metal ions.

**403412 Inorganic Chemistry Laboratory**  
3(1-6)  
Pre: 403313  
Preparation, characterization and studies of physical and chemical properties of inorganic compounds.

**403413 Spectroscopy in Inorganic Chemistry**  
3(3-0)  
Pre: 403313  
Vibrational spectroscopy, X-ray diffraction, X-ray fluorescence spectroscopy, photomission and auger spectroscopy, nuclear magnetic resonance spectroscopy, electron spin resonance spectroscopy, electron microscopy.

**403414 Basic Bioinorganic Chemistry**  
2(2-0)  
Pre: 403313  
Essential metal ions in biological system, metalloproteins and metal containing biological molecules, reactions of metalloenzymes, metal ions and coordination compound ions in medicine.

**403421 Spectroscopy of Organic Compounds**  
3(3-0)  
Pre: 403224  
Electromagnetic radiation, origin of molecular spectra ultraviolet spectroscopy, infrared spectroscopy, nuclear magnetic resonance spectroscopy, mass spectrometry, structure determination and analysis of organic compounds by spectroscopic methods, recent developments in spectroscopy and mass spectrometry.

**403422 Introduction to Theoretical Organic Chemistry**  
3(3-0)  
Pre: 403322  
Chemical bonding and molecular structure of organic compounds, molecular orbital theory, valence bond theory, methods of molecular orbital approximations, software for computational organic chemistry, detection of reactive intermediates, determination of organic reaction mechanisms, influence of isotope, substituent, solvent, acid and base on reaction rates.

**403423 Modern Synthesis and Reactions of Organic Compounds**  
3(3-0)  
Pre: 403322
Reactions and mechanism, carbon-carbon bond formation, structural analysis for synthesis of complex organic compounds.

403424 Chemistry of Natural Products 3(3-0)
Pre : 403322
Chemistry of natural occurring substances: topic include formation, isolation, characterization and identification, biosynthesis of oxygenated heterocyclic compounds; terpenes, steroids, alkaloids, porphyrins, antibiotics and other natural products.

403425 Applied Organic Chemistry 3(3-0)
Pre : 403322
Organic products for daily uses, drugs, food additives, detergents and others.

403426 Heterocyclic Compounds 3(3-0)
Pre : 403224
Syntheses and reactions of heterocyclic compounds.

403431 Commercial Product Analysis 3(1-6)
Pre : 403231
Product formulation, treatment and analysis of important commercial products.

403443 Structure and Reactivity in Zeolites 3(3-0)
Pre : 403241 or 403242 or 403341
Structures of crystalline solids, zeolite structures, molecular approaches to zeolites and zeotypes, adsorption in zeolites, catalysis by zeolites, industrial applications as ion exchangers, molecular sieves and catalysis.

403451 Industrial Chemistry I 2(2-0)
Pre : 403224 and 403243
Stoichiometry and materials, heat, mass balances, industrial management, chemical reactions and physical changes, equipment and operation conditions in various chemical industrial processes.

403452 Industrial Chemistry II 2(2-0)
Pre : 403451
Chemical reactions and physical changes, equipments and operation conditions in various chemical industrial processes.

403453 Agricultural Chemistry 3(1-6)
Pre : 403231
Studies of the chemistry of agricultural materials and products, principles and techniques in chemical analysis such as analyses of fertilizers, soil, plant products, and toxic substances.

403455 Environmental Chemistry 3(3-0)
Pre : 403221 or 403224
A study of the quality of the environment and factors affecting it, air and water pollution, chemical changes in the environment as affected by agricultural industrial and social activities.

403456 Chemical Pollutants 3(2-3)
Pre : 403221 or 403224
Chemical pollutants in air, water and soils, their generation, reactivity and action on the environment.

403461 Laboratory in Petrochemical Technology 2(0-6)
Pre : 403362
Fractional distillation, countercurrent extraction, adsorption, petroleum product analyses, catalytic cracking process, catalytic dehydrogenation process, petrochemical preparation, petrochemical waste treatment.
403462  Chemistry and Technology of Petroleum  2(2-0)
Pre : 403221 or 403224
Chemistry of natural gases and crude oils, introduction to processing refinery, test methods and physical properties of petroleum, industrial manufacture of major products, trends in technology of the petrochemical industries.

403464  Laboratory Techniques in Polymer Chemistry  3(1-6)
Pre : 403364
Basic polymerization techniques, purification of polymers, polymer fractionation, relationship of initiator concentration and molecular weight, kinetics of addition polymerization, copolymerization, measurement of molecular weights of polymers.

403471  Food Chemistry  3(2-3)
Pre : 403134 or 403231 and 403221 or 403224
Chemical composition of food, effects of processing and preservation on composition, food deterioration, food additives and food analysis.

403482  Chemistry of Gem and Identification II  2(1-3)
Pre : 403382
Practices in characterization of gems and jewelry. Field trips required.

403496  Selected Topics in Chemistry  3(3-0)
Special topics in chemistry at the bachelor’s degree level, topics are subject to change in each semester.

403497  Seminar  1
Presentation and discussion on current interesting topics in chemistry at the bachelor’s degree level.

403498  Special Problems  1
Study and research in chemistry at the bachelor’s degree level and compile into a written report.

449390  Cooperative Education Preparation  1(1-0)

GENERAL SCIENCE
(404xxx)

404101  General Science  3(3-0)
Principles in physical and biological science. Basic concepts in biology, chemistry, physics and environmental science; related to human and society; its uses and application.

404111  Life Science  3(3-0)
Biological and physical processes of life. Its interactions with different levels of environments.

404211  Evolution of Science  3(3-0)
Developmental process of scientific ideas and discovery in physical and biological sciences since the early human civilization up to present.

404311  Biophysical Science  3(3-0)
Pre : 424111 and 420111
Application of physical science principles to explain biological system. Relationship between physical and biological world.

404382  Life and Behavior  3(3-0)
Pre : 424111 or 424113
Life processes in relation to behavior; interaction, integration and maintenance behaviors of living organisms in the environments.

- **404383 Physical Science of Environment** 4(3-3)
  Pre : 403211 and 420112
  General introduction to atmosphere, hydrosphere and lithosphere with emphasis on their causes, effects and interaction environmental improvement; field trip required.

- **404384 Biological Science of Environment** 4(3-3)
  Pre : 419213
  Environmental factors in relation to living things. Changes of environment by nature and man-made and their effects on ecosystems. Ecotoxicology studies and safety measures; field trip required.

- **404451 Unity of Life** 3(3-0)
  Pre : 424111 and 403221
  The basic concepts of organization of life, energy, enzymes and bioenergetics.

- **404452 Cell Technology** 3(2-3)
  Pre : 419213 or 419214
  Animal, plant and microbial cell technology and their applications to agriculture, industry and environment.

- **404454 Cell and Molecular Diversity of Immunology** 3(3-0)
  Pre : 424111
  Cells and molecules that are essential components of the immune system; structures, function, and synthesis of these molecules; results of abnormal immune response.

- **404481 Life and Geography** 3(3-0)
  Pre : 424111 or 424113
  The origin and distribution of the living world based on geography and ecosystem.

- **404482 Natural Resource** 4(3-3)
  Pre : 404383 and 404382
  Types of natural resources; non-renewable and renewable. Their application, index of crisis, principles of natural resource management, measurements and regulation problems and resolution; field trip required.

- **404483 Environmental Pollution and Control** 3(3-0)
  Pre : 403211
  Causes and factors of environmental pollution, current environmental pollution Situation. Control of soil, water, air, solid, waste, hazardous waste, noise, radiation and thermal pollution; Field trip required.

- **404484 Environmental Toxicology** 3(3-0)
  Pre : 403221

- **404491 Scientific Research Methodology** 3(3-0)
  Pre : 422111
Principles and methods in problem analysis, experimental planning, scientific data, collection and report writing.

**404492 Scientific Research Instrumentation** 3(2-3)
*Pre : 404311*
Basic electronics, principles, components and applications of research instruments.

**404496 Selected Topics in General Science** 3(3-0)
Selected topics in general science at the bachelor’s degree level. Topics are subject to change each semester.

**404497 Seminar** 1
Presentation and discussion on current interesting topics in general science at the bachelor’s degree level.

**404498 Special Problems** 3
Study and research in general science at the bachelor’s degree level and compile into a written report.

**ATMOSPHERIC SCIENCE (405xxx)**

**405311 General Meteorology** 3(3-0)
*Pre : 420112 or 420118*
Structure, composition, energy and behavior of the atmosphere; fundamental processes, descriptions of the atmospheric activities; atmospheric circulation; field trip required.

**405431 Hydrometeorology** 3(2-3)
*Pre : 405311*
Evapotranspiration process, clouds, precipitation, catchment area, streamflow, flood and drought.

**405481 Cloud Physics** 3(3-0)
*Pre : 405311 or 420456*
Thermodynamics of phase change and nucleation; microphysical process of cloud droplet formation; cloud modification techniques; field trip required.

**SPACE SCIENCE (409xxx)**

**409411 Introduction to Space Science** 3(3-0)
Vector, kinetics and coordinate transformation; satellite orbits, gyrodynamics and navigatory devices; movement of spaceship, efficiency and appropriative values of space dynamics; calculus of variation, control, space technology and communication.
EARTH TECHNOLOGY  
(411XXX)

411231 Geodynamics 3(3-0) 
The nature and structure of materials composing the earth, dynamic processes that create landforms and structure of the earth surface; field trip required.

411241 Minerals and Rocks 3(2-3) 
The structure of matter, introduction to crystallography, mineralogy and petrology; rock-forming minerals; classification of crystal rock; minerals and rocks in industries.

411331 Structural Geology 3(2-3)  
Pre : 411231 
Stress, strain, behavior and mechanism of the crystal rocks deformation; microfabric and macrostructure of foliations, joints and faults; tectonics; field trip required.

411351 Introduction to Applied Geophysics 3(3-0)  
Introduction to geophysics by using basic principles of gravitation field, resistivity, magnetic field, electromagnetic field, seismic and radioactivity geophysical equipments and studies of well-logging.

411361 Principles of Geochemistry 3(3-0)  
Pre : 411241 
Historical geochemistry, theory and principles in geochemistry, geochemistry of silicates, crystallization of magmas, compositions of the earth, geochemical classification of elements, distribution and behaviors of elements in different geologic environments, fumaroles and ore solutions, geochemical cycles, field trip required.

411431 Natural Disasters 3(3-0)  
Natural disasters due to flooding, landsliding, drought condition, cyclonic storm, earthquake, volcanic eruption, land subsiding, protection technique, protection systems and mitigation plan; field trip required.

411441 Industrial Minerals 3(3-0)  
Pre : 411241 
Importance, classification, genesis, deposit, utilization and analysis of industrial minerals. Field work required.

411442 Gemology 3(3-0)  
Pre : 411241 
Gems and jewelry, gem crystallography and properties, classification of gemstones, Source rocks and deposits, Descriptive gemology, basic instrumentation in gemology, Gem identification, gemstone quality enchantment and synthesis. Field work required.

411451 Applied Geophysics 3(3-0)  
Pre : 411351 
Interpretation of geophysical data in accordance with appropriate geological evidences, applications of gravity, resistivity, magnetic field, electromagnetic field, seismic and radioactivity for explanation of geological structures trapping ground water; oil and mineral deposition.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>411461</td>
<td>Applied Geochemistry</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 411361</td>
<td></td>
<td>Study of geochemistry, geochemical processes and various applications, Field study included.</td>
</tr>
<tr>
<td>411472</td>
<td>Geotechnology</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 411231</td>
<td></td>
<td>The nature and mechanism of geologic materials under forced condition, exploration and drilling technology of geologic structure and resources, field study included.</td>
</tr>
<tr>
<td>411496</td>
<td>Selected Topics in Earth Science</td>
<td>1-3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 411461</td>
<td></td>
<td>Selected topics in earth science at the bachelor’s degree level. Topics are subject to change each semester.</td>
</tr>
<tr>
<td>404497</td>
<td>Seminar</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 41461</td>
<td></td>
<td>Presentation and discussion on current interesting topics in earth science at the bachelor’s degree level.</td>
</tr>
<tr>
<td>404498</td>
<td>Special Problems</td>
<td>1-3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 41461</td>
<td></td>
<td>Study and research in earth science at the bachelor’s degree level and compile into a written report.</td>
</tr>
</tbody>
</table>

**GENETICS**

(416xxx)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>416201</td>
<td>Genetics and Life</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 411461</td>
<td></td>
<td>Life and evolution, continuity of life and heredity, genetic material, structure and action of genetic material, inheritance, sex and sex determination, natural and artificial mutations, genetics and environment in daily life, genetic toxicology, genetics and biotechnology development.</td>
</tr>
<tr>
<td>416311</td>
<td>Principles of Genetics</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 424111</td>
<td></td>
<td>Cell and organelles related to genetics; genetic inheritance during mitosis and meiosis; Mendelian inheritance and probability; the extension of Mendelian laws; genetic materials, replications and repair; function and regulation; gene and chromosome mutations; quantitative and population genetics; extranuclear inheritance; evolutionary genetics.</td>
</tr>
<tr>
<td>416312</td>
<td>Laboratory in Genetics</td>
<td>1(0-3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : concurrence to 416311</td>
<td></td>
<td>Laboratory for Principles of Genetics.</td>
</tr>
<tr>
<td>416401</td>
<td>Genetics and Society</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 424111</td>
<td></td>
<td>Composition of life, genetic material behavior, continuity of life, sex and sex determination systems, human traits and their inheritances, genes in population and the effects of certain factors, improvement of the quality of life including genetic conservation and genetic counseling.</td>
</tr>
<tr>
<td>416421</td>
<td>Human Genetics</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 416311</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Mendelian heredity in human, function and behavior of genes and chromosomes, diagnosis, therapy and genetic counseling of inherited diseases. Applications of immunology, molecular genetics, cytogenetics, cancer, environmental hazards, population and evolutionary in understanding human genetics.

**416422 Plant Genetics**

- **Pre:** 416311
- Basic concepts of genetics and its applications to higher plants. Probability, linkage, chromosome aberrations, polyploid analyses, gene transfer in wide crosses, tissue and cell culture for plant improvement, and genetic manipulation of plant cell.

**416423 Animal Genetics**

- **Pre:** concurrence to 416311
- Fundamental of genetics and application in animal improvement. Statistical procedures. Population genetics application for breeding, estimation of breeding value, heritability etc. Qualitative and quantitative genetics. Genetic basis of some animal diseases and disease resistance. The application of new biotechnologies such as genetic engineering in animal husbandry.

**416424 Tissue Culture for Gene Transfer in Plant**

- **Pre:** 416312
- Principles of plant tissue culture; special techniques in plant tissue culture; mutation breeding by tissue culture, embryo culture, anther culture, protoplast culture and fusion; various techniques of plant gene transfer; recent knowledge in related fields.

**416441 Introduction to Cytogenetics**

- **Pre:** concurrence to 416312
- Cell biology and behavior related to inheritance. Variation in genetic material and the effect on expression and as well as evolution of organism. Application of to genetics in medicine, agriculture; plant and animal breeding. Laboratory techniques in cytogenetics.

**416453 Introductory Molecular Genetics**

- **Pre:** 416311
- Introduction to the structure and function of the genetic material. Structure of DNA and the cellular and molecular mechanism underlying DNA replication, recombination, mutation, DNA repair, transcription, translation and their regulations. The recent development in this area will be discussed.

**416454 Introduction to Bioinformatics**

- **Pre:** 416453
- Biological database, information retrieval, computer software usage for nucleotide and amino acid sequence analyses, nucleotide sequence and amino acid sequence alignments, prediction of RNA and protein structures, data mining, genome analysis.

**416456 Genetic Engineering I**

- **Pre:** 416311
- Introduction to molecular cloning; construction of recombinant DNA; cloning and analysis of genes in bacteria; gene transfer into plant and animal and application in medical science, industry and agriculture.

**416457 Genome and DNA Markers**

- **Pre:** 416311
Pre : 416456
Plant and animal genomes, genome analysis, extraction of DNA and general principles for handling DNA, hybridization and PCR techniques, principles of DNA markers, hybridization based and PCR-based DNA markers, applications and consideration for choosing markers.

416458 Laboratory in Genetic Engineering 1(0-3)
Pre : 416456
Isolation of total DNA and plasmid, DNA digestion and ligation, transformation, recombinant DNA detection and analysis.

416471 Introduction to Population Genetics 3(3-0)
Pre : 416311
Population and equilibrium, status of equilibrium in various types of inheritance, systems of mating and factors affected to population equilibrium.

416472 Quantitative Genetics 3(3-0)
Pre : 416311
Composition of genes in populations, environmental effects on gene frequency, inbreeding and outbreeding, estimation of gene quantitative contribution, heritability, selection and the correlation between genetical and environmental effects.

416473 Mathematical Genetics 3(3-0)
Pre : 416312
Probability and its application to Mendelian population and quantitative genetics.

416481 Genetics and Evolution 3(3-0)
Pre : 416311
The evolutionary theory, phenotypic variation as a result of genetic variation, maintenance of polymorphism, population genetics, the origin of species and the maintenance of uniqueness, role of hybrid in evolution.

416482 Ecological Genetics and Behavior 3(2-3)
Pre : 416311
The roles of ecology and behavior on the survival of species possessing different hereditary factor.

416483 Genetic Toxicology 3(3-0)
Pre : 416311
Diseases of genetic, the biochemical mechanisms of mutation, the mechanism of DNA repair synthesis, mutagens and carcinogens in environment, the short-test systems of mutagenicity.

416496 Selected Topics in Genetics 3(3-0)
Pre : 416311
Interesting topics in genetics. Topics are subjected to change in each semester.

416497 Seminar 1
Presentation and discussing on current interesting topics in genetics at the bachelor’s degree level.

416498 Special Problems 3
Research study at the bachelor’s degree level and writing a report.
### MATHEMATICS (417XXX)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>417101</td>
<td>Basic Mathematics</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Review trigonometry, analytic geometry, partial fractions, graph and function. Limits, continuity and derivatives, integral and applications.</td>
<td></td>
</tr>
<tr>
<td>417102</td>
<td>Elementary Mathematics</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Logic, sets, mathematical induction, number systems, abstract algebra.</td>
<td></td>
</tr>
<tr>
<td>417111</td>
<td>Calculus I</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Limits and continuity, derivatives and applications, differentials and applications, integration and applications.</td>
<td></td>
</tr>
<tr>
<td>417112</td>
<td>Calculus II</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 417111 Space geometry, partial derivatives, multiple integrations, elementary equations.</td>
<td></td>
</tr>
<tr>
<td>417116</td>
<td>Elementary Applied Mathematics</td>
<td>4(4-0)</td>
</tr>
<tr>
<td></td>
<td>Matrices and determinants, linear programming, limits and continuity of functions of one variable, derivatives and applications, integrals and applications.</td>
<td></td>
</tr>
<tr>
<td>417151</td>
<td>Elementary Calculus for Medical Science</td>
<td>2(2-0)</td>
</tr>
<tr>
<td></td>
<td>Limits and continuity, derivatives of functions an applications, introduction to definite integral and indefinite integral, first degree, first-order, ordinary differential equations and simple applications.</td>
<td></td>
</tr>
<tr>
<td>417152</td>
<td>Basic Calculus</td>
<td>2(2-0)</td>
</tr>
<tr>
<td></td>
<td>Limits, continuity, differentiation and integration, elementary differential equations.</td>
<td></td>
</tr>
<tr>
<td>417167</td>
<td>Engineering Mathematics I</td>
<td>4(4-0)</td>
</tr>
<tr>
<td></td>
<td>Mathematical induction, matrices and determinants, polar and rectangular coordinates, limits and continuity, derivatives and applications, differentials, integration, series.</td>
<td></td>
</tr>
<tr>
<td>417168</td>
<td>Engineering Mathematics II</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 417167 Vectors and solid analytic geometry, calculus of several variables, multiple integration, vector calculus, calculus of complex variables.</td>
<td></td>
</tr>
<tr>
<td>417231</td>
<td>Introductory Mathematical Logic</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Statement Calculus, arguments and validity, quantifiers, methods of proof.</td>
<td></td>
</tr>
<tr>
<td>417232</td>
<td>Mathematical Proofs</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 417231 Importance of proof, various kinds of proof, practical skill in using mathematical proof.</td>
<td></td>
</tr>
<tr>
<td>417241</td>
<td>Calculus III</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 417112 Vectors in 3 dimensions, vector valued function, vector calculus, calculus of variations, infinite series.</td>
<td></td>
</tr>
<tr>
<td>417242</td>
<td>Introductory Differential Equations</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 417112</td>
<td></td>
</tr>
</tbody>
</table>
Linear differential equations, non-homogeneous linear equations, Laplace transforms and inverses, power series, solutions of linear differential equations, system of linear equations, variation of parameters.

**417262 Mathematics for Physicists**  
*Pre: 417241*  

**417267 Engineering Mathematics III**  
*Pre: 417168*  
First order linear differential equations, linear differential equations with constant coefficients, Laplace transforms, inverse transforms, power series solutions, system of linear differential equations.

**417268 Engineering Mathematics IV**  
*Pre: 417267*  

**417271 Introductory Discrete Mathematics**  
Sets, functions, relations, Boolean algebra, combinatorics, groups and semi-groups.

**417311 Introductory Real Analysis**  
*Pre: 417231 and 417241*  
Real number system, sequences, continuity, uniform continuity, differentiation, uniform convergence.

**417312 Introductory Complex Analysis**  
*Pre: 417231 and 417241*  
Definition and basic properties of complex numbers and functions, complex derivatives, elementary functions, complex integration, Taylor and Laurent series, residue theory.

**417321 Introductory Algebra**  
*Pre: 417112 and 417231*  
Groups, semi-groups, Cayley's theorem, homomorphisms, rings, ideals, homomorphisms theorems for rings, integral domains, fields.

**417322 Introductory Linear Algebra**  
*Pre: 417112*  
Vector spaces, linear transformation and matrices, systems of linear equations, eigenvalues, eigenvectors, diagonalization, application.

**417331 Introductory Set Theory**  
*Pre: 417231*  
Axiomatic theories, set and classes, relations and functions, partially ordered sets, axiom of choice and related principles, cardinal and ordinal numbers.

**417332 Introductory Number Theory**  
*Pre: 417112*  

Divisibility and primes, congruences and consequences, quadratic residues, continued fractions.

417341 **Calculus IV** 3(3-0)
*Pre: 417241*
Uniform convergence, Fourier series, improper integrals with parameters, differentiation under integral signs, double series.

417342 **Intermediate Differential Equations** 3(3-0)
*Pre: 417242*
Partial differential equations, diffusion-type problems, hyperbolic-type problems, elliptic-type problems.

417343 **Introductory Numerical Analysis** 3(3-0)
*Pre: 417112*
Error analysis, zeros of non-linear equation, approximation of functions. Interpolation, numerical differentiation and integration.

417361 **Intermediate Mathematics for Physicists I** 3(3-0)
*Pre: 417262*

417362 **Intermediate Mathematics for Physicists II** 3(3-0)
*Pre: 417361*
Complex analytic functions, complex power series, residue theorems, conformal mapping, special functions, boundary value problems.

417371 **Finite Differences and Difference Equations** 3(3-0)
*Pre: 417241 and 417271*
Finite differences, finite integration, interpolation, difference equations, applications.

417381 **Introductory Linear Programming** 3(3-0)
*Pre: 417241*
Linear programming problems, convex sets, graphical solutions, the simplex method, dual problems, degeneracy, applications, integer programming.

417401 **Numerical Methods** 3(3-0)
*Pre: 417111*
Errors in approximation, location of zeros, approximating functions, interpolation, approximation of differentiation and integration.

417411 **Intermediate Real Analysis** 3(3-0)
*Pre: 417311*
Riemann integrals, Stieltjes integrals, integration of vector-valued functions, introduction to differential forms.

417412 **Intermediate Complex Analysis** 3(3-0)
*Pre: 417312*
Residue theory, conformal mapping, uniform convergence, infinite products.

417421 **Intermediate Algebra** 3(3-0)
*Pre: 417321*
Finitely generated abelian groups and their structures, finite groups, Sylow's theorems, p-groups, rings, polynomial rings, rings of quotients, unique factorization domains.

**417422 Intermediate Linear Algebra** 3(3-0)
Pre : 417322
Canonical forms, direct sum decomposition, rational and Jordan forms, inner product spaces and operators, bilinear forms.

**417423 Projective Geometry** 3(3-0)
Pre : 417322
Linear methods in geometry, projective postulates, geometry of straight lines, geometry of curves of degree 2, projectivity on conics, affine and Euclidean planes, projective spaces.

**417424 Differential Geometry** 3(3-0)
Pre : 417341
Vector functions of one variable, theory of curves, vector functions of a vector variable, theory of surfaces, tensor analysis.

**417425 Introductory Topology** 3(3-0)
Pre : 417311 and 417341
Topology of the real line and its higher dimensions, topology of metric spaces, general topological spaces, compactness, connectedness, separation.

**417426 Introductory Algebraic Geometry** 3(3-0)
Pre : 417321
Algebraic preliminaries, affine spaces, projective spaces, rational curves, algebraic sets with group structures, Segre and Veronese varieties, Plucker coordinates and Grassman varieties.

**417431 History of Mathematics** 3(3-0)
Pre : 417331
Development of Mathematics since the ancient Greeks, history of calculus and current mathematical structures.

**417432 Introductory Analytic Number Theory** 3(3-0)
Pre : 417332
An overview study of analytic number theory including prime number theory, diophantine approximation and transcendental number theory.

**417433 Introductory Algebraic Number Theory** 3(3-0)
Pre : 417332
Rings of polynomials and their properties, algebraic numbers and their properties, quadratic fields, unique factorization into ideals, applications to diophantine equations.

**417443 Intermediate Numerical Analysis** 3(3-0)
Pre : 417242
Iterative methods for system of linear equations, numerical solutions of initial value problems, approximation of two-point boundary value problems.

**417451 Introductory Finite Fields and Coding Theory** 3(3-0)
Pre : 417321
Finite fields, finite field construction, properties of finite fields, factorization polynomials over finite fields, trace and norm, error-correcting codes.

417461 Fourier Series and Boundary Value Problems 3(3-0)
Pre : 417342 or 417267
Orthogonal sets, Fourier series, various boundary value problems, Sturm-Liouville theory.

417463 Higher Mathematics for Electrical Engineers 3(3-0)
Pre : 417267
Functions of a complex variable, conformal mappings, residues, linear differential equations of order two or higher with variable coefficients and their applications, Bessel functions and Legendre polynomials, Fourier series, linear programming.

417471 Introductory Combinatorial Mathematics 3(3-0)
Pre : 417271
Permutations and combinations, elementary generating functions, recurrence, inclusion-exclusion principle.

417472 Graph Theory 3(3-0)
Pre : 417271
Graphs and subgraphs, trees, networks, matching, paths and distances, planar graphs, coloring.

417496 Selected Topics in Mathematics 3(3-0)
Selected topics in mathematics at the bachelor’s degree level. Topics are subject to change in each semester.

417497 Seminar 1
Presentation and discussion on current interesting topics in mathematics at the bachelor’s degree level.

417498 Special Problems 1-3
Study and research in mathematics at the bachelor’s degree level and compile into a written report.

COMPUTER SCIENCE (418XXX)

418111 Computer Applications 1(0-2)
Computer system, hardware, software, operating system, word processing, database and other application softwares.

418112 Introduction to Computer 3(2-2)
Evolution of computers, computer capabilities, type and structure of computers, computer operations, number systems, Boolean algebra, data and information systems, data representation, data processing, computer languages, principles of problem solving by computer, structure programming, programming applications.

418113 Electronics Data Processing 3(2-2)
Fundamentals of data processing, processing methods, data preparation, secondary storages, file organization, system analysis, computer data processing, data communication, use of computer and its equipments.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>418211</td>
<td>Computer Programming I</td>
<td>3(2-2)</td>
<td>Review principles of writing structured programs, multi-dimensional arrays, string, record, set, subprograms and parameters, pointer, file, algorithms for linear search and binary search, sorting.</td>
</tr>
<tr>
<td>418212</td>
<td>Computer Programming II</td>
<td>3(2-2)</td>
<td>Techniques for good programming style, documentation, control flow, debugging and testing, data processing with different types of data, searching, internal and external sorting, merging, simple data structure and recursion.</td>
</tr>
<tr>
<td>418213</td>
<td>BASIC Programming</td>
<td>3(2-2)</td>
<td>Structure and elements of BASIC. Principles of programming in BASIC and its applications.</td>
</tr>
<tr>
<td>418214</td>
<td>FORTRAN Programming</td>
<td>3(2-2)</td>
<td>Structure and elements of FORTRAN. Principles of programming in FORTRAN and its applications.</td>
</tr>
<tr>
<td>418215</td>
<td>COBOL Programming</td>
<td>3(2-2)</td>
<td>Structure and elements of COBOL. Principles of programming in COBOL and its applications.</td>
</tr>
<tr>
<td>418217</td>
<td>RPG Programming</td>
<td>3(2-2)</td>
<td>Structure and elements of RPG. Principles of programming in RPG and its applications.</td>
</tr>
<tr>
<td>418221</td>
<td>Internet Application for Commerce</td>
<td>3(3-0)</td>
<td>Introduction to the Internet, techniques and tools for the Internet, World Wide Web, website design and development, business and commerce in the Internet, Internet security, database on Internet Commerce, application programs on the Internet and World Wide Web.</td>
</tr>
<tr>
<td>418231</td>
<td>Algorithms and Data Structure</td>
<td>3(2-2)</td>
<td>Basic data structure, algorithm for their implementation, graphs, algorithm design and analysis, memory management, system design.</td>
</tr>
<tr>
<td>418232</td>
<td>Unix Operating System and Shell Programming</td>
<td>3(2-2)</td>
<td>Components of Unix operation system, functionality, command-line interfaces, system administration and management, editors and Unix utilities, shell programming, variation of Unix operating systems.</td>
</tr>
</tbody>
</table>
418241 Digital Computer Logic 3(2-2)
Pre: 417231 and 418112
Basic logic design; representation of both data and information by digital (binary) signals. Coding. Number representation and arithmetic. Computer architecture.

418261 Structured Programming 3(2-2)
Pre: 418112
Techniques for good structured programming style, documentation, control flow, debugging and testing, data processing with different types of data, basic data structure and recursion.

418262 Object Oriented Programming 3(2-2)
Pre: 418261
Basic concepts of object oriented software design and development, programming structures in object oriented language, object and class definitions, object attributes and behaviors, base classes, inheritance, arrays, reuse of software components, graphic, creating and manipulating dynamic data structures.

418311 Computer Organization and Assembly Language 3(2-2)
Pre: 418212 or 418262
Computer structure and machine language, assembly language, addressing techniques, macros, file Input/Output, program segmentation and linkage, Interpretive routines, assembler construction.

418312 Internet Programming 3(3-0)
Pre: 418231
Principles and elements of the Internet and World Wide Web, concept of object oriented programming language, scripts, data storage, control structures, subprogram, web database.

418321 Principles of Information System 3(3-0)
Pre: 418211 or 418261
Concept of data and information, management organization, information requirements of management, systems concept, information system structure, system life cycle, information system development, implementation of information system and examples.

418322 File Structures 3(2-2)
Pre: 418211 or 418261
Basic physical characteristic of peripheral storage devices, file and record structures, file organization and processing method, external sorting.

418323 Systems Analysis and Design 3(3-0)
Pre: 418322
Basic analysis steps, system analysis tools, systems flowchart, decision table and decision tree; feasibility study; cost effective analysis; input, output and design; computer process design; documentation; implementation and evaluation; proving the design; case studies.

418324 Electronic Commerce Design and Development 3(3-0)
Pre: 418261
Principles and infrastructure of electronic commerce, internet and extranet, process design, user interface design, security system, electronic payment system, creating
web page, web programming, software agents, implementation and evaluation of electronic commerce.

**418331 Data Compression**  
**Pre : 418231**  
Concept of data compression, lossless data compression techniques and applications, lossy compression techniques and applications, and compression techniques for network communications.

**418341 Computer Graphics Working Environments**  
**Pre : 418261**  
Program development under computer graphics working environments, system preparation, utility software, data structures in computer graphics, graphical user interfaces, and OpenGL.

**418342 Principles of Computer Animation**  
Production workflow, user interface for animation software, modeling, animation, texture and shading, lighting, rendering, particle systems, rigid and soft body dynamics, postproduction.

**418351 Fundamentals of Computer Communication and Networks**  
**Pre : 418231**  
Basic communications concept, components of data communications and networks, type of computer networks, local area network, network topologies, network protocol standard, system planning and design, layer of control, physical link control.

**418352 Network Programming**  
**Pre : 418262**  
Concepts, methods, and tools for the design network-distributed applications and its implementation; interprocess communication, communication protocols, TCP/IP protocols for application layer, socket programming, distributed application design client/server, remote procedure calls, JAVA remote method invocation, COBRA, performance evaluation and security.

**418353 Computer System and Communication Network Security**  
**Pre : 418231**  
Encryption techniques, authentication techniques, security administration, legal issues and ethics in computer system and communication network security.

**418401 Computer and Society**  

**418421 Fundamentals of Database System**  
**Pre : 418322**  
Introduction to database concepts, goals of database management system; data independence; integrity and reliability; logical and physical organizations; schema and subschema, data models; hierarchical, network and relational models, data normalization, data description languages, data dictionary, query facilities, file organization, file security.

**418422 Human Computer Interaction**  

II-289

Pre : 418321
Principles and elements of human computer interaction, design process, models of the users in design, task analysis, dialogue design, model of the system, implementation support, evaluation techniques, and groupware.

418423 Information Retrieval System 3(3–0)
Pre : 418231 and 418322
Introduction to information retrieval system, automatic text analysis, lexical analysis and stoplists, stemming algorithms, thesaurus construction, searching strategies, Boolean operation, hashing, clustering algorithms, file structures, inverted file, signature file, PAT tree, evaluation, ranking.

418431 Principles of Programming Languages 3(3-0)
Pre : 418262
Language definition structure, formal language concepts including syntax and basic characteristics of grammars. Data types and structures. Control structure and data flow. Run-time consideration. Interpretative languages. Lexical analysis and parsing.

418432 Fundamentals of Computer Architecture 3(3-0)
Pre : 418311 and 418241 or 418311 and 420242
Computer architecture characteristics, effects on the design and performance of system, price-performance tradeoffs, instruction sets design, CPU, I/O System, memory hierarchies, pipelining, vector and RISCs architectures, selected topics in parallel architectures of specified computer architecture.

418433 Operating System 3(3-0)
Pre : 418432
Evolution of operating system, operating system structure, process management, process scheduling, interrupt process communication, memory and secondary storage management, security, protection, I/O, computer system resource allocation, deadlocks, case studies in OS, selected topics in distributed OS, OS trends.

418435 Theory of Artificial Intelligence 3(3-0)
Pre : 418231

418436 Algorithms Design and Analysis 3(3-0)
Pre : 418231

418437 Software Design and Development 3(2-2)
Pre : 418231
Design techniques; formal model of structured programming; demonstrations of code reading and correctness; stepwise refinement and reorganization, segmentation, topl-
down and development; information hiding; interactive enhancement; structured design
module strength and coupling measures. Software development management. Team
project.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Prerequisite(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>418438</td>
<td>Compiler Techniques</td>
<td>3(3-0)</td>
<td>418431</td>
</tr>
<tr>
<td></td>
<td>Grammars, languages, and their syntax and semantics concept of parsing and ambiguity, scanners, finite state grammars and recognizers, lexical scanners, implementation of symbol tables, parser; theory and example of context-free languages and push-down automata, context-free parsing techniques translation, techniques of machine independent code generation and improvement, inherited and synthesized attributes. Syntax directed translation schema.</td>
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<tr>
<td>418439</td>
<td>Formal Language and Automata Theory</td>
<td>3(3-0)</td>
<td>418231 and 417271</td>
</tr>
<tr>
<td></td>
<td>Finite state concept; acceptors; regular expressions closure properties. Sequential machine and finite state transducers. State minimization. Formal grammars, computability and turing machines.</td>
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<tr>
<td>418441</td>
<td>Computer Graphics</td>
<td>3(2-2)</td>
<td>418311</td>
</tr>
<tr>
<td></td>
<td>Hardware and software components of computer graphic systems; graphic terminal and device. Display description. Interactive graphics. Graphic languages, hidden line elimination and shading applications.</td>
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<tr>
<td>418442</td>
<td>Simulation and Modeling</td>
<td>3(2-2)</td>
<td>418211 or 418261 and 422111</td>
</tr>
<tr>
<td></td>
<td>Simulation techniques, continuous and discrete simulation models, queuing theory, stochastic processes; design of simulation experiments, analysis of results of simulation, model and results.</td>
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<tr>
<td>418443</td>
<td>Computer Programming in Business</td>
<td>3(2-2)</td>
<td>418211 or 418215 or 418261</td>
</tr>
<tr>
<td></td>
<td>Business computer applications, business environment, business transaction; accounting applications and accounting information system; payroll, accounts payable, accounts receivable, invoicing, genera ledger, materials and operation control applications, or processing, inventory control and forecast, purchasing, sales analysis, banking applications.</td>
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<tr>
<td>418444</td>
<td>Computer Control and Audit</td>
<td>3(3-0)</td>
<td>418323</td>
</tr>
<tr>
<td>418445</td>
<td>Project Management and Control</td>
<td>3(2-2)</td>
<td>418323</td>
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<td></td>
<td>Project planning, project phasing, system life - cycle, project organization, project committees, project teams, project control, project evaluation, feasibility studies, economic evaluation, estimating techniques.</td>
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<tr>
<td>418446</td>
<td>Computer Performance and Evaluation</td>
<td>3(3-0)</td>
<td>418323</td>
</tr>
<tr>
<td></td>
<td>Project planning, project phasing, system life - cycle, project organization, project committees, project teams, project control, project evaluation, feasibility studies, economic evaluation, estimating techniques.</td>
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</tr>
</tbody>
</table>
Basic principles of model-building, the use of a model for performance evaluation and prediction, model building through operation analysis, models based on queuing, discrete simulation models, performance monitoring systems.

418447 Web Technology and Web Services 3(2-2)
Pre: 418262
Principles of Web technology and services, standard specification of technology, architecture and components, functionalities and mechanisms of Web services systems, development of Web technology packages, APIs functionalities and configurations.

418496 Selected Topic in Computer Science 3
Selected topics in computer science at the bachelor’s degree level. Topics are subject to change each semester.

418497 Seminar 1
Presentation and discussion on current interesting topics in computer science at the bachelor’s degree level.

418498 Special Problems 3
Study and research in computer science at the bachelor’s degree level and compile into a written report.

MICROBIOLOGY
(419XXX)

419201 Elementary Microbiology 3(2-3)
General properties of microorganisms; relation of microbes to life and environment.

419211 General Microbiology 3(3-0)
Pre: 424111
Principles of microbiology, groups of microorganisms, cell structures, genetics, growth and metabolism, classification, applications in agriculture, food, industry, environment, public health and medical approach.

419213 Laboratory in General Microbiology 2(0-6)
Pre: concurrence to 419211 and 424112
Laboratory for 419211

419214 Laboratory in General Microbiology 1(0-3)
Pre: concurrence to 419211 and 424112
Laboratory for 419211

419325 Fungi 3(2-3)
Pre: 419213 or 419214
Survey of fungi, morphology, physiology, genetics and applications; field trip required.

419341 Determinative Bacteriology 3(1-6)
Pre: 419213 or 419214
Principles of bacterial classification and identification; isolation of pure culture from various habitats and environmental conditions; identification methods and practices; field trip required.
419371 Genetic Systems of Microorganisms 3(3-0)
Pre : 419213 or 419214
Genetic systems and heredity processed in viruses, bacteria, actinomycetes, yeast, molds and mushrooms, adaptations, variations and mutations, methodology in cell fusion, protoplast fusion and genetic engineering.

419391 Instrumentation for Microbiology 1(0-3)
Pre : 419213
Principles, methodology and maintenance of instruments for studies and research in fundamental microbiology.

419411 Microbial Cell Growth and Cultivation 3(2-3)
Pre : 419213 or 419214 and 417112
Growth kinetics under submerged and solid state cultivation; mathematics of growth in batch, semicontinuous and continuous monoculture; mixed culture systems included.

419412 Analytical Microbiology 3(2-3)
Pre : 419213 or 419214
Principles and methods in using microorganisms for qualitative and quantitative analyses of substances such as: amino acids, vitamins, antibiotics, mutagens and carcinogens; field trip required.

419413 Preservation of Microbial Cultures 3(2-3)
Pre : 419213 or 419214
Principles and methods of microbial culture preservation and collection; information systeming and information collection; culture collection network and services; field trip required.

419423 Actinomycetes 3(2-3)
Pre : 419213 or 419214
Morphology, physiology, genetics, taxonomy, ecology and application; field trip required.

419424 Virology 3(2-3)
Pre : 419213 or 419214
General properties and genetics of viruses; infection, multiplication and effects of viral infection on host cells; plant viruses, animal viruses and bacteriophages, diagnosis and control; field trip required.

419426 Biology of Mushroom 3(2-3)
Pre : 419213 or 419214
Life cycles of mushrooms; growth and factors affecting growth; genetics; taxonomy; ecology; commercial cultivation and application; field trip required.

419427 Yeast and Yeast Technology 3(2-3)
Pre : 419213 or 419214
Biology of yeast, classification and identification, culture preservation, genetics and strain improvements; industrial significance; products from yeast and their technologies; fermentation kinetics; field trip required.

419428 Biology of Mycorrhiza 3(2-3)
Pre : 419213 or 419214
Types of mycorrhizae, morphology; physiology; ecology; relationship between mycorrhizal fungi and their host plants; techniques in mycorrhizal studies; field trip required.

**419434 Food Microbiology** 4(2-6)
- Microorganisms associated with food; effects of intrinsic and extrinsic factors on microbial growth and food spoilage; spoilage and preservation of various food products; index microorganisms; food borne infection and intoxication; methods for microbiological examination of foods; microbiological standards and quality control; field trip required.

**419435 Microbiology of Milk and Milk Products** 3(2-3)
- Microorganisms in milk and milk products; microbial spoilage; application of microorganisms in processing of milk products; microbiological standards and quality control; field trip required.

**419436 Industrial Microbiology** 4(3-3)
- Microorganisms of industrial importance; principles of screening and strain preservation; fermentation processes for production of primary metabolites; secondary metabolites and other microbial products at laboratory, pilot and industrial scales; field trip required.

**419437 Microbiology for Agriculture** 3(2-3)
- Application of microbiology in agriculture; for examples: composting and biogas; mycorrhiza and nitrogen fixing inoculants; ensilaging and microbial feed additives; post harvest microbiology and microbiology in relation to aquaculture; field trip required.

**419438 Microbiology of Fermented Foods** 3(2-3)
- Roles of microorganisms in food fermentation, fermentation with natural inoculation, fermentation using pure cultures; development of inoculum quality, fermentation processes and fermented food industries; field trip required.

**419451 Microbial Physiology** 4(3-3)
- Chemical compositions and functions of the structure of microbial cells; growth; dissimilation, assimilation and biosyntheses; factors affecting microbial activities.

**419461 Infection and Immunity** 4(3-3)
- Basic principles of immunology, immune systems include antibody immune responses and cell-mediated immune responses; antibody production, properties of antibody, types of immune cells that involved immune systems, antigen-antibody reaction,
immunological disorders and diseases involved; pathogenic microorganisms causing human and animal diseases; infection and immunity; diagnosis and prevention; field trip required.

419462 Microbiology for Public Health and Sanitation 3(2-3)
Pre : 419213 or 419214
Principles of public health and plant sanitation; microorganisms involved; epidemiology; prevention and control; field trip required.

419481 Environmental Microbiology 3(2-3)
Pre : 419213 or 419214
Microbial ecology systems; roles of microbes in environment changes; self-purification; methods of pollution control and waste recovery; field trip required.

419482 Pollution Microbiology 3(2-3)
Pre : 419213 or 419214
Microorganisms and microbiology of pollution; important roles, direct and indirect effects of microbes in causing pollution problems; use of microbiological indicators for quality assessment; applications of microorganisms in environmental mitigation; field trip required.

419483 Microbial Deterioration of Materials 3(2-3)
Pre : 419213 or 419214
Microorganisms and their roles in causing deterioration of textiles, wood and wood products, leather, dye, film, paint, paper and document, historical material and monument; impact of environmental factors on deterioration; analytical methods, prevention and control; field trip required.

419484 Microbiology of Waste Water Treatment 3(2-3)
Pre : 419213 or 419214
Microorganisms and microbiology of waste water; factors affecting microbial activities on wastewater treatment systems; analysis of problems and processes control for efficient operation; field trip required.

419485 Soil Microorganisms 3(2-3)
Pre : 419213 or 419214
Major groups of soil microorganisms, their activities and biochemical processes; ecology of soil microorganisms; their importance and applications to agriculture and forestry; field trip required.

419486 Aquatic Microbiology 3(2-3)
Pre : 419213 or 419214
Aquatic microorganisms in fresh, estuarine and sea water; distribution and biomass of microbial population; factors affecting aquatic microorganisms; roles and significance of aquatic microorganisms, impacts on and of environmental conditions; field trip required.

419496 Selected Topics in Microbiology 1-3
Selected topics in microbiology at the bachelor’s degree level. Topics are subject to change each semester.
**Seminar**  
Presentation and discussion on current interesting topics in microbiology at the bachelor’s degree level.

**Special Problems**  
Study and research in microbiology at the bachelor’s degree level and compile into a written report.

### PHYSICS  
*(420XXX)*

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>420101</td>
<td><strong>Elementary Physics</strong></td>
<td>2(2-0)</td>
</tr>
<tr>
<td>420102</td>
<td><strong>Basic Theater Physics</strong></td>
<td>3(3-0)</td>
</tr>
<tr>
<td>420103</td>
<td><strong>Laboratory in Elementary Physics</strong></td>
<td>1(0-3)</td>
</tr>
<tr>
<td>420111</td>
<td><strong>General Physics I</strong></td>
<td>3(3-0)</td>
</tr>
<tr>
<td>420112</td>
<td><strong>General Physics II</strong></td>
<td>3(3-0)</td>
</tr>
<tr>
<td>420113</td>
<td><strong>Laboratory in Physics I</strong></td>
<td>1(0-3)</td>
</tr>
<tr>
<td>420114</td>
<td><strong>Laboratory in Physics II</strong></td>
<td>1(0-3)</td>
</tr>
<tr>
<td>420115</td>
<td><strong>Laboratory in Abridged Physics</strong></td>
<td>1(0-3)</td>
</tr>
<tr>
<td>420117</td>
<td><strong>Basic Physics I</strong></td>
<td>2(2-0)</td>
</tr>
<tr>
<td>420118</td>
<td><strong>Basic Physics II</strong></td>
<td>2(2-0)</td>
</tr>
<tr>
<td>420119</td>
<td><strong>Abridged Physics</strong></td>
<td>3(3-0)</td>
</tr>
<tr>
<td>420181</td>
<td><strong>Basic Physics in Medicine</strong></td>
<td>4(3-3)</td>
</tr>
</tbody>
</table>
Mechanics, thermodynamics, electricity and magnetism, waves, modern physics; applications in medicine; field trip required.

420201 Gems and Jewelry 3(3-0)
Origins and classification of gemstones; properties of gemstones; characteristics of natural, synthetic, imitation, treated and organic gemstones; basic testing of gemstones and instruments; grading and appraising of colored gemstones and diamond; general knowledge of jewelry; process of production; jewelry grading and appraising; gemstone and jewelry trading.

420211 Mechanics I 3(3-0)
Pre : 420111 and 417112
Mechanics of a particle, systems of particles, oscillation problems, rigid body.

420212 Mechanics II 3(3-0)
Pre : 420211
Variational principles, relative motion, Lagrange's equations, Hamilton's equations, the Hamilton-Jacobi equations.

420221 Modern Physics 3(3-0)
Pre : 420112
An introduction to relativity theory and quantum theory, atoms, molecules, statistical mechanics, solids, superfluidity and superconductivity, nucleus and elementary particles.

420222 Laboratory in Modern Physics 1(0-3)
Pre : 420114 and concurrence to 420221
Laboratory for Modern Physics.

420241 Electricity and Magnetism 3(3-0)
Pre : 420112 and 417241
Principles of electricity and magnetism, direct and alternating current circuits.

420242 Laboratory in Electricity and Magnetism 1(0-3)
Pre : 420114 and concurrence to 420241
Laboratory for Electricity and Magnetism.

420243 Introduction to Electronics 2(2-0)
Pre : 420112
DC and AC circuits, signals and noise, signal processing, semiconductor, diode, transistor, amplifier, operational amplifier and applications, waveform generator, linear IC, thyristor, introduction to digital electronics, digital IC and applications.

420244 Laboratory in Introduction to Electronics 1(0-3)
Pre : 420114 and concurrence to 420243
Laboratory for Introduction to Electronics.

420245 Introduction to Digital Electronics 2(2-0)
Pre : 420112
Introduction to digital signal and devices. Number systems, code and logic mathematics. Analysis and design of logic gates, logic combination circuits, sequential circuits, arithmetic circuits, signal conversion circuits and devices. Introduction to computer architecture.

420246 Laboratory in Introduction to Digital Electronics 1(0-3)
Pre : 420114 and concurrence to 420245
Laboratory for Introduction to Digital Electronics.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>420251</td>
<td>Instrumentation Workshop I</td>
<td>1(0-3)</td>
</tr>
<tr>
<td></td>
<td>Physical properties of wood and non-metallic material in instrumentation, designing parts of instruments with wood and non-metallic material, basic carpenter work and tools, production of instrument parts with wood and non-metallic material.</td>
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<tr>
<td>420252</td>
<td>Instrumentation Workshop II</td>
<td>1(0-3)</td>
</tr>
<tr>
<td></td>
<td>Physical properties of metallic material in instrumentation, designing parts of instruments with metallic material, basic mechanic skill work and tools, production of instrument parts with metallic material.</td>
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<tr>
<td>420253</td>
<td>Instrumentation Workshop III</td>
<td>1(0-3)</td>
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<tr>
<td></td>
<td>Designing of instruments and parts with computer aided design, fine measurement and dimensional check, basic machine work and machine tools, production of instrument parts with production machine.</td>
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<tr>
<td>420254</td>
<td>Instrumentation Workshop IV</td>
<td>1(0-3)</td>
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<tr>
<td></td>
<td>Designing of instruments and parts with computer aided design, fine measurement and dimensional check, numerical control programming and production of instrument parts with computerized numerical control</td>
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<tr>
<td>420321</td>
<td>Quantum Mechanics I</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 420221 and 417361</td>
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<tr>
<td></td>
<td>Transition from classical to quantum mechanics, the wave functions, the Schrödinger equations, harmonic oscillator, hydrogenic atoms, angular momentum and spin.</td>
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<tr>
<td>420331</td>
<td>Thermodynamics</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 420221</td>
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<tr>
<td></td>
<td>Thermal properties of matter, kinetic theory of gas, fundamental law of thermodynamics, equilibrium conditions, thermodynamic potentials, systems of variable mass.</td>
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<tr>
<td>420332</td>
<td>Statistical Mechanics</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 420331</td>
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<tr>
<td></td>
<td>Fundamental equations for classical system in equilibrium, microcanonical, canonical and grand canonical ensembles, partition functions, equations of states, virial expansion for real gas, quantum statistics, quantum gases, Bose-Einstein condensation.</td>
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<tr>
<td>420333</td>
<td>Introduction to Material Science</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 420112</td>
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<tr>
<td></td>
<td>Crystal structure, physical properties, production and utilization of selected materials, ceramics, metals, polymer and semiconductor.</td>
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<tr>
<td>420334</td>
<td>Laboratory in Thermodynamics</td>
<td>1(0-3)</td>
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<tr>
<td></td>
<td>Pre: concurrence to 420331</td>
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<tr>
<td></td>
<td>Laboratory for Thermodynamics.</td>
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<tr>
<td>420335</td>
<td>Physics of Gemstones</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 420112 or 420118</td>
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<tr>
<td></td>
<td>Nature and classification of gemstones, elementary crystallography, physical properties, physics principles of gemstone identification and instrumental utilities, causes of color in gemstones, gem species and descriptions, organic gems, phenomenon gemstones, gemstone treatment.</td>
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<tr>
<td>Course Code</td>
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<td>Credits</td>
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<tr>
<td>420336</td>
<td>Laboratory in Physics of Gemstones</td>
<td>1(0-3)</td>
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<td></td>
<td>Pre : 420335</td>
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<tr>
<td></td>
<td>Laboratory for physics of Gemstones.</td>
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<tr>
<td>420341</td>
<td>Introduction to Electromagnetics Theory</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 420241</td>
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<tr>
<td></td>
<td>Maxwell's equations, electromagnetic wave, radiating systems, transmission lines, waveguides.</td>
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<tr>
<td>420343</td>
<td>Linear Electronics</td>
<td>2(2-0)</td>
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<tr>
<td></td>
<td>Pre : 420243</td>
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<tr>
<td></td>
<td>Principles of electronic circuit analysis, analysis of signals, noise, modulation, operational amplifier and applications of linear integrated circuit, waveform generator, multi-junction devices, thyristor and applications, opto-electronic devices.</td>
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<tr>
<td>420344</td>
<td>Laboratory in Linear Electronics</td>
<td>1(0-3)</td>
</tr>
<tr>
<td></td>
<td>Pre : 420244 and concurrence to 420343</td>
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<tr>
<td></td>
<td>Laboratory for Linear Electronics.</td>
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</tr>
<tr>
<td>420345</td>
<td>Introduction to Metrology</td>
<td>2(2-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 420243</td>
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<tr>
<td></td>
<td>Physical quantities, system of units and standard, principles of measurement, methods of measurement, statistical analysis of uncertainty, traceability, calibration, introduction to quality system and logistics, standard laboratory.</td>
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<tr>
<td>420346</td>
<td>Laboratory in Introduction to Metrology</td>
<td>1(0-3)</td>
</tr>
<tr>
<td></td>
<td>Pre : 420244 and concurrence to 420345</td>
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<tr>
<td></td>
<td>Laboratory for Introduction to Metrology.</td>
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</tr>
<tr>
<td>420347</td>
<td>Digital Electronics</td>
<td>2(2-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 420243</td>
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<tr>
<td></td>
<td>Introduction to coding theory and logic mathematics, logic network, logic combination, sequential control circuit and applications, digital integrated circuit, design and applications, digital signal conversion, display and control, principle of data transfer, devices and applications, microcontroller interfacing and applications.</td>
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</tr>
<tr>
<td>420348</td>
<td>Laboratory in Digital Electronics</td>
<td>1(0-3)</td>
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<tr>
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<td>Pre : 420244 and concurrence to 420347</td>
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<tr>
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<td>Laboratory for Digital Electronics.</td>
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<tr>
<td>420349</td>
<td>Physics of Sensor</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 420343</td>
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<td></td>
<td>Sensors and transducers, mechanical and electro-mechanical transducers, liquid phase and porous media transducers, magnetic transducers, optical and radiation transducers, silicon transducers and superconductor transducers, noise and signal processing and applications.</td>
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<tr>
<td>420351</td>
<td>Physical Geology</td>
<td>3(3-0)</td>
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<td>Pre : 420112 or 420118</td>
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<td></td>
<td>Causes and processes of formation of geological materials, surface features of the earth, physical and chemical properties of geological mass, introduction to geophysics, occurrence of economic mineral deposits with emphasis in Thailand, field trip required.</td>
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</tr>
<tr>
<td>420361</td>
<td>Introduction to Astronomy I</td>
<td>3(3-0)</td>
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<td></td>
<td>Pre : 420112 or 420118</td>
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Celestial mechanics, the sun and the solar system, structure of the planets, the origin of the universe, astronomical instruments and techniques of observation, field trip required.

**420362 Introduction to Astronomy II**  
*Pre: 420361*  
Stars and galaxies, stellar atmosphere and interiors, stellar spectrum, classification of stars and galaxies, evolution of stars.

**420363 Optics**  
*Pre: 420221*  
Geometrical and physical optics, vengeance and matrix methods of lens, optical instruments and aberration.

**420364 Physics of Waves**  
*Pre: 417241 and 420241 or 420211*  
Oscillating system and alternating current circuits, waves on strings, sound, electromagnetic waves, Maxwell's equations, physical optics.

**420371 Atomic Physics**  
*Pre: 420321*  
Quantum mechanics, symmetries, angular momentum and spin, atoms and ions, one-electron systems, many-electron systems, atomic spectra, simple reactions.

**420411 Computational Physics**  
*Pre: 420212 and 420221*  
The use of basic and numerical techniques in computer calculation leading to solution for physical problems, models and applications in mechanics, electromagnetism, waves, quantum physics and particle physics.

**420421 Quantum Mechanics II**  
*Pre: 420321*  
Semi-classical approximation, variational principles, time independent and time dependent perturbation theory, scattering theory systems of identical particles.

**420431 Material Science I**  
*Pre: 420221*  
Atomic and molecular interaction, crystal structure, properties of order and disorder crystals, phase diagrams of composite materials, mechanical, electrical, magnetic and optical properties of materials.

**420432 Material Science II**  
*Pre: 420332 and 420431*  
Surface phenomena, fracture and deterioration of materials, physical properties, production and utilization of ceramics, metals, polymer and semiconductor, field trip required.

**420441 Physical Electronics**  
*Pre: 420221 and 420241*  
Atom and crystal, conduction theory, junction, bipolar and unipolar devices, Josepsson junction and quantum devices, integrated circuits, opto-electronnic devices.

**420442 Physics of Instrumentation**  
*Pre: 420345 and 420343 or 420347*
Measurement system, transducer and sensor, characteristics and accuracy testing, signals processing and display, application in physics and other disciplinary.

420443 **Laboratory in Physics of Instrumentation**  
Pre: 420344 or 420348 and 420346 and concurrence to 420442  
1(0-3)  
Laboratory for Physics of Instrumentation.

420444 **Microprocessor Application in Physics**  
Pre: 420347  
2(2-0)  
Basic knowledge of microprocessor, microcontroller and its application. Microprocessor and microcontroller architecture. Memory and input output devices interfacing. Serial communication. Analog to digital signal conversion and digital to analog signal conversion. Sensor interfacing. Introduction to microprocessor or microcontroller programming with assembly language. Interrupts and direct memory access. Application in physics and other areas.

420445 **Laboratory in Microprocessor Application in Physics**  
Pre: 420348 and concurrence to 420444  
1(0-3)  
Laboratory for Microprocessor Application in Physics.

420451 **Geophysics**  
Pre: 420351  
3(3-0)  
Physical properties of interior of the earth, geophysical procedures, seismic, magnetic, gravitational and electrical measurements, geophysical prospecting for minerals and oil, application to engineering works, field trip required.

420452 **Environmental Physics**  
Pre: 420112 or 420118  
3(3-0)  
Radiation environment; heat, mass and momentum transfer; energy balance of the earth-atmosphere systems; environmental moisture and evapotranspiration; urban-rural temperature contrast; human and the atmosphere.

420453 **Energy Resources**  
Pre: 420221  
3(3-0)  
Solar energy, wind energy, hydro-energy, sea-wave energy, geothermal energy, ocean-thermal energy, nuclear energy, chemical cells, fossil fuels, fuel from biomass, fuel from hydrogen, energy utilization and conservation; field trip required.

420454 **Solar Energy**  
Pre: 420331  
4(3-3)  
Solar astronomy, terrestrial insulation, heat transfer, optics of collectors, solar heating systems, conversion of solar energy to work, photovoltaics; field trip required.

420455 **Applied Climatology**  
3(3-0)  
Climate statistics; the climatic water budget; application of climatology to farming program, industry, hydrology and human comfort.

420456 **Atmospheric Physics**  
Pre: 420112 or 420119  
3(3-0)  
Levels and composition of the atmosphere, radiation and optical phenomena, vapor and water, atmospheric thermodynamics, atmospheric dynamics, atmospheric electricity.

420461 **Optometry I**  
4(3-3)
Objective and subjective refractions, refractive errors, binocular coordination and its anomalies, theory and practice of optometric instruments, materials and designs of spectacle lenses and other visual aids; field trip required.

**420462 Optometry II** 4(3-3)
Pre : 420461
Lens and optical dispensing, lens design and material, optical properties of spectacle lens, lens testing, power measurement, selection of lens and frame, frame dispensing and modification, contact lens, contact lens design and material, chemical, physical and optical properties of contact lens material, measurement of power and other parameters, contact lens selection, after-care, maintenance and disinfection, field trip required.

**420463 Astrophysics** 3(3-0)
Pre : 420332
Stellar evolution, universe, quasars, pulsars, neutron stars, general theory of relativity, black holes, cosmology.

**420464 Theory of Acoustics** 3(3-0)
Pre : 420261
Basic properties of acoustic waves; reflection and transmission phenomena; sound emission and absorption; acoustic devices for transmission, reception and filtering; transduction.

**420465 Noise and Environment** 3(3-0)
Pre : 420261
Noise, signal detection, environmental acoustics, architectural acoustics, vibration.

**420471 Nuclear Physics** 3(3-0)
Pre : 420321
Nuclear elementary particles and their interactions, accelerators and analysis, nuclear models, nuclide table, nuclear reaction theory, nuclear decay.

**420472 Nuclear Radiation Physics** 4(3-3)
Pre : 420221
Atomic and nuclear structure, x-ray, natural and artificial radioactivity, radiation measuring instruments, accelerators, nuclear reactor and applications, introduction to health physics; field trip required.

**420473 Physics of Solid I** 3(3-0)
Pre : 420221
Crystal structure, diffraction of wave and particles by crystals, interatomic force and mechanical properties of various classes of solids, lattice vibrations and thermal properties, electronic energy band theory, electronic properties.

**420474 Physics of Solid II** 3(3-0)
Pre : 420473
Electronic properties in magnetic field, semiconductor physics, semiconductor devices, magnetic properties, superconductivity, elementary excitation of electron gas.

**420475 X-ray Crystallography** 4(3-3)
Pre : 420221
Crystal symmetry, application of group theory, x-ray physics, diffraction theory, experimental methods of x-ray crystallography.

420481 Health Physics 4(3-3)
Pre : 420221
Radioactivity and x-ray, radiological units, calculations of radiation quantities, radiation instrumentation, body radiation dose, principle of control and calculations in application of radioactive material and devices, environmental radiation, radiation protection, field trip required.

420482 Biophysics 3(3-0)
Pre : 420221
Biological structure and function; biophysical approach to special organ systems, biological effect of sonic, ionizing, and non-ionizing radiation.

420496 Selected Topics in Physics 3
Selected topics in physics at the bachelor’s degree level. Topics are subject to change in each semester.

420497 Seminar 1
Presentation and discussion on current interesting topics in physics at the bachelor’s degree level.

420498 Special Problems 1
Study and research in physics at the bachelor’s degree level and compile into a written report.

APPLIED RADIATION AND ISOTOPES (421XXX)

421211 Radiation Life and Environment 3(3-0)
Radiation and resources, types of radiation, radiation and life, biological effects of radiation, justification of permissible dose in man, energy and human, nuclear energy and effects environment, uses of nuclear energy in agriculture, medicine, industry and environmental conservation.

421311 Nuclear Science 3(3-0)
Pre : 420112 or 420118
Atomic nuclei, nuclides, radioactivity, law of radioactive decay and the natural radioactive series, interaction of radiation with matters, nuclear reactions and nuclear reactors.

421312 Radiation Detection Techniques 3(3-0)
Pre : 421311
Radiation detection and measurement, ionizing radiation and its interaction with matter, statistics of detection system, radiation detector and detection system, gas-filled detector, solid scintillation counting, liquid scintillation counting, semiconductor detector and non-electronic detector system.

421313 Laboratory in Radiation Detection Techniques 1(0-3)
Pre : concurrence to 421312
Laboratory for Radiation Detection Techniques.

421321 Radiobiology 3(2-3)
Types of radiation, radiation biochemistry, effects of radiation at cellular level, modification of cell and tissue response to radiation, clinical radiobiology, radiation effects on major organ system of mammals, late effects of radiation, body radiation response and radiation effects on higher plants.

**421322 Introduction to Nuclear Medicine** 3(3-0)
Pre: 424111
Physics of nuclear medicine, radiation safety in nuclear medicine, dosimetry of internally administered radionuclides, nuclear medicine instruments, radiochemicals and radiopharmaceuticals, clinical nuclear medicine.

**421411 Radiation Health Protection** 3(3-0)
Pre: 421311
Radioactivity, principle of radiation dosimetry and instruments, effect on radiation with matter and living organism, radiation protection guides, external and internal exposure protection, environmental radiation, acts and regulations: atomic energy for peace.

**421412 Nuclear Method of Analysis** 3(3-0)
Pre: 403231 and 421312
Evolution of nuclear analytical methods, nuclear analytical methods and comparison with other methods, applications in study of chemical processes, nuclear medicine, industries and environment.

**421413 X-ray Fluorescence Analysis** 3(2-3)
Pre: 421312
Atom excitation, X-ray fluorescence, sources of primary radiation, X-ray tube, secondary radiation, X-ray detectors, matrix effects, qualitative and quantitative analysis.

**421414 Radiation Imaging Technique** 3(1-6)
Pre: 424111
Theory of radiography, types and properties of radiation in radiography, films and film processing, equipments and their applications in industry and agriculture, principles of autoradiography techniques, applications in biology and agriculture, field trips required.

**421421 Isotope Tracer Techniques in Biology** 3(2-3)
Pre: 424111
Setting up isotope laboratory, nuclear reaction and synthesis of isotopically labelled compounds, principles of radiation measurement and types of radiation detector, liquid scintillation counter and sample preparation, experimental design using isotope tracer techniques in biology, applications in agriculture and environment.

**421422 Radiation and Mutation** 3(3-0)
Pre: 416311
Radiation and chemical mutagens, induced mutations by radiation and chemical mutagens, molecular basis of mutation and DNA repair mechanisms, mutation research and its application, environmental and its application, environmental mutagenesis and mutagen testing.

**421423 Radiation and Isotopes in Agriculture** 3(3-0)
Pre: 416311
Applications of radiation and isotopes in agriculture and biology, uses of radiation in food and agricultural product preservation, entomology and plant breeding, applications of isotopes in agricultural researches.

**421431 Environmental Radioactivity**  
**Pre:** 424111  
Sources of environmental radioactivity, natural radioactivity, anthropogenic radioactivity, physical and biological transport pathway in atmosphere, soil and aquatic environment through food chain, environmental monitoring and surveillance, lessons from nuclear accidents, environmental impact assessment.

**421496 Selected Topics in Applied Radiation and Isotopes**  
Selected topics in applied radiation and isotopes at the bachelor’s degree level, subject will be changed each semester.

**421497 Seminar**  
Presentation and discussion on current interesting topics in applied radiation and isotopes at the bachelor’s degree level.

**421498 Special Problems**  
Study and research in applied radiation and isotopes at the bachelor’s degree level and compile into a written report.

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**STATISTICS SCIENCE**  
*(422XXX)*

**422101 Elementary Statistics and Software**  
Basic concepts in statistics, variables, data and scale of measurement, frequency distribution, data presentation, measures of location, center and variability, introduction to probability, binomial distribution, normal distribution, sampling distribution, estimation and statistical hypothesis testing of one population and two populations, categorical data analysis, statistical software for data management and data analysis.

**422111 Principles of Statistics I**  
Concept of statistics, measures of relative standing, measures of center, measures of dispersion, random variables and their probability distributions, binomial distribution, Poisson distribution, normal distribution, sampling distribution, statistical inference for one and two populations, analysis of frequency data, one-way analysis of variance, simple linear regression analysis.

**422112 Elementary Statistics for Medical Sciences**  
Data description, introduction to probability, conditional probability, Bayes’ theorem, Chebyshev’s inequality, random variables and their probability distributions, sampling distribution, statistical inference for one and two populations, analysis of frequency data, analysis of variance, simple linear regression analysis.

**422211 Statistical Analysis**  
**Pre:** 422111  
Index numbers, construction of index numbers, classical time series analysis, introduction to nonparametric statistics, introduction to statistical decision making, introduction to statistical quality control.

**422221 Statistical Data Processing**  
3(2-3)
Application of computers and statistical techniques to data processing, data collection, data preparation, data handling on computer, use of statistical packages, data presentation by graphs and tables, analysis and interpretation of statistical data.

**422311 Principles of Statistics II**  
**Pre : 422111**  
Comparing two population means, basic concepts in experimental design, completely randomized design, randomized complete block design, Latin square design, nested design, analysis of treatment effects, assumptions underlying the analysis of variance, transformation of data, factorial experiments, analysis of covariance.

**422341 Statistical Theory I**  
**Pre : 422111**  
Probability, conditional probability, independent events, Bayes’ theorem, random variables, probability density function, cumulative distribution function, moment and moment generating function, conditional expectation and variance, distribution of random variables.

**422342 Statistical Theory II**  
**Pre : 422341**  
Functions of random variables; distribution of order statistics; Chebyshev’s inequality; limiting distribution; law of large number; central limit theorem; properties of estimator; point estimation: moment, maximum likelihood.

**422343 Mathematical Statistics**  
**Pre : 422111**  
Probability, conditional probability, Bayes’ theorem, random variables, probability density functions, mathematical expectations, discrete and continuous distributions, functions of random variables, sampling distributions.

**422361 Design and Analysis of Experiment I**  
**Pre : 422211**  
Principles of experimental designs, basic experimental designs, analysis of variance using conventional and matrix approaches, multiple comparisons and orthogonal comparisons, missing observations, assumptions underlying the analysis of variance, transformation of data, nested design.

**422411 Statistics for Environmental Science**  
**Pre : 422111**  
Probability distributions of data of environmental science, collection and analysis of data from experimental designs and sample survey designs, analysis of time series data.

**422412 Introduction to Statistics for Bioassay**  
**Pre : 422311 or 422361 or 422411**  
Concepts and structure of bioassay, estimation of relative potency using direct and indirect bioassay, application of probit analysis to pesticide and radiation dose response studies.

**422413 Statistical Analysis and Experimental Designs**  
**Pre : 422111**
Principles of experimental designs, completely randomized design, randomized complete block design, Latin square design, nested design, assumptions underlying the analysis of variance, transformation of data, multifactor experiments, split-plot design, analysis of covariance.

422414 **Statistics for Research in Social Sciences** 3(3-0)  
*Pre : 422111*  
Role of statistics in social research, sampling techniques, experimental designs, parametric and nonparametric statistical inference, analysis of categorical data, analysis of variance, regression and correlation analysis, path analysis, basic factor analysis, uses of statistical packages.

422415 **Statistics in Biological Science** 3(3-0)  
*Pre : 422111*  
Analysis of variance for basic experimental designs, factorial experiments, simple linear regression and correlation, multiple regression, nonlinear regression, analysis of covariance, nonparametric statistics for biological data.

422416 **Applied Nonparametric Statistics** 3(3-0)  
*Pre : 422101 or 422111*  
Concepts of nonparametric statistics, inferences for one and two populations, analysis of one-way and two-way classification data, tests for randomness, test for goodness of fit, measure of association, regression.

422421 **Statistics and Computer for Social Sciences** 3(2-3)  
*Pre : 422111*  
Application of a statistical package in social science research, analysis of data using parametric and nonparametric approaches, analysis of categorical data, analysis of variance, analysis of covariance, regression and correlation analysis.

422422 **Statistics and Computer for Applied Sciences** 3(2-3)  
*Pre : 422111*  
Application of a statistical package in applied science research, analysis of data from one and two populations, analysis of variance for data from various experimental designs, regression analysis, analysis of covariance, chi-square test.

422423 **Computer Programming for Statistical Analysis** 3(3-0)  
*Pre : 422111*  
Principles of computer programming, computer programming in statistics, descriptive statistics, chi-square test, analysis of data from various experimental designs, regression and correlation.

422424 **Data Analysis Using Computer Software** 3(2-3)  
*Pre : 422111*  
Computer software, statistical database, data management, data presentation, statistical graphics, statistical data analysis.

422425 **Statistical Analysis using Statistical Packages** 3(3-0)  
*Pre : 422111*  
Types of statistical packages, data preparation and data processing, use of a statistical package in univariate and bivariate data analysis using parametric and nonparametric approaches, output interpretation, comparison of statistical packages.

422431 **Sampling Techniques in Social Sciences** 3(3-0)
Pre : 422101 or 422111
Sampling methodology, scaling methods, questionnaire design, validity and reliability, probability and non-probability sampling, various sampling plan, errors in sample survey, applications in social sciences research.

422432 Sampling Techniques for Natural Sciences 3(3-0)
Pre : 422111
Basic concepts in sampling, simple random sampling, unequal probability sampling, ratio and regression estimation, sampling from dynamic population, applications in natural sciences.

422433 Elementary Sampling Theory 3(3-0)
Pre : 422341 or 422343
Sampling techniques, theory for parameter estimation in sampling, ratio and regression estimation, applications of sampling techniques.

422441 Statistical Theory III 3(3-0)
Pre : 422342
Point estimation: decision function, Bayes, minimax and least squares, interval estimation, hypothesis testing: Neyman-Pearson lemma, most powerful test, likelihood ratio test, chi-square test, sequential test.

422442 Probability Theory 3(3-0)
Pre : 422342 or 422343
Combinatorial analysis, occupancy problems, generating function, central limit theorem, law of large number, Poisson process, branching process, queuing process, random walk, Markov process.

422451 Applied Regression Analysis 3(3-0)
Pre : 422111
Simple linear regression, multiple linear regression, correlation analysis, model adequacy checking, nonlinear regression, selection of regression models.

422452 Regression Analysis 3(3-0)
Pre : 422341
Linear regression models, method of least squares, inferences in regression analysis, model adequacy checking, nonlinear regression models, model selection, problems in regression analysis.

422453 Time Series Analysis and Forecasting 3(3-0)
Pre : 422111
Time series, forecasting models, forecasting methods: decomposition, exponential smoothing, regression and Box-Jenkins method, forecasting the cycle, forecast error, monitoring forecasts, selection of forecasting methods.

422454 Decision Analysis 3(3-0)
Pre : 422111
Bayes’ theorem, utility, pay-off table, decision criteria, decision making under certainty and uncertainty, analysis of multiple-stage problems, influence diagram, games theory.

422455 Data Analysis 3(3-0)
Pre : 422311 and 422451 or 422361 and 422452
Graphical methods for data analysis, batch displays and summaries, smoothing data, assessing distributional assumption about data, developing and assessing regression models, transforming data, robust and resistant techniques for regression and analysis of two-way and multiway tables.

422456 Categorical Data Analysis 3(3-0)
Pre : 422111
Statistical techniques for categorical data, goodness-of-fit tests and measures of association for two-way tables, description and inference using proportions and odd ratios, log linear model, logic model, logistic regression model.

422457 Introduction to Multivariate Analysis 3(3-0)
Pre : 422451 or 422452
Multivariate normal distribution, transforming to normality, graphical techniques, multivariate analysis of variance, principal components analysis, factor analysis, discriminant analysis, cluster analysis.

422461 Design and Analysis of Experiment II 3(3-0)
Pre : 422361
Analysis of covariance, factorial experiments, response surface methodology, confounded design, fractional factorial design, split-plot design, repeated measures, change-over design, incomplete block design.

422462 Principles of Experimental Designs 3(3-0)
Pre : 422311
Fundamental concepts in the design of experiments, analysis of variance rationale, effects of failure to meet assumptions in the analysis of variance, basic experimental designs, factorial experiments, confounded design, fractional factorial design, split-plot design, change-over design, incomplete block design.

422463 Experimental Designs in Plant Sciences 3(3-0)
Pre : 422462
Field plot techniques, plot size and shape of subfield, experiments in greenhouse, complex factorial experiments, incomplete block design, data from series of experiments, long-term experiments, rotation experiments, interpretation and conclusion of the experiment.

422464 Experimental Designs in Animal Sciences 3(3-0)
Pre : 422462
Principles of animal sciences research, experimental designs in nutrition sciences, physiology and animal breeding, statistical techniques for analyzing experimental and field data.

422471 Statistics in Investment 3(3-0)
Pre : 417112
Interest rates, solution of problems in interest, types of annuities, yield rates, loan balance, bonds and other securities, depreciation, modern financial instrument.

422472 Life Insurance Statistics 3(3-0)
Pre : 422341 or 422343
Mortality measurement and construction of mortality tables, survival distribution, life insurance models, life annuity models, net premiums, gross premium, net
premium reserves, multiple life functions, multiple decrement functions, pension annuity models.

422473 Casualty Insurance Statistics 3(3-0)
Pre : 422341 or 422343
Statistical distributions useful in casualty insurance, individual risk models, collective risk models, risk premiums, application of risk theory, simulation techniques in insurance, casualty rate making and loss reserving.

422481 Statistical Quality Control 3(3-0)
Pre : 422111
Quality philosophy, graphical methods for quality control, probability models for quality control, inferences about process quality, statistical process control, control charts, process capability analysis, acceptance sampling.

422482 Industrial Statistics 3(3-0)
Pre : 422111
Quality and quality systems, statistical process control, off-line and on-line quality control, acceptance sampling, quality assurance, quality improvement, industrial experimentation, reliability.

422483 Introduction to Operations Research 3(3-0)
Concepts of operations research, linear programming, simplex method, transportation model, network analysis, project planning and control, dynamic programming, inventory model, queuing model.

422484 Operations Research – Deterministic 3(3-0)
Pre : 417112
Concepts of operations research, optimization techniques, linear programming, simplex method, properties of dual in linear programming, transportation model, network analysis, project planning and control, scheduling, sequencing, dynamic programming.

422485 Operations Research – Stochastic 3(3-0)
Pre : 417112
Probability theory, Markov chain, Markov processes, queuing model, inventory model, decision analysis, game theory, system simulation.

422486 Simulation 3(3-0)
Pre : 422341 or 422343
Systems and models, discrete event simulation, simulation modeling, design of simulation experiments, modeling input process, random number generation, tests for random numbers, random variate generation, analysis of simulation output.

422491 Research Methods 3(3-0)
Pre : 422452
Type of research, steps in conducting research, research design, measurement and scaling design, sampling and experimental design, data collecting instruments, field work, data analysis, presentation of research result.

422496 Selected Topics in Statistics 3(3-0)
Selected topics in statistics at the bachelor’s degree level. Topics are subjected to change in each semester.

422497 Seminar 1
Presentation and discussion on current interesting topics in statistics at the bachelor’s degree level.

**422498 Special Problems**

Study and research in statistics at the bachelor’s degree level and compile into a written report.

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**ZOOLOGY (423XXX)**

**423113 General Zoology**

Biology of the animals, principles of animal classification and their evolution.

**423243 Museum Collection**

Pre : 424111

Animal collection and preservation for class study and museum, zoological management, preparation for collection animals labelling and catalogue of museum specimens, preservation method for invertebrates and vertebrates, the preparation of vertebrates skeletons, animal transparency, and moulding methods.

**423251 Human Physiology**

Pre : 424111

Systematic functions of the human body.

**423311 Chordate Comparative Anatomy**

Pre : 423113 or 424114

Comparative study of the vertebrates in their structure and evolution.

**423351 Animal Physiology**

Pre : 423113

Systematic functions of a living organism in animal kingdom.

**423352 Animal Physiology Laboratory**

Pre : concurrence to 423351

Laboratory work in animal physiology.

**423361 Introduction to Human Parasitology**

Pre : 424111

Morphology, life cycle, transmission, pathogenesis, method of control and prevention of important protozoa, helminthes and arthropods causing diseases of man.

**423413 Animal Microtechnique**

Pre : 423113

Preparation of permanent slide from animal tissue for microscopic study.

**423414 Embryology**

Pre : 423113 or 424111

Gametogenesis, fertilization, development of zygote and embryogeny of vertebrates, anomalies.

**423415 Embryology of Invertebrates**

Pre : 423113

Gametogenesis, fertilization, development of zygote and embryogeny of invertebrates.

**423416 Microanatomy**

4(2-4)
Pre : 423113 or 424111
Structure and component of cells, tissue and organ system in the vertebrate body, the ultrastructure and staining properties.

**423417 Animal Cell Growth** 3(3-0)
Pre : 423113 or 424111
Biochemical changes, growth regulation at molecular level, cell transformation, reactions neighbouring cells as well as its surroundings, factors controlling cell growth.

**423418 Neuroanatomy** 3(2-3)
Pre : 423311
Structures and functions of the nervous system androgens of special sense.

**423419 Osteology** 3(2-3)
Pre : 423311
Development, composition, structures and normal morphology of the skeletal system.

**423421 Vertebrate Zoology** 3(3-0)
Pre : 423113
Morphology structure and characteristics of the vertebrates classification with emphasis on evolution. Field trip required.

**423426 Ornithology** 3(2-3)
Pre : 423113
Structural and functional characteristics of birds, behavior, biology and ecology, classification. Field trip required.

**423427 Mammalogy** 3(2-3)
Pre : 423113
Structural and functional characteristics of mammals, origin and phylogenetic relationships, behavior, biology and ecology, classification. Field trip required.

**423428 Herpetology** 4(2-6)
Pre : 423113
Structural and functional characteristics of amphibians and reptiles, origin and phylogenetic relationships, behavior, biology and ecology, classification. Field trip required.

**423431 Animal Taxonomy** 3(3-0)
Pre : 423113
Principles of animal classification and relationships of taxonomy to evolution and the other fields of biological science.

**423441 Invertebrate Zoology** 4(3-3)
Pre : 423113
Morphology, anatomy, physiology, taxonomy and ecology of the invertebrates. Field trip required.

**423443 Biology of Coelenterate** 3(2-3)
Pre : 423441
Classification, habitat, morphology and physiology of coelenterates in Thailand. Field trip required.

**423445 Biology of the Protozoa** 3(2-3)
Pre : 423113
General structures, genetics and some important organelles of protozoa, identification, collection and cultivation. Field trip required.

**423451 Endocrinology** 3(3-0)
Pre : 423251 or 423351 or 002342 or 506211
Principle of hormone function, mechanisms of hormone action, integration of hormone functions and impacts of hormone disorders.

**423452 Using of Laboratory Animals** 3(2-3)
Pre : 423113
Choosing of laboratory animals and manipulation of them in order to obtain exact experimental results. Ethics in using of laboratory animals.

**423453 Advanced Animal Physiology** 3(3-0)
Pre : 423351 or 423352
Function in detail of systems interested in the animal body and the current published research.

**423454 Ethology** 3(3-0)
Pre : 423113
Evolution of animal behavior, behavior of invertebrate and vertebrate animals including of analysis behavior. Field trip required.

**423455 Neurophysiology** 3(3-0)
Pre : 423351
Functions of the brain, spinal cord, nerves, and sense receptors, and all activities subjected to be brain functions, mechanisms in human and animal.

**423459 Endocrinology and Reproduction** 3(3-0)
Pre : 423351 and 423352
Relationship of reproductive system and other systems, especially endocrine with emphasis upon characteristics which altering for economic benefit and causes, prevention and treatment of endocrine abnormalities.

**423461 Parasitology** 3(2-3)
Pre : 423113
Morphology, identification, life cycle of human and domestic animal parasites, techniques for preservation. Field trip required.

**423462 Nematology** 3(2-3)
Pre : 423113
Morphology, physiology, ecology and life history of round worms.

**423464 Comparative Immunology** 3(3-0)
Pre : 423113
Ontogeny and mechanism of immune system, phagocytosis, phylogeny of complement, comparison of the immune in invertebrates and vertebrates, application of comparative immunology.

**423481 Animal Ecology** 3(2-3)
Pre : 423113 and 422111
Behavior, population dynamics and related environmental factors, Field trip required.

**423497 Seminar** 1
Presentation and discussion on current interested topics in zoology at the bachelor’s degree level.

**423498 Special Problems** 1-3
Study and research in zoology at the bachelor’s degree level and compile into a written report.

**BIOLOGY**
*(424XXX)*

**424101 Introduction Biology** 3(3-0)
Living organisms, environment, life science concept.

**424111 Principles of Biology** 3(3-0)
Biological concepts, cells, introduction to metabolism, chemical effect, cell structures, response and coordination, reproduction and development, genetics and evolution.

**424112 Laboratory in Biology** 1(0-3)
Pre : concurrence to 424111
Laboratory for 424111

**424114 Biology for Medical Science** 3(2-3)
Evolution and classification of living organisms, cell structure and function, organs and system in higher vertebrates, development, principles of genetics and molecular genetics, immune system.

**424201 Life and Environmental Science** 3(3-0)
The population problem, migration agricultural revolution and environmental distribution which affect the living organisms.

**424281 Introduction to Biotoxicology** 3(3-0)
Pre : 424111
Basic concepts of the toxicology and the residue effects of pesticides on the nature and biotic community.

**424331 Introduction to Biophysics** 3(3-0)
Pre : 424111 and 420112
Effects of basic physical components on the mechanism of biological macromolecules, cell and organisms.

**424351 Cell Biology** 3(3-0)
Pre : 424111
Major features of different cell type, organelle structure and function, metabolic pathway, interaction of nucleus and cytoplasm.

**424381 Ecology** 3(2-3)
Pre : 424111
Relationship of living organisms and the environments, patterns of energy flow, material cycles, limiting factor, community, population growth, interspecific relationship and pollution problems in Thailand. Field trip required.

**424396 Biological Literature** 1(1-0)
Pre : 424111
Types of information in biology publication, use of library.

424451  Mechanism and Function in the Cell  
**Pre**: 424111 and 402311  
Mechanisms and function and chemical mediation in cells.

424452  Cell Culture  
**Pre**: 419213  
Techniques of cell and tissue cultures.

424454  Developmental Biology  
**Pre**: 424111  
Developmental biology, mechanism of fertilization, developmental processes, organogenesis in plants and animals.

424473  Biometry  
**Pre**: 422111 and 424111  
Samplings, population calculation, distribution, correlation analysis, linear regression, experimental planning and data analysis.

424481  Population Ecology  
**Pre**: 424381  
Basic and applied ecology, evolutionary and mathematical model to identify and solve ecological problems. Field trip required.

424482  Pollution Biology  
**Pre**: 424111  
Environmental pollution and its effects to life, avoiding and deduction of causes. Field trip required.

424483  Biodiversity  
**Pre**: 416311  
Factors in the cause of biodiversity, type of biodiversity, usefulness of biodiversity, diminishing of biodiversity, cause and consequence, trends in biodiversity conservation and future research.

424484  Evolution  
**Pre**: 416311  
A history of evolutionary biology, origin of the Universe and life, the theories of evolution, the evidences of evolution, sources of evolution, speciation, phylogenetic pattern.

424485  Biological Control Agents in Agriculture and Public Health  
**Pre**: 419211  
Types of biological control agents used for controlling pests in agriculture and public health, modes of action, product development, advantage and disadvantage, application, related law and regulations. Field trip required.

424491  Biology Research Methodology  
**Pre**: 424111 and 422111  
Data and problems in biological work analysis.

424496  Selected Topics in Biology  
**Pre**: 424111  
Selected topics in biology at the bachelor’s degree level. Topics are subject to change in each semester.
42497 Seminar
Presentation and discussion on current interesting topics in biology at the bachelor’s degree level.

42498 Special Problems
Study and research in biology at the bachelor’s degree level and compile into a written report.

ENVIRONMENTAL SCIENCE
(425XXX)

425101 Introduction to Environment 3(3-0)
Relation between lifestyle and environment, critical problems of environment from human behavior, participation in environmental protection and improvement, environmental information publication.

425211 Principles of Environmental Science 3(3-0)
Overviews and various activities with direct and indirect impacts on environment, factors and processes of problems, prevention and improvement.

425312 Urban Environment and Management 3(3-0)
Pre : 425211
Introduction to urbanity; urbanization and urban growth; urban ecology; urban problems; quality of life; land use; urban design, planning, and management.

425321 Soil Pollutants 3(2-3)
Pre : 403118
Soil environments, characteristics of soil and pollutants, pollutant partitioning among soil phases, behavior and transportation of pollutants in soil.

425322 Wastewater Treatment 3(2-3)
Pre : 419213
Sources, types and characteristics of wastewater, wastewater treatment and water quality improvement, system design and operation, laboratory and field analyses of wastewater, field trip required.

425323 Wetland Biogeochemistry 3(3-0)
Pre : 424381
Compositions and characteristics of wetland systems; importance of wetland biogeochemistry; physical and chemical characteristics of wetland soils, hydrology and water quality; interactions among plants, microbes and soil; movement of nutrients and pollutants; wetlands for wastewater treatment; constructed wetlands.

425324 Air and Noise Pollution 3(2-3)
Pre : 403115
Sources of air and noise pollution, types of air pollutants, impacts of air and noise pollution on human and environment, monitoring systems, air and noise pollution control, field trip required.

425325 Introduction to Solid Waste 3(2-3)
Pre : 425211
Generation, storage, collection, transport, effective processing and disposal of solid waste with environmental considerations, field trip required.
425326 Environmental Pollutant Analysis 3(1-6)
Pre : 403115
Environmental sampling and storage, instrumental techniques for environmental pollutant analysis.

425381 Environmental Conservation 3(3-0)
Pre : 424381
Trends of nature conservation, sustainable use of natural resources, principles of management, conservation policy and laws.

425421 Field Study for Environmental Science 2(1-3)
Pre : 425211
Site selection; searching for environmental background data; map study; planning and sampling; collection of physical, chemical and biological samples; questionnaire preparation; data collection; data analysis; report of existing condition of the studied area.

425422 Hazardous Material and Waste Management 3(3-0)
Pre : 403115
Classification; characteristics; identification of hazardous materials and wastes; relevant laws, legislation and regulations; toxicity; fates of hazardous wastes in the environment and their impacts; hazardous material and waste management; field trip required.

425431 Principles of Environmental Management 3(3-0)
Pre : 425211
Physical and biological structures of environmental systems, use of natural resources and sustainable development, environmental policies and laws, environmental project management.

425432 Environmental Impact Study 3(2-3)
Pre : 425211
Survey, analysis, and assessment of environmental impact from various activities for project management and decision making, field trip required.

425433 Environmental Management Standard 3(3-0)
International environmental management standard, environmental policy, analysis of environmental aspects, preparation of environmental management program, environmental management system audit and management review for continual improvement, field trip required.

425451 Database Management for Environment 3(3-0)
Pre : 422111
Use of computer programs for information system and management, database for environmental science, environmental problem analysis and forecast by using statistics.

425452 Modeling in Environmental Science 3(3-0)
Systems, models, simulation analysis, random number and generation, simulation softwares, examples of modeling in environmental science.

425453 Environmental Science Writing 1(1-0)
Basic concepts of writing technical reports within the context of environmental science.
<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits (Lecture-Laboratory)</th>
</tr>
</thead>
<tbody>
<tr>
<td>425461</td>
<td>Workplace Safety and Hygiene</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Occupational diseases, workplace hazards,</td>
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<tr>
<td></td>
<td>occupational accidents, safety</td>
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<td></td>
<td>investigation and measures, field trip required.</td>
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<tr>
<td>425471</td>
<td>Recycling Technology</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Principles of recycling and technologies for</td>
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<td></td>
<td>reducing waste from various activities.</td>
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<tr>
<td>425481</td>
<td>Chemical Ecology</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 403221</td>
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<tr>
<td></td>
<td>Interactions of components in environment;</td>
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<tr>
<td></td>
<td>impacts of produced chemicals and processes on</td>
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<td>selves, surroundings and ecosystems;</td>
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<td></td>
<td>details of interactions between organisms and</td>
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<td></td>
<td>environment.</td>
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<td>425496</td>
<td>Selected Topics in Environmental Science</td>
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<tr>
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<td>Interesting topics in environmental science.</td>
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<td>Topics subjected to change each semester.</td>
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<td>425497</td>
<td>Seminar</td>
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<td>Presentation and discussion on current interesting</td>
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<td>topics in environmental science at the</td>
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<td>425498</td>
<td>Special Problems</td>
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<td>Study and research in environmental science at</td>
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<td>the bachelor’s degree level and compile into a</td>
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<td></td>
<td>written report.</td>
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(449XXX)

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>449390</td>
<td>Cooperative Education Preparation</td>
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<tr>
<td></td>
<td>Principles, concepts and processes of cooperative</td>
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<tr>
<td></td>
<td>education. Related rules and regulations. Basic</td>
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<tr>
<td></td>
<td>knowledge and techniques in job application.</td>
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<tr>
<td></td>
<td>Basic knowledge and techniques in working.</td>
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<tr>
<td></td>
<td>Communication and human relations. Personality</td>
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<td>development. Quality management system in</td>
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<td></td>
<td>workplace. Presentation techniques. Report</td>
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<tr>
<td></td>
<td>writing.</td>
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<tr>
<td>449490</td>
<td>Cooperative Education</td>
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<tr>
<td></td>
<td>On the job training as a temporary employee</td>
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<td>according to the assigned project including</td>
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<td></td>
<td>report writing and presentation.</td>
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</tbody>
</table>
451121  Human Geography  3(3-0)
Principles and concepts of human geography, population, culture, human settlement, economic activities, nutrition, distribution of diseases and medical care, environmental problems.

451141  Physical Geography  3(3-0)

451142  Man and Environment  3(3-0)
Relationship between human and the environment. Environmental management toward the equilibrium at both micro- and macro-scale. Field trips.

451221  Historical Geography  3(3-0)
Spatial distributions of human settlements following the Age of Discovery and global trading. Historic landscape with emphasis on their natural, cultural, and economic conditions influential to various groups of settlers.

451222  Agricultural Geography  3(3-0)
Development of agriculture. Agricultural system and relationship between sustainable agriculture and natural resources and socio-economic factors. Thirty hours of fieldwork.

451223  Economic Geography  3(3-0)
Principles of economic geography, resources and world population distribution, location and land use for human economic activities.

451231  Regional Geography  3(3-0)
Natural and cultural landscapes of Europe, North and South Americas, Africa, Australia and Oceania, and Asia.

451232  Geography of Thailand  3(3-0)
Physical, economic, social, and cultural characteristics; environmental and social problems of Thailand. Field trips.

451233  Geography of Asia  3(3-0)
Natural and cultural landscapes of East Asia, South Asia, Southeast Asia, Southwest Asia, and Central Asia.

451241  Landform Geography  3(3-0)
Pre : 451141
Components and conditions of physical factors influencing the landforms. Thirty hours of fieldwork.

451251  Map Reading and Aerial Photo Interpretation  3(3-0)
Characteristics of maps and aerial photographs, history, map composition, map projections, position, scale, distance, coordinates, directions, topographic map utilization, map reading, planning aerial photography, aerial photograph production technique,
geometric characteristics of aerial photographs, stereoscopic, and aerial photograph interpretation.

451252 Cartography  
Pre : 451251  
3(2-3)  
Basic cartographic principles; cartographic theory and technology; transformation of raw data into maps; map design, drafting, and printing. Field trips required.

451253 Map Projection  
Pre : 451251  
3(3-0)  
Basic concepts, property, and types of map projections. Relationship between geographic coordinates and map projection coordinates. Distortion of map projection. Selection of appropriate map projection.

451311 System Dynamics Approach to Geography  
3(2-3)  
Basic concepts of systems theory; structure of closed system or feed back systems in system dynamic; interaction between human behavior and dynamic systems in geography; graphing, causal loop mapping; synthesizing geographical topics; analyzing the cause and effect of the changing process by system dynamics; simulation modeling and using computer program in defining and analyzing dynamic problems in geography.

451321 Geography of Settlement  
Pre : 451121  
3(3-0)  
Concepts of human settlements; patterns of settlements and changes; future population trends and patterns of settlement; settlement and social structure patterns of employment and investment; migration and urbanization; infrastructure investment; settlement problems and improvement; spatial patterns of settlement growth in developed and developing countries. Field trips.

451322 Land Use Planning and Land Development  
Pre : 451121  
3(3-0)  
Rural and urban land use planning and development in harmony with socio-economic conditions. Field trips.

451323 Urban Geography  
Pre : 451321  
3(3-0)  

451324 Rural Geography  
3(3-0)  
Structure of world system; globalization and changes in rural population growth and quality of life; quality of life’s indicators; income distribution and amelioration of poverty; agriculture and rural development; rural development policy and planning in Thailand. Field trips.

451325 Geography of Manufacturing  
Pre : 451121 or 451223  
3(3-0)  
Concepts of industrial location, location factors, industrial location theories, case studies of industrial development planning.

451326 Geography of Transportation  
Pre : 451121 or 451223  
3(3-0)  
Concepts in transportation systems, routes and networks, transport development, transport models, network design and performance, transport costs.

451341 Conservation of Natural Resources  
3(3-0)
Principles and guidelines for conservation of several types of natural resources; soil, water, forest, wildlife, minerals and energy resources; environmental problems and guidelines for problem solving. Fieldwork.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>451342</td>
<td>Soil Geography</td>
<td>3(3-0)</td>
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<tr>
<td>Pre: 451141</td>
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<tr>
<td></td>
<td>Geographical factors influencing characteristics, types of soils and land use potentials. Thirty hours of fieldwork.</td>
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<tr>
<td>451343</td>
<td>Meteorological Geography</td>
<td>3(3-0)</td>
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<tr>
<td>Pre: 451141</td>
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<td></td>
<td>Factors affecting atmospheric changes. Types and distribution of precipitation, temperature and wind systems of the world. Climate classification, weather analysis and forecasting with satellite image. Field trips.</td>
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<tr>
<td>451344</td>
<td>Energy Sources and Consumption</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Studies and analysis of the distribution of sources of energy and alternative energy, utilization, major producer and consumers of energy resource, management and influence of various institutions, conservation and environmental impact of resource utilization. Field work.</td>
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</tr>
<tr>
<td>451351</td>
<td>Geographical Site Survey</td>
<td>3(2-2)</td>
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<tr>
<td>Pre: 451251</td>
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<tr>
<td></td>
<td>Physical and socio-economic data collection planning for fieldwork; utilization of aerial photo, satellite imageries and thematic maps in data collection and site survey; ground truth verification and data interpretation; questionnaire construction, interview, observation, and note-taking; analysis of physical and socio-economic data; emphasizing group projects.</td>
<td></td>
</tr>
<tr>
<td>451352</td>
<td>Photogrammetry I</td>
<td>3(3-0)</td>
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<tr>
<td>Pre: 451251</td>
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<tr>
<td></td>
<td>History, development, and usefulness of photogrammetry; aerial photography; geometry and coordinate system of photography; flight planning and photogrammetric ground control point; stereoscopy and stereoscopic parallaxes; basic adjustment; computation; principle of interior orientation; principle of exterior orientation.</td>
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<tr>
<td>451353</td>
<td>Photogrammetry II</td>
<td>3(2-3)</td>
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<tr>
<td>Pre: 451352</td>
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<tr>
<td></td>
<td>Principle, objective, usefulness and technique of photogrammetric aerial triangulation, strip aerial triangulation; block adjustment by independent model; bundle block adjustment; adjustment computation of aerial triangulation; photogrammetric application; automated photogrammetric mapping.</td>
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<tr>
<td>451354</td>
<td>Geodesy</td>
<td>3(3-0)</td>
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<tr>
<td>Pre: 451251</td>
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<td></td>
<td>Evolution and usefulness of geodesy, theory of earth’s shape, geodetic survey, calculation of earth’s size and shape, astronomic calculation and error correction.</td>
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<tr>
<td>451399</td>
<td>Practicum</td>
<td>3(0-9)</td>
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<tr>
<td></td>
<td>Ninety hours of fieldwork during the summer session.</td>
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<tr>
<td>451411</td>
<td>Readings in Geography</td>
<td>1(1-0)</td>
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<tr>
<td></td>
<td>Analysis of geographic documents and journals.</td>
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<tr>
<td>451412</td>
<td>Development of Geography Thought</td>
<td>2(2-0)</td>
</tr>
<tr>
<td></td>
<td>Reasoning and evaluation of thoughts of geographers; philosophy and effect of prominent geographers’ thoughts.</td>
<td></td>
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<tr>
<td>451421</td>
<td>Political Geography</td>
<td>3(3-0)</td>
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</tbody>
</table>
Evolution of political thoughts and concepts of prominent political geographers. Analysis of geographical elements within a state leading to political differences. Influence of physical, economic, and social conditions on political power. Political administration at national and local levels. International organizations. Contemporary political problems and condition in Thailand and other countries.

451425 Medical Geography 3(3-0)
Disease ecology; diffusion and distribution of selected major diseases; distribution, accessibility and utilization of medical care services.

451431 Geography of Australia and Oceania 3(3-0)
Natural and cultural landscapes of Australia, New Zealand, and the Pacific Islands. Existing situation and problems.

451432 Geography of South America and Africa 3(3-0)
Human settlements in South America and Africa. The geographical conditions and the social, economic, and cultural characteristics of the population. Relationship between physical environment and human

451433 Geography of Europe and North America 3(3-0)
Natural and cultural landscapes of Europe and North America. Existing situation and problems.

451441 Geography of Tourism Resources 3(3-0)
Definition and types of tourism resources. Geographical factors influencing tourism. Application of remote sensing and geographic information system for tourism resource analysis. Tourism resource planning and sustainable development. Thirty hours of fieldwork.

451442 Marine Geography 3(3-0)
Marine structures, resources, coastal environment, geopolitics of the oceans. Multi purpose for human activities, and conservation. Field trip.

451443 Hydro Geography 3(3-0)
Water resources, the changing global physical feature by water, the energy from water, the multi-utilization for humanity, conservation of the environment.

451451 Quantitative Techniques in Geography 3(3-0)
Pre : 422111
The application of statistical techniques to analyze spatial data.

451452 Application of Satellite Imageries for Geographer 3(3-0)
Pre : 451251
Principles of remote sensing, satellites for resource survey and earth stations, principles of visual and digital imagery interpretation, geographic applications of satellite imagery.

451453 Geographic Information Systems I 3(2-2)
Pre : 451251
Concepts, types, utilization, and usefulness of spatial data; digital data usage; computerized map making; concepts of geographic information systems; software for geographic information systems.

451454 Geographic Information Systems II 3(2-2)
Pre : 451453
Application techniques of spatial data; characteristics of data used; data management; analysis and presentation of spatial data; application of geographic information systems in works related to geography.

451455 Satellite Surveying 3(2-3)
Principles of surveying and mapping, coordinate systems, positioning, principles of geodesy, satellite system in surveying, global positioning system, GPS receivers, planning for satellite surveying, satellite surveying in the field.

**451491 Research Methods in Geography**  
1(1-0)  
Geographic research, problem identification, data collection and processing, descriptive and statistical data analyses, geographic research reporting.

**451496 Selected Topics in Geography**  
3(3-0)  
Selected topics in geography at the bachelor degree level. Topics are subject to change each semester.

**451497 Seminar**  
1  
Presentation and discussion on current interesting topics in geography at the bachelor degree level.

**451498 Special Problems**  
2  
Study and research in geography at the bachelor degree level and compiled into a written report.

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**HISTORY (452XXX)**

**452111 History and World Civilization**  
3(3-0)  

**452112 History and Contemporary World Affairs**  
3(3-0)  
The Industrial Revolution. The Establishment of European colonies. Causes of the two World Wars. Political, economic and social changes in Europe before and after the two World Wars. Significant events and world current problems.

**452113 Principles in Historical Report Writing**  
2(2-0)  
Principles historical review, documents and writing in historical report. Field trip.

**452114 Philosophy of History**  
3(3-0)  
A survey study on the development of the ideas on “what is history” of the outstanding historians of the western countries and Thailand from the past to the present time.

**452115 Eastern Civilization**  
3(3-0)  
Civilization of India, China, Japan, Persia, Islam and Southeast Asia. Development of political economic, social, and cultural thoughts. The dawn of Eastern philosophy. Epoch of changes influenced by Western civilization on social systems and philosophy of the East and its adaptation towards globalization.

**452116 Western Civilization**  
3(3-0)  
Ancient civilizations of the Western world in the Near East, classical Greek and Roman, Christianity in the Middle Ages. The Renaissance leading to the transformation of religion, science, government, economy, and society of the modem world; ist impact on modernization and conflicts in other parts of the world up to globalization.

**452211 History of Art**  
3(3-0)  
Meaning of art, motivation and influence of artistic creations, artist’s concepts; art work analysis and criticism; historical study of European, Middle-Eastern and Asian art from prehistoric period of the 19th century.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>452213</td>
<td>History of Buddhism</td>
<td>3(3-0)</td>
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<tr>
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<td>Life of Buddha. The origin and principles of Buddhism; its expansion and evolution. History of Buddhism in Thailand.</td>
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<tr>
<td>452214</td>
<td>History of Christianity</td>
<td>3(3-0)</td>
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<tr>
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<td>Life of Jesus Christ. The origin and principles of Christianity and its evolution; its expansion and influences upon civilization. History of Christianity in Thailand.</td>
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<tr>
<td>452221</td>
<td>Thai History</td>
<td>3(3-0)</td>
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<td></td>
<td>A survey of Thai History from the ancient times to the present. Emphasis is placed on the foundation of the Thai nation, the main trends of government, economics, religion, culture and foreign relations. Field trip.</td>
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<tr>
<td>452222</td>
<td>Ancient Thai History - Sukhothai Period</td>
<td>3(3-0)</td>
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<td>Trends of thoughts on origins and settlements of the Thai race and its movement to the South. The nature of the Indochina Peninsula and various kingdoms existing before the political, economic, social, and cultural development in the Sukhothai Period. Field trip.</td>
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<tr>
<td>452223</td>
<td>History of Ayutthaya</td>
<td>3(3-0)</td>
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<td>Social, political, economic, art and cultural developments; foreign relations and the two events of the fall of Ayutthaya Field trips.</td>
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<tr>
<td>452224</td>
<td>Socio-Economic History of Thailand</td>
<td>3(3-0)</td>
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<td>Socio-economic structure and development of Thai society from past to present. Factors influencing Thai society and economy.</td>
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<tr>
<td>452231</td>
<td>History of Southeast Asia I</td>
<td>3(3-0)</td>
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<td></td>
<td>The socio-economic and political changes in Myanmar, Vietnam, Cambodia and Laos since the ancient time until Western colonization. The transformation of colonial policies before and after World War I, as well as the occupation of Japanese forces during</td>
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<tr>
<td>452232</td>
<td>History of Southeast Asia II</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>The fundamental basis as well as the socio-economic and political development in Indonesia, the Philippines, Malaysia, Singapore and Brunei since the emergence of these nations until the colonial period. The movement for independence and the occupation of Japanese forces during World War II.</td>
<td></td>
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<tr>
<td>452241</td>
<td>History of East Asia</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Historical development of Chinese, Japanese and Korean societies from the ancient time to World War II. Their political and economic organizations, influences of thought and religions, foreign relations.</td>
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<td>History of Western Europe</td>
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<td>Social, economic, political and governmental developments of Europe in the 18th Century. Political, social, economic and diplomatic conceptions of Europe in World War I and II. The Cold War problem. The inter-relationships and the role of Europe in the world affairs until World War II.</td>
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<td>452252</td>
<td>History of Australia, New Zealand and the Oceania</td>
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<td>The founding of British colonies in Australia and New Zealand. Response of the natives to Western civilization. Politics and government after the independence. The significance of Australia, New Zealand and the Oceania in a politically divided world.</td>
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<td>452261</td>
<td>History of the United States</td>
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<td>452271</td>
<td>Middle East History</td>
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The growth and dissolution of the Ottoman Empire. Thought, cultural and political impact of the West on Iran, Turkey, and other Arab nations. Nationalism and reformist movements. Rise of modern independent states. The Arab-Israel conflicts, problems of the Suez, and the role of the United Nations. Relationships between the Middle East and the outer world.

**452272 Islamic Civilization** 3(3-0)
- Life of Muhammad. The origin and principles of Islam; its growth and expansion. Islamic civilization in other countries. History of Islam in Thailand.

**452311 Economic History** 3(3-0)
- Economic development from the Middle Ages through the ages of Commercial Revolution and Industrial Revolution to the present. Examples are selected from European, Asian, American and Thai economic histories.

**452321 Historic Archaeology of Thailand and Neighbouring Countries** 3(2-3)
- Archaeological data of the Thai historical periods. Relations between Thai culture and neighboring countries through archaeological analysis. Basic methods of excavation, recording, and interpretation of data. Field study required.

**452323 Thai Local History** 3(3-0)
- Political, social and cultural structures of each locality, the relationship between local society and the central government, centralization in the reign of King Rama V and the cultural exchanges. Field trips.

**452324 Thai History for Tourism** 3(3-0)
- Background of history, society and culture of various periods of Thailand. Role of the government and private sectors commitment to strengthening its historical significances for tourism. Tourism in the archaeological, historical and cultural basins. Field study required.

**452325 History of Thonburi and Ratanakosin Periods** 3(3-0)

**452331 Modern History of Southeast Asia I** 3(3-0)
- The socio-economic and political development in Myanmar, Vietnam, Cambodia and Laos after the end of World War II. The movement for independence and civil war. The related problems of national unification and minorities. Process of social and economic changes as well as the implications of international politics towards these countries during the present time.

**452332 Modern History of Southeast Asia II** 3(3-0)
- The development of nationalism, socialism and religious movement in Indonesia, the Philippines, Malaysia, Singapore and Brunei after the end of World War II. The chronic problems of racial conflict and religious difference. The declaration of independence and political structure of new states. The process of socio-economic changes during the present time.

**452333 History to South Asia** 3(3-0)

**452334 Political and Social History of Modern South Asia** 3(3-0)
- History, government, society and culture of Indian sub-continent. Gandhi and the struggles for independence. Leaders roles and policies of South Asian countries today.
Political, religious and cultural conflicts between India and Pakistan. The role of India and the world powers including her neighbours in South Asia today.

**452335  Indian Civilization**  3(3-0)
Origins of Indian society and culture. The impact of the West upon the belief-systems, social values and institutions of India. Changes and developments of contemporary Indian society.

**452341  Japanese Civilization**  3(3-0)

**452342  Chinese Civilization**  3(3-0)
The evolution of Chinese civilization from the ancient to the pre-republic period. Chinese cultural foundation in society, economy and politics. The influence of western civilization on reformation of the thought of modernization country in the late 19th Century.

**452351  Classic Greek and Roman Civilizations**  3(3-0)
Social structure, political institutions, value systems, ideas, arts and architecture, and forms of economic life of the Greek and the Roman.

**452352  History of England**  3(3-0)
A survey of British history from the Roman times to the twentieth century. Emphasis is placed on institutional, constitutional, and economic developments of England, and her recent relationship with the outer world.

**452353  History of Germany**  3(3-0)
A survey of German political, social, cultural, intellectual and economic developments from its founding to the present and her recent role to the outer world.

**452354  History of France**  3(3-0)
Political, social, cultural, intellectual, and economic developments of France from the beginning to the present. French imperialism and diplomacy. Two World Wars and decolonization. The role of France in the postwar period.

**452361  American Civilization**  3(3-0)
American civilization in the aspects of cultural geography, settlement and immigration, women and minorities, political institutions, foreign policy, legal system, economic and industrial institutions, social welfare, education, and religion.

**452421  Modern Thai History**  3(3-0)
Political, economic and social developments in Thailand and foreign policy since 1932 to the present time.

**452422  Diplomatic History of Thailand**  3(3-0)
History of Thai diplomacy. Impact of western imperialism on Thailand. The influences of western power on Thailand’s national politics, economic, social, art and cultural development.

**452423  History of Agricultural Development of Thailand**  3(3-0)
A study of Thai agricultural development from the past to the present; analysis of agrarian society with regard to tools; irrigation, and agrarian laws; the impact of the Boring Treaty during the reign of King Rama IV; continuous problems up to the present.

**452431  History of Overseas Chinese in Southeast Asia**  3(3-0)
The relations between China and other states in Southeast Asia since the ancient time. The establishment of socio-economic and political organizations among the Overseas Chinese. Changes of socio-economic positions of the Overseas Chinese after World War II. Different roles of ethnic Chinese in Southeast Asia during the present time.
452441 Modern History of Japan

A critical study of the social, economic, and intellectual developments of modern Japan beginning with the last phase of the Tokugawa period. The Meiji, Taisho and Showa Periods will be presented chronologically. Emphasis is on the development of Japan as a major modern economic power.

452442 Modern History of China

Society, economy and politics of China in the late Ching dynasty. The invasion of western superpowers. The revolution and the end of absolute monarchy. The birth of communist party. The change to the socialist state and the way of social, economic and political revolution in China in the new era.

452443 Diplomatic History of China

A conceptual framework of Chinese foreign policies toward the neighbouring countries in the past. Tributary system and diplomatic protocol. The reformation of foreign policy after the Opium War. Role of China in World affairs after World War II.

452444 Modern History of Korea

The socio-economic and political development in Korean Peninsula during the Japanese occupation. The Nationalist and Communist movement. The impacts of World War II and Korean War. The separation between the North and the South. The related problems of reunification as well as the implication of international politics and economics toward the two Korean nations during the present time.

452445 Economic History of Modern China

The economic structure of Communist China after 1949. Changes of socio-economic revolutions after 1960s and the implementation of four modernization policies. The role of foreign capital, modern technology, the reformation of state enterprises and financial institutions. The importance of special economic zones and the impact of international economics toward Chinese economy during the present time.

452451 Modern History of Europe

Social, economic and diplomatic conceptions of Europe after the Cold War. The inter-relationships and the role of Europe in the World affairs until present.

452452 History of Russia

Background of economic, political, social, cultural and intellectual history of Russia from the establishment of the Russian Kingdom. The Russian Revolution in 1997. The Russian Communism governed in the former Soviet Union. Role of the Russia in the world affairs until the present time.

452461 Modern History of the United States


452462 Diplomatic History of the United States


452491 Philosophy and Methods of Historical Research

A study of the historical philosophy and historiography of the outstanding historians of the world, especially Thai historians; examination of evidence; classification of data; and criticism of historical works.

452497 Seminar

1
Presentation and discussion on current interesting topics in history at the bachelor degree level.

**452498 Special Problems**

Study and research in history at the bachelor degree level and compiled into a written report.

**Laws**

(453XXX)

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<td><strong>Law in Everyday Life</strong></td>
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<td>exercise of ownership, co-ownership, possession,</td>
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<td>**Law on Torts, Management of Affair without</td>
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<td>Mandate and Undue Enrichment**</td>
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<td>mandate, undue enrichment and liability for</td>
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<td>453224</td>
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<td>Sale, exchange, gifts, hire of property, hire</td>
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<td>453225</td>
<td><strong>Family Law</strong></td>
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Marriage, conditions of marriage, relationship of husband and wife, rights and duties parent and child, guardianship and adoption.

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<td>453231</td>
<td><strong>Criminal Law II</strong></td>
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<td>453232</td>
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<td><strong>Succession Law</strong></td>
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<td>453322</td>
<td><strong>Specific Contracts III</strong></td>
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<td>453341</td>
<td><strong>Civil Procedure Law</strong></td>
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<tr>
<td>453342</td>
<td><strong>Judicial System and Court Organization</strong></td>
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*Insurance, insurance against loss, guarantee insurance and life insurance, warehousing, compromise, gambling and betting, surtyship, mortgage and pledge.*

*Agency and brokerage, sole proprietorship, ordinary partnership, registered partnership, limited partnership, limited company and public company.*

*The Penal Code Book II, concerning specific offences; offences concerning the security of the Royal Kingdom, public administration, justice, religion, causes of public danger, counterfeiting and alteration, trade, gender, life and body, property, Book III, Concerning Petty offences.*

*History, definition and evolution of constitution, categories of constitution, state and type of state, political institutions, rights and liberty of the people, important constitutional theories, control of constitution conformity and important laws related to constitution.*

*General principles and significant characteristics of administrative law, administrative organs, administrative act, legal effect and revocation of administrative act, administrative execution procedures, public service, administrative of state organs, jurisdiction and procedure of administrative court.*

*History of English and American common law system, history of civil law system in the Continental Europe, Thai legal history, law reform and development of law.*

*Reading and analysis of legal documents and law journals.*

*Writing legal documents and articles.*

*Devolution of an estate, heirship, disinheritance, renunciation of an estate, statutory right of inheritance, division into portions between the several classes and degrees of statutory heirs, representation for the purpose of receiving inheritance, wills and nullity of a will, partition of an estate, prescription.*

*Loans for use, loans for consumption, deposit, current account, bills of exchange, promissory notes, cheques.*

*Principle of civil procedure general provision, procedure in courts of first instance, appeal and dika appeal, provisional measures before judgment and execution of judgments or orders.*

*Judicial court system, the historical background of the Thai judicial system, work of the Court of Justice, Judicial affairs and administration affairs, court of the First Instance, Appeal Court, Dika Court, promotion of judicial affairs, jurisdiction of courts, the judgment party, reservation of judge, associate judge.*
453343  Criminal Procedure Law  4(4-0)
Pre : 453132
General provisions on the criminal procedure, powers of inquiry official and competency of court, summons, criminal warrants, arrest, detention, imprisonment, provisional release, inquiry, post mortem inquest, filling of civil cases in connection with an offence, appeal and Dika appeal, enforcement of judgments and costs, pardon and reduction dika of punishment of the Criminal Procedure Code.

453344  Law of Evidence  3(3-0)
The general provisions on laws of evidence, general rules, attendance and examination of witnesses, production of documentary evidence, inspection by court and appointment of experts by court on The Civil Procedure Code division I Title V and The Criminal Procedure Code division V.

453351  Private International Law  2(2-0)
Sources and basic principles of private international law, characteristics of personal nationality, acquisition and termination of Thai nationality, conflicts of laws.

453352  Public International Law  3(3-0)
Sources, evolution and basic theories of international law, the relationship of international and municipal law, international personality, state responsibility, state territory and state jurisdiction, law of treaties, dispute settlement, war and neutrality.

453361  Agrarian Law  3(3-0)
Systems of land possession, agrarian credits and institutions, applications of legal measures for solving agrarian problems.

453362  Law of Land Use Control  3(3-0)
Land use control in urban and rural areas, law related to land management and exploitation, the issuance of title deeds and documents of land, law of land reform, land use control for environment protection, urban planning and other related laws.

453363  Environmental Law  3(3-0)
Principles of law for urban and rural environmental protection related to personal hygiene, nuisance and controlling air and water pollution, the law of national Environmental Quality, analysis of legal doctrines, state policies and measures concerning claims for damages in environmental cases.

453364  Natural Resource Law  3(3-0)
Concept of natural resource law, problems concerning the use, management and conservation of natural resources, resolution through legal and other mechanisms, natural resource management in Thailand and the role of various public and private sectors.

453371  Introduction to Intellectual Property Law  3(3-0)
Concept of protection of intellectual property, categories of intellectual property, international protection of intellectual property, protection of intellectual property under the World Trade Organization and under Thai law, unfair trade competition and protection of intellectual property and settlement of intellectual property dispute.

453372  Information Technology Law  3(3-0)
Electronic transaction, electronic signature, personal data protection, electronic fund transfer, internet and intellectual property, computer crime, information technology and court procedure.

453381  Law on Labour and Social Security  4(4-0)
The general principles of labour law, history of Thai labour law, labour protections, employment of young workers and women, labour procedure, labour relations interpretation relating to labour problems, roles of labour union and social security.

453382  Bankruptcy Law  3(3-0)
Conditions of bankruptcy, comptrolling and discharging of bankrupt, proceeding for the dead legal personal debtors, the comptroller, the authority of the Bankruptcy Court, proceeding of the bankruptcy, investigation and determination of punishment on the bankruptcy act and business reorganization.

453383  Juvenile Law  3(3-0)
History and theory of the juvenile court system, convention on rights of children, juvenile justice for delinquent, rights of children under Thai law, state policy on juvenile.

**453384 Consumer Protection Law**  
3(3-0)  
Concepts, theories, rights of consumers under consumer protection law, consumer protection against quality, price, service, packaging, labeling, advertising of product and unfair contract terms, procedures for consumer claims, roles of consumer protection agencies.

**453411 Legal Profession**  
2(2-0)  
The principles of legal profession, history of legal profession, ethics and virtue of legal profession, the role of Thai Bar Association and the Law Society of Thailand.

**453412 Legal Philosophy**  
2(2-0)  
Meaning, scope, nature, evolution of philosophy of law, relationship between philosophy of law and jurisprudence, schools of philosophy of law, theories of rights and freedoms, philosophy and principles of public, private and international laws.

**453431 Law of Local Authority**  
Pre: 453233  
3(3-0)  
Concept, history, forms and categories of local authorities, local public finance, power and duties, structure, personal and tutelage, problems, obstacles and future trends.

**453451 International Organizations Law**  
3(3-0)  
Meaning and establishment of international organizations, legal personality of international organizations, law enforcement of resolutions of international organizations, privilege and immunity of international organizations, the structure and powers of the League of Nations and various organizations of the United Nations, specialized agencies and international regional organizations.

**453452 International Humanitarian Law**  
3(3-0)  
Meaning and evolution of international humanitarian law, international laws related to wars and weapon control, humanitarian international organizations.

**453453 International Criminal Law**  
3(3-0)  
Meaning of international criminal law, criminal jurisdiction according to international law, territorial and personal jurisdiction, aggression, war crimes, terrorism, genocide, piracy, international cooperation in criminal matters, extradition, International Criminal Court.

**453454 Human Rights Law**  
3(3-0)  
Meaning and philosophy of human rights, protection of human rights by the United Nations, protection of human rights at international and regional levels, protection of human rights under Thai legal system.

**453455 European Union Law**  
3(3-0)  
Evolution and general legal principles of the European Union, international law and the European Union, the European Union institutions, rights and duties of member states, jurisdiction of the European Court of Justice, problems, obstacles and future trends of the European Union.

**453456 Law of the Sea**  
3(3-0)  
Evolution and sources of law of the sea, state maritime jurisdiction, international dispute settlement under law of the sea.

**453461 Forest Law**  
3(3-0)  
Concepts and objectives of forest law, system of forest law, Thai forest law and related law, forest law enforcement, a comparative study of Thai forest law and other countries, the policy of administration and conservation of forest.

**453462 Fishery Law**  
3(3-0)  
Concepts and objectives of fishery law, system of fishery law, Thai fishery law and related law, fishery law enforcement, a comparative study between Thai fishery law and foreign law, the policy of administration.

**453463 Cooperative and Agricultural Welfare Law**  
3(3-0)
Concepts and objectives of cooperative and agricultural welfare law, Thai cooperative law, a comparative study of foreign cooperative law and agricultural welfare law, the government policy of administration for cooperative and agricultural welfare.

**453464 Agro–Industry Law**  
General principles of laws concerning industrial proceedings, industrial law, food legislation and standardization laws, consumer protection law, food sanitary law, textile law and law concerning international industrial standardization.

**453465 International Environmental Law**  
Causes of environmental problems and their effects on life and society, state jurisdiction and international environmental protection, international conventions on environment, dispute settlement in international environmental law.

**456466 Plant and Animal Laws**  
Concept and objective of law concerning plants and animals, law concerning plants and animals of Thailand, a comparative study between Thai plant and animal laws and other countries, civil and criminal proceedings, roles to administration of law enforcement.

**453471 International Economic Law**  
Evolution of international monetary system, new international economic order, relations between international Monetary Fund and International Bank for Reconstruction and Development and debt crisis relief, trade barriers, World Trade Organization, World Trade Organization and developing countries, dispute settlement under World Trade Organization, free trade areas and custom unions.

**453472 Copyright and Neighboring Right Law**  
Nature of copyright, type of copyright works, acquisition of copyright, rights of copyright holder and author, copyright infringement and exceptions, performer’s rights, infringement of performer’s rights, civil and criminal legal proceeding.

**453473 Industrial Property Law**  
Acquisition of rights, protection and infringement in patent, petty patent, product design, trademark, trade secret, integrated circuit layout, plant variety, geographic indication and other industrial properties.

**453474 International Dispute Settlement**  
Mechanisms of dispute settlement, negotiation, mediation, arbitration, adjudication, choice of law in international dispute settlement, international agreement on dispute settlement, institutional rules of dispute settlement.

**453475 International Trade Law**  
Development and sources of international trade law, law of international sale of goods, methods of payment and letter of credit, carriage of goods, insurance, intellectual property and technology transfer, agreements and role of the World Trade Organization, settlement of international commercial dispute.

**453476 Maritime Law**  
Sea-going ship, mortgage of sea-going vessel, maritime lien, liability and limitation of shipowner’s liability, arrest of sea-going vessel, charterparty, carriage of goods by sea, carriage of passengers by sea, collision, salvage, general average, marine insurance.

**453477 Law and Biotechnology**  
Development on biotechnology, protection of biotechnological invention, intellectual property and biotechnology, biosafety, biotechnology and international trade, biotechnology and environment.

**453481 Advocacy and Moot Court**  
Legal process of audience, preparation and submission of a plaint; responsive pleading, pronouncement and motions; court procedures, offering evidences, examination in chief, oral argument, judgment, appeal and dika appeal, mediation and conciliation in court.

**453482 Public Finance and Taxation Law**  

Principles of public finance, public finance policy, personal and corporate income tax, value added tax, building and land tax, excise tax, customs tax and international agreement on avoidance of double taxation.

**453483 Forensic Medicine**  
3(3-0)  
Meaning and evolution of medical science, relationship between medical science and law, roles of medical doctor and police in judicial administration, investigation and inquiry by medical science, the acceptance of scientific evidences by Thai court.

**453491 Methods for Legal Research**  
2(2-0)  
Theories and methods in legal research, research planning and administration, data gathering, application of statistics in legal data analysis, report writing.

**453496 Selected Topics in Laws**  
1–3  
Selected topics in laws at the bachelor’s degree level. Topics are subjected to change each semester.

**453497 Seminar**  
1  
Presentation and discussion on current interesting topics in laws at the bachelor’s degree level.

**453498 Special Problems**  
1–3  
Study and research in law at the bachelor’s degree level and compile into a written report.

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**POLITICAL SCIENCE**  
*(454XXX)*

**454111 Introduction to Political Science**  
3(3-0)  
Scope and crucial concept of political science. Political institution and political process. Form of government and political ideologies. Attitude and political interaction. International relations and public administration.

**454211 Thai Politics and Government**  
3(3-0)  
Pre : 454111  
Historical development of Thai politics and government. Economic, social and cultural factors affecting changes in political ideas, behavior, institutions and the Thai government. Problems and trends of democratic development.

**454212 Political Theory**  
3(3-0)  
Pre : 454111  
Political thought of philosophers from the time of the Greeks to the 19th Century. Major political theory.

**454213 Comparative Politics**  
3(3-0)  
Pre : 454111  
Principles and methods for comparative analysis of political system, power, institutions, culture, and behavior as related to socio-economic change.

**454311 Politics and Government of the United States**  
3(3-0)  
Pre : 454111  
Politics and government of the United States from the past to the present. Political structure, federal and state governments. International relations of the United States.

**454312 Politics and Government of Union Russia**  
3(3-0)  
Pre : 454111  
Political system and principles of communism after the 1917 Revolution to early 1990s. Origins and development of the party system and the state Political and
administrative process until the collapse of the Soviet system in 1991. Current political problems in Russia.

454313 Politics and Government of Japan 3(3-0)
Pre : 454111
Politics and government of Japan from the past to the present. Political structure, effects of culture on political behavior and the economy. International relations of Japan.

454314 Politics and Government of China 3(3-0)
Pre : 454111

454315 Politics and Government of the United Kingdom 3(3-0)
Pre : 454111
Political ideas, behavior, and institutions conducive to the development of liberal parliamentary democracy. The transition of the democratic regime at the end of twentieth and early twenty-first centuries.

454316 Politics and Government of Southeast Asia 3(3-0)
Pre : 454111
Factors affecting Southeast Asian politics. Political development of Southeast Asian countries at present. Problems and political obstacles.

454317 Politics and Government of the Middle Eastern Countries 3(3-0)
Pre : 454111
Politics and government of the Middle Eastern countries. Political economy of the Middle East and the Organization of Petroleum Exporting Countries. The role of super power in the Middle East. The politics of Arab countries and Israel.

454411 Political Parties and Election 3(3-0)
Pre : 454111
Meaning of political party. Function of political party in political system. The origin and decay of political party. Political party and election process in both democratic and socialist countries. The development of political party. Methods of political party study at present.

454412 Politics in Developing Countries 3(3-0)
Pre : 454111
Meaning of developing countries. Evolution of political studies of political studies of development countries. Crucial conceptual framework toward the study of politics in developing countries. Weak point of each conceptual framework. Political institution of developing countries.

454413 Political Elite 3(3-0)
Pre : 454111

454414 Modern Political Change 3(3-0)
Pre : 454111
Modernization, Reform and revolution as major forms of modern political change. Interrelationship between the origin of industrial society and mass politics. Limitations of representative democracy and the rise of semi-direct democracy.

454491 Research Methods in Political Science 3(3-0)
Principles and methods in political science research, identification of research problems, formulation of research objectives and hypotheses, collection of data, construction of questionnaire, data analysis and interpretation of statistics for research, report writing and presentation.

454496 Selected Topics in Government 3(3-0)
Selected topics in government at the bachelor’s degree level. Topics are subjected to change each semester.

454497 Seminar 1
Presentation and discussion on current interesting topics in politics and government at the bachelor’s degree level.

454498 Special Problems 2
Study and research in politics and government at the bachelor’s degree level and compile into a written report.

INTERNATIONAL RELATIONS (455XXX)

455231 Principles of International Relations 3(3-0)
The fundamental concept of international relations, factors associated with international relations, instruments of international relations the development of international relations from the Second World War to present.

455232 Contemporary International Relations 3(3-0)
Pre : 455231
The post-Cold War international relations, the new international agenda; ethnic and cultural conflicts, environmental issues, transnational crime problems.

455233 Geopolitics 3(3-0)
Pre : 455231
The relations among political science, geography and military science; the history and development of geo-politics; geopolitical theory at the global, regional and national scales.

455234 International Organizations 3(3-0)
Pre : 455231
The fundamental concept and the development of international organizations; integration theory; structures, powers, and functions of international organizations.

455235 International Relations and World Civilization 3(3-0)
Influence of Western and Eastern civilizations toward international political, economic, social and cultural development; interaction between the fundamental factors and international polioeconomic environment; patterns of state’s behaviour in international relations.

455331 Theories of International Politics 3(3-0)
Pre : 454111

455332 Foreign Affairs of African Countries 2(2-0)
Pre : 455231
Foreign policies of African countries vis-à-vis Communism and
Democracy. The United African organization. Policies towards former colonial mother countries; political relations among African nations; Africa vis-à-vis the United-Nations and other international organizations.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>455333</td>
<td>Foreign Affairs of Latin American Countries</td>
<td>3(3-0)</td>
<td>Foreign policies of Latin American countries, past and present. Contemporary organizations of these countries, especially American Stated organization. Latin American foreign policies vis-à-vis the United states and among Latin American countries.</td>
</tr>
<tr>
<td>455334</td>
<td>Foreign Policy of the European Union</td>
<td>3(3-0)</td>
<td>Foreign policies of countries in East and West Europe. Grouping and cooperation. Foreign policy making. Importance of European Union. Roles of European Union toward international politics.</td>
</tr>
<tr>
<td>455336</td>
<td>Foreign Policy of Southeast Asian Countries</td>
<td>3(3-0)</td>
<td>Factors attributing to Southeast Asian countries, foreign policies. Foreign policies of Southeast Asian countries.</td>
</tr>
<tr>
<td>455337</td>
<td>Foreign Policy of the United States of America</td>
<td>3(3-0)</td>
<td>The American foreign policy from World War Two up to the present, the American foreign policy towards international issues.</td>
</tr>
<tr>
<td>455338</td>
<td>Middle East Affairs</td>
<td>2(2-0)</td>
<td>Middle East foreign policies. Grouping of Arabs states. Foreign policies vis-à-vis the United Nations and the Super-powers. Problems of relations between the Arabs and Israel.</td>
</tr>
<tr>
<td>455431</td>
<td>Comparative Foreign Policy</td>
<td>3(3-0)</td>
<td>Concepts and theories of foreign policy making processes. Systematic analysis of foreign policies of developed countries, developing countries and less developed countries.</td>
</tr>
<tr>
<td>455432</td>
<td>Thai International Relations</td>
<td>3(3-0)</td>
<td>International relations of Thailand in the period after the end of the Second World War until the present, decision-making process of foreign policy of Thailand; factors and patterns of international relations of Thailand and her important partners.</td>
</tr>
<tr>
<td>455433</td>
<td>European Study</td>
<td>3(3-0)</td>
<td>Political, economic, and social issues of European Union with the application of international relations theories.</td>
</tr>
<tr>
<td>455434</td>
<td>Chinese Foreign Policy</td>
<td>3(3-0)</td>
<td>The development of Chinese foreign policy since 1949, Chinese foreign policy making process, and aspects of Chinese foreign policy.</td>
</tr>
<tr>
<td>455435</td>
<td>Technical Term Analysis in International Relations</td>
<td>3(3-0)</td>
<td>Important technical terms and concepts in the field of international relations with special emphasis on issues of politics, economics and society.</td>
</tr>
<tr>
<td>455496</td>
<td>Selected Topics in International Relations</td>
<td>3(3-0)</td>
<td>Selected topics in international relations at the bachelor degree level.</td>
</tr>
</tbody>
</table>
Topics are subject to change each semester.

**455497 Seminar**
Presentation and discussion current interesting topics in international relations at the bachelor degree level.

**455498 Special Problems**
Study and research in international relations at the bachelor degree level and compiled into a written report.

### JUSTICE AND SECURITY ADMINISTRATIONS
(456XXX)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>456251</td>
<td>Principles of Criminology</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>A basic course in the evolution of criminology from the classical school through the positive school to scientific approaches; criminal behavior; prevention and treatment; philosophy and ethics of punishment; methods of criminal statistics; social structure in relation to causation of crime.</td>
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<tr>
<td>456252</td>
<td>Juvenile Delinquency</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 456251</td>
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<tr>
<td>456253</td>
<td>Crime and Related Social Problems</td>
<td>3(3-0)</td>
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<td></td>
<td>Pre: 456251</td>
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<tr>
<td></td>
<td>Theory and concept of social problem, crime problem and deviant behavior problems, drug addiction, juvenile delinquency, prostitution, gambling, social environment, poverty, violence, corruption, social policy and responsibility to mitigate such problems. Field trip.</td>
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</tr>
<tr>
<td>456254</td>
<td>Crime Prevention</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 456251</td>
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<tr>
<td>456255</td>
<td>Criminal Justice</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 456251</td>
<td></td>
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<tr>
<td></td>
<td>Analysis of policy and practice in criminal justice system. Role and power of Legislature, courts, police, prosecutors, legal advisors and corrections; their relations with each other. Public roles in criminal justice.</td>
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</tr>
<tr>
<td>456351</td>
<td>Criminological Theory</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 456251</td>
<td></td>
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<tr>
<td></td>
<td>Evolution of criminological theory, deviant behavior, causation of crime and Cultural conflict, gangs and subcultures, transmission of criminal behavior, ecology of crime, gender and crime.</td>
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<tr>
<td>456352</td>
<td>Clinical Criminology</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 456251</td>
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<td></td>
<td>Application of medical science psychology and law to the mentally ill offenders in criminal court. Role of officer in criminal justice for treatment of the offenders.</td>
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</tr>
<tr>
<td>456353</td>
<td>Forensic Science</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 456251</td>
<td></td>
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<tr>
<td></td>
<td>Concepts, principles, practices, history, issues and problems of forensic science; criminal evidence collection, scientific application in police work, medical examination systems, investigation of causes of death, and other forensic techniques.</td>
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</tr>
<tr>
<td>456354</td>
<td>Principles of Criminal Investigation</td>
<td>3(3-0)</td>
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</tbody>
</table>

456355  **Security Management**  
3(3-0)  
Concept of security. Role of community and private sector in security.  
Laws and regulations. Management of security units. Field trip.

456356  **The Juvenile Justice System Administration**  
3(3-0)  
Pre : 456251  
Procedure of criminal justice system of juvenile delinquency. Structure and administration for juvenile justice. Role of judge and probation officer.

456357  **Crime, Criminal Justice System and Mass Media**  
3(3-0)  
Concept and theories of crime. Roles of the mass media concerning crime problems and criminal justice system. Individual and societal perceptions and reactions to crime and criminal justice system.

456358  **Women, Crime and Criminal Justice**  
3(3-0)  
History and analytical overview of women and crime. Feminist theories and crime. Pattern of control, punishment and treatment of women offenders. Criminal justices policy towards women offenders. Roles of non-governmental organization and community toward women offenders. Field trip.

456451  **Probation and Parole**  
Per : 456251  
3(3-0)  

456452  **Punishment and Institutional Corrections**  
3(3-0)  
History, evolution, philosophy, objective, pattern, punishment, and correction. Theory, technique, trend in institutional treatment of offenders. Laws, regulations and administration of institutional correction. Field trip.

456453  **Police and Community Law Enforcement**  
3(3-0)  
Law enforcement concepts, basic principles and practices of administration and their application, contemporary issues and problems of law enforcement in the community. Theory and concept of police, police administration, responsibilities, functions, community relations, current police policies and problems. Field trip.

456454  **Social Work in Criminal Justice**  
3(3-0)  
Meaning, concept, evolution, principle, method and category of social work. Application of social work to criminal justice with methods of case study, group and community organization studies. Field trip.

456455  **Victimology**  
3(3-0)  
History, scope, and concept of victimology; victim typology, factors related to victimization; impact on individual, family, and society; victim’s and offender’s right, victimless crime, role of criminal justice system and related organizations. Field trip.

456456  **Community – based Corrections**  
3(3-0)  
456457 Economics of Crime 3(3-0)
Crimes in economics’ point of view. Economics and application in analyzing crime causation.

456491 Research Methods in Criminology 3(3-0)
Pre : 456251
Principles and methods in political science research, identification of research Problems, formulation of research objectives and hypotheses, collection of data, construction of questionnaire, data analysis and interpretation of statistics for research, report writing and presentation.

456496 Selected Topics in Criminology and Criminal Justice Administration 3(3-0)
Selected topics in criminology and criminal justice administration at the bachelor degree level. Topics are subject to change each semester.

456497 Seminar 1
Presentation and discussion current interesting topics in criminology and criminal justice administration at the bachelor’s degree level.

456498 Special Problems 2
Study and research in criminology and criminal justice administration at the bachelor’s degree level and compiled into a written report.

LOCAL GOVERNMENT (457XXX)

457241 Principles of Local Government 3(3-0)
Pre : 454111

457242 Thai Local Government 3(3-0)
Pre : 454111

457341 Comparative Local Government System 2(2-0)
Pre : 457241
Local government system in developed and developing countries; various structures and functions of local government, vis-a-vis the development of Thai local government.

457342 Urban Government 2(2-0)
Pre : 457241
Forms of urban government; urban administration and organizations of powers; comparison of urban government in unitary and federal state systems.

457343 Power in Politic 2(2-0)
Development of the state. Delegation of power. Concepts and theories of centralization, decentralization, and systems of semi-decentralization of power. Relationship between local and central government in the use of political power, co-operation and command.

457441 Comparative Communities 2(2-0)
Pre : 457241
Comparative characteristic of local communities in structures, processes and social relation including behavior, tradition and culture; culture and social influences on politics, government and community development.

**457442 Community and Regional Planning**
3(3-0)
Processes and tactics of master and sub-planning for community and regional development; collection and analysis of economic, social, political and geographical data; prediction of needs for responding to future urbanization and community development.

**457497 Seminar**
1
Presentation and discussion current interesting topics in local government at the bachelor’s degree level.

**457498 Special Problems**
2
Study and research in criminology and local government at the bachelor’s degree level and compiled into a written report.

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**PUBLIC ADMINISTRATION**
(458XXX)

**458221 Scope and Theories of Public Administration**
3(3-0)
Definition, concepts and scope of public administration; evolution and theories of public administration; evolution of body of knowledge of Thai public administration.

**458222 Human Resource Management**
3(3-0)
Pre : 458221
The origins of human resource management. The difference between personnel administration and human resource management. The functions of human resource management. Labour union and international human resource management.

**458223 Organization Theory and Design**
3(3-0)
Pre : 458221

**458224 Public Management**
3(3-0)
Pre : 458221

**458225 Public Policy Analysis and Program Evaluation**
3(3-0)
Pre : 458221
Development, definition, types, and models in public policy analysis. Public policy making process, implementation, evaluation, and impact on political, economic and social development.

**458321 Government Correspondence and Regulations**
3(3-0)
Characteristic of public service. Thai public service system. The role of public servants in Thailand. Office correspondence, types of official letters, drafting, writing, typing and reporting of official letters. Copies memorandam, communication,
receiving and sending, storing and destroying official letters. Uses of words and phrases in official letters.

**458322 Public Sector Budgeting** 3(3-0)  
Pre : 458221

**458323 Labor Administration** 3(3-0)  
Pre : 458221
The process of labor administration at the macro level, focusing on skill development, employment, labor protection, welfare, social security and labor relations in Thailand.

**458324 Public Finance Administration** 3(3-0)  
Pre : 458221
Concepts and theories of public finance; government’s role in economic system; receipt, expenditure, taxation and debt of government. Application of fiscal policy and its impacts on country’s economy.

**458325 Comparative Public Administration and Development Administration** 3(3-0)  
Pre : 458221

**458326 Organization Behavior in the Public Sector** 3(3-0)  
Pre : 458221
Definition and scope of organizational behavior in the public sector. Behavior of Individual, groups, and organization.

**458327 Conflict Management in Public Sector** 3(3-0)  
Pre : 458221
Concepts and theories of leadership. Types and roles of leader. Sources of power and influence. Theoretical applications of leadership to reach understandings and assessments of practice and behaviors in public organization.

**458328 Public Management Information Systems** 3(3-0)  
Pre : 458221

**458421 Planning in the Public Sector** 3(3-0)  
Pre : 458221
Theory, principles and techniques of planning; public policy, strategic management and project management in the public sector. Case studies.

**458422 Quantitative Techniques in Public Administration** 3(3-0)  
Pre : 458221
Application of quantitative techniques in public administration.

**458423 Productivity Improvement in the Public Sector** 3(3-0)  
Pre : 458221

**458424 Japanese Management** 3(3-0)  
Pre : 458221

**458425 Organizational Development and Change** 3(3-0)
### Administration

**458426 Intergovernmental Administration**  \[3(3-0)\]
- Administrative aspects of policies that cross government jurisdiction lines.
- Cooperation, conflicts and competition among the various levels of government. Impact on the administration of public programs.

**458427 Conflict Management in Public Sector**  \[3(3-0)\]
- Pre: 458221

**458428 Public Management Information Systems**  \[3(3-0)\]
- Pre: 458221
- Organizations, management, and the network evolution; information technology infrastructure; building information systems; support system and organization managing information systems.

**458429 Quality Management in the Public Sector**  \[3(3-0)\]
- Pre: 458221
- Importance and development of quality management. Quality management tools.

### Research Methods

**458491 Research Methods in Public Administration**  \[3(3-0)\]
- Pre: 458221
- Principles and methods in political science research, identification of research problems, formulation of research objectives and hypotheses, collection of data, construction of questionnaire, data analysis and interpretation of statistics for research, report writing and presentation.

**458497 Seminar**  \[1\]
- Presentation and discussion on current interesting topics in public administration at the bachelor degree level.

**458498 Special Problems**  \[1-3\]
- Study and research in public administration at the bachelor degree level and compiled into a written report.

### Psychology

**459111 General Psychology**  \[3(3-0)\]
- Behavior and causes of human behavior in natural setting. Psychological methods, growth and development, influence of heredity and environment, behavior of organism in term of perception, personality, emotion, motivation, intelligence, learning and various ability.

**459221 Biological Basis of Human Behavior**  \[3(3-0)\]
- Concept, hypothesis, observation, theory about various phenomenology of behavior rooted from biology are studied to understand structure, way of control and factors for behavior change and development.

**459222 Physiological Psychology**  \[3(3-0)\]
- Pre: 459111
- The study of role of the nervous system and physiological mechanisms as applied to the understanding of behavior in perception, cognition, memory processes,
motivation, learning, emotion, development and personality. Study the conditions of brain and body during sleep and the mental activity particularly dreaming.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>459223</td>
<td>Mental Hygiene</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 459111</td>
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<tr>
<td></td>
<td>Natures of Mental Health. Various factors that lead to healthy mind. Principles of prevention and avoidance from mental destruction. Mental problems from various causes. Suggestions in maintaining healthy mind.</td>
<td></td>
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<tr>
<td>459224</td>
<td>Psychology of Learning</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 459111</td>
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<tr>
<td></td>
<td>Theories of learning, Research and experimental findings, Applications are included. Field trip required.</td>
<td></td>
</tr>
<tr>
<td>459225</td>
<td>Sensation and Perception</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 459111</td>
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<tr>
<td>459226</td>
<td>Experimental Psychology I</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 459111</td>
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<tr>
<td></td>
<td>Basic experimental designs. Practice and report writing in psychological experiments such as perception, motivation, learning and etc.</td>
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<tr>
<td>459227</td>
<td>Psychology of Personality</td>
<td>3(3-0)</td>
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<td>The meaning and the development of personality, theories of personality, psychoanalytic, learning, phenomenological.</td>
<td></td>
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<tr>
<td>459231</td>
<td>Community Psychology</td>
<td>3(3-0)</td>
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<tr>
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<td>History and theories in community psychology. The structures of community. Field trip required.</td>
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<tr>
<td>459233</td>
<td>Environmental Arrangement and Human Relations in Community</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Psychological principles in environmental arrangement for community. Various problems in the community that should be considered, such as pollutions. Methods of promoting interpersonal and group understandings in the community. The establishment of motivation that creates cooperation in the community.</td>
<td></td>
</tr>
<tr>
<td>459234</td>
<td>Community and Resources Conservation</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Community ecology and various resource conservation in the community. Atmosphere that affects people’s health, advancement of technology. Field trip required.</td>
<td></td>
</tr>
<tr>
<td>459235</td>
<td>Comparative Study Between Communities</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Comparative study between communities in various ways in order to understand people’s behaviors in that community. Considering psychological, geographic and socioeconomic factors. Field trip required.</td>
<td></td>
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<tr>
<td>459236</td>
<td>Recreation in Community</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Nature of recreation. Principles and methods in recreational management and bringing recreation into the community. Effects of recreation on the minds of people in the community. Field trip required.</td>
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</tr>
<tr>
<td>459237</td>
<td>Literature and Research in Community Psychology</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Literatures in various communities. Research and study in literature in order to understand human’s behaviors in that community.</td>
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</tr>
<tr>
<td>459238</td>
<td>Psychopathology</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>459239</td>
<td>Psychology of Human Relationship</td>
<td>3(3-0)</td>
</tr>
</tbody>
</table>

**459241 Introduction to Clinical Psychology** 3(3-0)
*Pre: 459111*
Conceptual framework of clinical psychology; history and distinctive features of clinical psychology from other psychological fields. Duty and responsibility of clinical psychologist. Psychological assessment and the applications with normal and psychiatric patients. Field trip required.

**459242 Introduction to Abnormal Psychology** 3(3-0)
*Pre: 459111*
Abnormal behavior: psychotic and neurotic, psycho physiologic, mental retardation, study of causes, symptomatology, therapy and prognoses. Field trip required.

**459261 Developmental Psychology** 3(3-0)
Study of human development from fertilization until old age.

**459262 Child Psychology** 3(3-0)
Study of growth and development from fertilization through adolescence, effects of heredity and environmental factors upon child behavior.

**459263 Psychology of Adolescence** 3(3-0)

**459271 Introduction to Industrial Psychology** 3(3-0)
History of industrial psychology, purposes of industrial organization, organizational climate, individual behavior in industrial organization, job satisfaction, training, motivation, leadership and engineering psychology.

**459272 Psychology of Business and Personnel Management** 3(3-0)
Managerial psychology in business, leadership in business, environment of management, problems in management, problem solving and conflict-resolution, personnel selection, job and task analysis, policy and planning in business organization. Field trip required.

**459321 Introduction to Psychological Test and Measurement** 3(3-0)
*Pre: 459111*
An introduction to psychological test and measurement.

**459322 Experimental Psychology II** 3(3-0)
*Pre: 459226*
Advanced experimental designs. Interested psychological data are tested and analyzed.

**459324 Viewpoints in Psychology** 3(3-0)
*Pre: 459111*
The various theoretical postures taken by current psychologists are explored along with their most direct antecedents.

**459331 Guidance** 3(3-0)
Basic concepts, objectives, principles and methods of guidance. Guidance need and practice in community.

**459332 Psychology of Behavior Modification** 3(3-0)
Principles of behavior modification, personality and learning theory using in the process of modification of abnormal behavioral patterns.

**459333 Psychology of Counseling** 3(3-0)
Theories in counseling: logistics and strategies of counseling procedures.

**459334 Encounter Group** 3(3-0)
Concepts of encounter group, group theory, group technique and group as a
mean for prevention and treatment. Field trip required.

459335 Psychology of Exceptional Children 3(3-0)
Study of children who present various psychological problems, children with
mental retardation, gifted children, children with physical impairments, children with
emotional and behavioral problems. Field trip required.

459336 Psychology of Parenting 3(3-0)
Good parenting. Parent education. Psychological concepts in raising offsprings
since infancy till adolescence. Various resources, knowledges, and skills for parents in
raising children. Field trip required.

459339 Psychology of Critical Period in Life 3(3-0)
Analysis of the social, cultural, economic, physical and psychological factors
influencing the processes of development in the life cycle. Personality, cognition and
adaptation in each stage of life.

459341 Introduction to Psychiatry 2(2-0)
Pre : 459241
Basic concepts of psychiatry applied to clinical psychology.

459342 Psychology of Non-Verbal Child 3(3-0)
Pre : 459111
Introduction to speech and hearing sciences; communication process; speech and
language development; relationship between language and personality development;
characteristics of non-verbal child and their causes; speech and language evaluation for
emotionally disturbed child, speech therapy and prevention.

459351 Psychology of Socialization 3(3-0)
Pre : 459111
Development of social behavior, various aspect of socialization. Behavioral and
personality outcome brought about by socialization, language capacity, intellectual level,
aggression, anxiety, good citizenship. Social structure influencing behavior. Theoretical
concepts and research works related.

459352 Psycho-Sociometry 3(3-0)
Principles and method of psycho-sociometry. Application of psycho-sociometry
to the study of human behavior in society. Analysis of psycho-sociometry.

459353 Social Interaction 3(3-0)
Patterns and objectives of social interaction, interactional behavior in daily life.
Factors influencing the individual in developing social relationship. Principles and
techniques of simple self practice in order to interact effectively.

459361 Methods of Child Study 3(3-0)
Pre : 459262
Importance of various methods for child study to gain understanding of child
behavior. Developmental characteristics.

459362 Psychological Test in Human Development 3(3-0)
Pre : 459261
Theory and practice in psychological test in human development for various age.
Field trip required.

459363 Activity in Developmental Psychology 3(3-0)
Pre : 459261
Activities and activity arrangement for human development in childhood
adolescence, adult and old age. Field trip required.

459391 Statistical Analysis in Psychological Research 3(3-0)
Pre : 422111

The meaning of technical terms in research and statistics. General aspects of research. Method of sampling, method of data collection, research problems, typology of research, hypothesis formation, hypothesis test, analysis of differences, and various types of correlations.

459411 Practicum

Practicum in psychological field work according to each division.

459412 Psychology in Everyday Life

Psychological application for everyday life for better and happy life in the society.

459421 Psychology of Language Behavior

Pre : 459111

Study of human language behavior, personality, development, and thinking. Normal language development. Relationship between verbal and nonverbal behavior.

459422 Psychological Analysis in Literature

Pre : 459111

Analysis of psychological viewpoint in literature, short story and novels.

459423 Human Relations

Pre : 459111

Concept of human relation at work, motivation at work, morale, job satisfaction, organizational climate and organization culture, group in organization, leadership, communication in organization, conflict management, human relation training.

459424 Psychology of Motivation

Pre : 459111


459425 Humanistic Psychology

Pre : 459111

System of humanistic psychology, viewpoint, theory, methods, and researches to understand self and others, gain human relation, increase sensitivity and have a meaningful meaningful life for better human being.

459426 Environmental Psychology

Researches in learning, social psychology and environment affecting human behavior. Change according to environmental change. Principle and theory of behavior for human to adapt themselves. Field trip required.

459427 Applied Psychology

Pre : 459111

The application of psychological theories and principles for work, social, family, and personal in order to create better life. Deep understanding of self in personality, communication, leadership, conflict management, stress management.

459428 Psychology of Individual Differences

Pre : 459111

Psychology of individual differences in the perspective of the study process and research methodology. Individual differences in development, heredity, gender, intelligence, creative thinking, personality, community and society, behavior of person in organization and effect of innovation.

459431 Psychology of Gender and Society

Nature and consequences of social differentiation and stratification on gender. Social position of women and men in society, focusing on their positions in family, politics, work and education institute.

459432 Family Dysfunctions
Personal, interpersonal and social problems developed in the context of family life. The analysis of the relationship between family problems, marital distress, divorce, family violence and social problems.

459434 Psychopathological Assessment  
Psychological diagnosis of individual with problem in the community. An analysis of the results from psychometric measurement in order to prevent psychopathology and treat individual in the community.

459435 Primary Prevention and Health Promotion  
Policy and goals for a basic prevention of health problems. Causes and problems of abnormal behaviors. Parent education and skills in solving children’s problems. Social factors which influences basic prevention. Life style adjustment for high risk population, including environmental stress.

459436 Psychology of Human Adjustment  

459437 Psychology of Culture and Personality  
Psychological theories relating to both majority and minority groups in the community. Field trip required.

459438 Behavioral Disorder in Childhood and Adolescents  

459439 Training in Community Psychology  
Concepts and techniques in community training. Methods in applying psychological knowledge in training, group dynamic, group cooperation and harmony.

459441 Psychological Assessment I  
Pre: 459111  
Theory and practice in using objective tests with psychiatric patients for diagnosis, therapeutic planning and prevention.

459442 Psychological Assessment II  
Pre: 459111  
Theory and practice in using projective tests with psychiatric patients for diagnosis, therapeutic planning and prevention.

459443 Psychotherapy  
Pre: 459224  
Theory and variety of psychotherapeutic methods with psychiatric patients for both individual and group. Field trip required.

459444 Neurological Basis of Behavior  
Pre: 459222  
Neuroanatomy of behavior; neurological diseases; neurological investigation and mental conditions relating with nervous system. Psychological viewpoint about abnormal in brain.

459445 Psychopharmacology  
The origin of psychopharmacology, classification of psychotropics agents, the meaning and knowledge, understanding about psychotropic drugs, and substances of effect to neurological system, emotion, feeling, and thought.

459446 Behavior Therapy  
Pre: 459224  
Study of human behaviors based on principles of learning and applying
learning principles to the disorders of behavior for new learning including case
demonstration and training. Field trip required.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>459447</td>
<td>Drug Dependence</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>459448</td>
<td>Marital and Family Counseling</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre: 459241</td>
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<tr>
<td></td>
<td>Present problems faced by marriage couples and families. Viewpoint and theories that the counselor can use in helping clients deal with these problems, emergent techniques today.</td>
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<tr>
<td>459451</td>
<td>Social Psychology</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 459111</td>
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<tr>
<td></td>
<td>Concepts and research methodology in social psychology. Processes of social transmission indicative of social, political and cultural influences related with social learning, social attitudes and perception, theories and research results partly related with social attitudes and perception, and group processes.</td>
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<tr>
<td>459452</td>
<td>Psychology of Attitude</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 459451</td>
<td></td>
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<tr>
<td>459453</td>
<td>Group Process</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 459111</td>
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<tr>
<td></td>
<td>Aspects of group, group processes, leadership and membership, group influences on member, group dynamics, encounter group and cognitive group.</td>
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<tr>
<td>459454</td>
<td>Psychology of Communication and Persuasion</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Social psychology on development of language. Usage of word, language and gesture language in communication. Structure and forms of communications, advertisement, public relations, rumour, persuasion. Psychological learning created the efficiency in persuasion. Field trip required.</td>
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<tr>
<td>459455</td>
<td>Psychology of Political Behavior</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Principles and process of psychology applied to political behavior. Faith of group. Influences created by individual personality, decision-making, characteristics and pattern of individual affected the voting behavior and being political leaders.</td>
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<tr>
<td>459456</td>
<td>Population Psychology</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Human and animal congestion. Problem of malnutrition, creation of attitude and persuasion in family planning. Comparison of cultural differences in family planning problems and contraceptive practice. Psychological consequences due to birth control, abortion, and sterility. Psychological factors concerning the way to reduce the birth rate.</td>
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<tr>
<td>459457</td>
<td>Psychology and Social Change</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Psychological factors related to social and cultural changes. Acceptance and rejection of social change. Development of individual behavior and group behavior due to social.</td>
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<tr>
<td>459458</td>
<td>Personality and Social Development</td>
<td>3(3-0)</td>
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<td></td>
<td>Comprehension of roles and statuses of individual in society. Personality and mental aspects contributing to development in social, economic and political and ethical dimensions. Personality development in relevant to social development.</td>
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<tr>
<td>459461</td>
<td>Psychology of Juvenile Delinquency</td>
<td>3(3-0)</td>
</tr>
</tbody>
</table>
Problems and society. The study emphasizing on aggressive, anti-social behavior of adolescence caused social problems. Causes for juvenile delinquent behavior, motives measurement prevention and treatment. Field trip required.

**459462 Psychology of Woman**  
3(3-0)  
Psychological theories related to the study of woman. Gender differences, nature of woman emphasizing on physiology, physiological changes in various life period from childhood, adolescence, adult and old age. Problems and mental health of woman.

**459463 Adulthood and Old Age Psychology**  
3(3-0)  

**459464 Psychology of Sexual Behavior**  
3(3-0)  

**459465 Childhood Diseases**  
3(3-0)  
Physiological disease, malnutrition and diseases affecting behavior and development of the child. Advice and care. Field trip required.

**459467 Advanced Psychological Test in Human Development**  
3(3-0)  
The study of psychological test for human development by using various test. Nature of each test. Skill practice for testing and interpretation of test results. Field trip required.

**459471 Consumer and Advertising Psychology for Marketing**  
3(3-0)  
Pre : 459111  
The relationship between the producers or distributors and consumers of goods and services. Consumer satisfaction for product features, consumer attitudes and motivation, buying habits and patterns, influence of brand name media research, estimating demand for products and services. Field trip required.

**459472 Psychology of Advertising for Marketing**  
3(3-0)  
Principle of psychology of advertising, motivating behaviors, personal characteristics of advertisers, personality of advertising models, advertising designs and advertisement study.

**459473 Psychology of Consultation and Negotiation**  
3(3-0)  
Meaning of consultation and negotiation, management and conflict resolution.

**459474 Psychology of Work**  
3(3-0)  
Concept of work, characteristics of work, individual differences at work, work environment, work and modern technology, quality of work life.

**459475 Psychology of Training in Industry**  
3(3-0)  
Concepts of training, training process, training need analysis, training management, evaluation of training, training methods, media of training. Application of psychology for training in industry.

**459476 Psychological Test in Industry**  
3(3-0)  
Pre : 459321  
The application of psychological standardized tests for personnel selection in industry. Necessary tests construction, motivation, job satisfaction and attitude tests. Application of using tests in personnel promotion and reward giving is also included.

**459478 Decision Making and Problem Solving in Organizations** 3(3-0)

**459479 Environmental Psychology at Work** 3(3-0)
Study the relationship between person and environment. Personal adjustment to work environment and environmental adjustment for required behaviour. The relationship between human behavior and work environment in industrial organization. Industrial environment, as in economic and social aspects. Effects of work environment on physical health, mental health and social health.

**459491 Research Methods in Psychology** 3(3-0)
Pre : 459391
Research, problem selection, research hypothesis, measurement and quality of measurement. Type of important tests and research practice in test construction and analysis by oneself. Field trip required.

**459496 Selected Topics in Psychology** 3(3-0)
Selected topics in psychology at the bachelor’s degree level. Topics are subject to change each semester.

**459497 Seminar** 1
Presentation and discussion on current interesting topics in psychology at the bachelor’s degree level.

**459498 Special Problems** 1
Study and research in psychology at the bachelor’s degree level and compile into a written report.

**SOCIOLOGY**
*(460XXX)*

**460111 Introduction to Sociology** 3(3-0)
Scope and Methods of sociology ; description of the nature of society and culture; sociological explanations of human social behavior ; analysis of groups, communities and social institutions ; explanation of social change.

**460211 Social Organization** 3(3-0)
Pre : 460111
Theories and concepts of social organization ; essential factors relating to social stability or conflicts and segregation as well as potential problems in modern societies, study of social organization both at the community level and at the larger social context, organization and small groups.

**460231 Rural Sociology** 3(3-0)
Development of rural sociology; comparison of urban and rural societies; rural population; patterns of village settlement; social institutions and stratification in rural society; rural social surveys; social changes and rural development. Field trip required.

**460232 Urban Sociology** 3(3-0)
Structure, function and culture of urban society; factors affecting urban and suburban growth; urban problems, city planning and services to cope with the problems. Field trip required.

**460311 Sociological Thought and Theory** 3(3-0)
Pre: 460111
Development of social thoughts, history and the works of prominent sociologists, substance of modern sociological theories.

**460312 Intergroup Relations** 3(3-0)
The study of social process of intergroup relation with emphasis on racial and ethnic groups; analysis of the causes of conflict, prejudice, and discrimination as well as factors related to acculturation, assimilation and co-existence.

**460313 Social Stratification** 3(3-0)
Nature and development of social stratification; patterns and result of stratification; social mobility.

**460321 Sociology of Family** 3(3-0)
Types of families and marriage systems; primitive families, rural and urban families; relationship of families and other institutions; family problems; changes in society and families.

**460322 Sociology of Education** 3(3-0)
Role of education; relation of education and other social institutions; social system in school; problems and social factors related to education.

**460323 Political Sociology** 3(3-0)
Sociological theories and concepts which explain political behavior, types of power and political institutions; social factors and political changes.

**460324 Sociology of Religion** 3(3-0)
Collective behavior; religious belief and practice; evolution of religion, religious role and influence on human lives, relation between religion and other social institutions, religion and social stratification.

**460325 Industrial Sociology** 3(3-0)
Characteristic and development of the industrial system; social organization relating to industrial system; labour relations; social change and social problem concerning the industrialization.

**460326 Deviance and Social Control** 3(3-0)
Pre: 460111
Concepts and theories on deviance, social control, case study, social policy and critique.

**460331 Principles of Demography** 3(3-0)
Composition of population; population change affected by fertility; mortality and mobility; distribution of population and work force; relationship of population to social and economic factors; population problem and policy.

**460332 Community Study** 3(3-0)
Characteristics of communities and their variation; methods of analysis; change and development.

**460349 Gender and Development** 3(3-0)
Theoretical concepts in gender and feminism; theoretical perspectives in gender and development; culture and beliefs relevant to gender; socialization into gender; relations of gender and development in terms of employment, education, and health; problems related to gender issues; development policies involved.

**460391 Methods in Social Research I** 3(3-0)
Meaning of scientific enquiries; principles in social science research, problem defined, conceptualization, hypothesis, various methods of data gathering, research planning and field work.

**460411 Social and Cultural Change** 3(3-0)
Pre: 460111
Theories of social and cultural change; condition and factors which cause social and cultural change, trends and directions of changes in various societies.

**460421 Buddhistic Sociology** 3(3-0)
Sociological concepts and theories as approached from Buddhistic points of view, and Buddhist philosophy as related with social evaluation, social development, social problems, social stratification, social institution, social change, population and ecology. A comparative study of the objective, value and methods of sociology in general and Buddhistic sociology.

**460422 Social Problems** 3(3-0)
Concepts and theories on social problems, social problems in various countries, social problems in Thailand and proposals on solutions.

**460431 Human Ecology** 3(3-0)
Relations between human behavior and physical, biological, social, and cultural environment; modern basis theories; ecological changes in the suburban area.

**460441 Sociology of Development** 3(3-0)
Sociological theories and concepts relating to development; models of development.

**460442 Community Development** 3(3-0)
Concepts, philosophy, principles and process of community development; community development in Thailand and other countries, Field trip required.

**460443 Rural Development** 3(3-0)
Pre: 460231
Concept in rural development, principles, frame of reference, and patterns of rural development in various countries; policy and strategy. Field trip required.

**460444 Human Resource Development** 3(3-0)
Man and life in the perspective of natural sciences, social sciences, philosophy and religion; Man and society concepts in human resource development; human resource planning for socio-economic development. Field trip required.

**460445 Manpower Development Planning** 3(3-0)
Theories and methods in manpower development; social and economic indicators in manpower development planning.

**460446 Child, Youth and Women Development** 3(3-0)
Concepts in child, youth, and women development; issues and problems relating to child, youth, and women in rural and urban society.

**460447 Introduction to Social Work** 3(3-0)
Definition, scope, and objective of social work, needs for welfare service, development of social work; principles and process; role of social workers in relation to other professions. Field trip required.

**460448 Comparative Social Work** 3(3-0)
Social work in rural and urban area; comparative study of social work in Thailand and other countries; social work technique in different problem groups.

460491 Methods in Social Research II 3(3-0)
Pre : 460391
Methods in research planning and administration; data processing; analysis and application of statistics, and report writing.

460492 Quantitative Methods in Social Science Research 3(3-0)
Application of quantitative methods in social science research and application of the statistical package programs.

460497 Seminar 1
460498 Special Problems 1-3
Study and report on specific problem.

ANTHROPOLOGY
(461XXX)

461111 Introduction to Anthropology 3(3-0)
The scope of anthropology; its relation to other fields of study; emergence of man; the variation of human groups in both physical and cultural aspects; stages of cultural development.

461211 Cultural Anthropology I 3(3-0)
Definitions, types, composition and patterns of culture, comparative study of culture in terms of archaeology, linguistics and ethnology.

461212 Biological Anthropology 3(3-0)
Structure of human body; comparative anatomy; genetics; concepts of races; evolution; relation of genes to physical environment and culture.

461213 Introduction to Archaeology 3(3-0)
Objectives and methods in archaeology, types of data and specimens, excavation, recording, analysis and interpretation, conservation and display. Field trip required.

461311 Anthropological Thought and Theory 3(3-0)
Pre : 461111
History and development of anthropological thoughts, theories and methods in anthropology, modern anthropological theories.

461312 Linguistic Anthropology 3(3-0)
Methods in linguistic; languages and cultures and their distribution; structural analysis of language in various cultures; language problem in relation to cultural change.

461321 Family and Kinship 3(3-0)
Structure and function of family and kinships in different cultural groups with emphasis on aboriginal groups; comparative analysis of status, roles, conflict and cooperation in traditional family and modern family.

461322 Economic Anthropology 3(3-0)
Economic systems in traditional developing societies and rural communities; traditional belief and practice in relation to economic activities; analysis of cultural influence on economic behavior.

461323 Political Anthropology 3(3-0)
Political systems in traditional and developing societies; relation between political institution and other institutions; analysis of conflicts deriving from interaction of different political cultures at ethnic group level, peasant group level and the national level.

461324 Anthropology of Religion 3(3-0)
Religious and magical belief and practice among different ethnic groups; comparative study of functions of magic and supernatural power among aboriginal groups and modern societies.

461325 Anthropology of Education 3(3-0)
Anthropological approach to the analysis of problems in education; classroom situation; and general administration.

461326 Folk Tale 3(3-0)
Concepts and methods in the study of folk tales, myths and proverbs, analysis of their implication relating to social structure and other cultural tradition; emphasis on Thailand.

461327 Peasant Society 3(3-0)
Characteristics of peasant society; perspective and way of life of the peasants; cultural patterns of the peasants in relation to development. Field trip required.

461331 Cultural Areas 3(3-0)
Pre : 461111
Cultural diffusion theories; cultural assimilation and change; origin and characteristic of different cultures from various parts of the world; relation of different cultures from the same area, emphasis on the area of South East Asia.

461332 Thai Society and Culture 3(3-0)
Historical development; geographical and demographic characteristics, culture and social institutions, relationship between society and culture, and current social and cultural problems of Thai society. Field trip required.

461333 Australian Society and Culture 3(3-0)
Social and cultural aspects of Australia: geography, history, economics, politics, minority groups and everyday life, including the relations between Australia and Asia.

461341 Museology 3(3-0)
History, objectives, type, category and organization of museum, object registration, exhibition and education for the public. Field trip required.

461342 Photography in Anthropology 2(1-2)
History, objectives, features and techniques of photography in anthropology and applicability. Field trip required.

461391 Methods in Qualitative Research 3(3-0)
Concepts related to methods in qualitative research, collecting and recording data on physical elements of the community setting, diary keeping of the life cycle, participant and non-participant observation, individual interview, group interview, study group, participation action research, analysis of data and report writing. Field trip required.

461411 Cultural Anthropology II 3(3-0)
Cultural analysis of political, economic, religious and educational institutions and technology.

461421 Culture and Personality 3(3-0)
Enculturation and personality; relation of culture and personality development; cultural influence on human behavior in various societies.

461422 Minority Group 3(3-0)
Definition of ethnic group; history of significant ethnic groups in Thailand; analysis of social, economic, and political structure, their beliefs and practice; minority problems and the state policy dealing with the problems. Field trip required.

461441 Applied Anthropology 3(3-0)
Pre: 461111
Principles of applied anthropology in administrative work in various culture groups, planning for people participation in the community, case study from developing countries with emphasis on Thailand.

461496 Selected Topics in Anthropology 3(3-0)
Selected topics in anthropology at the bachelor degree level. Topics are subject to change each semester. Field trip required.

461497 Seminar 1
461498 Special Problems 1-3
Study and report on specific problem.
## VETERINARY MEDICINE
(500xxx – 519xxx AND 521xxx – 549xxx)

### VETERINARY ANATOMY
(501xxx)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Pre-requisites</th>
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<tbody>
<tr>
<td>501111</td>
<td>Veterinary Anatomy I</td>
<td>2(1-3)</td>
<td>423113</td>
</tr>
<tr>
<td></td>
<td>Descriptive terms in anatomy, gross anatomy of visceral organs of experimental animals, fish, shrimp, Anatomy of skeletal system of domestic animals.</td>
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<tr>
<td>501151</td>
<td>Introduction to Veterinary Medicine</td>
<td>1(1-0)</td>
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<tr>
<td></td>
<td>Foundation of veterinary education, moral education, moral principles, good professional attitude and the social activities of veterinary profession for the society.</td>
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<tr>
<td>501212</td>
<td>Veterinary Anatomy II</td>
<td>3(1-6)</td>
<td>501111</td>
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<tr>
<td></td>
<td>The gross anatomy of domestic animal nervous system, cardiovascular system, lymphatic system, respiratory system, joints and special sense organs, using canine as principle model and comparative study with other domestic animals, clinical application.</td>
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<tr>
<td>501213</td>
<td>Veterinary Gross Anatomy III</td>
<td>4(2-6)</td>
<td>501212</td>
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<tr>
<td></td>
<td>The gross anatomy structures and organ in domestic animal alimentary system, urinary system, integumentary system, Avian Anatomy and Anatomy of laboratory animals, applied Anatomy, seminar in Anatomy.</td>
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<tr>
<td>501221</td>
<td>Veterinary Histology I</td>
<td>2(1-3)</td>
<td>501111</td>
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<tr>
<td></td>
<td>Cells and basic tissues in the body of domestic animals at microscopic level, components morphology, functions and activities of cells and tissues of domestic animals. Classification of cell types and tissue components in animal tissues. Microscopes and animal tissue preparation for microscopic study.</td>
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<tr>
<td>501222</td>
<td>Veterinary Histology II</td>
<td>3(2-3)</td>
<td>501221</td>
</tr>
<tr>
<td></td>
<td>Components at microscopic level, morphology, functions and activities of various structures in body system of domestic animals, classification of cell types, tissue and component structures in animal organs.</td>
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<tr>
<td>501231</td>
<td>Veterinary Embryology</td>
<td>3(2-3)</td>
<td>501111</td>
</tr>
<tr>
<td></td>
<td>Formation of gametes, fertilization, early development of domestic animals and systematic development, comparative mammalian placentation, developmental anomalies of clinical significances and basic embryonic biotechnology.</td>
<td></td>
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<tr>
<td>501635</td>
<td>Clinical Maternal-Fetal Interaction in Domestic Animals</td>
<td>2(2-0)</td>
<td>501231</td>
</tr>
<tr>
<td></td>
<td>Fetal implantation, maternal recognition to fetus during pregnancy, placentation, placentation, maternal immune responses during pregnancy and fetal survival, maternal immune responses during pregnancy.</td>
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<tr>
<td>501698</td>
<td>Special Problems</td>
<td>2(0-4)</td>
<td></td>
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<tr>
<td></td>
<td>Study and research in anatomy and compile into a written report.</td>
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<tr>
<td>Course Code</td>
<td>Course Title</td>
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<tr>
<td>502411</td>
<td>Large Animal Clinical Nutrition</td>
<td>1(1-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 506341</td>
<td></td>
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<tr>
<td></td>
<td>Principles of clinical nutrition in large animals. Nutrient requirements and nutritional management in relation to health, reproduction and production of cattle, sheep, goat and horse.</td>
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<tr>
<td>502412</td>
<td>Bovine Medicine and Surgery</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 504312</td>
<td></td>
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<tr>
<td></td>
<td>Important systemic diseases and infectious diseases in cattle. Etiology, pathogenesis, epidemiology, clinical signs, diagnostic examination, medical and surgical treatment, prevention and control.</td>
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<tr>
<td>502413</td>
<td>Practices in Large Animal Medicine and Surgery</td>
<td>1(0-3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 504312 and 506313</td>
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<tr>
<td></td>
<td>Practice in clinical examination, diagnosis, medical and surgical treatments in large animals.</td>
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<tr>
<td>502421</td>
<td>Equine Medicine and Surgery</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 501213 and 504312</td>
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<tr>
<td></td>
<td>Management and health care, diagnostic examination, treatment, prevention and control of important equine diseases by medical and surgical techniques.</td>
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<tr>
<td>502511</td>
<td>Large Animal Theriogenology</td>
<td>2(2-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 502413</td>
<td></td>
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<tr>
<td></td>
<td>Applied physiology and endocrinology of reproductive system. Reproductive biotechnology, fertility and factors affecting male and female fertility. Clinical examination in large animals.</td>
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<tr>
<td>502512</td>
<td>Practice in Large Animal Theriogenology</td>
<td>1(0-3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 502413</td>
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<tr>
<td></td>
<td>Practice and demonstrate in diagnostic and therapeutic techniques in large animal theriogenology.</td>
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<tr>
<td>502513</td>
<td>Bovine Production Medicine I</td>
<td>2(2-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 502411 and 502412</td>
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<tr>
<td></td>
<td>Metabolic diseases of cattle; etiology, pathogenesis, clinical sign, diagnostic examination, treatment, prevention and control. Production system in beef and dairy farms. Management problems influencing production efficiency.</td>
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<tr>
<td>502513</td>
<td>Bovine Production Medicine II</td>
<td>2(2-0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre : 502513</td>
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<td></td>
<td>Herd health and production management in dairy farm, nutritional and managerial factors in each period of the gestation-lactation cycle in relation to udder health, infertility, low milk production, and hoof health. Information technology system for strategic planning and solving production management problems in dairy farm.</td>
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<tr>
<td>502531</td>
<td>Wildlife and Zoo Animal Medicine and Surgery</td>
<td>2(2-0)</td>
<td></td>
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<tr>
<td></td>
<td>Pre : 504312</td>
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<tr>
<td></td>
<td>Principles of preventive medicine and zoo animal management. Diseases; etiology, epidemiology, pathogenesis, clinical signs, diagnostic examination, medical and surgical treatments, prevention and control. Nutrition. Laws and ethics wildlife and zoo animals.</td>
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<tr>
<td>502571</td>
<td>Wildlife Farming</td>
<td>2(2-0)</td>
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</tbody>
</table>
Pre : 502413  
Commercial wildlife farming; deer, ostrich, crocodile and bird. Biology, laws, regulations and ethics. Health care, farm management and marketing in wildlife farming. Field trip.

502572  Sheep and Goat Herd Health Management  2(2-0)  
Pre : 502411  
Health and production management in sheep and goat farms. Important diseases and disorder in goat and sheep emphasizing on etiology, pathogenesis, clinical signs, diagnosis, treatment, prevention and control.

502573  Reproductive Technologies in Animals  2(2-0)  
The Principles of reproductive technologies. The application of technologies for animal reproduction. Abnormalities of offspring resulting from these technologies.

502681  Clinical Practice in Large Animals  6(0-12)  
Pre : for sixth year student  
Practice in clinical examination, diagnosis, treatment, prevention and control of diseases in medicine, surgery and theriogenology in large animals and wildlife.

502685  Special Clinical Practice in Large Animals  3(0-6)  
Pre : for sixth year student  
Clinical practice in selected large animals. The practice aims to obtain professional skills particularly on medicine, surgery and theriogenology.

502698  Special Problems  2(0-4)  
Study and research in large animal and wildlife clinical science at bachelor’s degree level and compile into written report.

VETERINARY OBSTETRICS AND GYNAECOLOGY  
(503xxx)

503411  Principles of Herd Health and Production Management  2(2-0)  
Pre : 504312, 505312 and 506314  
Principles of livestock production system. The significance of herd health and production management. Computerized program for veterinary service and farm administration.

503511  Principles of Farm Animal Medicine  2(1-3)  
Pre : 503411  
Principle knowledge in clinical examination and disease diagnosis in farm animal; history-taking, anesthesia and sample collections for laboratory diagnosis.

503512  Clinical Laboratory in Farm Animal  2(0-6)  
Pre : 503511  
Practice in physical examination, diagnosis, treatment and necropsy in farm animals.

503521  Disease of Swine I  2(2-0)  
Pre : 503411  

503522  Disease of Swine II  2(2-0)
Pre : 503511 and 503521
Antibiotic and vaccination applications for treatment and prevention in swine diseases. Contagious disease and diseases; etiology, pathogenesis, diagnosis, prevention and medical or surgical treatment in sows, sucklings, weanlings and fattening swine.
503531 Diseases of Poultry I 2(2-0)
Pre : 503411
503532 Diseases of Poultry II 2(2-0)
Pre : 503511 and 503531
Bacterial, viral, protozoal and fungal diseases; etiology, pathogenesis, diagnosis, prevention and treatment. Antibiotic and vaccination applications in prevention and treatment in poultry. Mycotoxicosis and emerging diseases.
503541 Disease of Aquatic Animal I 2(2-0)
Pre : 503411
Diseases of shrimp and other aquatic animals. Etiology, epidemiology, pathogenesis, clinical signs, diseases diagnosis, control, prevention and treatment.
503542 Disease of Aquatic Animals I 2(2-0)
Pre : 503511 and 503541
Diseases of shrimp and other aquatic animals. Etiology, epidemiology, pathogenesis, clinical signs, diseases diagnosis, control, prevention and treatment.
503571 Swine Herd Health and Production Management 2(2-0)
Pre : 503511 and 503521
Partitioning swine production system into several processes, a definition of an efficient swine herd, measuring herd efficiency with production indices, monitoring herd productivity, problem analysis, how to provide veterinary services to swine production enterprises, vaccination and medication programs, prevention and control of economically important diseases.
503681 Clinical Practice in Farm Animal 6(0-12)
Pre : for sixth year student
Practice in clinical examination, diagnosis, treatment and preventive medicine in farm animals, emphasizing on swine, poultry and aquatic animals.
503685 Special Clinical Practice in Farm Animal 3(0-6)
Pre : for sixth year student
Clinical practice in selected farm animals. The practice aims to obtain professional skills particularly on medicine, surgery and theriogenology.
503698 Special Problems 2(0-4)
Study and research in medicine, surgery and obstetrics in farm animals at the bachelor’s degree level and compile into a written report.

VETERINARY PATHOLOGY
(504xxx)

504311 General Veterinary Pathology 4(3-3)
Pre : 501221
Study of pathological changes of cells, tissues, and organs and general pathology of tumors.

**504312 Special Veterinary Pathology**  
Pre : 504311  
Study of pathological changes of organs in various body systems. Methods and techniques to perform necropsy including necropsy examination for diagnostic purpose.

**504411 Veterinary Clinical Pathology**  
Pre : 504312  
Laboratory examination of pathological changes of blood, urine, stool, serum, cerebrospinal fluid and other specimens for clinical diagnosis.

**504511 Biotechnology for Animal Diseases Diagnosis**  
Pre : 504411  
Theoretical study on various techniques in biotechnology to apply for animal diseases diagnosis.

**504681 Clinical Practice in Necropsy and Diagnostic Pathology I**  
Pre : for sixth year student  
Practice in necropsy for macroscopic and microscopic pathological examinations. Interpretation and analysis of clinical examination data, laboratory examination data and morphologic pathological data, to conclude and report in final diagnosis form for the diseases of mainly companion animals, poultry, laboratory animals and aquacultures.

**504682 Clinical Practice in Necropsy and Diagnostic Pathology II**  
Pre : for sixth year student  
Practice in necropsy for macroscopic and microscopic pathological examinations. Interpretation and analysis of clinical examination data, laboratory examination data and morphologic pathological data, to conclude and report in final diagnosis form for the diseases of mainly livestock animals.

**504698 Special Problems**  
Study and research in pathology at the bachelor’s degree level and compile into a written report.

**VETERINARY PHARMACOLOGY**  
*(505xxx)*

**505311 General Pharmacology**  
Pre : 506222  
Pharmacokinetics properties in animals, mechanism of drug action, principles of drug usage, prescriptions and dispensing, law and regulations of feed and administration of drug in animals and chemotherapy.

**505312 Veterinary Pharmacology**  
Pre : 505311  
Drug effecting on various systems in animals, hormones, vitamins, feed additives and growth promoters.

**505313 Veterinary Toxicology**  
Pre : 506211  
Principles of toxicology in animals, sources and properties of poisons,
mechanism of action, clinical signs of poisoning, diagnosis and antidotal treatment in animals.

505514 Clinical Pharmacology  2(2-0)
Pre : 505312
Concept of pharmacology related to the therapeutic and adverse reaction of drug affecting specific systems and clinical management of side effects. Clinical use of drugs treating the cardiac disorders. Pain management and anti-inflammatory drugs used in veterinary medicine. Groups of drug using in various animal species, including aquatic animals and herbal medicine.

505698 Special Problems  2(0-4)
Study and research in pharmacology and compile into a written report.

VETERINARY PHYSIOLOGY
(506xxx)

506211 Veterinary Physiology I  3(2-3)
Pre : 501111
Functional activities of cells and molecules, nervous system, muscular and skeletal system, and hematology.

506212 Veterinary Physiology II  2(1-3)
Pre : 506211
Hematology; functional mechanisms and roles of the cardiovascular system, respiratory system, renal system and the homeostatic regulation of body fluid, electrolytes and acid-base.

506221 Veterinary Biochemistry I  3(2-3)
Pre : 403221 and 403222
Principles of acid-base and buffer system in the body; chemical structures and functions of biomolecules, enzymes, vitamins and hormones. Basic principles of biochemical techniques for diagnosis in veterinary medicine.

506222 Veterinary Biochemistry II  2(2-0)
Pre : 506221
Metabolism of biomolecules and regulation. DNA and RNA replication, protein transcription, gene expression and control. Basic principles in biotechnology and genetic engineering. Genetic material application in Veterinary Medicine.

506232 Principles of Basic Equitation and Equine Care  1(0-3)
Pre : 501111 and 506211
Use of equipment and tools in caring and cleaning the horse, approaching horses, restraining and principles of exercising horse in basic equitation, basic care in health problems of horse.

506313 Veterinary Physiology III  3(2-3)
Pre : 506212 and 506221
Functional activities of renal system, acid-base balance and digestive system.

506314 Veterinary Physiology IV  3(2-3)
Pre : 506222 and 506313
Functional activities of endocrine and reproductive systems, hormonal physiology, thermoregulation, stress and shock condition.

506331 Animal Behavior and Restraint  2(1-3)
Pre : 015221
Behavior and nature of domestic animals, approaching and restraining methods.

506341  Nutritional Balance and Animal Disease Development  4(3-3)
Pre : 506222 and 506313
Source, value and essentials of nutrients and animal feedstuffs; basic ration formulation and modification to meet physiological requirements, disturbances and mechanism of health disorder under nutritional imbalance, analysis, diagnosis and approaches to problem solving.

506414  Basic Signal Transduction  2(2-0)
Pre : 402313, 402411, 402451, 423251, 423351, 506222 or 506314
Mechanisms and basic components of molecular and cellular signal transductions; receptors, G-proteins, second messengers, protein phosphorylation, post-translational protein modifications, and transcriptional regulation and gene expression.

506497  Seminar  1
Pre : 506313 and 506222
Presentation and discussion on current interesting topics in physiology at the bachelor’s degree level.

506642  Canine and Feline Clinical Nutrition  2(2-0)
Pre : 506341
Principles of clinical nutrition in canine and feline. Feedstuffs and food safety for normal and sick animals. Physiological nutrient requirements. Nutritional management in sick animals with specific diseases or disorders of body functional systems.

506698  Special Problems  2(0-4)
Study and research in physiology at the bachelor’s degree level and compile into a written report.

COMPONION ANIMAL CLINICAL SCIENCES  
(507xxx)

507411  Principles of Small Animal Medicine and Surgery  3(2-3)
Pre : 504312, 505312 and 506313
Systemic approach to clinical examination, history taking, clinical examination and data-recording techniques. Basic of surgical exercises and anesthesia in small animals.

507412  Veterinary Radiology and Ultrasound  2(1-3)
Pre : 501213 and 504312
Clinical diagnosis using radiography and ultrasound. Application of radiography and ultrasound machines.

507413  Small Animal Medicine and Surgery I  2(2-0)
Pre : 504312, 505312, 508231 and 508321
Diagnostic examination and treatment of dermatological, hematological, immunological and oncological diseases in small animals.

507414  Small Animal Medicine and Surgery II  1(1-0)
Pre : 504411, 507411 and 507412
Diagnostic examination and treatment of ophthalmological and neurological diseases in small animals.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
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</thead>
<tbody>
<tr>
<td>507415</td>
<td>Small Animal Medicine and Surgery III</td>
<td>2(2-0)</td>
<td>504411, 507411 and 507412</td>
</tr>
<tr>
<td></td>
<td>Diagnostic examination and treatment of respiratory and cardiovascular diseases in animals.</td>
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<tr>
<td>507416</td>
<td>Small Animal Medicine and Surgery IV</td>
<td>3(3-0)</td>
<td>504411, 507411 and 507412</td>
</tr>
<tr>
<td></td>
<td>Diagnostic examination and treatment of gastrointestinal, urinary and endocrinological diseases in small animals.</td>
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<tr>
<td>507417</td>
<td>Small Animal Theriogenology</td>
<td>2(2-0)</td>
<td>504411, 507411, 507412 and 507413</td>
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<tr>
<td></td>
<td>Female and male reproductive systems in dogs and cats. Puberty, function of ovary and testis. Hormones, estrous cycle, breeding management, pregnancy, parturition, post-partum disorders, newborn cares, infertility, diseases and disorders of reproductive system.</td>
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<tr>
<td>507418</td>
<td>Clinical Laboratory in Small Animals</td>
<td>1(0-3)</td>
<td>504411, 507411 and 507412</td>
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<tr>
<td></td>
<td>Practice in medicine, surgery, theriogenology, radiographic image analysis and interpretation, and clinical seminar in small animals.</td>
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<tr>
<td>507511</td>
<td>Small Animal Medicine and Surgery V</td>
<td>2(2-0)</td>
<td>504411, 507411 and 507412</td>
</tr>
<tr>
<td></td>
<td>Diagnostic examination and treatment in orthopedics and dentistry in small animals.</td>
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<tr>
<td>507512</td>
<td>Small Animal Medicine and Surgery VI</td>
<td>2(2-0)</td>
<td>504411, 507411 and 507412</td>
</tr>
<tr>
<td></td>
<td>Infectious diseases in small animals caused by viruses, bacteria, protozoa, rickettsia and fungi. Epidemiology, pathogenesis and immune response, clinical signs, diagnosis, treatment and prevention.</td>
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<tr>
<td>507513</td>
<td>Veterinary Ethics</td>
<td>1(1-0)</td>
<td>for fifth year student</td>
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<tr>
<td></td>
<td>Ethics in veterinary practices. Veterinarian-client-animal relationships and responsibility towards veterinary profession.</td>
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<tr>
<td>507521</td>
<td>Small Animal Health Management</td>
<td>2(2-0)</td>
<td>507417 and 507512</td>
</tr>
<tr>
<td>507681</td>
<td>Clinical Practice in Small Animal I</td>
<td>4(0-8)</td>
<td>for sixth year student</td>
</tr>
<tr>
<td></td>
<td>Practice in clinical examination, diagnosis, treatment and prevention in small animal medicine.</td>
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</tr>
<tr>
<td>507682</td>
<td>Clinical Practice in Small Animal II</td>
<td>4(0-8)</td>
<td>for sixth year student</td>
</tr>
<tr>
<td></td>
<td>Practice in clinical examination, diagnosis, treatment and prevention in small animal surgery, radiology and ultrasound.</td>
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<tr>
<td>507683</td>
<td>Clinical Practice in Small Animal III</td>
<td>2(0-4)</td>
<td>for sixth year student</td>
</tr>
<tr>
<td></td>
<td>Practice in clinical examination, diagnosis, treatment and prevention in small animal Theriogenology.</td>
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<tr>
<td>507685</td>
<td>Special Clinical Practice in Small Animals</td>
<td>3(0-6)</td>
<td>507681, 507682 and 507683</td>
</tr>
</tbody>
</table>
Clinical practice in small animals. The practice aims to obtain professional skills particularly on medicine, surgery and theriogenology.

**507698 Special Problems**  
Study and research in medicine, surgery and obstetrics in small animals at the bachelor’s degree level and compile into a written report.

### VETERINARY MICROBIOLOGY AND IMMUNOLOGY  
(508xxx)

**508211 Laboratory in Clinical Microbiology**  
Pre: 501221  
Microbiological laboratory in microbial morphology, growth and metabolism. Methods for cultivation and isolation of clinical microorganisms, media preparation, sample connection, antimicrobial sensitivity test and control of microbial contamination.

**508241 Veterinary Immunology**  
Pre: 501221  
Principles and mechanisms of cells in immune system, antigen and antibody reactions, immune effector mechanisms, interaction of immunity in the response to infection, production and usage of vaccines in veterinary medicine.

**508311 Veterinary Bacteriology and Mycology**  
Pre: 508211  
Pathogenic bacteria and fungi in animals; virulence mechanisms and pathogenesis. Microbial diagnosis, control and prevention of pathogen distribution.

**508331 Veterinary Virology**  
Pre: 508311  
General properties of viruses, morphology, chemical composition, classification, replication, cultivation, pathogenesis, transmission, diagnosis, viral diseases in animals, and zoonosis.

**508681 Clinical Practice in Microbiology I**  
Pre: for sixth year student  
Clinical practice in laboratory for diagnosis of bacterial and fungal diseases in animals.

**508682 Clinical Practice in Microbiology II**  
Pre: for sixth year student  
Clinical practice in laboratory diagnostic techniques of viral diseases in animals and clinical immunology.

**508698 Special Problems**  
Study and research in microbiology and immunology and compile into a written report.

### VETERINARY PARASITOLOGY  
(509xxx)

**509211 Veterinary Helminthology**  
Pre: 423113
Important parasitic helminth in veterinary, morphology, life cycle, pathogenesis, epidemiology, treatment, prevention and control.

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisite</th>
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</thead>
<tbody>
<tr>
<td>509321</td>
<td>Veterinary Entomology</td>
<td>2(1-2)</td>
<td>Pre : 423113</td>
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<tr>
<td></td>
<td>Important arthropods in veterinary, taxonomy, life cycle, pathogenesis, epidemiology, treatment, prevention and control.</td>
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</table>

Important protozoa in veterinary, structures and organelles of protozoa, classification of life cycle, pathogenesis, epidemiology, treatment, prevention and control.

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<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisite</th>
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</thead>
<tbody>
<tr>
<td>509331</td>
<td>Veterinary Protozoology</td>
<td>2(1-2)</td>
<td>Pre : 423113</td>
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<tr>
<td></td>
<td>Important protozoa in veterinary, structures and organelles of protozoa, classification of life cycle, pathogenesis, epidemiology, treatment, prevention and control.</td>
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509698  Special Problems  2(0-4)
Study and research in parasitology and compile into a written report.

**VETERINARY PUBLIC HEALTH AND DIAGNOSTIC SERVICE (510xxx)**

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisite</th>
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<tbody>
<tr>
<td>510411</td>
<td>Veterinary Public Health</td>
<td>2(2-0)</td>
<td>Pre : 505312 and 508311</td>
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<td></td>
<td>Roles of veterinary public health to the community in order to prevent them from zoonoses or exposure to chemical residues in meat. Controlling of animal products for food safety reason for consumers. Understanding of risk analysis, planning, of data collection and data analysis, data collection, sampling. Control and prevention of veterinary public health problem and problem solving.</td>
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</table>

510421  Biostatistic in Veterinary Research  2(2-0)
Concepts of research and veterinary biostatistics, data, data management, descriptive statistics, sampling, hypotheses testing, confidence interval, appropriate statistical analysis, parametric and non parametric analysis, sample linear regression and evaluation of statistical analysis in veterinary research.

510422  Veterinary Epidemiology and Preventive Medicine  2(2-0)
Pre : 510421
Concepts of epidemiology, disease determinants, disease patterns, epidemiological studies, descriptive, analytical, experimental epidemiology. Risk assessments, Screening test, outbreak investigation, strategies and practical measures in prevention and control programs.

510511  Regulations and Environmental Protection in Veterinary Medicine  1(1-0)
Pre : 510411
Laws and regulations in veterinary works including environmental protection related to animals.

510512  Veterinary Hazardous Substance, and Toxic Waste and Animal By-products Management  2(2-0)
Pre : 510451

510531  Food and Milk Hygiene  3(2-3)
Pre : 510411
Food from animal origin and milk hygiene. Their production, processing and preservation. Foodborne diseases and health detrimental effect from consumption of toxic or contaminated food. Food microbiology, analysis of residues in food.

510532 Meat Hygiene and Inspection 2(2-0)
Pre: 503521, 503531 and 510411
Factors influencing farm animal growth; animal body structure and lymph node, postmortem changes and spoilage of meat; diseases requiring specific inspection and control; measures in pre-slaughter quarantine and animal inspection, slaughter techniques, carcass and animal product inspections, standard carcass quality setting, carcass dressing, regulation of structure and sanitation system of abattoir, food processing plant; principles of food from animal source’s production and control.

510533 Food Hygiene System Auditing 2(2-0)
Pre: 510531
Food hygiene system auditing, regulation for the food industry, hazard analysis and critical control point system and factory auditing, premise design and fabrication; raw materials, food processing equipment and machinery auditing; personal hygiene standards, preventive pest control, cleaning and disinfecting systems, management system control auditing.

510541 Zoonoses 2(2-0)
Pre: 501411
Classification and cycles of zoonotic diseases, animal diseases affecting human health and basic community health problems; principles of data collection, analysis, diagnosis, treatment, prevention and control, strategy in eradication of urban and national zoonotic diseases.

510591 Basic Research Methods in Veterinary Medicine 2(2-0)
Pre: 510421
Principles and methods in veterinary medical research, identification of research problems, formulation of research objectives and hypothesis, collection of data, construction of questionnaire, data analysis and interpretation, application of statistics for research, report writing, paper presentation, laboratory animal utilization, good laboratory practice and paper criticisation.

510681 Clinical Practice in Veterinary Public Health and Epidemiology 2(0-4)
Pre: for sixth year student
Application of veterinary epidemiology and preventive veterinary medicine into practices in field practice, design of epidemiological studies, data collection and management, sampling, usage of epidemiological and statistical software for data analysis, interpretation, reporting and presentation of epidemiological works.

510682 Clinical Practice in Meat Hygiene and Inspection 1(0-2)
Pre: for sixth year student
Clinical practice in veterinary public health and slaughterhouse hygiene. Investigation, analysis and problems solving in meat quality control.

510685 Special Clinical Practice in Veterinary Public Health 3(0-6)
Special clinical practice in the field of veterinary public health for sixth year students focusing on meat inspection, food hygiene, milk hygiene and diseases surveillance.

510698 Special Problems 2(0-4)
Study and research in veterinary public health at the bachelor’s degree level and compile into a written report.
FACULTY OF VETERINARY TECHNOLOGY
VETERINARY TECHNOLOGY
(520xxx)

520211 Anatomy for Animal Health 4(3-3)
Pre : 423113
General systemic anatomy of domestic animals.

520212 Fundamental Embryology and Histology 4(3-3)
Pre : 423113
Cytology, animal basic tissues, organogenesis and organology of organs.

520221 Basic Biochemistry for Animal Health 4(3-3)
Pre : 403221
Elements, properties, synthesis and chemical structure of carbohydrate, protein, lipid, mineral and vitamin. Metabolic changes and significances in animal diagnosis.

520222 Elementary Animal Physiology 4(3-3)
Pre : 423113
Role and function of organ systems in animal.

520311 Histopathological Technics 2(1-3)
Pre : 520212
Tissue preparation for histological and pathological studies.

520321 Reproductive Physiology 2(2-0)
Pre : 520222
Function of reproductive system, accessory sex organs, physiological variation of hormones and system function.

520331 Fundamental of Pharmacology 3(3-0)
Pre : 520221
Drugs for animal common drugs and emergency drugs. Preparation, drugs administration, internal and external drugs using, first-aid drugs, their toxicity and treatment.

520341 Animal Microbiology 4(3-3)
Pre : 520212
Bacteria, virus, fungi significant to animal disease and animal health care.

520342 Immunology 2(2-0)
Pre : 520341
Immunology, diseases caused by bacteria, virus and protozoa, immunological responses in animal.

520343 Laboratory Service in Microbiology 2(0-6)
Pre : 520341
Culture media preparation, sterilization, harvesting of microorganisms, culturing, isolation, testing and serological examination.

520351 Helminthology 3(2-3)
Pre : 520212
Internal parasites, significant to animal health care, structure, life cycle, lesions, animal condition affected by parasitic diseases, prevention and control.

520352 Protozoalogy and External Parasites 3(2-3)
Pre : 520212  
External parasites and protozoalogy in animal, structure life cycle. Parasitic condition, prevention and control.

520353  Laboratory Services in Clinical Parasitology 2(1-3)  
Pre : 520351  
Diagnostic technics for parasitic diseases, collection of fecal sample, blood, parasitic samples. Laboratory.

520361  Principles of Pathology 3(2-3)  
Pre : 520212  
Pathological lesions in animal organs affected by pathological changes of diseases.

520362  Laboratory Service in Pathology 2(1-3)  
Pre : 520361  
Post mortem examination, tissue sampling and preliminary report of disease diagnosis.

520363  Laboratory Service in Clinical Pathology 3(1-6)  
Pre : 520361  
Hematology, hemogram, differential count, blood chemistry, fecal, urine and tissue examinations for diagnosis purposes.

520471  Principles of Artificial Insemination 3(2-3)  
Pre : 520321  
Evolution of artificial insemination, semen collection, semen preservation, handling of semen and artificial insemination methodology.

520481  Basic Animal Health Care 5(4-3)  
Pre : 520342  

520482  Laboratory Management 2(2-0)  
Pre : 520343  
Principles of various laboratory managements, aseptic technic, surgery room, X-ray room, O.P.D, post-mortem laboratory. Handlings of chemicals, veterinary equipments and laboratory equipments.

520483  Principles of Veterinary Public Health Service 4(2-6)  
Pre : 520341 and 520361  
Scopes and significances of veterinary public health services. Disease control, sanitation of meat and meat processing. Collection and analysis of public health data particularly zoonoses.

520484  Principles of Epidemiology 2(2-0)  
Pre : 520481  
Principles of infectious diseases, causes and effects to host and environments, data analysis for disease control and protection, animal health management design.

520485  Radiography 2(1-3)  
Pre : 520211  
Radiation, radiation interaction, radiation measurement radiation hazard and protection, radiography in veterinary science.

520486  Medical Photography 2(1-3)  
Pre : 520211  
Photographic technics for medical purposes.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit (Lecture-Tutorial-Lab)</th>
</tr>
</thead>
<tbody>
<tr>
<td>520487</td>
<td>Laboratory Animal Management</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Management and care of various types of laboratory animals.</td>
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<tr>
<td>520488</td>
<td>Laws Concerning Livestock</td>
<td>2(2-0)</td>
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<tr>
<td></td>
<td>Pre : 520481</td>
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<tr>
<td></td>
<td>Laws and regulations concerning livestock.</td>
<td></td>
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<tr>
<td>520489</td>
<td>Recording System and Report Presentation</td>
<td>2(2-0)</td>
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<tr>
<td></td>
<td>Pre : 520481</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Regular report, case report, official report, data base, handling of reports and report presentation.</td>
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</tr>
<tr>
<td>520497</td>
<td>Seminar</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Presentation and discussion on current interesting topics in veterinary technology at the bachelor’s degree level.</td>
<td></td>
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</tbody>
</table>
# KAMPHAENG SAEN CAMPUS

## FACULTY OF AGRICULTURE KAMPHAENG SAEN

### ENTOMOLOGY

(026xxx)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>026101</td>
<td>General Entomology</td>
<td>3(2-3)</td>
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</tr>
<tr>
<td></td>
<td>Insects and their importance, insects in relation to economic, social, industrial, and public health development, procedures and coordinating method of insect control.</td>
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</tr>
<tr>
<td>026311</td>
<td>Insect Identification and Classification</td>
<td>2(1-3)</td>
<td>Pre : 036241</td>
</tr>
<tr>
<td></td>
<td>Evolution of insect classification, identification and classification of insects to the orders and common families.</td>
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</tr>
<tr>
<td>026312</td>
<td>Economic Entomology</td>
<td>3(2-3)</td>
<td>Pre : 036241</td>
</tr>
<tr>
<td></td>
<td>Important economic insects of Thailand, their origin, distribution, habitat, biology, host plants and damages, insect survey and control measures. Field trips are included.</td>
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<tr>
<td>026321</td>
<td>Sericulture</td>
<td>3(2-3)</td>
<td>Pre : 424111</td>
</tr>
<tr>
<td></td>
<td>Silkworm rearing, silkworm strains. Habit, biology, mulberry as food sources, environmental factors affecting silkworm rearing, and silkworm cocoon production diseases and other pests of mulberry and silkworm, and control measures. Field trips.</td>
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<tr>
<td>026322</td>
<td>Lac Culture</td>
<td>3(2-3)</td>
<td>Pre : 424111</td>
</tr>
<tr>
<td></td>
<td>Lac culture, lac insect strains, habit, biology, and host plants, environmental factors affecting the lac culture, principles and practices in industrial lac culture and production, diseases and enemies of lac insects and control measures. Field trips.</td>
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<tr>
<td>026323</td>
<td>Apiculture</td>
<td>3(2-3)</td>
<td>Pre : 424111 or 424113</td>
</tr>
<tr>
<td></td>
<td>Beekeeping, honeybee strains, habit, biology, host plants, environmental factors affecting honeybees and other pollinators, beekeeping and industrial honey production, diseases and enemies of honeybees and control measures. Field trips.</td>
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<tr>
<td>026324</td>
<td>Aquatic Entomology I</td>
<td>3(2-3)</td>
<td>Pre : 036241 or 423113</td>
</tr>
<tr>
<td></td>
<td>Aquatic insects, biology, distribution and environmental factors relating to growth and outbreak of aquatic insets, beneficial and harmful aquatic insects and control methods. Field trip.</td>
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<tr>
<td>026331</td>
<td>Insect Pests of Cereal and Field Crops</td>
<td>3(2-3)</td>
<td>Pre : 036241</td>
</tr>
<tr>
<td></td>
<td>Insect pests of cereal and field crops, biology, damaging stages and types of damages, distribution and control measures. Field trips.</td>
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</tbody>
</table>
026332  Horticultural Pests 3(2-3)
Pre : 036241
Insect pests of vegetable crops, fruit trees and ornamental plants, biology, damaging stages and types of damages, distribution and control measures. Field trips.

026333  Insect Pests of Plantation Crops 3(2-3)
Pre : 036241
Insect pests of plantation crops: palm trees, rubber, tea and coffee plants. Biology, damaging stages and types of damages, distribution and control measures. Field trips.

026334  Insect Pests of Stored Products 3(2-3)
Pre : 036241
Insect pests infesting stored grain and stored products, their morphology and biology, outbreaks, damages, distribution and control measures; selected laws and regulations concerning inspection and prevention of spread of insect pests in imported and exported products. Field trips.

026335  Insect Pests of Forest, Shade Tree and Forest Products 3(2-3)
Pre : 036241
Roles and economic importance of insect pests of forest, shade trees and forest products, their ecology and control measures. Field trips.

026371  Bird and Rodent Control 3(2-3)
Pre : 424111
Economic importance of birds and rodents destroying plants and products, their development, life history, habits, and control measures. Field trips.

026372  Economic Insects Management 3(2-3)
Pre : 036241

026431  Termites and Their Control 3(2-3)
Pre : 036241 or 302331
Problems and distribution of termites, factors affecting their distribution and biology, classification of termites in Thailand, laboratory rearing and testing, principal control methods, examining and maintaining of wood. Control measures before and after building construction. Field trips.

026441  Insect Morphology 3(2-3)
Pre : 036241
Comparative study on external and internal anatomy of insect, histology of insect and insect evolution.

026452  Aranelology 3(2-3)
Pre : 424111
Spider morphology, anatomy, ecology, and classification, beneficial and injurious spiders, collecting, handling and preserving spiders for study and research, control procedures of the harmful spiders.

026461  Insect Ecology 3(2-3)
Pre : 036241 and 422111
Influences of environmental factors, both abiotic and biotic factors, to the survival, growth, and outbreak of insects, population attributes and density, their fluctuation and community succession. Field trips.

026471  Principles of Insect Pest Management 3(2-3)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>026472</td>
<td>Extension Entomology</td>
<td>3(2-3)</td>
<td>036241</td>
</tr>
<tr>
<td>026481</td>
<td>Insecticides and Their Application</td>
<td>3(2-3)</td>
<td>036241, 403221</td>
</tr>
<tr>
<td>026482</td>
<td>Toxicology of Insecticides</td>
<td>3(2-3)</td>
<td>036241, 403221</td>
</tr>
<tr>
<td>026491</td>
<td>Basis Research Methods in Entomology</td>
<td>1(1-0)</td>
<td>036241</td>
</tr>
<tr>
<td>026492</td>
<td>Statistics for Entomological Research</td>
<td>3(2-3)</td>
<td>422111</td>
</tr>
<tr>
<td>026496</td>
<td>Selected Topics in Entomology</td>
<td>1-3</td>
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<tr>
<td>026497</td>
<td>Seminar</td>
<td>1</td>
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<tr>
<td>026498</td>
<td>Special Problems</td>
<td>3</td>
<td></td>
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<tr>
<td>026499</td>
<td>Specific Practicum in Entomology</td>
<td>3</td>
<td>036299</td>
</tr>
</tbody>
</table>


Principles of extension entomology, pest control measures, problems caused by insects in agricultural, medical and public health aspects, recommendation and guidelines for solving the problems, entomological services to the community.

Classification, formulation, properties and mode of action of insecticides, toxicity to man, animal and environment, insecticide resistance in insects, proper use of insecticides and spraying.

Classification of insecticides, toxicity of various groups of insecticides, mode of entries into living organisms, mode of action and metabolism in nature as well as in insects, animals and human beings, physiological and biochemical process of degradation in living organisms and environment, translocation of insecticides in the environment, insecticide resistance in insects, problems and solutions of toxic residues and food contamination.

Principles and methods in Entomology research, identification of research problems, formulation of research objectives and hypotheses, collection of data, construction of questionnaire, data analysis and interpretation, application of statistics for research, report writing and presentation.

Application of statistical techniques for Entomological data, regression analysis, probit analysis of insecticide trials, data transformation of insect counts, analysis of variance, nonparametric methods, various sampling techniques on insect populations.

Selected topics in Entomology at the bachelor’s degree level. Topics are subject to change each semester.

Presentation and discussion on current interesting topics in Entomology at the bachelor’s degree level.

Study and research in Entomology at the bachelor’s degree level and compile into a written report.

Specific practicum in Entomology.
AGRICULTURAL MECHANIZATION
(027xxx)

027111 Basic Farm Workshop 2(1-3)
Methods of using and maintenance of welder, carpenter tools, basic construction, blueprint reading and marking assigned specimens.

027201 Farm Engine and Farm Machinery 3(2-3)
Components, functions, repair, maintenance and service of power source and farm machinery. Safety practice in farm operation. Field trip.

027211 Agricultural Surveying 3(2-3)
Pre : 417112

027212 Agricultural Machinery Drawing 3(2-3)

027221 Farm Engine I 3(2-3)
Pre : 420111 or 420119
Engine components and their functions. Type of agricultural equipment. Practical operation and usage of tractors and farm equipment.

027222 Applied Thermodynamics 3(3-0)

027311 Farm Electricity Design 2(1-3)
Pre : 420112 or 420119
Calculation of farm electric power, planning for electrical systems, electric cost estimation, cause and repair of electric failure, repair and maintenance of electrical instrument.

027321 Principles of Farm Machinery I 3(2-3)
Pre : 027221
Basic principles of operation for farm machinery; plough, harrow and cleaning machine, hydraulic controls, power drive and power transmission system. Traction and shear force analysis.

027322 Principles of Farm Machinery II 3(2-3)
Pre : 027321
Type of structure, operation system and manufacturing of farm machinery. Efficiency of tillage implement, planter, harvester and thresher. Repair and maintenance of farm machinery. Design and application of machinery in agriculture.

027323 Gasoline and Diesel Engines Diagnosis 3(2-3)
Pre : 027221
Use of modern engine testing equipment in the evaluation of engine components and accessories. Evaluation of engine conditions. Methods of measuring horsepower of engines.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisite(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>027324</td>
<td>Agricultural Power Transmission</td>
<td>3(2-3)</td>
<td>027321</td>
</tr>
<tr>
<td></td>
<td>Fundamentals of power transmission, measurement and utilization in agriculture.</td>
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<tr>
<td>027331</td>
<td>Elementary Hydraulics</td>
<td>3(3-0)</td>
<td>417111 or 420111</td>
</tr>
<tr>
<td>027332</td>
<td>Irrigation and Drainage</td>
<td>3(2-3)</td>
<td>027331</td>
</tr>
<tr>
<td></td>
<td>Principles of irrigation, water measurement, water pumping, storage of water and utilization of irrigation channels. Methods of drainage, quantity of water needed by plants, various types of dams used in agriculture.</td>
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<tr>
<td>027333</td>
<td>Sprinkler and Drip Irrigation System</td>
<td>3(2-3)</td>
<td>015261</td>
</tr>
<tr>
<td></td>
<td>Factors affecting water consumption of plant, relationship among water in soil, plant and air. Determine rate of water consumption by plant. Computerized design and economic analysis of sprinkler and drip irrigation system.</td>
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<tr>
<td>027341</td>
<td>Elementary Mechanics of Material</td>
<td>3(3-0)</td>
<td>417112 or 420111</td>
</tr>
<tr>
<td></td>
<td>Force and resultant force. Force system, moment of force, force equilibrium, friction, stress strain and deformation. Screw, rivet and welding joint. Shear and bending moment, beam design, torque in shaft and keys.</td>
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</tr>
<tr>
<td>027342</td>
<td>Introduction to Strength of Materials</td>
<td>3(3-0)</td>
<td>417112 or 420111</td>
</tr>
<tr>
<td>027371</td>
<td>Computer Application for Agriculture</td>
<td>3(2-3)</td>
<td></td>
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<tr>
<td>027399</td>
<td>Practicum in Agricultural Mechanization I</td>
<td>1(0-6)</td>
<td>015299</td>
</tr>
<tr>
<td></td>
<td>Basic practicum in agricultural mechanization.</td>
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<tr>
<td>027411</td>
<td>Machine Shop</td>
<td>2(1-3)</td>
<td>027111</td>
</tr>
<tr>
<td>027412</td>
<td>Welding and Soldering</td>
<td>2(1-3)</td>
<td>027111</td>
</tr>
</tbody>
</table>
027413 Farm Shop Management 2(2-0)
Principles of farm shop layout. Farm shop safety. Farm shop management.
Job description. Raw material purchase. Governing of tools and instruments. Preparation
and storage of raw materials. Care and maintenance of tools and instruments.

027421 Farm Engines II 3(2-3)
Pre: 027221

027422 Automobile Mechanics 2(1-3)
Pre: 027221
Automotive trouble shooting, care and maintenance. Suspension system. Steering system. Braking system. Automotive electrical system.

027423 Testing and Evaluation of Agricultural Machinery and Equipment 3(2-3)
Pre: 420112

027424 Animal Housing and Equipment 3(2-3)
Animal housing and equipment livestock farm planning and construction, location and layout, waste treatment system, road and transportation. Cost estimation of animal housing construction. Field trips.

027431 Irrigation Systems Planning 3(2-3)
Pre: 027331
Planning to use sprinkler, other systems for irrigation. Relationship between land level and water supply. Selection of water pump.

027432 Agricultural Drainage 3(3-0)
Pre: 027331
Principles and methods of agricultural drainage. Characteristics of surface and subsurface drainage. Selection of open drains, tile drain and wells.

027433 Pump and piping Systems 3(2-2)
Pre: 027201 or 027221

027441 Strength of Materials 3(3-0)
Pre: 027342

027442 Agricultural Structure 3(2-3)
Pre: 027341
Building Structural elements and Structural materials. Simple design of timber and concrete. Structural drawing applied to agricultural building.

027443 Agricultural Building Planning 3(2-3)
Pre: 027341
Basic principles of design and planning of farm building and farm site including cost estimate.
027444  Farm Building Design  3(2-3)
Pre : 027341
Design of various types of farm buildings. Control of moisture, lighting, water supply and fertilizer application in greenhouse.

027447  Farm Building Management  2(2-0)
Pre : 027442

027451  Post-Harvest Mechanization  3(2-3)
Pre : 027221
Principles of agricultural machinery for post-harvest. Operation and maintenance of equipment for handling, drying, milling, cleaning, grading, storage, refrigeration and packaging. Suitable post-harvest equipment testing for each product. Field trip.

027452  Drying and Storage Technology for Agricultural Commodities  3(3-0)
Pre : 027451

027471  Computer Programming in Agricultural Mechanization  3(2-3)
Pre : 027371
The structure and design of computer algorithms, including basic data structures and memory management. Sequential and random access analysis of algorithms, establishing correction of programs and program testing. High level programming languages. Applications of computer programming for agricultural mechanization.

027472  System Analysis and Modeling in Agriculture  3(3-0)
Pre : 417112

027474  Geographical Information System of Agriculture  3(3-0)
Fundamental of geographical information system (GIS). Essential elements of geographical information system. Data structure, data management and GIS manipulation. Computer software in GIS. System design and application in agriculture.

027491  Research Techniques in Agricultural Mechanization  1(0-3)
Project development and research planning. Literature search. Principles and use of equipment for specific research.

027496  Selected topics in Agricultural Mechanization  1-3
Topics of interest in agricultural mechanization. Topics may be changed from semester to semester.

027497  Seminar  1
Current development in agricultural mechanization.

027498  Special Problems  1
Special problem in agricultural mechanization for undergraduate study.
027499  Practicum in Agricultural Mechanization II  1(0-6)
Pre : 027399
Specific Practicum.

SOIL SCIENCE (028xxx)

028101  General Soil Science  3(3-0)
Soil genesis and classification, composition, characteristics and properties, problem soils in agriculture, plant nutrients, fertilizers and soil amendment, soil conservation and management for sustainable agriculture.

028301  Elementary Soil Science  3(2-3)
Composition, general characteristics, genesis and classification, of soils; soil properties for importance in the supply of nutrient elements, water, oxygen and heat for plants; quality deterioration in soils; and correction measures; basic principles of conservation and management of soil and water, resources.

028321  Fertilizers and Manures  3(3-0)
Pre : 036261 or 009111
Kinds and important properties of organic and inorganic fertilizers, organic fertilizer preparation, principle of fertilizer application, suitable uses of fertilizers for some economic crops under different soil types. Field trip required.

028401  Elementary Soil Pollution  3(3-0)
Composition and formation of soil; soil pollutant originating from parent material, natural environment, and chemical and biological changes occurring in soil; role of soil pollutants in the ecosystem.

028411  Geographic Information System in Agriculture  3(2-3)
Pre : 036261
Development of geographic information system (GIS), GIS components, data design and data sources for GIS application in agriculture, coordinate systems and their transformation, principles of geographic positioning system (GPS), application of remote sensor data related to soil and agriculture production in GIS, interpolation of soil and agriculture data in GIS, soil and agriculture modeling and their application in GIS.

028421  Soil Fertility  3(3-0)
Pre : 036261 or 009111
Factors controlling plant productivity; nature and importance of plant nutrients in soils; fertilizer uses; methods to test, assess and solve soil fertility problems.

028422  Soil and Plant Relationships  3(3-0)
Pre : 036261 or 009111
Morphology, physical, chemical and biological properties affecting quantitatively and availability of plant nutrients in soils; relationships of soil properties with plant growth and plant production.

028423  Chemical Fertilizer Technology and Usage  3(3-0)
Pre : 028321
Types of mineral resources and raw materials for fertilizer production; processes and procedures for production of nitrogen, phosphate and production of nitrogen, phosphate and potassium fertilizers. Production of mixed fertilizers; reaction of nitrogen, phosphate and potassium fertilizers in soils and availability of fertilizers in soils for plants; principles of chemical fertilizer usages. Field trip required.
028431  Soil Chemistry  3(3-0)
Pre :  036261 or 009111
Chemical and biological composition of soils; important chemical reaction in soils; importance of colloids to chemical reactions in soils.

028433  Chemical Analysis of Soil and Plant Materials  3(2-3)
Pre :  036261 or 009111
Methods on chemical analysis of soil and plant with special emphasis on plant nutrients; principles on instrumental analytical in soil and plant analysis; interpretation of analytical results for use in soil improvement for crop production.

028441  Aerial Photo-interpretation in Soil Survey  3(2-3)
Pre :  036261 or 009111 or 028301 or 010111 or 010101
Elements of aerial photographs and remote sensing; principles on interpretation of aerial photographs and remote sensing information; methods in aerial-photo and landsat imagert interpretation for soil survey, land use mapping and other related natural resources; uses of basic materials and instruments in aerial-photo interpretation. Field trip required.

028442  Soil Survey  3(2-3)
Pre :  036261 or 009111
Characteristics and types of soils; soil fermentation and soil classification systems; principles and methods in soil survey and mopping; preparation of soil survey report. Field trip required.

028443  Soils of Thailand  3(3-0)
Pre :  036261 or 009111
Types of soils in Thailand; their classification, importance characteristics and agricultural potentials. Field trip required.

028444  Highland Soils  3(3-0)
Pre :  036261 or 009111
Types and genesis of soils in highland and highly sloping areas; classification, prominent physical, chemical and mineralogical properties of hillslope soils; relationship of soils to vegetation and topographic position; basic concept on uses and conservation of highland soils based on soil properties and limitation for plant production. Field trip required.

028451  Soil Microbiology  3(2-3)
Pre :  036261 or 009111 or 419211 or 419214
Relationship between microorganisms and environments; roles of microorganisms in transformation processes of compounds important in agricultural practices; legume’s root nodule bacteria; influence of microorganisms on soil fertility.

028452  Biofertilizer  3(3-0)
Pre :  036261 or 009111
Role, significance, kind and biological characteristic of biofertilizer being used in agriculture. Production, quality control and utilization of biofertilizer. Biotechnology improvement of biofertilizer.

028453  Soil Ecology  3(3-0)
Pre :  036261 or 009111
Physical Analysis of Soils 3(3-0)
Pre : 036261
Principle and analytical methods of soil physical properties for agricultural applications.

Soil Physical Conditions and Plant Growth 3(3-0)
Pre : 036261 or 009111 or or 028301
Relationships of soil physical properties to plant growth and development; use of water by plants and availability of soil water for plants; soil management for plant production based on soil structure, temperature and water.

Soil Physics 3(3-0)
Pre : 036261 or 009111 or 028301
Soil composition; particals size distribution, orientation and aggregation; physical properties and processes of soils; water quantity and energy in soils; movement of water, air and heat in soil.

Soil Management 3(3-0)
Pre : 036261 or 009111
Management of soil moisture, soil organic matter and soil fertility for crop production; tillage operation and crop rotation; management of soil for certain crop of importance. Field trip required.

Soil and Water Conservation 3(3-0)
Pre : 036261 or 009111
Causes of soil erosion and its control measures; soil erosion in relation to various soil properties, physiography of soil earth's surface and other factors; sources, geographical distribution and cycle of water resources; principles of soil and water conservation. Field trip required.

Soils Pollution and Its Management 3(3-0)
Pre : 036261 or 009111 or 028301

Selected Topics in Soil Science 1-3
Selected topics in soil science at the bachelor’s degree level. Topics are subject to change each semester.

Seminar 1
Presentation and discussion on current interesting topics in soil science at the bachelor’s degree level.

Special Problems 1-3
Study and research in soil science at the bachelor’s degree level and compile into a written report.

Specific Practicum in Soil Science 3(0-10)
Pre : 015299
Specific practicum in soil science.
### AGRONOMY

**029201  Crop Production**  
Principles and methods of economically important crops production and their utilization.

**029211  Economic Crops**  
*Pre: 029111 or 036231*  
The most important economic crops, their significance, production area, suitable soils and climates, cultural practices and harvest requirements, including utilization, production problems and solutions.

**029212  Laboratory in Economic Crops**  
*Pre: 029111 or 036231*  
Botanical details of the most important economic crops indicated in 029211 (Economic Crops), including field practicum and laboratory observed.

**029417  Principles of Weed Control**  
*Pre: 401114*  
Botany of weeds, classification, propagation, competition with crop plants, weed control by different methods, herbicides and the application.

**029418  Hericides and Their Application**  
Methods of herbicide classification, chemical name, common name and trade name, chemical properties of the active ingredients, methods of herbicide application, storage caution, biochemical activity in plant and soil, including toxicity to human, animal and environment, methods of synthesize and quantity analytical.

**029419  Weed Biology**  
*Pre: 029111 or 036231*  
Study of growth and habitat, propagation, dispersal and competition of certain major weeds in cropped and non-cropped areas.

**029421  Plant Climate**  
*Pre: 029111 or 036231*  
Energy exchange near the ground, crop microclimate and its management by cultural practices.

**029423  Water Management for Field Crops**  
*Pre: 029111 or 029211 or 036231*  
Water management for field crop production, relation between water, soil and crops. Systems of irrigation and their efficiency.

**029431  Field Crops for Industry I**  
*Pre: 029201 or 029211 or 036231*  
Economic importance of starch producting field crop for industry. Effect of environments on productivity, handling of products, processing. Production limitation, marketing and industrial utilization.
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<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits (Lecture:Practical)</th>
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<tbody>
<tr>
<td>029432</td>
<td>Field Crops for Industry II</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 029201 or 029211 or 036231</td>
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<td>Economic importance of field crop for industry.</td>
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<td>Effect of environments on productivity, handling</td>
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<td>of products for processing. Production limitation</td>
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<td>marketing and industrial utilization.</td>
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<td>029433</td>
<td>Field Crops for Energy</td>
<td>3(3-0)</td>
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<td>Pre: 029201 or 029211 or 036231</td>
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<td>for energy. Effect of environments on productivity,</td>
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<td>production management. Production limitation,</td>
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<td>marketing and utilization.</td>
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<tr>
<td>029434</td>
<td>Field Crops for Animal Feed</td>
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<tr>
<td></td>
<td>Pre: 029201 or 029211 or 036231</td>
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<tr>
<td></td>
<td>Importance of forage crops, botanical and</td>
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<td>agricultural characteristics, types and</td>
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<td>identification of forage crops, field management,</td>
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<td>breeding and seed technology in forage crops.</td>
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<td>Utilization of by products.</td>
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<tr>
<td>029451</td>
<td>Physiology of Field Crop Production</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 029211, 029212 and 401114</td>
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<tr>
<td></td>
<td>Physiological aspects of crop growth, application</td>
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<td>to cultural practices with strong emphasis on</td>
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<td>influences of light, temperature, water and soil</td>
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<td>minerals on crop yield.</td>
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<td>029461</td>
<td>Cropping System</td>
<td>3(3-0)</td>
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<tr>
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<td>Pre: 029111 or 029211 or 036231</td>
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<td>Systems of growing more than one crop in the</td>
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<td>natural resources, socioeconomic for a high</td>
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<tr>
<td>029471</td>
<td>Principles of Plant Breeding</td>
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<td>Pre: 416311</td>
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<tr>
<td></td>
<td>An introduction to plant breeding with emphasis</td>
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<td>on genetic and cytogenetical principles used in</td>
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<td>crop improvement.</td>
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<tr>
<td>029472</td>
<td>Techniques in Plant Breeding</td>
<td>3(2-3)</td>
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<td></td>
<td>Pre: 029471</td>
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<tr>
<td></td>
<td>Techniques used in hybridization and seedling</td>
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<td></td>
<td>culture of field crop, germplasm evaluation and</td>
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<td>lines testing, screening for the resistant lines</td>
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<td>and seed production.</td>
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<td>029473</td>
<td>Plant Cell and Tissue Culture for Crop Improvement</td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Pre: 029471 or 029451</td>
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<tr>
<td></td>
<td>Basis and techniques of plant tissue, cell and</td>
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<td>organ culture, cell suspension and protoplast</td>
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<td>culture, their application for improvement,</td>
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<td>propagation and germplasm preservation of field</td>
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<td>029481</td>
<td>Seed Technology of Field Crop</td>
<td>3(2-3)</td>
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<tr>
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<td>Pre: 029211 or 029212</td>
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<tr>
<td></td>
<td>Physiology of field crop seeds, seed production,</td>
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<td>storage and quality control. Principle and theory</td>
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<td>in seed quality testing.</td>
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<tr>
<td>029491</td>
<td>Basic Research Techniques in Agronomy</td>
<td>3(2-2)</td>
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<tr>
<td></td>
<td>Pre: 029471 or 029451</td>
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<tr>
<td></td>
<td>Principles and methods in Agronomy research,</td>
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<td>identification of research problems, formulation</td>
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<td>of research objectives and hypotheses, collection</td>
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<td>of data,</td>
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construction of questionnaire, data analysis and interpretation, application of statistics for research, report writing and presentation.

029493  Field Plot Methods in Agronomy 3(2-2)
  Pre : 422111
  Principles of statistics and various field plot techniques for agronomic research. Data analysis and interpretation. Use of statistical packages.

029496  Selected Topics in Agronomy 1-3
  Selected topics in agronomy at the bachelor’s degree level. Topics are subject to change each semester.

029497  Seminar 1
  Presentation and discussion on current interesting topics in Agronomy at the bachelor’s degree level.

029498  Special Problems 1-3
  Study and research in agronomy at the bachelor’s degree level and compile into a written report.

029499  Specific Practicum in Agronomy 3(0-10)
  Pre : 036299
  Specific practicum in agronomy.

PLANT PATHOLOGY (031xxx)

031371  Principles of Plant Disease Control 3(2-3)
  Pre : 036281 or 031467
  Theory and practice in plant disease control, quarantine, cultural practice, avoidance of disease, physical, chemical and biological control, use of resistant varieties.

031411  Bacterial Diseases of Plants 3(2-3)
  Pre : 419211
  Symptomatology, classification, epidemiology, interaction with environmental conditions and other organisms and control measures.

031421  Introduction to Mycology 4(3-3)
  Pre : 401114
  An introduction to the morphology, ontogeny, evolution and taxonomy of representative species of the major taxa of the fungi.

031422  Aquatic and Soil Fungi 3(2-3)
  Pre : 424111 and 424112 or 424113 and 424442
  Isolation, identification, life cycle, relation of aquatic and soil fungi with other organisms.

031424  Fungus Diseases of Plants 3(2-3)
  Pre : 031421
  Symptomatology, identification, modes of infection, epidemiology, physiological interaction between fungus and diseased plant and control measures.

031431  Plant Parasitic Nematodes 3(2-3)
  Pre : 036281 or 031467
  History, morphology, anatomy, classification of plant parasitic nematodes, symptomatology of diseases caused by plant parasitic nematodes of economic crops, ecology and control measures.
031441  Introduction to Plant Virology 3(2-3)  
Characteristics of plant viruses, structure and compositions of virus particles, infection process, multiplication, life cycle, distribution, disease symptoms, control measures and techniques for identification and diagnosis.

031451  Molecular Plant Pathology 3(3-0)  
Pre : 419211 and 402311  
Molecular biology of plant pathogens, gene structures, gene regulation and gene expression involving infection and plant response, pathogen and vector relationship, manipulation of genetic materials of plant pathogens and the utilization for disease control.

031461  Diseases of Field Crops I 3(2-3)  
Pre : 036281 or 031467  
Diseases of economic field crops especially monocotyledonous plants; history, geographical distribution, symptomatology, etiology, disease cycle, infection, epidemiology, host-parasite interaction, environmental factors affecting disease development and control measures.

031462  Diseases of Field Crops I 3(2-3)  
Pre : 036281 or 031467  
Diseases of economic field crops especially dicotyledonous plants; history, geographical distribution, symptomatology, etiology, disease cycle, infection, epidemiology, host-parasite interaction, environmental factors affecting disease development and control measures.

031463  Diseases of Fruit Crops 3(2-3)  
Pre : 036281 or 031467  
Diseases of economic fruit crops, symptomatology, their causes, predisposing factors, diseases diagnosis and control measures.

031464  Diseases of Ornamental Plants 3(2-3)  
Pre : 036281 or 031467  
Diseases of economic ornamental plants, geographical distribution, symptomatology, etiology, life cycle, epidemiology, host-parasite interaction and control measures.

031465  Diseases of Vegetable Crops 3(2-3)  
Pre : 036281 or 031467  
Diseases of economic vegetable crops, history, symptomatology, etiology, disease cycle, epidemiology, host-parasite interaction, favorable environmental conditions for disease development and control measures.

031466  Non-Parasitic Diseases of Plants 3(2-3)  
Pre : 401351  
Plant diseases cause by nutritional excess, deficiency, water and air pollution, environmental conditions and control measures.

031468  Plant Pathogens 3(3-0)  
Essential characteristics of plant pathogens; bacteria, fungi, nematodes, viruses, viroids and phytoplasmas. Classification and identification of pathogens, host-parasite interaction, ecology, epidemiology and disease management. Research trends and development in plant pathology.
031469  Laboratory in Plant Pathogens  1(0-3)
Pre : 031468
Laboratory work for Plant Pathogens.

031471  Chemicals Used in Plant Disease Control  3(2-3)
Pre : 036281 or 031467
Types of chemicals used in plant disease control. Structure and chemical properties, analysis of chemical residues, chemical reaction against the pathogens, effect of chemicals to the environmental use and application.

031472  Chemicals in Plant Disease Control Process  3(2-3)
Pre : 036281 or 031467 and 403221
Chemicals involved in plant disease control process. Preformed antimicrobial substances, plant-response active substances to environmental factors, and chemicals derived from microorganisms for plant disease control caused by fungus, virus, bacterium and nematode are emphasized. History, chemical structures, physical and chemical properties, methods of application and efficacy evaluation, residual effects in environment and residue detection.

031481  Diagnosis of Plant Diseases  3(1-6)
Pre : 036281 or 031467
Diagnosis of plant diseases by direct observation and isolation of causal agents from diseased tissues and other diagnostic tools. Recommendations for control measures.

031482  Seed Pathology  3(2-3)
Pre : 036281 or 031467
History, economic importance, seed transmission of pathogens, detection and control measures.

031483  Post-Harvest Diseases  3(2-3)
Pre : 036281 or 031467
Economic importance, symptomatology, causal agents, factors affecting disease incidence and toxin production, detection and control measures.

031484  Serology in Plant Pathology  3(2-3)
Pre : 036281 or 031467 or 419211
Introduction to immune response, antigenic properties of plant pathogens, production, purification and basic serological tests of antisera, application of serological reactions for plant disease diagnosis and forecasting.

031491  Research Techniques in Plant Pathology  3(2-3)
Pre : 036281 or 031467
Techniques in research planning and experimental designs, literature search, data collection and analysis, presentation and report writing, principles and used of selected scientific equipments and various techniques in plant pathology, techniques for disease-free plant production.

031496  Selected Topics in Plant Pathology  1-3
Selected topics in plant pathology at the bachelor’s degree level. Topics are subject to change each semester.

031497  Seminar  1
Presentation and discussion on current interesting topics in plant pathology at the bachelor’s degree level.

031498  Special Problems  3
Study and research in plant pathology at the bachelor’s degree level and compile into a written report.
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<tr>
<th>Course Code</th>
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<th>Credits</th>
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<tbody>
<tr>
<td>031499</td>
<td>Specific Practicum in Plant Pathology</td>
<td>3(0-10)</td>
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<tr>
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<td>Pre: 036299</td>
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<td></td>
<td>Specific practicum in Plant Pathology.</td>
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**AGRICULTURAL EXTENSION AND COMMUNICATION**

(032xxx)

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>032211</td>
<td>Rural Extension Development</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Roles of agricultural extension in rural development; extension structure affecting rural development.</td>
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<tr>
<td>032301</td>
<td>Agriculture</td>
<td>3(3-0)</td>
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<td></td>
<td>History, policy and agricultural organization of Thailand. Principles and problems of crop and animal productions important to economic and social benefits. Field trip required.</td>
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<tr>
<td>032302</td>
<td>Agricultural Development</td>
<td>3(3-0)</td>
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<td></td>
<td>Agricultural problems, applied agricultural technology to increase crop and animal production that are important to economy and society; a guideline to agricultural extension, production and marketing management. Field trip required.</td>
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<tr>
<td>032311</td>
<td>Introduction to Extension</td>
<td>3(3-0)</td>
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<td></td>
<td>Philosophy, specific principles of agricultural extension; problem identification, selection, methods and practices; principles and procedure of extension evaluation.</td>
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<tr>
<td>032312</td>
<td>Interdisciplinary Aspects for Agricultural Development</td>
<td>3(3-0)</td>
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<td>Pre: 036211</td>
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<td></td>
<td>Concept, principles, methods and agricultural development theory. Agricultural situations and problems. Agricultural dimensions involving in economic, social, environment, and agricultural policy. Interdisciplinary knowledge for sustainable agricultural development. Case study. Field trip required.</td>
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<tr>
<td>032342</td>
<td>Human Resource Development in Agricultural Community</td>
<td>3(3-0)</td>
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<td>Concepts, principles, methods and trends in human resource and development, groups, organizations, learning process, learning organization, knowledge base management and leadership. Participatory techniques for human resource development in agricultural community.</td>
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<tr>
<td>032351</td>
<td>Principles of Photography</td>
<td>3(2-2)</td>
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<td>Principles of photography; photographic equipment, accessories and materials; techniques in taking, printing, and enlarging pictures for extension publication and exhibition activities.</td>
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<tr>
<td>032352</td>
<td>Communication in Agriculture</td>
<td>3(3-0)</td>
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<td>Communication concepts, principles and theories. Media and psychology application for agricultural communication development. Basic knowledge and steps in agricultural communication.</td>
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<tr>
<td>032353</td>
<td>Media Productions in Agriculture</td>
<td>3(2-2)</td>
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<td>Concepts, principles, theories and production process of print materials, radio broadcasting, television, on-line and folklore media in agriculture.</td>
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<td>032371</td>
<td>Environmental Planning for Agricultural Development</td>
<td>3(3-0)</td>
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**032381  Agri-business Promotion in Rural Community  3(3-0)**

**032401  Principles of Extension  3(3-0)**
Principles and methods in agricultural extension to bring about knowledge and new practices to relevant people.

**032411  Rural community and Agricultural Development  3(3-0)**
Pre : 036211 or 032311 or 032401 or 460111
Principles, scope, rural community problems identifications, and application of social theories suitable to resource development for rural community and agricultural development.

**032412  Integrated Rural Development  3(3-0)**
Pre : 036211 or 032311 or 032401 or 460111
Theories, principles, methods, procedures, and strategies in integrated rural development. Practical effect on agricultural and rural development especially in developing countries. Analysis of developmental factors affecting the national rural development plans.

**032413  Extension of Sustainable Agriculture  3(3-0)**

**032421  Rural Home Economics Extension  3(3-0)**
Pre : 036211 or 032311 or 032401
Principles, procedures in rural home economics extension, applied theory in home economics. Agricultural extension for personnel’s and family development to suit rural economics situation.

**032422  Rural Home Economics Extension Development  3(3-0)**
Pre : 036211 or 032311 or 032401
Development of applied technology and resource personnel of the government and private sectors for rural home economics extension development.

**032431  Rural Youth and Development  3(3-0)**
Philosophy, practice, establishment, group development, selection, leadership training, rural youth group activity to support agricultural and rural development.

**032432  Rural youth and Adult Leadership Development  3(3-0)**
Pre : 036211 or 032311 or 032401 or 460111
Basic concept of rural youth and adult leadership development, rural youth activities arrangement in formal and nonformal education system, rural youth development, importance of rural youth and adult leadership in agricultural extension and development.

**032433  Career Development of Rural Youth  3(3-0)**
Pre : 036211 or 032311 or 032401
Characteristics and implanting agricultural career. Problems, methods and procedures of career development to rural youth for agricultural and rural development.

032441  Population Studies  3(3-0)
Some changes in quality and quantity of population, including theory, policy, component, structure, population distribution, maturity, mortality, migration, labour condition of rural people. Factors affection to population change, impact from population change related to others involving agricultural and rural development.

032451  Agricultural Communication  3(3-0)
Theory, principles, methods and techniques in agricultural communication.

032452  Audio-Visual Materials in Extension Work  3(2-2)
Pre : 036211 or 032311 or 032401
Importance, selection, preparation, production, and techniques of using audio-visual materials in extension work.

032453  Oral and Written Expression in Extension Work  3(3-0)
Pre : 036211 or 032311 or 032401
Principles of public speaking; administering meetings and conference; practice in preparation and oral presentation of written information, news and reports in extension work.

032454  Public Speaking  2(2-0)
Principles and methods of public speaking, meeting procedures, criticism, discussion and group meeting.

032455  Writing and Producing Agricultural Information  2(2-0)
Pre : 036211 or 032311 or 032401
Principles and practice in preparation of agricultural articles, news, and reports for extension work.

032456  Radio and Television Programs Preparation in Agriculture  3(2-2)
Principles of presenting agricultural information, radio and TV programs; article writing, and preparation of radio programs for farmers.

032457  Principles of Public Relations  3(3-0)
Significance of public relations, definitions, meaning, principles and other related theories. History and development of public relations, communication process, persuasion, planning strategies, public opinions formation, and evaluation.

032458  Communication Media Administration  3(3-0)
Principles and methods of communication media administration related to rural population. Media analysis and utilization techniques applicable to rural situation.

032459  Mass Communication for Extension  3(3-0)
Influence, importance and profitable of mass communication for extension, selection techniques in choosing appropriate mass media for extension.

032461  Technical Photography  3(1-4)
Pre : 032351
Technical Photography production for education material, publication and research work.

032462  Cinematography  3(2-2)
Pre : 032351
Cinematography development, theory, principles, materials, methods and steps in cinematography.

032463  Radio Programs Production for Extension  3(1-4)
Pre : 032451
Script writing, steps on radio programs production for extension.
032464  Television Programs Production for Extension  3(1-4)
Pre : 032451
Script writing, steps on television programs production for extension.

032465  Computer in Agricultural Extension Works  3(2-2)
Application of computer for extension works, database management for
agriculture, data analysis, computer network and computer using for media production.

032466  Agricultural Information Transfer  3(2-2)
Principles and theories for agricultural information oral and written
expression and public relation. Technology utilization and planning for agricultural
information transfer.

032467  Agricultural Electronic Media Production  3(2-2)
Concepts, principles, process and steps of agricultural electronic media
production in agricultural extension works. Basic knowledge and theories in electronic
media design. Electronic media production techniques in off-line and on-line types
including agricultural electronic media management.

032472  Agricultural Resources Management Promotion in Rural
Community  3(3-0)
Application of principles, methods, process, and implementation for
appropriate agricultural resource management promotion in rural community. Case
study. Field trip required.

032491  Basic Research Methods in Agricultural Extension and
Communication  3(3-0)
Principles and methods in Agricultural Extension and Communication
research, identification of research problems, formulation of research objectives and
hypotheses, collection of data, construction of questionnaire, data analysis and
interpretation, application of statistics for research, report writing and presentation.

032492  System Management for Agricultural Development  3(3-0)
Concept and paradigm for system management in agricultural
development. Trend in sustainable agricultural development through socio-economic and
environmental by interdisciplinary approaches. Case study. Field trip required.

032496  Selected Topics in Agricultural Extension and Communication  1-3
Selected topics in agricultural extension and communication at the
bachelor’s degree level. Topics are subject to change each semester.

032497  Seminar  1
Presentation and discussion on current interesting topics in agricultural
extension and communication at the bachelor’s degree level.

032498  Special Problems  1-3
Study and research agricultural extension and communication at the
bachelor’s degree level and compile into a written report.

032499  Specific Practicum in Agricultural Extension and
Communication  3(0-10)
Pre : 036299
Specific practicum in Agricultural Extension and Communication.
**ANIMAL SCIENCE (033xxx)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits (Lecture-Tutorial)</th>
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</thead>
<tbody>
<tr>
<td>033111</td>
<td>Principles of Animal Husbandry</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>The basic principles of animal husbandry with particular reference to the aspects of animal production that are of great economic importance to livestock industry in Thailand. Type and breeds of farm animals, in the fundamental principles used in selecting and breeding them. Economic problems associated with the production of meat, milk and eggs.</td>
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<tr>
<td>033231</td>
<td>Animal Breeding</td>
<td>3(3-0)</td>
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<td></td>
<td>Pre : 734111, 730311</td>
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<tr>
<td></td>
<td>Mathematics and statistics for animal breeding, population genetics, inheritance of qualitative and quantitative traits, inbreeding and relationship coefficients, principles of selection and mating system.</td>
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<tr>
<td>033241</td>
<td>Anatomy and Physiology of Domestic Animals I</td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Pre : 737113</td>
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<tr>
<td></td>
<td>Comparative anatomical and physiological studies of mammals and avian part I.</td>
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<tr>
<td>033242</td>
<td>Anatomy and Physiology of Domestic Animals II</td>
<td>3(2-3)</td>
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<tr>
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<td>Pre : 033241</td>
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<tr>
<td></td>
<td>Comparative anatomical and physiological studies of mammals and avian part II.</td>
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<tr>
<td>033291</td>
<td>Statistical Methods in Animal Science</td>
<td>3(3-0)</td>
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<td></td>
<td>Pre : 734111</td>
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<tr>
<td>033299</td>
<td>Practicum I</td>
<td>2</td>
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<tr>
<td></td>
<td>Fundamental practicum in animal science.</td>
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<tr>
<td>033301</td>
<td>Animal Production</td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Species of economical livestock, principle of livestock production. Livestock and environment, equipment and housing for livestock and feed production.</td>
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<tr>
<td>033302</td>
<td>Animal Respircles and Management</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Animal resources and management, waste minimization technologies, animal farm wastes treatment and value-adding and recycling of animal wastes.</td>
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<tr>
<td>033311</td>
<td>Poultry Production</td>
<td>3(3-0)</td>
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<td></td>
<td>Pre : 015221</td>
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<tr>
<td>033312</td>
<td>Swine Production</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 015221</td>
<td></td>
</tr>
<tr>
<td>033313</td>
<td>Beef Production</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 015221</td>
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</tbody>
</table>
Importance of beef production, breed, feed and feeding, fattening, health care and marketing. Farm planning and housing, environmental management, computer programs for farming and management. Field trip required.

**033314 Dairy Production**  
Pre : 015221  
3(3-0)

Commercial dairy production, breeds, dairy cattle selection for the tropics. Feed and feeding, reproduction, lactation and milking, milk quality and price evaluation, dairy health.

**033315 Equine Husbandry**  
Pre : 015221  
3(3-0)

General characteristics of equine breed, anatomy, physiology, conformation and movement of good equine. Principles of farm management, feeding, care and first aid restraint and, horse-riding training. Field trip required.

**033316 Sheep and Goat Production**  
Pre : 015221  
3(3-0)


**033321 Animal Nutrition**  
Pre : 725311  
4(4-0)

Classification of feedstuffs, metabolism and role of primary nutrients, feed formulation and evaluation.

**033322 Biotechnology in Animal Feed**  
Pre : 033321  
3(3-0)


**033323 Feed Analysis**  
Pre : 725311  
2(1-2)

Chemical analysis of nutrient in feedstuffs. Analysis of gross energy, minerals and digestibility.

**033331 Applied Animal Breeding**  
Pre : 033231  
3(2-3)


**033341 Anatomy of Domestic Animals**  
Pre : 423113  
3(2-3)

Systematical body structure and organs study of domestic animals, including comparative anatomical study of mammals and avian.

**033342 Physiology of Domestic Animals**  
Pre : 033341  
3(2-3)

Physiological study of the systemic body functions and regulation of coordinated body organs function under the physiological changes of domestic animal.

**033351 Principles of Animal Hygiene and Sanitation**  
Pre : 015221  
3(2-3)

Principles of systemic disease prevention and control, medical therapy, important epidemic and parasitic diseases of domestic animals.

**033381 Animal Biotechnology**  
3(3-0)
Biotechnology in animals production emphasizing application of biotechnology in nutrition, physiology, genetic modification, disease prevention and detection.

033399  Practicum II  2  
Pre : 033299  
Specific practicum in livestock and processing of animal products. Field trip required.

033411  Livestock Industries  3(3-0)  
Pre : 015221  
Overview in livestock industry. Pigs, poultry, dairy and beef industries. Feed mills, and ingredient, drugs and feed supplements. Slaughter house and meat products industries. Financing agents and personnel management in livestock industry.

033412  Companion and Non-conventional Animals Production  3(3-0)  
Pre : 015221  
Breeds, Breeding feed and feeding, health and management of dog, cat, ostrich, deer and other animals. Field trip required.

033413  Finishing Pig Management  3(3-0)  
Pre : 015221  

033414  Dairy Herd Management  3(3-0)  
Pre : 015221  
Fundamentals of dairy farm management, techniques of feeding. Herd health, reproduction, milking and housing management. Field trip required.

033415  Beef Management  3(3-0)  
Pre : 015221  
Commercial herd management for fattening and breeder. Problems and solution. Reproduction management, breeding, feeding and herd health management. Computerised system to increase efficiency of farm management.

033416  Poultry Breeder and Hatchery Management  3(2-3)  
Pre : 015221  
Broiler and layer breeder farm management. Hatching egg production. Embryo growth and development. Hatching egg management, incubation, hatchery management. Field trips required.

033417  Animal Restraint and Management  3(3-0)  
Pre : 015221  

033418  Animal Welfare  3(3-0)  

Animal welfare. Laws in different countries and break event of animal production. The effects of changing of farm management on animal behavior, productivity, quality of the products and the stockman.

033419  Livestock Business  3(3-0)  
Overview and factors effecting on the livestock production in Thailand, business management, production and marketing cost approach, demand and supply of
animal product, marketing system, financial account and statement. Tariff and trade
Barrier of animal product. Financial sources and livestock project proposal.

033421  Feed Microscopy and Quality Control  3(2-3)
Pre : 725311
Microscopic identification of structural and physical characteristics of
feedstuff components. Chemical test for quality and adulteration of animal feeds.

033422  Feedstuff Processing  3(3-0)
Pre : 033321
Principles of feedstuff production. Rice milling, drying process, vegetable
oil expelling and extraction. Feedstuff products from fish meal and cannery fish waste,
meat meal and slaughter house waste, milk and milk by-products. Field trip required.

033423  Principles of Feed Processing  3(3-0)
Pre : 033321
Principles of feed production. Grinding, mixing and pelleting. Materials
handling in feed mill, bins and silos. Steam system in feed production processes.
Automatic feed production process. Feed mill design. Field trip required.

033424  Advanced Feed Processing  3(3-0)
Pre : 033321
Special feed processing methods. Principles and methods of extrusion, aquaculture and
companion feed production, Application of extrusion process, microencapsulated feed
production. Production of total mixed ration for ruminants.

033425  Forage Utilization  3(2-3)
Pre : 015221 or 033321 or 003412
The importance of soil preparation for pasture, quality and quantity of
pasture. Pasture management, cutting, grazing and preservation for dry season. Pasture
improvement for high quality forage. Field trip required.

033426  Applied Animal Nutrition  3(3-0)
Pre : 033321
Application of supplement in feed formulation to improve the quantity and
quality of animal products, quality control and evaluation of feed formulation.

033431  Animal Molecular Genetics  3(3-0)
Pre : 730311
Molecular genetics in animal science. Repetitive DNA sequence
interspersion in animal genome and its application in chromosome mapping. DNA
amplification by PCR. Gene screening and cloning. Molecular techniques for animal
science study.

033441  Biotechnology in Animal Reproductive Physiology  3(2-3)
Pre : 033242
Anatomy and physiology of reproductive system of domestic animals.
Proven sires and dam, semen collection, evaluation, and insemination technique, estrus
detection, pregnancy diagnosis, parturition, management before and after parturition,
diseases of reproduction. Artificial insimination recording and embryo transplantation.

033442  Applied Physiology for Animal Production  3(2-3)
Pre : 033242
Applied physiology for animal production in Thailand. Pure bred and cross
bred animal management. Biotechnology for improvement of livestock production and
fertility.

033451  Animal Health Management  3(3-0)
Pre : 033351
Principles of farm management for environmental health and potentially genetic adaptation to environment. Farm management for pathogen free, herd health management. Principles of drug use and vaccination.

**033452 Animal Diseases and Health Care**  
**Pre:** 033451  
3(2-3)  
Principles of diagnostic, health care, principles of pharmacology and principles of animal biological products administration for disease prevention.

**033461 Principles of Meat Science**  
**Pre:** 015221  
3(2-3)  

**033462 Principles of Dairy Science**  
**Pre:** 732214  
3(2-3)  

**033463 Poultry Product Management**  
**Pre:** 015221  
3(3-0)  

**033464 Livestock Product Management**  
**Pre:** 015221  
3(3-0)  
Scenario of quantity and values of livestock produces. Collection, transportation, grading, storage and sales of livestock produces in terms of meat and milk. Management of economical by-products. Domestic and export market systems. Development for export market. Field trip required.

**033465 Slaughtering Technology**  
**Pre:** 015221  
3(3-0)  
Principles and objectives of comparative livestock slaughtering standards. Animals for slaughtering, transportation and resting. Abattoir design and work steps, equipment and utensils, refrigerated room, hygienic principles, carcass inspection and grading. Carcass management prior to meat cutting and waste management. Field trip required.

**033466 Quality Control in Meat Production**  
**Pre:** 033461  
3(3-0)  
Principles and objectives of the HACCP. The application of HACCP in meat production from farm level to meat ready for processing, HACCP design and implementation in meat production. Field trip required.

**033471 Animal Information System**  
**Pre:** 033461  
3(3-2)  
Basic structure in animal information system. Construction of information system via internet and intranet. Construction of multimedias for animal
information system. Information system in different animal species. Animal science softwares. Analysis of data via information system.

**033472 Bioinformatics and Computer packages in Animals Science** 3(2-3)
- **Pre:** 734111
- Basic knowledge in molecular biology and biochemistry of animals.


**033473 Computer Simulation in Animal Breeding** 1(0-3)
- **Pre:** 033231
- Theories, basic statistics and software usage for computer simulation in animal science. Application of computer package for animal breeding.

**033481 Animal Waste and Management** 3(2-3)
- **Pre:** 015221
- Type and quality of animal waste in farm. Waste management, treatment and utilization.

**033482 Animal Housing and Equipment** 3(2-3)
- **Pre:** 015221
- Environmental physiology of animals, animal behaviour, principles of animal housing construction, air ventilation system, waste treatment, housing and equipment design, farm layout and budgeting evaluation.

**033491 Basic Research Methods in Animal Science** 3(3-0)
- **Pre:** 734111
- Principles and methods in animal science research, indentification of research problems, formulation of research objectives and hypotheses, collection of data, construction of questionnaire, data analysis and interpretation, application of statistics for research, report writing and presentation.

**033496 Selected Topics in Animal Science** 1-3
- Selected topics in Animal Science at the bachelor degree level. Topics are subjected to change each semester.

**033497 Seminar** 1
- Presentation and discussion on current interesting topics in animal science at the bachelor degree level.

**033498 Special Problems** 1-3
- Study and research in animal science at the bachelor degree level and compiled into a written report.

**033499 Practicum III** 1-3
- Off-campus work experience approved by the department. Knowledge and skills, are to be evaluated. Written summary paper is required.

**AGRICULTURAL BIOTECHNOLOGY (034xxx)**

**034111 Overview of Agricultural Biotechnology** 2(2-0)
- **Pre:** 424111
- History and development of biotechnology and genetic engineering, biotechnology and agricultural development, socio-economic and environmental impact, scope and limitation for application of biotechnology and biosafety.

**034321 Plant Biotechnology** 3(3-0)
- **Pre:** 416311

**034322 Microbial Biotechnology for Agriculture 3(3-0)**
Pre : 419211
Biotechnology in utilization of beneficial microorganisms for agriculture, microorganisms for soil improvement, plant growth promotion, plant pest control, animal production, agroindustry and microorganisms for ecological and environmental improvement.

**034341 Biotechnology in Cell and Tissue Culture 3(3-0)**
Pre : 424111

**034342 Laboratory in Plant Tissue Culture for Micropropagation 1(0-3)**
Pre : 034341 or 007472 or together
Plant tissue culture laboratory for micropropagation. Media preparation, tissue sterilization and aseptic techniques, subculture and acclimatization of plantlet, tissue storage for short, medium and long term. Field trip required.

**034411 Computer Application in Agricultural Biotechnology 3(2-3)**
Use of programs in agricultural biotechnology and data searching from various databases including nucleotide sequences, amino acid sequences, molecular structure. Use of statistical packages in data analysis.

**034421 Gene Function and Control 3(3-0)**
Pre : 416311
Genome structure and genome change in prokaryotic and eukaryotic organisms. DNA replication, transcription, translation and regulations. Gene expression in prokaryote and eukaryote and its control. Effect of gene expression on the development of living organisms.

**034431 Molecular Techniques in Agricultural Biotechnology 3(1-6)**
Pre : 416311
Molecular biological techniques for agricultural science, useful genes isolation and identification, gene cloning, gene engineering, cell and tissue culture, techniques in protein, DNA and RNA for probe production, gene transformation, gene mapping, variety identification of plant, animal and microorganism.

**034432 Monoclonal Antibody 1(1-0)**
Pre : 419211
Monoclonal antibody production, immunization, mouse-myeloma cell fusion, ELISA techniques for hybridoma screening, hybridoma cell cloning, maintenance and preservation of hybridoma cells, mouse ascetic fluid production.

**034433 Protoplast Technology 1(0-3)**
Pre : 416311
Protoplast preparation from plant tissue and microorganism. Chemo fusion and electrofusion of protoplasts. Protoplast transformation, culture, selection and transgene identification.

**034434 DNA Sequencing 1(0-3)**
Pre : 416311
Techniques in DNA sequencing, principles of dideoxy chain termination and Maxam and Gilbert methods, equipments for DNA sequencing, data processing and computer analysis.

034435 DNA Fingerprint Analysis 1(0-3)
Pre : 034431
DNA fingerprint analysis using Southern hybridization and Polymerase Chain Reaction techniques. Utilization of DNA fingerprint in identifying genetic relationship of germplasm, hybrid verification and quality control.

034436 PCR Technology 1(0-3)
Pre : 034431
PCR technology for development and application in research in the field of agricultural biotechnology.

034441 Laboratory in Animal Cell Culture 1(0-3)
Pre : 424111
Laboratory practices in animal cell culture, maintenance and preservation of cell culture, and applications of cell culturing technique.

034442 Laboratory in Plant Tissue Culture for Micropropagation 1(0-3)
Pre : 034341 or 007455
Plant tissue culture laboratory for micropropagation. Media preparation, tissue sterilization and aseptic techniques, subculture and acclimitization of plantlet, tissue storage for short, medium, and long term, field trip required.

034443 Embryo Transfer 1(1-0)
Pre : 423113
Superovulation and artificial insemination, oocytes collection, embryo cell culture, oestrus cycle investigation, recipient preparation, embryo transfer technique and embryonic development.

034444 Gene Transfer in Animal 1(1-0)
Pre : 416311
Principles of gene transfer methods, embryo preparation for gene transfer, plasmid expression vectors, gene transfer based on viral infection, gene transfer techniques in mammals and poultry, usefulness of gene transfer for animal improvement.

034445 Plant Transformation 1(0-3)
Pre : 416311
Crop improvement by gene transfer technique, methods for gene transformation, useful genes for crop improvement, transplanting of transgenic plantlet and analysis.

034446 Bt Technology 1(0-3)
Pre : 419211
Biology of the bacterium, Bacillus thuringiensis (Bt), isolation and strain identification, cellular structure, protein toxin, gene encoding insecticidal protein and mode of action. Efficiency and stability improvement of Bt strains by genetic engineering. Application and formulation of Bt for insect control. Biosafety and the impact to the environment.

034447 Trichoderma Technology 1(0-3)
Pre : 419211
Biology of Trichoderma fungus, isolation, identification, mechanism of antagonistic activities against plant pathogens, strain improvement, mass production and formulation development, application for plant disease control.

034471 Plant Biotechnology 3(3-0)
Pre : 416311
Plant tissue and organ culture, recombinant DNA technology and transferring of DNA from certain organism into plants. Control of gene expression, study and application of plant genome research for improving quality, increasing yield and preserving environment.

034496 Selected topic in Agricultural Biotechnology 1-3
Current and interesting topics in agricultural biotechnology. Topics may be changed from semester to semester.

034497 Seminar 1
Seminar for undergraduate level.

034498 Special Problems 3
Individual study on the selected problem in agricultural biotechnology. Report must be submitted in an assigned format.

034499 Specific Practicum 3(0-10)
Pre : 015299
Specific practice in agricultural biotechnology.

CENTER COURSE
(036xxx)

036111 Overview in Agriculture 1(1-0)
The significance of agriculture to civilization; relationship of economics, society, politics and environment to agriculture in Thailand and the world; national and international institutions and organizations involving in agriculture and environment; agricultural system and production structure; relationship with agroindustry.

036211 Agricultural Extension and Technology Transfer 3(3-0)
Concept, meaning, philosophy and principles of agricultural extension, learning and communication processes for the transfer of technology. Program planning and evaluation for sustainable agricultural extension, comparative extension work, agricultural information and technology. Innovation and adoption process for target audience. Media communication for technology transfer.

036221 Animal Science and Technology 3(3-0)
Importance of animal production, relationship to other agricultural production sectors, science and technology in animal production, farm management and the environment, primary products and animal products, livestock marketing, future trend of animal production.

036231 Crop Science and Technology 2(2-0)
Significances of field crop to global ecosystem, classification and center of origin, production physiology, crop improvement, cultural practices and production ecology, cropping system and management, seed science and technology of economic crops.
Introduction to Entomology 3(2-3)
Pre : 424111 or 424113

Anatomy, physiology, biology, ecology and behavior of insects, classification of insects, beneficial and harmful insects and insect pest management, collecting and preserving insects for scientific studies and researches.

Plant Pest Control and Management 3(3-0)

Plant pests and classification, ecology of plant pests, principles and management of plant pests, case study.

Agricultural Machinery and Equipment 3(2-3)

Equipment, and agricultural machinery technology for soil preparation, planting, crop maintenance, crop processing and animal husbandry; development, testing, and standard of agricultural machinery.

Soil Science 3(3-0)
Pre : 403111

Genesis, survey and classification, physical, chemical and microbiological properties of soil; plant nutrients; fertilizer utilization and soil organic matter management; soil degradation; soil and water conservation; soil information for agricultural and environmental uses.

Horticultural Science and Technology 2(2-0)

Socio-economic and environmental significance of horticulture; science and technology of production, propagation, harvesting, storage, processing; marketing and transport of fruit, flower, ornamental, vegetable, spices, herb, and other horticultural crops.

Introductory Plant Pathology 3(2-3)
Pre : 424111 and 424112 or 424113 and 424112

History and importance of plant diseases; plant disease concepts; disease development; etiology, symptomatology, epidemiology, classification, diagnosis; principles of plant disease control; biotechnology in plant pathology.

General Practicum 2(0-10)

Farm practices in agronomy, horticulture, forage crops, pest management, soil and fertilizer, animal husbandry and farm machinery.

Cooperative Education Preparation 1(1-0)


Cooperative Education 6

On the job training as a temporary employee according to the assigned project including report writing and presentation.
HORTICULTURE (037xxx)

037311  Principles of Horticulture  3(2-2)
Pre :  036271
Principles of growing fruit, vegetable and ornamental crops based on their
physiology and ecology for
sustainable and commercial purposes.

037361  Drawing and Perspective in Horticulture Design  2(1-3)
Principles of drawing and watercolor painting of objects, plants and
scenery. Theories used in drawing of such items including small garden, plots, plant bed
etc. as a basis for supporting the study of landscape architecture and systematics of
horticultural crops.

037371  Principles of Plant Propagation  3(2-3)
Pre :  401114
Site establishment and management in plant propagation. Principles of
propagation by seed, cutting, budding, grafting. Basic concepts in plant propagation.

037402  Postharvest Handling of Fruits, Vegetables and Flowers  2(2-0)
Pre :  401114
Harvesting, trimming, cleaning, sorting, sizing, cooling, disease and insect
control, packaging and storage of fruits, vegetables and flowers

037411  Nursery Management  3(2-2)
Pre :  037371
Principles of nursery management. Types of nursery. Preparations of building
and materials for construction. Management of propagated plant material. Commercial
production and distribution of plants in the nursery.

037412  Quality of Fresh Fruits and Vegetables  3(2-2)
Pre :  036271 or 037311
Physical and chemical qualities of fresh fruits and vegetables in relation to
utilization. Quality standardization and evaluation.

037421  Technology of Vegetable Production  3(2-2)
Pre :  036271
The nature and modern production technology for economic vegetable
crops.

037422  Vegetable Production Management  3(2-2)
Pre :  036271
Vegetable marketing, production planning, production input management.
Factors affection yield and quality and quality standard in vegetables.

037424  Mushroom Production  3(2-2)
Pre :  419214
Importance of mushroom, culture techniques, production of spawn.

Utilization of various mushrooms.

**037431  Floriculture**  3(2-2)

Pre :  037311 or 036271

Flowers in domestic and international business. Technology in the production of cutflower plants, flowering pot plants, and flowering plants for outdoor.

**037432  Ornamental Plants**  3(2-2)

Pre :  037311 or 036271

Types and characters of ornamental plants. Cultivation, propagation and management relating to decorative purposes for indoor and outdoor.

**037433  Orchidology**  3(2-2)

Pre :  037311 or 036271

Types and characters of orchid in different genera. Cultural practices and management. Propagation, tissue culture, pollination, seed germination in aseptic culture and orchid trade.

**037441  Tropical Fruits**  3(2-2)

Pre :  037311 or 036271

Botanical characteristics, origin, adaptation, propagation, planting, cultural practices, and production of tropical fruits.

**037442  Subtropical Fruits**  3(2-2)

Pre :  037311 or 036271

Botanical characteristics, origin, adaptation, propagation, planting, cultural practices, and production of subtropical fruits.

**037444  Orchard Management**  3(2-3)

Pre :  037311 or 036271


**037451  Physiology of Horticultural Crops**  3(2-2)

Pre :  401351 and 402311

Basic physiology of horticultural crops. Environment and other factors affecting horticultural crop production.

**037454  Plant Growth Regulators in Horticulture**  3(2-2)

Pre :  401351 and 403221

Plant growth regulators, their properties and uses for horticultural crop production.

**037461  Systematics of Horticultural Crops**  3(2-3)

Pre :  401114

Principles of horticultural classification and characteristics of family, genus, and species of horticultural crops.
037463  Landscape Design  3(2-3)
  Pre : 037311 and 037361

037464  Landscape Management  3(2-3)
  Pre : 037436
  Site planning for home. Basic knowledge in contour and slope. Details in landscape materials, rock arrangement, waterfall, spring (fountain). Preparation of detail specifications. Landscape practice projects.

037471  Principles of Horticultural Breeding  3(2-2)
  Pre : 416311

037472  Principles of Plant Tissue Culture  3(3-0)
  Pre : 037311 and 401351
  Technique and usefulness of economic plant tissue culture.

037481  Seed Technology of Horticultural Crops  3(2-3)
  Pre : 401351 and 402311
  Physiology of seed development, germination, dormancy and vigour. Technology in seed production, conditioning, storage, seed quality testing and certification.

037482  Postharvest Technology of Horticultural Commodities  3(2-3)
  Pre : 401351
  Physiology, harvesting, packing, handling, transportation and storage of fresh fruits, vegetables and cut flowers.

037491  Research Techniques in Horticulture  3(2-2)
  Pre : 422111
  Principles and methods in horticulture research, identification of research problems, formulation of research objectives and hypotheses, collection of data, construction of questionnaire, data analysis and interpretation, application of statistics for research, report writing and presentation.

037496  Selected Topics in Horticulture  1-3
  Selected topics in horticulture at the bachelor’s degree level. Topics are subject to change each semester.

037497  Seminar  1
  Presentation and discussion on current interesting topics in horticulture at the bachelor’s degree level.

037498  Special Problems  3
  Pre : 037491
  Study and research in horticulture at the bachelor’s degree level and compile into a written report.
037499 Specific Practicum in Horticulture 3(0-10)
Pre : 036299
Specific practicum in horticulture.

FACULTY OF EDUCATION KAMPHAENG SAEN
(178xxx, 181xxx)

AGRICULTURAL (178xxx)

178111 Fundamentals of Agricultural Education 2(2-0)
The importance of Agricultural Education, its history and philosophy. The objectives, curriculum, management and problems providing Agricultural Education at different levels both in Thailand and abroad.

178161 Agricultural Practices for Teachers I 1(0-3)
Introductory farm experiences for agriculture teachers.

178162 Agricultural Practices for Teachers II 1(0-3)
Practicum in basic agricultural skills for agriculture teachers.

178251 Evaluation Techniques of Agricultural Teaching and Learning 2(1-3)
Basic concepts on measurement and evaluation applied to agriculture teaching and learning. Procedures and techniques in evaluation all the three program components: in class and laboratory learning, supervised farming experience, and F.F.T. activities. Practices in analysis of instructional objectives, construction and analysis of tests and other evaluation tools for evaluating the three domains of learning behaviors: cognitive, affective, and psychomotor.

178262 Agricultural Practices for Teachers III 1(0-3)
Basic farm practices in poultry production, ruminant production, non-ruminant production and aquaculture.

178321 Agricultural Instruction 3(2-3)
Principles, objectives, and methods of teaching agriculture. Lesson planning applies to agriculture program of each school level. Teaching observation and practice in simulated as real classroom environments.

178331 Instructional Media in Agriculture 3(2-3)
Theories and applications of instructional media for teaching agriculture in formal and non-formal situations. Practices in selection, utilization, and production of teaching media.

178351 Evaluation Techniques of Agricultural Teaching and Learning 3(2-2)
Definition, objectives, theories and ideas of measurement and evaluation in agricultural teaching and learning. Practice to analyze objectives, develop and analyze test and evaluation on knowledge, attitude and skills. Utilize the result of test and evaluation in teaching and learning agriculture.

178365 Directed Farming Programs 1(0-3)
Practicum on directed farming programs, involving production and management of farm products.
178366 Supervised Farming Programs 1(0-3)
Supervised planning and management of farming programs for agriculture teachers.

178421 Young and Adult Farmers Education 2(2-0)
Principles, objectives and methods of providing agricultural education to farmers and others in the agriculture-related sector. Implementation and administration of farmers’ organizations.

178431 Computer Applications in Agricultural Education 3(2-2)
Applications of computer for data system management and retrieval for educational purposes in agriculture. Data analysis for classroom research and evaluation, and production of teaching media in agriculture.

178441 Programs and Organizations in Agricultural Education 3(3-0)
Planning supervision and follow-ups of farming programs. Organizations and activities in agricultural education.

178442 Administration of School Agricultural Program 2(2-0)
School policy and administration as to management of agriculture program; involving management of resources, personnel, budget, facilities, and school environment for agriculture learning. Basic concepts of program planning and evaluation of school agriculture program.

178461 Professional Experiences in Agriculture I 1(0-3)
Supplementary experiences in agribusiness and leadership from governmental or private farms.

178462 Professional Experiences in Agriculture II 1(0-3)
Supplementary experiences in agribusiness and leadership from governmental or private farms.

178481 Leadership Training for Agriculture Teachers 3(2-3)
Significance, definition and leadership characteristics of agriculture teacher; theory and method of development of agriculture teacher for being community leader; leadership development by method or group dynamic, and other techniques.

178491 Classroom Research Techniques 3(2-3)
Pre: 178321
Basic concepts and techniques of action-oriented research in agriculture teaching and learning situations. Planning and conducting simple designs of classroom research. Reporting and utilization of research results for instructional purposes.

178496 Selected topics in Agricultural Education 1-3
Exploratory study in agricultural education. Topics of interest vary from semester to semester.

178497 Seminar 1
Undergraduate seminar in agricultural education. Focus on presentation and sharing of experiences on current issues of interest in agricultural education.

178498 Special Problems 1-3
Independent study and scholarly report on selected topics of individual interest in agricultural education.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits (HR)</th>
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</thead>
<tbody>
<tr>
<td>02181111</td>
<td>Introduction to Agricultural and Environmental Education 3(3-0)</td>
<td></td>
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<tr>
<td>02181261</td>
<td>Field Experiences in Agricultural and Environmental Education I 1(0-3)</td>
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<tr>
<td></td>
<td>Practical experiences in sustainable plant production for small farm system. Exploratory field study in agriculture and environment on plant production.</td>
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<tr>
<td>02181262 1</td>
<td>Field Experiences in Agricultural and Environmental Education II 1(0-3)</td>
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<tr>
<td></td>
<td>Practical experiences in sustainable animal production for small farm system. Exploratory field study in agriculture and environment on animal production.</td>
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<tr>
<td>02181322</td>
<td>Management of Agricultural and Environmental Learning Experiences 3(2-2)</td>
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<tr>
<td></td>
<td>Principles and concepts of learning experiences in agriculture and environment. Strategies and techniques of learning experience management in agriculture and environment. Practicum in simulated and actual situations.</td>
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<tr>
<td>02181331</td>
<td>Communication in Agricultural and Environmental Education 3(2-2)</td>
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<tr>
<td></td>
<td>Applications of communication concepts and theories for agricultural and environmental education. Production and use of educational media. Use of information technology. Information access, analysis, and selection for agricultural and environmental education.</td>
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<tr>
<td>02181351</td>
<td>Learning Assessment in Agriculture and Environment 3(2-2)</td>
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<tr>
<td></td>
<td>Learning target and achievement taxonomy in agriculture and environment. Basic principles of learning assessment. Approaches and techniques of assessing knowledge, value, and behavior in agriculture and environment. Assessment results and their applications.</td>
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<tr>
<td>02181361</td>
<td>Field Experiences in Agricultural and Environmental Education III 1(0-3)</td>
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<tr>
<td></td>
<td>Integrated agricultural activities in educational farm, focusing on environment-friendly production and product management.</td>
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<td>02181362</td>
<td>Field Experiences in Agricultural and Environmental Education IV 1(0-3)</td>
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<tr>
<td></td>
<td>Professional experiences in organizations related to agricultural and environmental education. Transfer of learning experiences for management of agriculture and environment in small-scale demonstration farm.</td>
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<tr>
<td>02181390</td>
<td>Cooperative Education Preparation 1(1-0)</td>
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<tr>
<td>02181421</td>
<td>Construction of Local-based Curriculum in Agriculture and Environment 3(2-2)</td>
<td></td>
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<tr>
<td></td>
<td>Concepts of local-based curriculum. Construction of local-based</td>
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</tbody>
</table>
curriculum in agriculture and environment. Curriculum implementation and evaluation at the practitioner level.

**02181441 Planning of Programs and Activities in Agricultural and Environmental Education** 3(2-2)

Fundamentals of planning, implementation, and evaluation of programs and activities to support agricultural and environmental education. Network of organizations and activities in agricultural and environmental education. Direct field experience.

**02181471 School and Community Environmental Management** 3(3-0)

Environmental problems in school and community. Participatory approach in assessment, planning and management of environmental problems in school and community.

**02181481 Environmental Value and Ethics** 2(2-0)

Conceptual basis of value and ethics. Environmental value and ethical concerns. Role of educational and social institutions in value and ethical enhancement. Study of environmental value and ethics. Case studies.

**02181482 Environmental Consumer Education** 2(2-0)


**02181483 Indigenous Knowledge in Agriculture and Environment** 2(2-0)

Nature and importance of indigenous knowledge. Exploration and organization of indigenous knowledge in agriculture and environment. Applications of indigenous knowledge into activities of agricultural and environmental education.

**02181490 Cooperative Education** 6

On-the-job training as a temporary employee according to the assigned project including report writing and presentation.

**02181491 Research Methods in Agricultural and Environmental Education** 3(2-2)

Concepts of research. Role and importance of research in agricultural and environmental education. Scope and problem areas of research in agricultural and environmental education. Approaches and fundamental techniques of research in agricultural and environmental education. Use of research and ethical concerns.

**02181496 Selected Topic in Agricultural and Environmental Education** 1-3

Selected topics in agricultural and environmental education at the bachelor's degree level. Topics are subject to change in each semester.

**02181497 Seminar** 1

Discussion and presentations on issues related to agricultural and environmental education at the bachelor's degree level.

**02181498 Special Problems** 1-3

Study and research in agricultural and environmental education at the bachelor's degree level and compiled into a report.
SPORT SCIENCE (183xxx)

183111  Sport Science I 2(2-0)
Definition, objectives and history of sports science. Introduction to various fields of sports science, sports physiology, sports psychology, sociology in sports and sports coaching.

183112  Sports Science II 2(2-0)
General knowledge in interdisciplinary of biomechanics in sport, sports and medicine and sports nutrition. Integrated basic knowledge on anatomy and biomechanics with human movement. Sport injuries and rehabilitation, basic knowledge about drugs and doping, food related to the health status of athletes. Nutrition and weight control, dietary programs for sportsmen.

183113  Fundamental Biochemistry for Sports Science 3(3-0)
Basic knowledge in biochemistry and general chemistry related to sports science. Structure, characteristics and importance of carbohydrate, protein, lipid, enzyme and other substances. Basic knowledge in general metabolism, biochemistry application on sports science.

183114  Fundamental Physics for Sports Science 3(3-0)
Physics concept related to force, linear motion and angular motion. Basic knowledge in mechanics, thermodynamics in relation to biomechanics in sport.

183115  Application statistics for Sports Science 2(2-0)
Definition, importance and concepts of applied statistics in sports science. The usage of scale, measures of central tendency, variables probability, shapes of frequency distribution, sample and random sampling methods, hypothesis testing, the usage of analysis of variance and data application for sports science.

183121  Anatomical Basis in Sports Science 2(1-2)
Integrated basic knowledge on human body including skeletal, muscles and nervous systems. Anatomical structure related to sports, field trip required.

183122  Physiological Basis in Sports Science 2(1-2)
Definition, scope and functions of physiological basis in sports science. The relationship of human body systems including muscular system, nervous system, cardiorespiratory system and endocrine system. Field trip required.

183141  Racket Sport 2(1-2)
Definition, different types of racket sport. Movement skills in racket sport. Application of skills in racket sport through sports science principles.

183142  Team Sport 2(1-2)
Definition, different types of team sport. Movement skills for team sport. Application of skills in team sport through sports science principles.

183143  Combative Sport 2(1-2)
Definition, different types of combative sport. Movement skills in combative sport through sports science principles.

183144  Rhythmic Activity and Dance Sport 2(1-2)
- Definition, different types of rhythmic activity and dance sport. Movement skills in rhythmic activity and dance sport. Application of skills in rhythmic activity and dance sport through sports science principles.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
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<tbody>
<tr>
<td>183145</td>
<td>Aquatic Sport</td>
<td>2(1-2)</td>
</tr>
<tr>
<td>183146</td>
<td>Thai Traditional Sport</td>
<td>2(1-2)</td>
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<tr>
<td>183147</td>
<td>Adventure Sport</td>
<td>2(1-2)</td>
</tr>
</tbody>
</table>

- Definition, different types of aquatic sport. Movement skills in aquatic sport. Application of skills in aquatic sport through sports science principles.

- Definition, different types of Thai traditional sport. Movement skills in Thai traditional sport. Application of skills in Thai traditional sport through sports science principle.

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<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
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<tbody>
<tr>
<td>183221</td>
<td>Physiology of Exercise I</td>
<td>2(1-2)</td>
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<tr>
<td>183222</td>
<td>Physiology of Exercise II</td>
<td>2(1-2)</td>
</tr>
</tbody>
</table>

- Effect of exercise upon the nervous system, muscular system, respiratory and cardiovascular system.

- Effect of exercise upon the endocrine, digestive and reproductive system, change and control of the body temperature due to the environmental humidity, temperature and altitude levels.

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<tr>
<th>Course Code</th>
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<th>Credits</th>
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<tbody>
<tr>
<td>183231</td>
<td>Introduction to Sports Psychology</td>
<td>2(2-0)</td>
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</table>

- Definition, scope and significance of sports psychology to mind power training, mental readiness during sport training and competition. Psychological techniques and strategies facilitation athletic peak performance. Field trip required.

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<tr>
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<th>Credits</th>
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<tbody>
<tr>
<td>183232</td>
<td>Practicum in Motor Skill Learning</td>
<td>2(0-4)</td>
</tr>
</tbody>
</table>

- Introduction to basic concept, theory and principle in motor skill learning. Factors of motor skill learning which influences to exercise and sports. Practical training in information processing, transfer of learning, feedback and learning intention, learning strategies, reaction and response time. Field trip required.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>183241</td>
<td>Coaching in Track and Field</td>
<td>2(1-2)</td>
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<tr>
<td>183242</td>
<td>Coaching in Swimming</td>
<td>2(1-2)</td>
</tr>
<tr>
<td>183243</td>
<td>Coaching in Racket Sport</td>
<td>2(1-2)</td>
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<tr>
<td>183244</td>
<td>Coaching in Team Sport</td>
<td>2(1-2)</td>
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<tr>
<td>183245</td>
<td>Coaching in Combative Sport</td>
<td>2(1-2)</td>
</tr>
</tbody>
</table>

- Principles and techniques in training track and field. Application of sports science principles in body conditioning, mental readiness, movement analysis. Develop track and field training programs in real sport situation.

- Principles and techniques in training swimming. Application of sports science principles in body conditioning, mental readiness, movement analysis. Develop swimming training programs in real situation.

- Principles and techniques in training racket sport. Application of sport science principles in body conditioning, mental readiness, movement analysis. Develop racket sport training programs in real situation.

- Principles and techniques in training team sport. Application of sports science principles in body conditioning, mental readiness, movement analysis. Develop team sport training programs in real situation.
Principles and techniques in training combative sport. Application of sports science principles in body conditioning, mental readiness, movement analysis. Develop combative sport training programs in real sport situation.

183246  **Coaching in Rhythmic Activity and Dance Sport**  2(1-2)
Principles and techniques in training rhythmic activity and dance sport. Application of sports science principles in body conditioning, mental readiness, movement analysis. Develop rhythmic activity and dance sport training programs in real sport situation.

183247  **Coaching in Aquatic Sport**  2(1-2)
Principles and techniques in training aquatic sport. Application of sports science principles in body conditioning, mental readiness movement analysis. Develop aquatic sport training in real sport situation.

183248  **Coaching in Thai Traditional Sport**  2(1-2)
Principles and techniques in training Thai traditional sport. Application of sports science principles in body conditioning, mental readiness, movement analysis. Develop Thai traditional sport training programs in real sport situation.

183249  **Coaching in Adventure Sport**  2(1-2)
Principles and techniques in training adventure sport. Application of sports science principles in body conditioning, mental readiness, movement analysis. Develop adventure sport training programs in real situation.

183281  **Sports Science Technology**  2(1-2)
Definition, importance, and roles of technology for sport training and competition. Application of sport science technology in the field of sports physiology, sports psychology, sports biomechanics, nutrition in sport, sports medicine, and sport testing instruments for developing sport performance. Field trip required.

183331  **Social Psychology in Sport**  2(2-0)
Definition, importance and roles of social psychology in sport. Relationships between social and sport, social structure affecting to sport participation, effects of audience to mental and performance of the athletes. Theories and principles concerning aggression in sport. Field trip required.

183332  **Psychological Techniques in Sport**  2(1-2)
Introduction to sports psychological techniques. Processes and procedures of the sport psychological techniques for athletes performance. Imagery creation, goal setting, muscle relaxation, concentration training, self-confidence. Evaluation of sport psychological technique training program. Field trip required.

183341  **Scientific Principles of Sports Coaching**  2(1-2)
Application and principles in anatomy, physiology, biomechanics, nutrition, psychology, biology, biochemistry, and medicine in sports in term of sport planning and training program. Field trip required.

183342  **Introduction to Weight Training**  2(1-2)
General knowledge and principles of weight training for developing of muscle strength, muscle endurance, muscle speed and muscle power. Weight training program, assessment and evaluation. Field trip required.

183343  **Body Conditioning for Sport**  2(1-2)
Definition, importance principles and different training methods in sports science for body conditioning and development sport skills. Field trip required.

183344  **Fitness Testing**  2(1-2)
Components of physical fitness, application of fitness equipments, fitness assessment and evaluation. Construct exercise prescription for individual. Field trip required.

183351  Introduction to Biomechanics in Sport  2(1-2)
Definition, scope and basic knowledge in sports biomechanics. Application of biomechanics principles and theories in sports. Analyzed the basic movement related to sport skills and performance. Field trip required.

183361  Introduction to Sport and Medicine  2(1-2)
Definition, scope and the importance of sport and medicine. Basic knowledge of fitness assessment and evaluation, sports medicine management, reading x-ray film, exercise and sports for children, aging and pregnancy. Field trip required.

183362  Introduction to Physical Therapy in Sport  2(1-2)
Basic knowledge, scope, principles and methods of physical therapy related to sport. Application of processes and procedures for preventing, curing, promoting and rehabilitating the athletes condition. Field trip required.

183363  Exercise Prescription for Special Populations  2(1-2)
Characteristics and needs of exercise prescription for special populations. Organization for exercise programs, equipments and spaces for special individuals; handicap, mental retarded and several types of diseases. Field trip required.

183364  Sports Injury and Rehabilitation  2(1-2)

183371  Introduction to Nutrition in Sport  2(2-0)
Importance of nutrition on health, types of nutrients and their value, nutritional requirements in various ages and condition. Assessment of nutritional status and influencing factors. Application of nutrition in health, exercise and sport.

183381  Computer Application in Sports Science  2(1-2)
Computer hardware and software with emphasis on application in sports science, exercise, sport, testing, data searching and analysis.

183431  Practicum in Sports Psychology  2(0-4)
Practice under supervision in sports psychology. Muscle relaxation training, imagery training, goal setting, concentration and mind power training. Develop training programs in sport psychological techniques for athletes. Field trip required.

183441  Practicum in Sports Coaching  2(0-4)
Practice under supervision in sports coaching in government and private organization, clubs or sports associations for direct experiences. Application basic knowledge in sports science, sport planning and training programs. Fields trip required.

183442  Introduction to Sports Management  2(0-4)
Sports management in government and private sectors, management of sports organization in terms of administration, marketing, financial. Processes in management of activities, public relations, creating visions and business perspectives in viewing sport. Field trip required.

183461  Practicum in Sport and Medicine  2(0-4)
Practice under supervision in sport and medicine. Utilization of equipments in prevention of injury. In first aid for sports injuries, bandaging and taping, transportation, referring and initial pre-treatment. Field trip required.
<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>183462</td>
<td>Massage for Health and Sport</td>
<td>2(1-2)</td>
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<tr>
<td>183491</td>
<td>Research Methods in Sports Science</td>
<td>2(2-0)</td>
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<tr>
<td>183492</td>
<td>Practicum in Sports Science</td>
<td>3(0-9)</td>
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<tr>
<td>183497</td>
<td>Seminar</td>
<td>1</td>
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<tr>
<td>183498</td>
<td>Special Problems</td>
<td>2</td>
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</tbody>
</table>

- **Massage for Health and Sport**: Definition, principles and scopes of massage technique for health and sports. Application of massage, Thai massage and Chinese massage for athletes. Field trip required.
- **Research Methods in Sports Science**: Definition, types of research in sports science. Process and procedures in research methodology. Problem selection, random sampling, research tools in sports science, research hypothesis, data collection, statistics for data analysis, research report. Application of research findings for elite performance.
- **Practicum in Sports Science**: General practice under supervision in the field of sports science in relevant places and agencies for 150 hours, areas are composed of physiology of exercise, sports psychology, biomechanics in sport, sports and medicine, nutrition in sport and sports coaching.
- **Seminar**: Presentation and discussion on current interesting topics in sports science at the bachelor degree level.
- **Special Problems**: Study and research in sports science at the bachelor degree level. And compiled into a written report.

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**FACULTY OF ENGINEERING KAMPHAENG SAEN**  
**(201xxx, 207xxx, 212xxx)**

**AGRICULTURAL ENGINEERING**  
**(201xxx)**

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>201211</td>
<td>Applied Drawing for Agricultural Engineering</td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Pre: 208111</td>
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<td></td>
<td>Welding, screw threads drawings; dimensioning tolerancing, geometric tolerancing; surface texture; gears, coupling and key drawings; pipe system drawing; working drawings; basic computer-aided design software, drawings with computer-aided design program applied for agricultural engineering.</td>
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<tr>
<td>210212</td>
<td>Microorganisms in Water and Wastewater</td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Factors affecting the growth of microorganism, relation to environment and role in biodegradation of organic matter, application to wastewater treatment, concepts of microbial control in treatment process, laboratory analysis of microbial wastewater parameters.</td>
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<tr>
<td>210311</td>
<td>Applied Mathematics in Environmental Engineering</td>
<td>3(3-0)</td>
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<td>Differential equations, integral theorem, power series, finite difference method, weighted residual method, finite element method, applications of numerical methods in formulating mathematical models.</td>
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<tr>
<td>201312</td>
<td>Agricultural Machinery Design</td>
<td>4(4-0)</td>
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<td></td>
<td>Pre: 208261</td>
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</table>
Principles of agricultural machine parts design; properties of materials; design of simple machine elements; different types of stress and theories of failure; stress concentrations and fatigue loading; bending beam and shafts; joining parts together with bolted joints, riveted connections, welded joints; power transmission with v-belt drives, roller chain drives and different types of gear; bearings; couplings; spring.

201313 Power for Agricultural Systems 3(2-3)
Pre: 208241
Power used in agriculture, internal combustion engine fundamentals, fuels and combustion, ignition system, ideal fuel air cycle, supercharging and scavenging, lubrication and cooling, performance and testing, remedy and maintenance of tractor engine.

201314 Hydraulic-Pneumatic Systems and Machines 3(3-0)
Pre: 208342 or 209211
Power in hydraulic-pneumatic systems, hydraulic-pneumatic equipment used in the systems, hydraulic pumps, air compressor, control valves and control accessories in hydraulic-pneumatic systems, hydraulic-pneumatic actuators, hydraulic-pneumatic motors, symbols and design of hydraulic-pneumatic circuits, hydraulic-pneumatic systems diagnosis and trouble shooting.

201321 Heat and Mass Transfer 3(3-0)
Pre: 208241
Steady state heat conduction, one and multi-dimension, unsteady state heat conduction, radiation, forced and natural convection heat transfer, boiling and condensation heat transfer, heat exchanger, mass transfer in agricultural product processing.

201322 Agricultural Process Engineering 3(2-3)
Pre: 208241
Mass and energy balance in agricultural product processing, control and record of the processes, drying and dehydration, thermal processing and cold storage of agricultural products.

201323 Physical Properties of Agricultural Products 3(2-3)
Pre: 208261
Physical characteristics and rheology: elastic, viscoelastic properties and vibration; contact problem and damage of agricultural product under static and dynamic conditions.

201324 Refrigeration and Cold Storage System 3(3-0)
Pre: 201321
Principles of refrigeration; compression gas type, absorption type, and special type; refrigeration system: refrigerant, compressor, evaporator, condenser, controlling system, piping and equipment; load calculation of cold storage; ventilation and circulation of air in cold storage; preservation of agricultural products and food with cold storage.

201341 Agriculture Electrification 3(2-3)
Pre: 205201
Utilization of electricity from distribution system; load and wiring; design of farm electricity system; electricity for agricultural processing, heating, cooling, lighting, water supply and motor; special electrical equipment used in farm.

201342 Specific Programming in Agricultural Engineering 3(3-0)
Theory of computer programming; programming of specific work; for the design and research in agricultural machinery, crop production, agricultural chemical application, drying and cooling of agricultural products.

201411 Agricultural Tractors 3(2-3)
Pre : 201313
Types and basic structures of tractor, mechanics of tractor chassis, stability, transmission, hitching and hydraulic system, traction and traction aids. safety operation, tractor test, maintenance and design, tractor operation cost.

201412 Agricultural Machinery 3(2-3)
Pre : 201312
Operation and adjustment of land preparation, planting, crop protection, fertilizer and harvesting equipment; safety for operation; maintenance and agricultural machinery cost.

201413 Theory of Soil – Machine System 3(2-3)
Pre : 209211 or 208342
Physical characteristics of soils, texture and particle size distribution, soil classes, soil structures, soil water content, mechanical behavior of soil element, dynamic properties of soil, tillage machinery, traction machine, effect of soil compaction on plant growth, soil failure.

201414 Chemical Spraying and Dusting Equipment 3(3-0)
Pre : 208342
Problem of pesticide application in Thailand, sprayer and nozzle, design and selection of spraying systems, performance testing, use and calibration of sprayer and duster, chemical drift, effects of vibration and noise of spraying equipment, aerial application and safety precautions.

201415 Agricultural Machinery Production Engineering 3(3-0)
Pre : 201312
Manufacturing process; product design and development processes, ferrous metal; hot and cold working process; forming process by machining; plant layout; planning and production control; cost estimation.

201416 Fishery Machinery Engineering 3(3-0)
Analysis and design of machines for raising and processing aquatic animals, pond digging machines, supply and drainage systems in the pond, aerators, sizing and cleaning of aquatic animals, handling of aquatic animals, mixing and feeding machines, waste treatment machines, equipment for water quality examining, fishery catching machines and packaging.

201417 Hydraulic System and Control 3(3-0)
Pre : 208342
Fluid power in hydraulic system; components of hydraulic system; pumps, cylinders and hydraulic motors, control valves, hydrostatic drives, hydraulic fluids, hydraulic symbols and circuits; design of hydraulic system; hydraulic systems of tractors; analysis and trouble shooting of hydraulic systems: transfer function and block diagram; analysis of time and frequency response; analysis of stability of linear feedback system.

201418 Power and Agricultural Machinery Management 3(3-0)
Agricultural mechanization in Thailand, relationship of agricultural production and level of mechanization, performance and capacity of prime movers and agricultural machines, time and working schedules, system rotation of using agricultural machines, planning agricultural machinery protection, cost analysis, depreciation, break-even point and pay back period.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tr>
<td>201419</td>
<td>Theory of Soil-Machine System</td>
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<tr>
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<td>Physical characteristics of soil, texture and particle size distribution, soil classes, soil structures, soil water content, mechanical behavior of soil element, dynamic properties of soil, tillage machinery, traction machine, effect of soil compaction on plant growth, soil failure.</td>
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<tr>
<td>201421</td>
<td>Agricultural Process Equipment</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 208261</td>
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<tr>
<td></td>
<td>Analysis and design of agricultural product processing equipment, size reduction, separation and cleaning machines, techniques and use of heat exchanger, distillation, extraction and packaging.</td>
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<tr>
<td>201422</td>
<td>Agricultural Product Handling Equipment Design</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 208261</td>
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<tr>
<td></td>
<td>Principles and techniques of agricultural products handling; principles and design of chain; trolley; belt, screw, bucket and vibrating conveyors.</td>
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<tr>
<td>201423</td>
<td>Thermal Processing and Food Freezing</td>
<td>3(2-3)</td>
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<td></td>
<td>Pre : 201321</td>
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<tr>
<td></td>
<td>Principles of food processing, principles of thermal processing, heat exchanger, evaluation of thermal processing, chemical and biological changes of products in thermal processing, refrigerator, precooling, freezing, calculation of freezing time, thawing.</td>
<td></td>
</tr>
<tr>
<td>201424</td>
<td>Drying and Storage of Agricultural Products</td>
<td>3(2-3)</td>
</tr>
<tr>
<td></td>
<td>Pre : 201322</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Theory of drying, sun drying, principles of air flow, drying of agricultural products by heated air, moisture content determination, relationship of moisture and temperature, equilibrium moisture content, design of dryers, storage of agricultural products and silos.</td>
<td></td>
</tr>
<tr>
<td>201425</td>
<td>Thermal System Design Engineering</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 201321</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Thermal engineering design for appropriate systems and optimum systems, development of thermal equations from raw data, development of performance equations for heat exchangers from fundamental concepts, simulation of thermal systems, financial feasibility analysis of thermal systems, analysis of thermal problems for optimum solutions.</td>
<td></td>
</tr>
<tr>
<td>201426</td>
<td>Waste Treatment in Agricultural Processing Plant</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>201427</td>
<td>Postharvest Machinery for Fruits and Vegetables</td>
<td>3(2-3)</td>
</tr>
<tr>
<td></td>
<td>Pre : 201322</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Packing house operations; sorting principles; machines for sorting, sizing, precooling, waxing, drying, ripening, labelling, packaging; packing house design; quality check by nondestructive techniques, special postharvest machinery for fruits and vegetables.</td>
<td></td>
</tr>
<tr>
<td>201428</td>
<td>Rice Mill Engineering</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 201322</td>
<td></td>
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<tr>
<td></td>
<td>Design of rice mill systems; design of rice mill machinery; cleaning and hulling of paddy, separation of rice husks, whitening and polishing, grading of milled rice; packaging; rice quality testing equipment.</td>
<td></td>
</tr>
<tr>
<td>201429</td>
<td>Refrigeration and Cold Storage System</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Pre : 201321</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ice and cold storage systems for agricultural products.</td>
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</tr>
</tbody>
</table>
Principles of refrigeration; compression gas, absorption and special type; refrigeration systems; refrigerant, compressor, evaporator, condensor, controlling system, piping and equipment; load calculation of cold storage; psychrometric and ventilation, circulation of air in cold storage and duct system design; air conditioning systems; preservation of agricultural products and food with cold storage, low temperature refrigeration system and cryogenic technique.

210431 Environmental System Management 3(3-0)
Environmental pollution problems, priority ranking of environmental pollution problems, monitoring of environmental quality, organizations and institutes related to environmental management, laws and standard values related to environmental pollution, standard system for environmental management, environmental risk analysis and assessment, an analysis for decision making in environmental problem protection, case studies.

201432 Agricultural Waste Water 3(3-0)
Pre : 208342 or 209211
Characteristics of agricultural waste water, source of toxicity, limitation, acceptable level of toxicity, waste water inspection techniques, primary and secondary waste water treatment, control of toxicity in water resources.

201433 Ergonomics in Agricultural Engineering 3(3-0)
Model and research of the principles of human working with machine and environment; body measurement and motions; hand and foot operated controls, lifting and carrying, workspace layout; perception of sight, sound, scent, taste, and feeling, physical load and processes, mental load and processes, reduction of hazards in agriculture, application of ergonomics principles in the design of agricultural machinery and processes in tropical climates.

201434 Soil and Water Management Engineering 3(3-0)
Precipitation, infiltration, evaporation and transpiration; relationship of soil, water and crop; water resources development; principle of irrigation and drainage; control of soil erosion, soil and water conservation.

201435 Ergonomics in Agricultural Engineering 3(2-3)
Model and research of the principles of human working with machine and environment; body measurement and motions; hand and foot operated controls, lifting and carrying, workspace layout; perception of sight, sound, scent, taste, and feeling, physical load and processes, mental load and processes, reduction of hazards in agriculture, application of ergonomics principles in the design of agricultural machinery and processes in tropical climates.

201436 Measurement and Instrumentation 3(2-3)
Pre : 205201 and 205202
Principles of measurement methods; analog and digital measuring instruments; types of transducer; measurement in engineering experiments; measurement of temperature, flow, pressure, stress, strain, torque, power, sound; measurement accuracy and instrument calibration; amplifying and recording of signals; recording devices; signal processing and data acquisition by computer.

201441 Agricultural Systems Engineering 3(3-0)
Methods and use of system engineering techniques for solving agricultural engineering problems, project management and planning in agricultural engineering by program and evaluation and review technique and critical path method, time and project control, analysis of network and management, project acceleration, aggregate planning, agricultural system management by linear programming.
201442 Agricultural Building Structural Design 3(3-0)
Pre : 208261
Principles of farmstead for planning of agricultural buildings, basic analysis of structures; wood, steel, reinforced concrete structures; animal buildings, greenhouse buildings, fishery buildings.

201443 Renewable Energy for Agriculture 3(3-0)
Pre : 420112
Application of solar, wind, water energy, wood, biogas and agricultural wastes; calculation of solar intensity, solar collector, solar pond, solar cell; charcoal production and furnaces; measuring instrument for solar and wind energy; small turbines and biogas reactor.

201444 Livestocks Machinery 3(3-0)
Forage, principles of cutting and chopping, design of chopping machines, feed materials, physical properties of feed materials, grinding and design of grinding machines, mixing and design of mixing machines, pelleting and pelleting machines, physical properties of feed pellet and testing, total mixed ration, dust reduction for feed, automatic feeding machines, drinking water equipment, feed production center and machines, medicinal plants processing machines for livestocks, milking machine, milking parlour, machines in milk collection center.

201445 Agricultural Environmental Engineering 3(3-0)
Pre : 208241
Animal and environments, heat and mass transfer, humidity and its effect on animal, heat and vapor transmission through buildings, ventilation, integrated farming systems, animal waste, plant residue, utilization of crop residue and animal waste for rural development.

201446 Computer Application for Agricultural Engineer 3(2-3)
Application of softwares in research and report making, computational softwares for agricultural engineering work.

201447 Silos 3(3-0)
Pre : 208261
Principles of silos, handling systems of industrial silo, mechanical behavior of material exerted in silo, safe grain storage, drying of grain, site selection for silo construction.

201448 Numerical Methods for Engineers 3(3-0)
Pre : 417268
Numerical solution for cable design, numerical solution for electrical circuit design, approximation from spring tension test, determination of a length of corrugated surface using numerical integration, and numerical solution for rigid beam design.

201451 Design of Harvesting Machinery 3(3-0)
Pre : 201312
Physical characteristics of agricultural products, principles of cutting of agricultural materials and types of cutter, principles of reels and pullers, conveying of plant stem, threshing, seed cleaning systems, specific harvesting equipment.

201452 Feed Back Control System for Agricultural Engineering 3(3-0)
Pre : 417268
Laplace transform and differential equation solving, transfer function and block diagram, open loop control system, closed loop control system, transient response of systems, state space representation and analysis, frequency response of systems, Bode
diagram, Nyquist diagram, Routh-Hurwitz stability criterion, stabilizing technique and system performance, hydraulic system and servo, process control, different types of control system in agricultural engineering.

201453  Design Practice of Agricultural Machinery  2(1-3)
Pre : 201312
Principles of design; analysis of designing of agricultural machinery and constraints; design practice of shafts, transmission system of v-belt and chain; drawing of transmission system of v-belt and chain.

201495  Agricultural engineering Project Preparation  1(0-3)
Needs for solving agricultural engineering problems, literature review, preparation of project proposal, researchers’ ethics.

201496  Selected Topics in Agricultural Engineering  1-3
Selected topics in agricultural engineering at the bachelor level, topics are subject to change in each semester.

201497  Seminar  1
Presentation and discussion of interesting topics in agricultural engineering at the bachelor level.

201498  Special Problems  1-3
Study and research in agricultural engineering at the bachelor level and complied into a report.

201499  Agricultural Engineering Project  2(0-6)
Project of practical interest in various fields of agricultural engineering.

IRRIGATION ENGINEERING
(207xxx)

207211  Introduction to Irrigation Engineering  3(3-0)
Principles and methods of irrigation engineering, characteristics of irrigation works in the past and present, irrigation project components, soil-water-plant relationships, yield response to water, crop and irrigation water requirements, irrigation scheduling, water application methods, methods of water delivery and drainage systems.

207251  Engineering Statistics  3(3-0)
Basic statistics, probability theory, probability distributions, sampling and estimation, hypothesis testing, regression analysis, experimental design and analysis of variance, computer aided in statistical analysis.

207301  General Irrigation  3(3-0)
Characteristics of irrigation works in the past and present, irrigation project components, basic soil-water-plant relationships, crop water requirements, methods of water delivery and methods of water application, introduction to planning of farm irrigation and drainage systems, land consolidation.

207311  Engineering Hydrology  3(2-3)
Hydrological process and measurement, rainfall-runoff relation, statistics for hydrology, hydrological analysis and design, reservoir analysis and design.

207312  Drainage Engineering  3(3-0)
Pre : 209211
Drainage systems and components, design discharge, hydraulics of drainage works, design and layout of main drainage system, agricultural land drainage, urban sewer systems, wastewater treatment.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>207313</td>
<td>Groundwater Engineering</td>
<td>3(3-0)</td>
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<tr>
<td>Pre : 417167</td>
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<tr>
<td></td>
<td>Characteristics and uses of soil moisture measuring instruments, plant water stress measuring instruments, agro-climatological measuring instruments, water discharge measuring instruments, automatic water application control instruments, fertigation application instruments, chemical concentration control instruments of water application system, water control instruments for both open channel and close conduct systems, statistical methods for determination of measurement accuracy, application of instruments to increase irrigation efficiencies.</td>
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<tr>
<td>207321</td>
<td>Design of On-farm Irrigation Systems</td>
<td>3(2-3)</td>
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<tr>
<td>Pre : 207211</td>
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<td></td>
<td>Components of farm irrigation systems; selection of water application methods, design and evaluation of surface, sprinkler and micro irrigation systems; land grading; design of water delivery systems; farm water control and drainage systems; cost-benefit analysis of farm irrigation systems development.</td>
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<tr>
<td>207341</td>
<td>Water and Land Resources Management Engineering</td>
<td>3(3-0)</td>
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<tr>
<td>Pre : 207211</td>
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<td></td>
<td>Watershed management, organization and responsibility, socio-economic and environmental conditions of land and water resources systems, land suitability and land use planning, pollution in soil and water, land and water conservation engineering, information technology for land and water resources management.</td>
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<tr>
<td>207342</td>
<td>Engineering Management</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Principles of management, methods of increasing productivity, human relation, engineering safety, commercial laws, basis of engineering economics, finance, marketing, engineering project management.</td>
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<tr>
<td>207351</td>
<td>Computer Application for Irrigation Engineering</td>
<td>3(2-3)</td>
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<tr>
<td>Pre : 204111 and 207211</td>
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<tr>
<td></td>
<td>Application of computer on hydrology, hydraulics and water resources system analysis, computer aided design and drawing in irrigation engineering.</td>
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<tr>
<td>207361</td>
<td>Soil and Water Conservation Engineering</td>
<td>3(3-0)</td>
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<tr>
<td>Pre : 209241</td>
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<td>Runoff, soil erosion and its control, soil and water conservation structures, engineering planning and design in soil and water conservation.</td>
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<tr>
<td>207391</td>
<td>Irrigation Field Study</td>
<td>1</td>
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<tr>
<td>Pre : 207211</td>
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<td></td>
<td>Field study on water management, irrigation system, irrigation structures and farm irrigation system during construction and operation, report writing.</td>
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<tr>
<td>207411</td>
<td>Groundwater Engineering</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>Pre : 417267 and 209211</td>
<td></td>
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<tr>
<td></td>
<td>Groundwater occurrence, characteristics of aquifers, groundwater resources exploration, Darcy’s Law and basic differential equation for groundwater movement, aquifer test, flownet analysis, design and construction of water well, yield test of well, maintenance, groundwater recharge, groundwater quality, development and management of well.</td>
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<tr>
<td>207421</td>
<td>Design of Canal and Conveyance Structures</td>
<td>3(2-3)</td>
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<tr>
<td>Pre : 20331</td>
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</tr>
</tbody>
</table>
General characteristic of irrigation systems, irrigation systems layout, design of earth canal and concrete lining canal section, design of transition, design of bench and elevated flume, design of drop structure, design of box culvert, design of inverted siphon and engineering drawing.

**207422 Design of Small Dams and Water Control Structures** 3(3-0)
Pre: 2073331 and 203352

Design of small earth dams, concrete weirs, spillways, energy dissipators, head regulator, bank protection, construction cost estimation of water resource works and planing of construction.

**207423 Design of Pipe and Pressurized Irrigation Systems** 3(3-0)
Per: 209211

Pump and pipe systems, selection of pumps and accessories, hydraulic of pipe flow, design of pipe and control systems, design of sprinkler and micro irrigation, principles of mechanized irrigation systems, design of fertigation systems.

**207424 Design of Small Dams** 3(3-0)
Pre: 203352

Types and selection of small dams data, for small dam design, design of small earth dams and appurtenant structures, rock-filled dams, concrete gravity dams, design of diversion weirs, checking and maintenance of small dams and weirs.

**207431 Feasibility Study and Environmental Impact Assessment of Water Resources Development Project** 3(3-0)
Pre: 207221

Planning of water resources development project, considerations on engineering, socio-economic, agriculture and environmental issues in planning of water resource project, cost and benefit analysis, environmental and social impact assessment, preparation of study report, case study.

**207432 Irrigation Economy** 2(2-0)

Time values of money, benefit-cost analysis, cost allocation, repayment, economic evaluation for irrigation and water resources projects.

**207441 Management of Water Resources Project** 3(3-0)
Pre: 207211

Project management, institution and organization, socio-economic and environment implications of water resources project, water resources project management, operation and maintenance, monitoring and evaluation, computer application in project planning and management.

**207451 Computer Application for Irrigation Engineering** 3(2-3)
Pre: 207311 and 204111

Application of computer programming to irrigation engineering works including analysis, design, management and maintenance.

**207491 Research Methods in Irrigation Engineering** 1(1-0)

National research policy and direction in irrigation and water resources engineering, topics in irrigation engineering research, document search, statistical method for research, writing research proposal, writing and presentation of the research result.

**207496 Selected Topics in Irrigation Engineering** 1-3

Interesting topics in irrigation engineering.

**207497 Seminar** 1

Presentation and discussion of current topics of interest in industrial engineering.

**207498 Special Problems** 1-3
Individul study and research at undergraduate level, a report is required.

207499 Irrigation Engineering Project
An interesting project in various fields of irrigation engineering.

FOOD ENGINEERING
(212xxx)

212211 Food Machinery Drawing 1(0-3)
Pre: 208111
Dimensional tolerances; geometrical tolerances; surface texture; drawing of screw threads, gear, cam, fastener, welding, piping; detail and assembly drawing.

212311 Introduction to Food Chemistry and Microbiology 3(2-3)
Food components and their chemical and physical properties; chemical and biochemical changes of food components during processing and storage, food additives, classification of microorganism involving in food products; relationship between food product properties and microbial species and content; microbial utilization in food industry, microbial spoilage of food; its effect and hazard to the health.

212312 Engineering Physics of Food Materials 3(2-3)
Pre: 206221
Principles of shape and size determination; mechanical, thermal, electrical and light properties of food materials, analysis and utilization of these data for designing of storage, handling, and processing of food materials.

212313 Principles of Food Engineering 3(3-0)
Pre: 208241
Mass and energy balance in food engineering; processing of food products; principles, components and operations of processing equipments in food industry.

213314 Principles of Heat Transfer in Food Industry 3(3-0)
Pre: 208241
Temperature differences and rate of heat transfer per unit area in food industrial system; heat conduction equations and problem solving in steady and unsteady state; heat radiation equations; heat convection equations of liquid foods; heat exchanger; state changes of food products.

212315 Unit Operations in Food Engineering I 3(3-0)
Pre: 420112
Characteristics of solid particles; kinetic theory of particles; and principles of particle separation by mechanical methods: filtration, sedimentation; size reduction; crystallization; and fluidization; mixing of solid, liquid and paste foods; extrusion of liquid and solid foods; power consumption in each unit operations.

212316 Thermodynamics for Food Engineering 3(3-0)
Pre: 208241
Thermodynamics cycles, thermodynamic property relation, multi-component system, multi-component phase equilibrium, solution thermodynamics, chemical reaction equilibria, applications of thermodynamics principle in food industries.

212317 Laboratory for Food Engineering 1(0-3)
Operational principle of the equipment and instruments used in food processing and factor adjustments of the machines; various types of drying, evaporation,
extraction, cutting, crunching, freezing, thawing, canning, extrusion, homogenization, separation.

212318  Food Rheology  3(3-0)
Pre : 212312
Rheological testing theory, mathematical relationships to explain fundamental of rheological testing, analytical tools to determine rheological properties from experimental data, standard techniques in rheology measurement for fluid and semi-solid foods, principle of polymer rheology related to flow behavior of food and applications in food industries.

212321  Refrigeration for Food Engineering  3(3-0)
Pre : 208241 and 212316
Principles of refrigeration, vapor compression refrigeration, absorption refrigeration, refrigerants properties, refrigeration system components, refrigerant piping and accessories, control system, cold storage, cooling load calculation, food preservation by cold storage.

212331  Manufacturing Processes for Food Machinery  3(2-3)
Pre : 208281 and 213211
Material properties used in manufacturing of food processing machinery; work part preparing machines: cutter, drilling machine, folding machine, lathe, shaper; welding and machine part assembly.

212341  Computer for Food Engineering  3(2-3)
Pre : 208342
Application and usage of application software for food machinery design, management, and food product processing; computer usage for research and experimental systems; data transferring and storing with microcomputer; programming for specific work.

212342  Hydraulic and Pneumatic Systems in Food Industry  3(3-0)
Pre : 208342
Hydraulic and pneumatic components, hydraulic and pneumatic cylinders, hydraulic and pneumatic motors, control valves and control accessories, symbols and circuit layout of hydraulic and pneumatic system, design of hydraulic and pneumatic system, hydraulic and pneumatic system in food machinery, analysis and correction of hydraulic and pneumatic system.

212361  Food Engineering Economy  2(2-0)
Pre : 206221
Structure of costs and principle of the accounting, economic analysis for decision making in food industry plant design, investment analysis, replacement analysis, break-even analysis, depreciation and income tax considerations, economic risk analysis.

212411  Unit Operations in Food Engineering II  3(3-0)
Pre : 212315
Study and design of unit operations in food industry for diffusion and mass transfer systems between phases; phases equilibrium, distillation, evaporation, absorption, leaching, extraction, adsorption and ion exchange.

212412  Energy Utilization in Food Engineering  3(2-3)
Pre : 205202 and 208241
Energy sources utilized in food industry; energy production and distribution systems, control systems of energy utilization, system components; energy saving techniques.

212413  Energy Management for Food Engineering Laboratory  1(0-3)
Pre : 202412
Energy sources utilized in food industry; energy production and distribution systems, control systems of energy utilization, system components; energy saving techniques.

212421 Food Products Conveying Equipments Design  3(2-3)
Pre : 208361
Adjusting and installing of food product conveying equipment; designing of belt, chain, bucket, pneumatic, roller and hanging rails conveyor.

212422 Mechanics of food Machinery  3(3-0)
Pre : 208222
Linkages in food machinery, position analysis, analysis of velocity and acceleration of moving parts, velocity ratio of gear trains, static and inertia force analysis of linkages and gear trains of machine balancing of rotating and reciprocating mass.

212423 Food Machine Manufacture  3(3-0)
Pre : 208361
Production and manufacturing processes of food machine; machining accuracy, surface quality, allowance and tolerance in manufacturing; production planning; metallurgy; balancing of work pieces and assembly; repair and maintenance.

212424 Fluid Machinery in food Industry  3(3-0)
Pre : 208342
Classification and characteristics of pumps, blowers and compressors used in hydraulic and pneumatic system; calculation of capacity and efficiency of fluid machinery; design of piping system for fluid distribution; application and solution of occurring problems of fluid machinery in food industry.

212431 Food Freezing  3(2-3)
Pre : 208241, 212316 and 212321
Design of food freezing equipments; properties of frozen foods, freezing-point elevation, ice crystals formation in frozen foods and enthalpy changes during freezing; freezing time prediction by Plank’s equation and others; frozen food storage and thawing.

212432 Food Dehydration  3(2-3)
Pre : 212313
Basic drying processes, psychrometrics and drying rate; prediction of drying time and equilibrium moisture content; design of food dryers, fixed bed, moving bed, fluidization, freeze-dry and storage of dried food.

212433 Evaporation of Fluid Food  3(2-3)
Pre : 212411
Thermodynamics of evaporation, boiling-point elevation and heat transfer during evaporation; balance of mass and energy in single and multi-effect evaporators; design of evaporation systems and improvement of evaporating efficiency; various types of evaporators for foods.

212434 Dairy Process Engineering  3(2-3)
Pre : 212411
Application of mechanical separation in dairy product industry; design of centrifuge equipments especially milk fat centrifuge; ultrafiltration and homogenizer; design of thermal processing for pasteurization, sterilization and ultra high temperature in dairy product industry; equipments of cheese making, ice cream, yoghurt, cleaning in place and dairy products packaging.

212441 Automatic Control in Food Manufacturing Processes  3(3-0)
Pre : 205201
Principles of automatic control; linear and non-linear control systems; transfer function and block diagram; open loop and closed loop control; solving equations by Laplace transform, response to inputs, feedback system, analysis of stability of the system by the method of root locus and the principle of Nyquist stability criterion; application of control engineering system to food engineering in food machinery and food processes.

212442 Instrument and Measurement System for Food Processing 3(3-0)
Pre: 206221
Characteristics and application of analog and digital instrumentation to food engineering problems, basic measurement theory, concepts of mechanical and electrical transducers, signal conditioning, recording devices, analysis of experimental data using statistical methods.

212451 Waste Treatments in Food Industry 3(2-3)
Pre: 212311
Characteristics and components of various wastes from food industry; waste water flow rate, basic in waste water management; systems and processes of waste management in food industry and design of waste treatment in food industry.

212461 Food Plant Design 3(3-0)
Pre: 206221
Principles of food industrial plant design; plant location analysis, various methods of location comparison; analysis of plant layout size, plant layout, systematic plant layout design; selection of equipments; flow diagram of the process of food materials, adjusting the balance of route; management of production system; material handling; various techniques in plant layout and design, plant layout by computer, food plant sanitary.

212462 Quality Control in Food Industry 3(3-0)
Pre: 206221
Industrial quality control principles, design of quality control system, application of control charts, process capability analysis, statistical process control techniques, acceptance sampling plans, control and testing by sampling, techniques for identifying product details, reliability and product life testing, industrial standards in quality control, International Organization for Standardization system standards; Hazard Analysis Critical Control Point and Good Manufacturing Practices principles and applications in food quality assurance.

212463 Food Production Planning and Control 3(3-0)
Pre: 206221
Organization of the food production function in food industry; control to meet the quality and quantity price and specification requirements; plant location and process selection; production forecasting, raw materials handling, resource allocation and scheduling, quantitative approach to decision making and PERT and CPM analyses.

212464 Food Plant Management 2(2-0)
Pre: 206351
Organization and operation of modern food industry; study of fundamentals of organization, the operation of function elements and associate problems; nature of management, management theories, food production management for economic value, evaluation and engineering management techniques; food engineering office, time, perceptual and culture factors.

212465 Food Machinery Maintenance Engineering 3(3-0)
Pre: 212462
Maintenance concepts, failure statistics and causes analysis, preventive maintenance system, planning and control of maintenance activities, spare parts controls, human resources for maintenance works, maintenance performance measurement and system appraisal for improvement.

<table>
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<th>Credit</th>
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<tbody>
<tr>
<td>212471</td>
<td>Food Engineering Analysis</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 417267</td>
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<tr>
<td>212495</td>
<td>Food Engineering Project Preparation</td>
<td>1(0-3)</td>
</tr>
<tr>
<td></td>
<td>Interesting food engineering project; project preparation and plan as well as its presentation.</td>
<td></td>
</tr>
<tr>
<td>212496</td>
<td>Selected Topics in Food Engineering</td>
<td>1-3</td>
</tr>
<tr>
<td></td>
<td>Interesting topics in food engineering.</td>
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<tr>
<td>212497</td>
<td>Seminar</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Presentation and discussion on topics of interest in food engineering.</td>
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</tr>
<tr>
<td>212498</td>
<td>Special Problems</td>
<td>1-3</td>
</tr>
<tr>
<td></td>
<td>Research on various topics in food engineering.</td>
<td></td>
</tr>
<tr>
<td>212499</td>
<td>Food Engineering Project</td>
<td>2(0-6)</td>
</tr>
<tr>
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<td>Pre: 212495</td>
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<tr>
<td></td>
<td>Continuing project from the food engineering project preparation.</td>
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</table>

**FACULTY OF LIBERAL ARTS AND SCIENCE**

**(700xxx – 749xxx)**

**ENGLISH**

**(721xxx)**

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Credit</th>
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<tr>
<td>721101</td>
<td>Introduction to Business</td>
<td>3(3-0)</td>
</tr>
<tr>
<td></td>
<td>Business and economic system, business and social responsibility, types of business organization, business administration and management, production and purchasing, marketing, business finance and investment, business accounting, communication and transportation, business tax, international trade, risk and insurance, small business management, business law.</td>
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</table>

**GENERAL SCIENCE**

**(723xxx)**

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<tr>
<td>723111</td>
<td>Introduction to Agricultural Economic</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 722181</td>
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<tr>
<td></td>
<td>Accelerating factors and necessary elements of agricultural development in developing countries. Role of natural resources, population, capital, and technology in agricultural and economic development. Overall structure of agricultural economy of</td>
<td></td>
</tr>
</tbody>
</table>

**723221  Principles of Farm Management** 3(3-0)  
Pre : 723111  
Decision-making process of a farmer as a farm manager. Economic principles applied to farm management. Analysis of capital and land requirements. Selecting and integrating farm enterprises. Farm accounts and accounting analysis. Farm planning and farm budgeting. Farm layout, Management of crops, livestock, labour, mechanization, building, and water resources. Influences of changes affecting farm management.

**COMPUTER SCIENCE**  
(729xxx)

**729101  Introductory Computer** 2(1-2)  
History and development, types, structures and working systems of computers. Number system and representation. Structure programming, chart, flowcharts and problem analysis. Computer Languages, applications and communication.

**ECONOMIC BOTANY**  
(736xxx)

**02736421  Techniques for Preparation and Preservation of Plant Specimen** 3(1-6)  
Pre : 01401114  
Techniques for and methods of preservation of fresh and dried tissues. Preservation of plant specimens soaked in fixative solution for plant research and taxonomic studies. Various methods of preparing temporary and permanent slides for microscopic research in botany. Field trips included.

**02736422  Plant Anatomy** 3(2-3)  
Pre : 01401114  
Plant growth and development from cell to tissue. Characteristic and function of tissue and structure of plant organs. Adaptation of specific functions and structure to various environmental conditions.

**02736423  Plant Growth and Development** 3(2-3)  
Pre : 01401351  
Processes of growth and development, germination, root formation, vegetative growth, flowering, fruit setting, fruit development, abscission, senescence, and dormancy. Internal and external factors affecting growth and development.

**02736431  Plant Genetic Resources** 3(2-2)  
Pre : 02416311

02736432  Biodiversity  3(3-0)
Pre : 01424111

02736433  Phytoplankton  3(2-3)
Pre : 02401114
Biology, identification, distribution and diversity of phytoplankton. Roles and functions of plankton in the ecosystem. Methods and techniques on surveys and samplings for population study and evaluation. Field trip included.

02736434  Biology of Cyanobacteria  3(2-3)
Pre : 01419214

02736436  Ecology of Economic Plant  3(3-0)
Pre : 01424111

02736437  Mangrove Ecology  3(3-0)
Pre : 02424111

02736451  Analysis of Plant Organic Compounds  3(2-3)
Pre : 01403221
Principle of separation, purification and characterization of plant organic compounds, proteins, nucleic acids, pigments, lipids and other economic substances. Equipment, methods, and techniques in analysis.

BIOLOGICAL SCIENCE
(738xxx)

02738311  Introduction to Behavioral Study  3(2-3)
Pre : 02424111
History and study approaches of behavioral study; basic knowledge of behaviors in their physiology, development, ecology, and evolution, examples of animal and plant behaviors in response to their environments; applications of behavioral study. Field trip included.

02738321  Plant Bioregulators and Applications  3(3-0)
Pre : 01401114
History and property of plant bioregulators and application in plant growth and development.
02738361 Introductory Molecular Biology 3(3-0)
Pre : 01424111

02738411 Entrepreneurship for Scientists 3(3-0)

02738431 Principles of Zoogeography 3(3-0)
Pre : 01423113
Principles of zoogeography, distribution pattern; history, the interaction of genetics and ecology in development of speciation; the species equilibrium theory, the evolutionary zoogeography of communities and major zoogeographical regions of the world.

02738441 Applied Microbiology 3(2-3)
Pre : 01419211
Application of microorganisms in food, industrial, medical, agriculture and environmental biotechnology. Application of microbialmolecular genetics techniques in microbial strain development and metabolic engineering. Field trips included.

02738451 Applied Biochemistry 3(3-0)
Pre : 01402313
Application of biochemistry in food, pharmaceutical, agriculture, industry, medicine and environment. Field trips included.

02738452 Physical Chemistry in Biological Science 3(3-0)
Pre : 01403111
Principles of biochemical thermodynamics, kinetics and mechanisms of biochemical reaction, electrochemistry in biological system, enzyme kinetics; Application in biological science.

02738461 Gene Transfer Technology in Plant 3(3-0)
Pre : 01416311
Principles of recombinant DNA techniques, gene cloning, plant cell and tissue culture, gene transfer and application of genetic engineering in plants.

02738471 Biological Science Photography 3(2-3)
Pre : 01424112
Principles and techniques of biological science photography. Field trips included.

02738472 Instrument for Biological Science 3(2-3)
Pre : 01424112
Principles and methods of using the instruments for biological science. Field trips included.

02738473 Computer Application in Biological Science 3(3-0)
Pre : 01418112 or 01418113
Data communication and internet, the study on internet, information system, database system and computer application in biological science.

02738481 Community Ecology 3(3-0)
Pre : 01424381
Principles of community ecology, characteristics and patterns, factors affecting, community structure, stability, food web relationships, energy transfers and succession. Application of community ecology to solve problems concerning the management of natural, altered or reconstructed communities.

02738496 Selected Topics in Biological Science 3(3-0)
Selected topics in biological science at bachelor’s degree level. Topics are subject to change each semester.

02738497 Seminar 1
Presentation and discussion on current interesting topics in biological science at bachelor’s degree level.

02738498 Special Problems 3
Study and research in biological science at the bachelor’s degree level and compile into a written report.

02738499 Practicum in Biological Science 1
Specific practicum for technical and professional experience in Biological Science.

INFORMATION TECHNOLOGY
(739xxx)

02739111 Computer and Information System 3(3-0)
Evolution of computers, computer system, hardware, software, computer structure and operations, number systems, data and information systems, fundamentals of data processing, computer languages, principles of problem solving by computer, structure programming, data communication and Internet.

02739211 Principles of Programming 3(3-0)
Pre : 02739111
Techniques for structure programming, debugging, testing, data processing, array, subprogram and parameter, pointer.

02739212 Computer Programming I 3(3-0)
Pre : 02739211
Principles of structure programming, multidimensional arrays, string, record, set, subprograms and parameters, pointer, file, algorithms for linear search and binary search, sorting.

02739213 Computer Programming II 3(3-0)
Pre : 02739211
Concept of object oriented programming, designing and programming development, skills for application programming development, object oriented programming languages and its applications.

02739214 Principles of Object Oriented Programming 3(3-0)
Pre : 02739211
Basic concepts of object-oriented software design and development, program structures of object-oriented language, object definitions, object attributes and behaviors, classes, inheritance, array, reuse of software components, graphics, creating and manipulating dynamic data structures.

02739221 Electronic Commerce 3(3-0)
Pre : 02739111
Basic concepts of electronic commerce, e-commerce design and development, e-commerce strategies, payment system, marketing, public relations, security system, trends of e-commerce and case studies.

02739231 Data Structure 3(3-0)
Pre : 02739211
Principles of structure programming; data structures array, record, stack, queue, linked list, tree and graphs, techniques for sorting and searching.

02739241 Internet Technology 3(3-0)
Pre : 02739211
Internet and information service, world wide web, data security level on network, electronic commerce, digital signature, wireless and information technology, application on internet, future trend of internet technology.

02739311 Introduction to Computer Organization and Architecture 3(3-0)
Pre : 02739211
Basic concept of the organization and architecture of computers, CPU, register, arithmetic and logical unit, control unit, data and command representation, computer evolution, virtual memory, cache memory, input and output architecture, parallel processing, pipe line processing.

02739312 Internet Programming 3(3-0)
Pre : 02739241
Introduction to Internet, software for Internet and web, Internet programming design and development, computer language for Internet programming, web database, web server.

02739321 File Management 3(3-0)
Pre : 02739231
Basic physical characteristics of peripheral storage devices, definition of record, file, file organization, compaction, file processing, sorting and merging.

02739322 Management Information System 3(3-0)
Pre : 02739211
Roles and importance of information systems in management and decision-making, technology application in the development of management information system, information systems for organization management, organization and planning.

02739323 Information System Analysis and Design 3(3-0)
Pre : 02739321
Basic step of analysis, tools for system analysis, system development life cycle, system flowchart, decision table and decision tree, computer information system design, procedural design, user interface design, database design, project management design, documentation, implementation and evaluation, cost effectiveness analysis, case studies.

02739324 Electronic Commerce Design and Development 3(3-0)
Pre : 02739241
Basic elements and structure of electronic commerce, Internet and Extranet, user interface design, security system, electronic payment system, web programming, implementation and evaluation of electronic commerce, case studies.

02739341 Business Programming 3(3-0)
Pre : 02739211
Business computer applications, business environment, business transactions, accounting applications, accounting information system, payroll, payable
accounts, receivable accounts, invoicing general ledger, material and operation control, 
order processing, inventory control and forecast, purchasing, sale analysis, banking 
applications.

02739342   Computer Graphic Applications for Information  3(3-0) 
Pre : 02739231
Introduction to computer graphic, graphic systems, interactive graphics, 
raster and vector design, application of graphic in information system.
02739343   Three-Dimensional Images and Animations  3(3-0) 
Pre : 02739231
Construction of three-dimensional images and animations, story board and modeling creation, object texture creation, three-dimensional image and animation applications.

02739344   Multimedia Technology  3(3-0) 
Pre : 02739231
Multimedia systems, components and structure; image creations; hypertext, hypermedia, presentation media, text, graphic, animation, audio, video; multimedia presentation; multimedia system technology.
02739351   Data Communication and Computer Network  3(3-0) 
Pre : 02739231
Concepts of data communication, components of data communication, types of computer networks, local area network, network topologies, network protocol standards, network system planning and designing, data communication layers in open system interconnection: layer of control, physical link control, data communication technology.
02739421   Software Engineering  3(3-0) 
Pre : 02739231
Software design and development techniques, software reuse, software maintenance, documentation, testing, software errors, software project management, cost estimation.
02739422   Database System  3(3-0) 
Pre : 02739311
Database concepts, database management system, data independence, reliability and integrity, logical and physical organization, schema and subschema; data models, hierarchical model network model and relational model, data normalization, data definition language, data security.
02739423   Information Retrieval  3(3-0) 
Pre : 02739321
Introduction to information retrieval system, principles of retrieval, Boolean operation, fuzzy logic, p-norm, vector space and Baysian modelling, text analysis and automatic index, standard of text alignment in SGML and HTML, automatic question formatting, techniques of knowledge and optimization formatting between a system and hypertext-information retrieval users.
02739424   Object Oriented Analysis and Design  3(3-0) 
Pre : 02739214
Basic concept of object-oriented model, system development life cycle, object-oriented analysis, diagram construction, using CASE, class diagram, object-oriented design, object-oriented applications.
02739425   System Management  3(3-0) 
Pre : 02739231
Object management, state management, relationship presentation, alarm reporting, log control, security audit trial, test management.

**02739426 Human Computer Interaction 3(3-0)**

*Pre : 02739323*

Principles and component of human-computer interaction, design process, models of the design users, task analysis, dialogue design, model of the system, implementation support, evaluation and groupware.

**02739427 Computer Games Design and Development 3(3-0)**

*Pre : 02739231*

Introduction to computer games, principles of game design, game design and development process, creation of game on microcomputer and Internet system, document creation and evaluation.

**02739428 Digital Signal and Image Processing 3(3-0)**

*Pre : 02739231*

Techniques in signal processing and digital image, file format for digital image, graphic capture, image compression and perception, visual language.

**02739431 Operating System and System Software 3(3-0)**

*Pre : 02739231*

Evolution of operating system, system software, operating system structure, process management, process scheduling, interrupt process communication, memory and secondary storage management, virtual memory, security, protection, input/output, computer system, resource allocation, deadlocks, distributed processing and network, operating system and system software trend, case studies.

**02739432 Decision Support System 3(3-0)**

*Pre : 02739321*

Definition and roles of decision support system, relation of DSS and Executive Information System, DSS structures, system design and technology for developing DSS, system development processing and application of DSS.

**02739433 Expert System 3(3-0)**

*Pre : 02739231*

Component of expert system; expert system in problem solving, planning and controlling; knowledge representation, knowledge base, knowledge searching, uncertainty of decision-making mechanism, rule-based and frame-based systems, case studies in expert system design.

**02739434 Introduction to Artificial Intelligence 3(3-0)**

*Pre : 02739231*

Introduction to artificial intelligence, artificial intelligence production process by computer, computer representation of knowledge, problem solving and searching, procedure, fuzzy logic, natural language, robotic and expert system, game playing, the use of computer to solve artificial intelligence problems.

**02739441 Introduction to Computer Laws 3(3-0)**

*Pre : 02739111*

Introduction to computer act, intellectual properties, protection of personal and data privacy, electronic commerce laws, international trading and important regulations related to electronic commerce.

**02739442 Office Automation System 3(3-0)**

*Pre : 02739322*

Office system and organization management, application of innovations in data processing, word and image processing, office communication, graphic construction,
data collection system design and developing modern organization, maintenance and efficiency in modern organization. Application of word processing, database and data analysis, integrated office system and evaluation of investment cost.

02739443  **Multimedia System**  
Pre : 02739322  
3(3-0)  
Fundamentals of multimedia system, technology and psychology for communication by visualizing and hearing, hardware and software for developing multimedia system, development and communication theories under multimedia system, multimedia system design, software engineering and management on multimedia system. Legal and social concerns for multimedia system.

02739444  **Office Information System**  
Pre : 02739321  
3(3-0)  
Duties and office management, characteristic of office, office information processing, equipment and technology for office automation, computer system in office, component of office information system, benefit and cost of office information system, trend of office information system.

02739445  **Financial Information System**  
Pre : 02739321  
3(3-0)  
Roles and importance of financial information systems, relation between organization management and financial, application of information technology in financial; analysis design and control of financial processing system, reporting and system evaluation, trend of financial information systems.

02739446  **Manufacturing Information System**  
Pre : 02739321  
3(3-0)  
Basic concept of organization operation in the production and service of manufacturing information system; information system for product development, product planning, product operating and controlling, case studies.

02739447  **Accounting Information System**  
Pre : 02739321  
3(3-0)  
Principles and concepts of accounting information system, structure and component of accounting system in various business organization, planning, analysis, designing and selecting of accounting information system, controlling and auditing, reporting for controlling and decision making in business system.

02739448  **Software Metrics**  
Pre : 02739323  
3(3-0)  
Concept of software metric, measuring and collecting project data, productivity models and measurement, quality metric, task and resource management by metric, estimating software cost, developing a metric plan.

02739449  **Simulation and Modeling**  
Pre : 02739231  
3(3-0)  
Simulation techniques, continuous and discrete simulation models, queuing theory, stochastic process, designing simulation experiments, analysis of simulation results, accuracy of model and results.

02739451  **Network Management**  
Pre : 02739351  
3(3-0)  
Introduction to network, structure and operation of computer network, client-server system, network operating system, network protocol, network installation, resource sharing and network security, network administration, server environment configuration, network maintenance.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>02739452</td>
<td>Information Technology Management</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 02739351</td>
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<tr>
<td></td>
<td>Definition and component of information technology, computer technology and network, strategies and information technology management in organization, system development and maintenance, application of information technology, business information management of information technology, information technology management for future business, case studies.</td>
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<tr>
<td>02739453</td>
<td>Information System for Communication</td>
<td>3(3-0)</td>
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<tr>
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<td>Pre : 02739351</td>
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<td>Information system, distributed information system, communication system tools, communication method, computer architecture and network, workstation, local area network interface, database for communication network, office automation and network organization, communication technology, Internet and Extranet.</td>
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<tr>
<td>02739454</td>
<td>WWW Server System</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre : 02739351</td>
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<tr>
<td></td>
<td>World wide web, web browser, web server installation and development, web security systems, web database, web server services, web maintenance, case studies.</td>
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<tr>
<td>02739455</td>
<td>Internet Information Services and Intranet</td>
<td>3(3-0)</td>
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<tr>
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<td>Pre : 02739351</td>
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<tr>
<td></td>
<td>Internet services, electronic mail, File Transfer Protocol, Gopher, installation Internet system, world wide web service, Extranet.</td>
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<tr>
<td>02739481</td>
<td>Workshop in Information Technology I</td>
<td>1</td>
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<tr>
<td></td>
<td>Presentation and discussion or current interesting topics in information technology and workshop.</td>
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<tr>
<td>02739482</td>
<td>Workshop in Information Technology II</td>
<td>1</td>
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<tr>
<td></td>
<td>Seminar and workshop in Advanced Information Technology.</td>
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<tr>
<td>02739496</td>
<td>Select Topic in Information Technology</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Selected topics in information technology at the bachelor degree level.</td>
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<tr>
<td></td>
<td>Topics are subject to change each semester.</td>
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<tr>
<td>02739497</td>
<td>Seminar</td>
<td>1</td>
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<tr>
<td></td>
<td>Presentation and discussion on current interesting topics in information technology at the bachelor degree level.</td>
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<tr>
<td>02739498</td>
<td>Special Problems</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Study and research in information technology at the bachelor degree level and complied into a written report.</td>
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</tr>
</tbody>
</table>
SRI RACHA CAMPUS
(751xxx – 800xxx)

FACULTY OF RESOURCES AND ENVIRONMENT

CHEMICAL ANALYSIS
(114xxx)

03114331 Instrumental Chemical Analysis 3(3-0)
Pre : 403231

COOPERATIVE EDUCATION
(199xxx)

199390 Cooperative Education Preparation 1(1-0)

199490 Cooperative Education 6
On the job training as a temporary employee according to the assigned project including report and presentation.
SCIENCE  MATHEMAECS AND STATIC
(767xxx)

767111 Basic Science  3(3-0)
Thermodynamics for health science, gas, liquid, solution, matter and chemical reaction, inorganic compound for life, carbon compounds, biochemical, way of living, anatomy, control and integration system, circulatory system, lymphatic system, respiration system, digestion system, excretory system and reproductive system.

PHYSICAL ACTIVITIES
(768xxx)

768111 Pe’tanque  1(0-2)
Origin, values, movement mechanics in throwing boules, playing methods of techniques, rules and competition.

768112 Weight Training  1(0-2)
Technical terms, freehand exercises, exercises with equipment, competition and project plan of long term exercises.

768121 Basketball  1(0-2)
Origin, skills, personal and team techniques, rules and safety in playing.

768141 Thai Classical and Social Dances  1(0-2)
Origins, values, benefits and primary skills of Thai classical and social dances, textual and standard dances, social manners including different rhythmic dances.

768151 Sword and Pole Fighting  1(0-2)
Origin, techniques and primary skills in sword and pole fighting, tools handling and safety in playing.
FACULTY OF MANAGEMENT SCIENCE

SOCIAL SCIENCES
(751xxx)

751111 Man and Environment 3(3-0)
Ecological and environmental concepts, relations between man and natural resources and environment, principles of natural and environmental conservation, ways of adaptation and utilization of environment for human living, effects of human activities to environmental, social and economical conditions, present environmental problems and situations, environmental pollution, including controlling policy, prevention, and solution of environmental problems.

751112 Social and Politics 3(3-0)
Sociological concept and theory, politics and cultures, origins of society and state, social structure and components, social and political institutions, social group and political system, political ideology and doctrines, political parties and governmental system, participation in politics, political development, social and political changes, and administration of modern country.

751151 Basic Psychology 3(3-0)
The science of psychology, definition, the origin of psychology, human development in different ages, effects of bodily systems towards human behaviors, emotions, perception, learning, motivation, attitude, personality, individuality, mental health, adaptation, stress control, human behaviors in society, psychological roles towards the work and industrial business.

751152 Service Industry Psychology 3(3-0)
Concept and basic psychological theory. Psychological factors affecting tourist behavior. Working and leisure values. Psychological implementation in service.

751161 World Trade Regional Geography 3(3-0)
The comparison of one region to the other in the aspect of expansion in local residents and territories. Economics changing systems. The effects of geographical and cultural conditions on international business and evaluation tools.

751291 Development, Social System and Thai Cultures 3(3-0)

HUMANITIES
(752xxx)

752111 Information Resources for Research 1(1-0)
Significance, information and source, the use of information technology in library, selection, and report writing.

**Philosophy and Logic**

The definition, boundaries, problems and methods of philosophy, the relation between philosophy and logic that is philosophical instrument of justification about rationality valid, and reliable argument in metaphysics epistemology, and ethics problem on everyday life.

**ECONOMICS**

*(753xxx)*

**Microeconomics**

Demand and supply theories, elasticity value, consumer behavior, decision-making under uncertainty, production and cost, maximize profit, perfectly competitive market and monopoly market, equilibrium price, and efficiency of economic system.

**Macroeconomics**

National income, money, interest, income and expenditure, monetary and fiscal policy, international relationship, aggregate demand, aggregate supply, equilibrium, products and growth, consumption and saving, investment, currency in economic system, inflation, deflation, unemployment, current account, foreign debt making, theories and concepts of economic development.

**ENGLISH**

*(754xxx)*

**Fundamental English I**

Structures and practice of four basic language skills: listening, speaking, reading, and writing for effective and appropriate communication.

**Fundamental English II**

Pre: 754111

Structures and development of four basic language skills: listening, speaking, reading, and writing at the intermediate level to communicate effectively and appropriately.

**Fundamental English III**

Pre: 754112

Structures and development of four basic language skills: listening, speaking, reading, and writing at the advanced level to communicate effectively and appropriately.

**English for Careers**

Pre: 754113
English vocabularies and idioms used for careers, writing memos, announcements, time schedules, facsimile messages, and other related documents, including basic practice of conversations related to work.

**754291 Analytical Reading for Business**

*Pre : 754113*

Reading and analysis of data in articles, reports, news, advertisements and other documents for business purposes.

**754321 Speech Communication**

*Pre : 754271*

Speech preparation, techniques of speaking, principles of effective listening, conduct of meeting and conference, group discussion, interview, lecture and debate.

**754361 Business English**

*Pre : 754271*

Use of four integrated skills: listening, speaking, reading, and writing in correspondence. Use of vocabularies and idioms in business communication.

**754371 English for Accountant**

*Pre : 754113*

To learn forms of communication used by accounting profession. To practice writing and speaking topics in the accounting profession: financial reporting, managerial accounting, auditing and accounting taxation.

**754416 Business Reports Writing in English**

*Pre : 754113*


**754471 Business English for International Trade I**

*Pre : 754113*

Application of English vocabularies and idioms used in texts, articles, and other related documents in international trade.

**754472 Business English for International Trade II**

*Pre : 754471*

Application of English in functions used in international trade for better proficiency.

**754473 English for Hotel I**

*Pre : 754113*

Application of English vocabulary and expressions used in different functions of hotel business for more proficiency

**754474 English for Tourism I**

*Pre : 754113*

Application of English vocabulary and expressions used in different functions of tourism business for more proficiency.
### BUSINESS

**757111 Introduction to Business** 3(3-0)
Business organization forms, significance, roles and effects towards societies. Business objectives and relationships between business functions and business activities, roles of each function and ethics in operation business.

**757112 Organization and Management** 3(3-0)
Pre: 757111
Managerial concept and its evolution, organizational theory and management, decision-making, planning, organizing, human resource management, leadership, motivation, organizational communication, conflict management and its control.

**757121 Fundamental Computer for Business** 3(2-2)
Basic knowledge of computers, its evolution, elements and computer operation, internet network system, the use of computer for personal and organizational work, significance of computer technology in business operation and business system in the future trend.

**757122 Business Statistics** 3(3-0)
Application of statistical principles and methods in business decision-making, probability and random variables, measures of central tendency, probability distribution theory, sampling random and measures of variability, confidence interval, hypothesis test, comparison between two populations, variance analysis, regression and correlation, time series, forecasting and index, chi–square test, estimation and decision-making under uncertainty.

**757123 Mathematics for Business** 3(3-0)
The essential, fundamental mathematics for business, interest calculation, depreciation, present value and annuity, mathematics for buying and selling, insurance, decision-making under risk and uncertainty, derivative and integral functions, and application for decision-making in business.

**757221 Business Forecasting** 3(3-0)
Pre: 757111 and 757122
Principles and applications of forecasting technique for business. Exploration of data patterns and selection of forecasting techniques. Application of statistic theories forecasting and testing hypothesis. Forecasting with regression analysis and time-series decomposition, including judgment in forecasting and management of forecasting process.

**757222 Quantitative Analysis for Business** 3(3-0)
Pre: 757122
Roles and significance of quantitative analysis which effect the decision-making in business, the development of quantitative analysis, product and inventory control, linear programming, program evaluation and review technique, critical path method and Markovian analysis, queuing theory model, simulations and game theory.

**757231 Business Law** 3(3-0)
Business legal environment, concepts of business law and origins, types of law, justice process, settlement by court and arbitration, civil and criminal liability.

**757321 Management Information System**  
3(3-0)

Pre: 757121 and 757111

Concepts of management information system, the structure of management, information system, information, system and pattern, decision-making, decision-making support system, information system development, database, information technology and applications.

**757322 Electronic Commerce**  
3(3-0)

Pre: 757121

The use of information technology and network system as tools in business operation, the changing of forms and business process, buying and selling system, goods and service transaction, competitive forms, electronic payment, security system and law related to the operation of electronic commerce.

**757331 Business Ethics**  
3(3-0)

Pre: 757112


**757332 Technology Management for Business**  
3(3-0)

Pre: 761111


**757341 Change Management**  
3(3-0)

Pre: 757112

Definition and nature of change, changes having a result to management pattern, organizational effectiveness and the role of change management, motivating others to change, strategic change, controlling the change process, intervention strategies for change management.

**757342 Leadership in Organization**  
3(3-0)

Significance of leadership, characteristics of good leaders, appropriate vision and skills of leaders, management of change and leadership roles, leadership development.

**757343 Strategic Human Resource Development**  
3(3-0)

Concepts, processes and strategies of effective human resource development.

**757344 Remuneration Management**  
3(3-0)

Pre: 757112

Remuneration philosophy principles, and strategies; the relationship between remuneration system and financial statements, base payment, variable payment, administration and evaluation of payment, and differences of remuneration in various countries.

**757345 Organization Development**  
3(3-0)
Structure, pattern and process of organization development, organization
development in international environment, ethics and directions of future organization
development.

**757346 Employee Recruitment and Selection** 3(3-0)
Employee recruitment and selection process, job analysis, criteria for
assessing potential candidates, techniques of recruitment, selection interview, testing,
reliability and validity of measurement, evaluation of recruitment and selection process.

**757347 Strategic Thinking Skill Development** 3(3-0)
Concept and tools of strategic thinking. Rules and regulations of the Go game.
Basic techniques of the game from the beginning, the medium and the highest level of the game.
Real game practices, business game and business application of the game.

**757348 Management of Process Innovation** 3(3-0)
Pre : 03757112
Managing contemporary technology. Developing innovation processes
integrated with environment, human, organizations and technological factors. Principles and
methods of designing organizations and systems of effective technology. Principles of
designing criteria for innovation processes.

**757361 Business Taxation** 3(3-0)
Meaning, types, principles and practice in business taxation. Taxpayer.
Calculation, registry, and preparation reports for payment of taxation.

**757421 Database Management for Business** 3(3-0)
Pre : 757321
Types of business and database management, gathering information in
business, database management, models of database gathering, using tools in database
management, effectiveness of business database management, searching tactics and
presenting techniques from stored database for implementing in business.

**757441 Carrier Logistics** 3(3-0)
Pre : 757112
Roles and functions of transportation. Transportation models, transportational
logistics, strategic management for cost reduction and productivity improvement. Analysis of
transportation system and contracts. Process of transportation and delivery to customers.
Case study related to carrier management are also included.

**757442 Strategic Management** 3(3-0)
Pre : 757112
the organization vision and mission. Strategic planning in business corporate, business units,
and functional levels. Implementation, evaluation, and strategically controlling concept using
case studies.

**757443 Mergers and Acquisition** 3(3-0)
Pre : 757112
Definition and significance of mergers and acquisition. Analysis and decision-
making in merging and acquiring. Process, method, benefit, effect from mergers and
acquisition, including related law.

**757444 Process Analysis and Design in Business** 3(3-0)
Pre : 757111
Planning process of information system, perspective of organizational strategies, goals, policies, planning, forms of organizational structure, designing business activities, analysis of working system and operations procedure.

**757445  Goal Setting and Performance Measurement 3(3-0)**
Pre : 757112

**MARKETING (758xxx)**

**758111  Principles of Marketing 3(3-0)**
Definitions and marketing concepts, marketing process, consumer behavior, market segmentation, selecting target market, designing strategies and marketing mix.

**758212  Integrated Marketing Communication 3(3-0)**
Pre : 03758111

**758213  Public Relations for Business 3(3-0)**
Pre : 03758111

**758214  Business to Business Marketing 3(3-0)**
Pre : 03758111

**758311  Materials and Purchasing Management 3(3-0)**
Pre : 03758111

**758316  Business Market Management 3(3-0)**
Pre : 03758111
Perspective of business market. Characteristics of business buyers and buying

758341  Marketing Management 3(3-0)
   Pre : 03758111
   Significance of marketing management. Building consumers’ satisfaction, planning marketing strategies, analyzing marketing opportunity. Marketing information management, measurement of market demand, developing in marketing strategies, marketing program, organizing, evaluating, and controlling marketing activities. Analysis of marketing problems and case studies.

758343  Retailing Management 3(3-0)
   Pre : 03758111

758444  Internet Marketing 3(3-0)
   Pre : 03758111
   Importance and concepts of the Internet in marketing. Marketing strategy and planning through the Internet. Website designs and marketing mix through the website. Evaluating marketing operations.

758445  Customer Relation Management 3(3-0)
   Pre : 03758111

FINANCE
(759xxx)

759211  Financial Management 3(3-0)

759312  Financial Report Analysis 3(2-2)
   Pre : 03759211

759425  Financial Modeling 3(2-2)
Pre: 03759211
Theory and financial modeling used in financial analysis and budget planning.
The application of financial principle in business decision making.

**ACCOUNTING**
*(760xxx)*

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>760111</td>
<td>Principles of Accounting</td>
<td>3(3-0)</td>
<td></td>
</tr>
<tr>
<td>760221</td>
<td>Financial Accounting</td>
<td>3(2-2)</td>
<td>Pre: 03760111</td>
</tr>
<tr>
<td></td>
<td>Accounting framework, double entry system, accounting cycle, and single accounting. Recording of assets, liabilities and equities. Accounting for service, merchandising and manufacturing firm. Preparation of cash flow statements.</td>
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</tr>
<tr>
<td>760241</td>
<td>Accounting for Business Management</td>
<td>3(3-0)</td>
<td>Pre: 760111</td>
</tr>
<tr>
<td></td>
<td>Definitions and significance of accounting for management, financial problem and applications, cost and financial accounting for planning, decision-making and business control, budgeting, analysis for investment project and performance evaluation.</td>
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</tr>
<tr>
<td>760323</td>
<td>Advance Managerial Accounting</td>
<td>3(2-2)</td>
<td>Pre: 01130321, 03757121</td>
</tr>
<tr>
<td></td>
<td>Framework of managerial accounting and control, cost management, managerial strategies of various costs, variance analysis, contemporary cost management systems, decentralization management and evaluation of business units, transfer pricing, performance evaluation and compensation systems.</td>
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</tr>
<tr>
<td>760325</td>
<td>Applications in Accounting</td>
<td>3(2-2)</td>
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</tr>
<tr>
<td></td>
<td>Applications for preparation of various accounts, including specific and general internal computer controls.</td>
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</tr>
<tr>
<td>760421</td>
<td>Strategic Managerial Accounting</td>
<td>3(2-2)</td>
<td>Pre: 03760323</td>
</tr>
<tr>
<td>760441</td>
<td>Control Management</td>
<td>3(2-2)</td>
<td>Pre: 03760323</td>
</tr>
<tr>
<td></td>
<td>Concepts of managerial accounting in controlling; differentiation between prevention, evaluation and correction; environment of organization with internal control, internal control system, internal audit, control systems and risk evaluation.</td>
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</tr>
<tr>
<td>760491</td>
<td>Research Methods in Accounting</td>
<td>3(3-0)</td>
<td></td>
</tr>
</tbody>
</table>

II-442
Research principles and methods. Defining research problem of managerial accounting including research proposing and presenting.

**760497 Seminar**

Presentation and discussion on current interesting in managerial accounting at the undergraduate level.

**760498 Special Problems**

Study and research in managerial accounting at the bachelor degree level and compile into a written report.

**PRODUCTION (761xxx)**

**761111 Principles of Production and Operations** 3(3-0)

Concepts of production and operations, general management, statistical and quantitative methods, planning and operating production activities, materials management, purchasing, production management, inventory management, quality control management and improvement of productivity.

**INTERNATIONAL BUSINESS (762xxx)**

**762311 International Business Management** 3(3-0)

Pre: 757112

Management, strategies of international business, analysis of business competition, trading principles and theories, investment, managerial activities, human resources management, marketing, production, finance, and international environment.

**762312 International Marketing Management** 3(3-0)

Pre: 758111

Analysis of international marketing environments. Distinctive characteristics and trends of foreign markets. International marketing strategies, plan, and control as well as effects from different societies, cultures, economics, and politics. Problem and threat in foreign market.

**762313 International Financial Management** 3(3-0)

Pre: 759211

International financial management, balance of payment, international financial markets and institutions, exchange rate system and foreign exchange tools, international financial theory, currency forecasting including measurement and management of interest rate risks and interest rate risks and the foreign exchange rate.
762314  International Investment 3(3-0)
Pre : 759211
Differences of foreign cultures, international financial instruments, international financial markets, international investment rate of return and risks, international investment theories, significance and method in diversifying international investment risks, international investment performance analysis and important issues involving currency exchange rate.

762321  Law on International Carriage 3(3-0)
Pre : 03757231

762331  Global Economics 3(3-0)
Pre : 753112
International trade theories, economic growth, factors in economic movement, international trade policies, policy of international free trade, foreign exchange rate, the balance of payment, international investment policy of new currency exchange rate, application of international economics principles and theories.

762332  International Trade Law 3(3-0)
Pre : 757231
Law of international trade, law of transportation, law of insurance, disputation of international trading, international movement of capital investment, international currency control and exchange, tax and principles of international law concerning contract, judgement and dispute resolution and case studies of international trade.

762333  Analysis of Business Environment in Cross-Culture 3(3-0)
Pre : 757111
Development, types and characteristics of cultures as related to racism, colonialism, and imperialism. Theory of humanity relations. Process of cultural changes among nations. Cultural conservation and its effects to international business.

762341  Export and Import Management 3(3-0)
Pre : 758111
Export and import management in organization. Development of international trade. Process and method of export and import, regulations, customs duty, functions and activities of service division.

762342  International Logistics 3(3-0)
Pre : 757112
Managerial concept of future business. Significance and international logistics, strategies in international logistics, elements of logistics management, business logistics in purchasing, production, marketing, finance and human resources. Documentation, organizing and controlling in logistics cost.

762343  International Human Resource Management
3(3-0)
Pre : 757112
Strategies and differences in international human resource management. Structures and cultural differences in communication. Selection, development, training, and performance evaluation of personnel under internationally assigned work.

762344 International Accounting Systems  3(3-0)  
Pre : 760241  
International accounting, difference of accounting procedures, accounting method, financial and internal audits in each country. Accounting for changing prices, analysis of international financial statements, accounting systems and performance evaluation, taxation for multinational corporate and case studies.

762421 International Air Transport Management  3(3-0)  
Pre : 03757112  

762422 International Regulation for Business  3(3-0)  
Development of regulations from national to international levels. Regulations on employers and employees. Laws on consumers. Regulations on finance and investment. Laws on agriculture, food and pharmaceuticals including other relating laws.

762431 International Institutions and Politics  3(3-0)  
International politics, basic factors affecting to political political position and condition and institutions, regulation and international policy including tools and policy of international.

762432 Industry and Trade in Asia  3(3-0)  

762433 Industry and Trade in Europe  3(3-0)  

762434 Industry and Trade in Africa  3(3-0)  

762435 Industry and Trade in North America  3(3-0)  
762436  Industry and Trade in South America  3(3-0)

762441  Global Business Strategies  3(3-0)
Pre : 757112
Strategies of global corporations, evolution, international business environment, strategic planning, organization structure, management and marketing issues, cultural changes, ethics and evaluation.

762491  Research Methods in Business  3(3-0)
Pre : 757122
Research principles and methods. Defining research problem of international business including research proposing and presenting.

762497  Seminar  1
Presentation and discussion on current interesting in international business at the bachelor level.

762498  Special Problems  3
Study and research in international business at the bachelor degree level and compiled into a written report.

HOTEL AND TOURISM MANAGEMENT
(763xxx)

763111  Tourism Business  3(3-0)

763211  Tourist Behavior  3(3-0)
Analysis of tourist behavior. Internal and external factors affecting decision-making process. Patterns of tourist behavior. Tourist market and trends.

763241  Human Relations in Hotel and Tourism Business  3(3-0)
Pre : 757112

763242  Front Office Management  3(3-0)
Pre : 763311
Room management. Reservation systems. Room assignment. Room rates. Reception. Registration. Luggage handling service. Information technology in
communication. Payment. Coordination with other departments. Safety and security management. Standardization and quality management in front office.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>763243</td>
<td>Housekeeping Management</td>
<td>3(3-0)</td>
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<tr>
<td>Pre: 763311</td>
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<tr>
<td></td>
<td>Designing and organizing housekeeping structures.</td>
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<td></td>
<td>Characteristics of an efficient staff.</td>
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<tr>
<td></td>
<td>Development of housekeeper skills and behavior.</td>
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<tr>
<td></td>
<td>Management of inventory and equipment.</td>
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<tr>
<td></td>
<td>Human resource management and operational control.</td>
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<tr>
<td>763244</td>
<td>Airline Business Management</td>
<td>3(3-0)</td>
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<tr>
<td>Pre: 763311</td>
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<tr>
<td></td>
<td>Airline industry components. International air geography.</td>
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<td>Freedoms of the air.</td>
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<td></td>
<td>Airlines and network.</td>
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<td></td>
<td>Reservation and ticketing system. Passenger services.</td>
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<td>Immigration and custom clearance. Air cargo.</td>
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<tr>
<td>763245</td>
<td>Food and Beverage Management</td>
<td>3(3-0)</td>
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<tr>
<td>Pre: 763311</td>
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<tr>
<td></td>
<td>Food and beverage management. Customer expectation.</td>
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<td></td>
<td>Food and beverage management in business and organizations. Case studies.</td>
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<tr>
<td>763311</td>
<td>Management and Operations in Hotel Business</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>Pre: 761111</td>
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<tr>
<td></td>
<td>Development of hotel industry. Types and concept of hotel management.</td>
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<td></td>
<td>Housekeeping. Accounting and control. Trends in hotel industry.</td>
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<tr>
<td>763312</td>
<td>Management and Operations in Tourism Business</td>
<td>3(3-0)</td>
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<tr>
<td>Pre: 761111</td>
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<td></td>
<td>Development of business tourism. Tourism organization structure.</td>
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<tr>
<td>763313</td>
<td>Marketing Management for Hotel and Tourism Business</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>Pre: 758111</td>
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<tr>
<td></td>
<td>Marketing management for hotel and tourism business, planning marketing strategies, analyzing marketing opportunity. Management of marketing information, measurement of service market demand. Developing in marketing strategies, marketing program; organizing, evaluating, and controlling marketing activities. Analysis of marketing problems and case studies on hotel and tourism business.</td>
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</tr>
<tr>
<td>763314</td>
<td>Accounting and Finance in Hotel and Tourism Business</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>Pre: 759211 and 760111</td>
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<tr>
<td>763331</td>
<td>Ethics in Hotel and Tourism Industry</td>
<td>3(3-0)</td>
</tr>
<tr>
<td>Pre: 757112</td>
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</tr>
</tbody>
</table>
Principles of ethics in business and social responsibilities. Use of ethics in decision-making. Effectiveness of ethics implementation in hotel and tourism industry.

**763341 Menu Planning**  
3(3-0)  
**Pre:** 758111  

**763342 Catering Management**  
3(3-0)  
**Pre:** 757112  

**763343 Cruise Business Management**  
3(3-0)  
**Pre:** 757111  

**763344 Bar and Beverage Management**  
3(3-0)  
**Pre:** 757111  
Beverage service. Bar design and set up. Equipment. Purchasing, inventory management, storage, production, service, and marketing.

**763345 Restaurant Management**  
3(3-0)  
**Pre:** 757111  

**763346 Food Selection and Preparation**  
3(3-0)  
Food nutrition. Safety and prevention in food preparation and making. Menu planning and service. Type of food.

**763347 Trade Fair and Exposition Management**  
3(3-0)  
**Pre:** 757111  

**763348 Incentive Travel Management**  
3(3-0)  
**Pre:** 757111 and 763211  

**763351 Tour Guide**  
3(3-0)  
**Pre:** 752191  
Roles, responsibilities and quality specifications of a tour guide. Immigration process and regulations. Laws concerning the tour guide. Field trip required.
Conservative and Tourism Environment Management 3(3-0)
Pre : 763111

International Hotels Management 3(3-0)
Pre : 757111

Sustainable Tourism Management 3(3-0)
Pre : 763111
History and scope of sustainable tourism. Dimensions of sustainable tourism. Key groups in sustainable tourism. Functional management. Relations to other sectors.

Marine Tourism Management 3(3-0)
Pre : 757111

Resort Management 3(3-0)
Pre : 757111

Project Development in Tourism Business 3(3-0)
Pre : 757112
The development of hotel and tourism business. Feasibility study in business development. Planning and process of project development. Implementation, control and evaluation of project.

Club Management 3(3-0)
Pre : 757112

Meeting and Convention Business 3(3-0)
Pre : 757111
Pre : 760111 and 761111
Cost control and management of sales volume. Production controls in relation with cost and quality of food and beverage.

763449  Marketing Planning and Development in Service Industry  3(3-0)
Pre : 768313
Situation analysis, competition and financial analysis in service business. Marketing planning, implementation, and control by software.

763491  Research Methods in Hotel and Tourism Business  3(3-0)
Pre : 757122
Research principles and methods. Defining research problem of hotel and tourism business including research proposing and presenting.

763497  Seminar  1
Presentation and discussion on current interesting issues in hotel and tourism business at the bachelor level.

763498  Special Problems  3
Study and research in hotel and tourism business at the bachelor degree level and compiled into a written report.

LOGISTIC MANAGEMENT
(764xxx)

764321  Inventory and Distribution Center Management  3(3-0)
Pre : 03761111

764322  Land Transport Management  3(3-0)
Pre : 03757112

764331  Procurement and Purchasing in Supply Chain  3(3-0)
Pre : 03761111

764341  Service Operations in Logistics  3(3-0)
Pre : 03761111

764390  Cooperative Education Preparation 1(1-0)

764421  Logistics Performance Measurement 3(3-0)
Pre : 03757112

764441  Cargo Insurance 3(3-0)
Pre : 03757231

764490  Cooperative Education 6
Pre : 03764390
On the job training as a temporary employee according to the assigned project, including report writing and presentation.

764491  Basic Research Methods in Logistics Management 3(3-0)
Pre : 03757122
Principles and methods in Logistics Management research, identification of research problems, formulation of research objectives and hypotheses, collection of data, Construction of questionnaire, data analysis and interpretation, application of statistics for research, report writing and presentation.

764497  Seminar 1
Presentation and discussion on current interesting in logistics management at the bachelor’s degree level.

764498  Special Problems 3
Study and research in logistics management at the bachelor’s degree level and compiled into a writing report.
FACULTY OF SI RACHA ENGINEERING

NAVAL ARCHITECTURE AND MARINE ENGINEERING
(03501xxx)

03501211  Overview in Marine and Ocean Systems  3(3-0)
Sea, ocean and general knowledge on oceanography, mercantile marine,
transportation systems and fisheries; basic of ship operation, astronomy, meteorology,
maritime law; types and classifications of marine vehicles; basic concept of marine and
offshore structures design; naval architecture and marine engineering professions,
preparation; codes and ethics of engineers and naval architects.

03501212  Introduction to Naval Architecture and Marine Engineering  3(3-0)
Pre : 03501211
Types and purposes of ships and offshore structures; basic concepts of hull
resistance and propulsion, power systems; ship and platform strength and dynamics; general
knowledge on marine and shipyard industries.

03501213  Introduction to Marine Electrical Engineering  3(3-0)
Pre : 03501211
Types and purposes of shipboard electrical plants; electrical fundamental;
circuits and circuit calculations; vital electrical systems and equipment onboard ship;
electrical load analysis.

03501261  Computer-Aided Design and Drafting  2(1-3)
Pre : 790111
Design and drafting with the assistance of computer; drafting of naval
architecture and marine engineering works; two and three dimensional drafting.

03501262  Computation in Naval Architecture and Marine Engineering  2(1-3)
Pre : 03501261
Computer programming; numerical analysis and applications on naval
architecture and marine engineering problems; practical training on various kinds of ship
design programs.

03501311  Form Calculations and Stability  3(3-0)
Pre : 790342
Determination of areas, volumes, displacements; calculation of center of
gravity; calculation of static and dynamic stability for new design and damaged ships; tests
of ship inclination; launching of ships.

03501312  Marine Electrical Engineering Laboratory  1(0-3)
Pre : 03501213
Experiments on marine electrical engineering; DC circuits; AC circuits;
power factor correction; electrical characteristic test for important marine electrical devices
and equipment.

03501321  Ship Structures I  3(3-0)
Pre : 790261
Calculation of forces exerted on ships and offshore structures; calculation of
ship longitudinal strength, load distributions; combined stresses and losses of ship strength;
strength of hull panels including major parts of ship structures; ship grillages systems; materials using in ship structures; application of classification society rules in ship structural design.

03501322 Offshore Engineering 3(3-0)
Pre : 208261
Offshore oil and gas industry, environment and design criteria of foundation, fabrication and installation. Subsea pipeline. Statutory instrument and operations manuals.

03501331 Marine Engineering I 3(3-0)
Pre : 790341
Marine power systems used in ship; their operating characteristics and limitations; engine-propeller matching; calculation of piping and ventilation systems; electric power generation and auxiliary systems.

03501332 Ship Resistance and Propulsion I 3(3-0)
Pre : 03501211
Factors on ship resistance; dimensional analysis and similitude; ship model testing and the extrapolation; propeller testing and their interaction with the hull; analysis of propeller cavitation and prevention; applications of computer programs for determining of ship power and propeller.

03501333 Applied Thermodynamics for Marine Engineers 3(3-0)
Pre : 208241
Principle of reciprocating engines, spark and compression ignition engines, Otto cycle, diesel cycle, principle of gas turbine engines, Brayton cycle, steam power plant, Rankine cycle, refrigeration, vapor compression refrigeration cycle, psychrometry, air conditioning, combustion and chemical equilibrium, ship propulsion and ship auxiliary system.

03501334 Internal Combustion Engine 3(3-0)
Pre : 03501333
Engine types and operation, engine design and operating parameter, engine cycles, combustion in spark-ignition engine, combustion in compression-ignition engine, thermochemistry and fuels, heat transfer and lubricants in engine, engine characteristics, marine diesel engine.

03501335 Shipboard Electrical Machines 3(3-0)
Pre : 03501213
Principle, structure, operation, type and efficiency generator, motor, transformer and alternator.

03501341 Ship Hydrodynamics I 3(3-0)
Pre : 790342
Basic ship hydrodynamics; viscous fluid flow on flat-plate and curved surface; fluid flow on ship; ocean wave; wave effects; ship responses in wave; other ship hydrodynamics problems.

03501342 Ship Dynamics 3(3-0)
Pre : 03501341
Free vibration of single and simple harmonic motion; ship motions in rigid body mode; damping and added mass due to ship motions in fluid; ship responses due to ocean waves; propeller excitation.

**03501371  Automatic Control  3(3-0)**
Pre : 03501213
Transfer function and block diagram analysis, time and frequency response of system, system steady state error, stability of system by root locus method, Nyquist diagram and Bode diagram.

**03501381  Marine Engineering Laboratory I  1(0-3)**
Pre : 03501211
Experiments on fluid mechanics; ship buoyancy and stability; propeller tests; and material tests.

**03501411  Ocean Systems Engineering  3(3-0)**
Pre : 771268
Ocean system; requirements for marine resources; system development planning; factors in the marine system and environment; applications of systems engineering to ocean; utilizing of hydrospace simulation in engineering works.

**03501421  Ship Structures II  3(3-0)**
Pre : 03501321
Stress distributions; local strength analysis, panels under external loads, columns and stanchions, the strength of panels with grillage; finite-element method in ship strength analysis.

**03501422  Ship Vibrations  3(3-0)**
Pre : 03501321
Basic mechanical vibrations; free vibrations of one-degree of freedom and multi-degree of freedom; simple harmonic, general period, and random forced vibrations; vibrations of ship and off-shore structures; dynamics and vibrations problems of propeller shafts and equipment; vibrations problems of ship panels and curved surfaces.

**03501423  Ship Structures III  3(3-0)**
Pre : 03501421
The ocean environment and structural loading; configurations, analysis, and design of mooring, buoy systems, and anchoring devices; applications of shell theory and design of pressure vessels for structural optimization; deep submersible vehicles and floating offshore platform types; design requirements and case histories; vibration of floating offshore platform.

**03501425  Composite Structures  3(3-0)**
Pre : 03501422
Composite materials used in engineering; calculation of characteristics of materials; theory of composite structures; strength, buckling, and vibration of composite plates and shells; thermal stresses; elements of the mechanics of sandwich structures; applications of composite materials in ship structures.
03501427  Offshore Structure Design  3(3-0)
Pre : 03501322

03501431  Marine Engineering II  3(3-0)
Pre : 03501331
Alignment analysis of marine propulsion; power and speed interactions among engines, propellers and hulls; characteristics of electrical generators, motors, and distribution systems with emphasis on marine ship-service and propulsion systems; propulsion shaft torsional vibration analysis, with emphasis on application to reciprocating marine propulsion engines.

03501432  Ship Resistance and Propulsion II  3(3-0)
Pre : 03501332
Fluid flow on body inside and outside boundary layers; foil sections, lifting line and lifting surface theory; foil design works on marine application; modern propeller systems.

03501433  Refrigerator and Air Conditioner  3(3-0)
Pre : 03501333
Properties of air, psychometric diagram, air condition load calculation, type of air conditioning system, equipment selection, air distribution and duct design, electrical power design, safety device and control, general refrigeration system, installation and maintenance.

03501434  Marine Diesel Engine  3(3-0)
Pre : 03501333
Principle of diesel engine, rating and selection, engine control panel and monitoring system, installation, operation and maintenance of marine diesel engine.

03501441  Ship Hydrodynamics II  3(3-0)
Pre : 03501341
Theory of similarity and model testing; Navier-Stokes equations; boundary-layer theory, laminar and turbulent; frictional resistance; momentum theorems; elementary of water-wave theory; formulation of wave resistance of ships; Michell’s solution and applications.

03501442  Ship Motions  3(3-0)
Pre : 03501342
Derivation of the equations of motion of a ship in six-degrees of freedom; ship maneuvering; design criteria for controls stability at different planes; rudder design; waves and wave effects; ship response in regular waves; ship response in random waves.

03501443  Hydrofoil and Propeller Design  3(2-3)
Pre : 03501341
Application of hydrodynamic principles to the design of hydrofoil and propeller; propeller design charts; foil section analysis including cavitation occurrence; current research and development on hydrofoil and propeller.
03501444  Computational Fluid Dynamics for Naval Architects         3(2-3)
Pre : 03501341
Mathematical description of physical phenomena; partial differential
equations; discretization methods; algorithms for the calculation of the flow-field and heat
transfer; applications to marine problems.

03501451  Operations Research in Marine Systems                      3(3-0)
Pre : 0771268
Techniques in operations research and applications to marine systems;
ship maintenance effectiveness using operation research; equipment replacement and the
repair limit method, application of the method to marine system; risk analysis; qualitative
and quantitative aspects of marine system analysis; Monte Carlo method for marine system
quantification.

03501452  Ship Operation and Maintenance                            3(3-0)
Pre : 03501212
Ship operations and management; maintenance of hulls, machinery and
equipment; maintenance planning and control; applications of modern maintenance systems
to ships and shipyards; quality assurance and quality control systems.

03501453  Ship Construction and Management                         3(3-0)
Pre : 0771268
Principles of management, production management and shipbuilding
industry including related industries, shipyard organization; shipyard facilities and
equipment; shipbuilding process, planning scheduling and production control, management
by optimization; information systems management; case study in shipbuilding.

03501454  Offshore Operations                                     3(3-0)
Pre : 03501322
Marine operations of offshore floating structures. Environmental and
stability considerations and criteria. Principles of transportation and installation of platforms.
Field installation of platforms. Planning of marine lifts. Crane and crane vessels. Fire and
basic principles of protection systems. Basic principles of offshore drilling.

03501461  Ship Design                                           3(3-0)
Pre : 03501321
Preliminary ship design to meet user’s general requirements; principal
dimensions, form, power requirements, and stability; outfitting; structural design and
accommodation arrangement; including other conveniences; preliminary design drawings;
applications of computer-aided ship design programs.

03501462  Modern Marine Vehicles Design                         3(3-0)
Pre : 03501461
Design of various kinds of marine vehicles; concepts and developments in
modern marine design.

03501463  Submarine Design Analysis                                3(3-0)
Pre : 03501461
Principles of submarine design, objectives and operations; structural
analysis of submarine design; propulsion and auxiliary systems; safety systems.
03501464  Marine Machinery System Design  3(3-0)
Pre : 208321
Design features and practical constraints of marine machinery diesel engines and electric generators. Engine and auxiliary space requirements and general arrangements. Design and development, efficiency and environmental considerations for marine machinery and systems. Statutory regulations for marine machinery and systems.

03501465  Offshore System Design  3(3-0)
Pre : 03501322
Flow of multiphase and non-Newtonian at high pressure and varying temperature. Design of process equipment on an oil producing offshore installation. Characterisation of crude oil and natural gas. Phase separation of gas, oil and water, separator design and phase separation theory. Design for constructability, maintainability and operability. Transportation phenomena and pipeline design.

03501471  Ship Control and Measurement Systems  3(3-0)
Pre : 771461
Measurement systems in marine uses; examining the measurement systems and their static and dynamic characteristics; response characteristics of open loop and feedback control systems; techniques and the applications to marine operations.

03501481  Marine Engineering Laboratory II  1(0-3)
Pre : 03501332
Experiments of materials and structures tests; vibrations and ship dynamics; ship model testing; engine tests; inclining experiment by full scale ship.

03501495  Naval Architecture and Marine Engineering Project Preparation  1(0-3)
Preparation of project proposal. Literature review and progress report.

03501496  Selected Topics in Naval Architecture and Marine Engineering  1-3
Selected topics in naval architecture and marine engineering at the bachelor level, topics are subject to change each semester.

03501497  Seminar  1
Presentation and discussion of interesting topics in naval architecture and marine engineering at the bachelor level.

03501498  Special Problems  1-3
Study and research in naval architecture and marine engineering at the bachelor level and compiled into a report.

03501499  Naval Architecture and Marine Engineering Project  3(0-9)
Project of practical interest in various fields of naval architecture and marine engineering or ship design team project.
# NAUTICAL SCIENCE

(03521xxx)

<table>
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<tr>
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<th>Credits (Lecture-Tutorial)</th>
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<td>Mathematics for Navigator</td>
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<td>Seamanship</td>
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<td>03521113</td>
<td>Introduction to Navigation</td>
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<td>Navigator's instrument.</td>
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<td>03521151</td>
<td>Terrestrial Navigation I</td>
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<td>03521241</td>
<td>Introduction to Oceanography</td>
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<td>Maritime Meteorology</td>
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<td>03521251</td>
<td>Terrestrial Navigation II</td>
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<td>03521252</td>
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<tr>
<td>03521253</td>
<td>Onboard Watch Keeping Regulation I</td>
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<tr>
<td>03521254</td>
<td>Onboard Watch Keeping Regulation II</td>
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03521261 International Maritime Terminology 2(2-0)

03521271 Introduction to Maritime 3(3-0)

03521321 Shipboard Machinery 3(3-0)

03521351 Celestial Navigation II 3(3-0)
Pre : 03521252

03521352 Electronic Navigation 3(3-0)
Pre : 03521351

03521353 Ship Handling I 2(2-0)

03521354 Ship Handling II 2(2-0)
Pre : 03521353
Ship handling in confined area. Ship handling in heavy weather. Ship handling in approaching pilot vessel. Ship handling when rescue man overboard.

03521361 Marine Communication 2(2-0)
Communication language. Reading and pronunciation of letter. Digit and number in international communication. Marine communication. Communication equipment system. Safety communication system.

03521362 Electro-magnetic Wave Propagation 3(3-0)

03521371 Cargo Transportation Management 3(3-0)
Business logistic management. Macroeconomics and microeconomics of transportation. Introduction to cargo transportation management. International commercial

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<th>Course Title</th>
<th>Credits</th>
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<td>Marine Cargo Handling and Stowage Operation</td>
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<td>Type of marine cargo. Cargo handling equipment.</td>
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<td>Principle of cargo stowage on board.</td>
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<td>Hazardous cargo stowage.</td>
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<td>Maritime Business</td>
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<td>Ship management.</td>
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<td>Interface management between ship and shore.</td>
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<td>Strategy of maritime company.</td>
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<td>Accounting, budgeting, financing and business</td>
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<td>planning. Shipping law and marine insurance.</td>
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<td>Port-state control.</td>
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<td>03521374</td>
<td>Maritime Law and Convention</td>
<td>3(3-0)</td>
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<tr>
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<td>Introduction to jurisprudence, treaty and</td>
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<td></td>
<td>international agreement on maritime operation</td>
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<tr>
<td></td>
<td>and procedural law. Limitation and court</td>
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<td>jurisdiction. Right on cargo ship seizure.</td>
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<tr>
<td></td>
<td>Salvage law and agreement on ship collision,</td>
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<tr>
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<td>Physical characteristic of ocean.</td>
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<td>Physical property of sea water.</td>
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<td>Water circulation. Current, wave, and tide.</td>
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<td>Interaction between atmosphere and ocean.</td>
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<td>Information source for meteorology. Hourly</td>
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<td>information. Weather report from local</td>
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<td>observation station. Weather broadcast code.</td>
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<td>Satellite and radar information interpretation.</td>
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<td>Weather chart analysis. Interactivity between</td>
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<tr>
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<td>upper and lower atmosphere.</td>
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<td>Weather forecast.</td>
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<td>03521443</td>
<td>Tropical Meteorology</td>
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<td>Pre: 03521242</td>
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<tr>
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<td>Tropical wind. Temperature, humidity, precipitation</td>
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<td></td>
<td>and vaporization. Vertical energy transfer.</td>
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<td>Trade wind. Controlling factor weather change.</td>
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<tr>
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<td>Weather chart scale. Characteristic and mechanism</td>
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<tr>
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<td>of tropical storm. Tropical storm formation and</td>
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<td>movement. Tropical storm forecast.</td>
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<td>03521444</td>
<td>Coastal Engineering</td>
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<td>Coastal phenomena. Wave theory.</td>
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<td>Wave in the ocean. Wave change when approaching</td>
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<td>shallow water. Destruction and formation of</td>
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<td>coastal area. Offshore sand dune formation.</td>
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<td>Wave interaction with coastal structure. Design</td>
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<td>of coastal structure.</td>
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<td>03521471</td>
<td>Maritime Economics</td>
<td>3(3-0)</td>
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<tr>
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<td>Fundamental of economic. The relationship between</td>
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<td>maritime industry and economic. Demand and</td>
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<tr>
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<td>supply forecasting. Shipping fee, cost and tax.</td>
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<tr>
<td>03521472</td>
<td>Port Management</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Business management and marketing in port</td>
<td></td>
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<tr>
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<td>industry. Maritime operation in port with</td>
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<tr>
<td></td>
<td>environment, health and safety consideration.</td>
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<tr>
<td></td>
<td>Port security and emergency management.</td>
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<tr>
<td>03521497</td>
<td>Seminar</td>
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</table>
Presentation and discussion of interesting topic in nautical science at the bachelor's degree level.

**03521498  Special Problems**  
Study and research in nautical science at the bachelor's degree level and compile into a report.

**03521499  Onboard Training**  
Onboard training.
<table>
<thead>
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<th>Course Title</th>
<th>Credits (Lecture-Term)</th>
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<tbody>
<tr>
<td>04801211</td>
<td>Introduction to Food Science and Technology</td>
<td>1(1-0)</td>
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<tr>
<td></td>
<td>Food quality factors. Food spoilage and principles of food preservation. Various types of food products.</td>
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<tr>
<td>04801221</td>
<td>Fundamental Food Processing</td>
<td>3(2-3)</td>
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<tr>
<td>04801231</td>
<td>Fundamental Food Engineering</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Pre: 04825111</td>
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<tr>
<td>04801312</td>
<td>Food Biochemistry and Nutrition</td>
<td>3(3-0)</td>
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<tr>
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<tr>
<td>04801323</td>
<td>Technology in Food Process</td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Pre: 01052322</td>
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<tr>
<td></td>
<td>Technology of food processing and product development, food fermented products, products from cereal, meat, fishery, dairy, fat and oil; beverage, confectionery. Industrial waste utilization.</td>
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<tr>
<td>04801331</td>
<td>Principles of Food Engineering</td>
<td>4(3-3)</td>
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<tr>
<td></td>
<td>Pre: 04801231</td>
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<tr>
<td></td>
<td>Engineering theory and principles in food processing, food processing equipments and food engineering operations. Sedimentation, centrifugation, filtration, extraction, distillation, crystalization, heat exchangers, evaporation, dehydration, refrigeration and size reduction.</td>
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<tr>
<td>04801341</td>
<td>Food Standard and Packaging</td>
<td>3(3-0)</td>
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<tr>
<td></td>
<td>Principles of quality grading, establishment of standards for food products, national and international food standards and regulations. Types of food packaging and packaging technology.</td>
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<tr>
<td>04801342</td>
<td>Food Quality and Measurement</td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Important quality characteristic of food products, physical properties of food products and their measuring methods. Sensory evaluation. Criteria for selection of appropriate food quality measurement method.</td>
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<tr>
<td>04801361</td>
<td>Food Microbiology</td>
<td>3(2-3)</td>
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</table>
### Classification of microorganisms important to food, factors affecting growth and changes of microorganisms in foods, food poisoning microorganisms, microbiological standards and quality assurance of food.

<table>
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<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tr>
<td>04801399</td>
<td>Practicum I</td>
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<tr>
<td></td>
<td><strong>Pre:</strong> 01419221 and 01419222</td>
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General field practices in food industry.

<table>
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<th>Course Title</th>
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<tr>
<td>04801424</td>
<td><strong>Fruit and Vegetable Processing</strong></td>
<td>3(2-3)</td>
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<td></td>
<td><strong>Pre:</strong> 01052322</td>
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Relation between physiological properties of fruit or vegetables and processing condition to finished product qualities, processing methods and preservation, waste utilization.

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tr>
<td>04801426</td>
<td><strong>Bakery Processing</strong></td>
<td>3(2-3)</td>
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<td></td>
<td><strong>Pre:</strong> 01052322</td>
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</table>

Type and properties of baking ingredients; formula balance, cereal products, processing and their keeping qualities, packaging and storage, quality control and management of industries. Field study.

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>04801428</td>
<td><strong>Meat and Poultry Processing</strong></td>
<td>3(2-3)</td>
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</table>

Relationship of physical, chemical, and biological properties of meat, poultry, egg and their products to quality; processing, preservation and storage techniques, factors affecting meat and meat products deterioration. Field study.

<table>
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<th>Course Code</th>
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<th>Credits</th>
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<tr>
<td>04801429</td>
<td><strong>Dairy Products and Processing</strong></td>
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<td><strong>Pre:</strong> 04801342</td>
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</table>

Chemical and physical properties of milk and dairy products including microbiological grades and classes of milk, processing of milk and other dairy products, quality control of milk and dairy products. Field study.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tr>
<td>04801443</td>
<td><strong>Principles of Food Quality Assurance</strong></td>
<td>3(2-3)</td>
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<td></td>
<td><strong>Pre:</strong> 04801342</td>
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</table>

Quality, quality control and assurance, principles of organization management concerning quality, quality system and standard of quality system. Field study.

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<thead>
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<td>04801491</td>
<td><strong>Research Techniques</strong></td>
<td>3(1-6)</td>
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<td><strong>Pre:</strong> 04801412</td>
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Techniques in conducting experimental research, proposal writing, experimental design, data collection and interpretation; development of an independent research paper in food technology.

<table>
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<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tr>
<td>04801496</td>
<td><strong>Selected Topics in Food Technology</strong></td>
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Selected topics in food technology at the bachelor’s degree level. Topics are subject to be changed each semester.

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Presentation and discussion on current interesting topics in food technology at the bachelor’s degree level.

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<th>Course Title</th>
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<tr>
<td>04801498</td>
<td><strong>Special Problems</strong></td>
<td>1-3</td>
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Study and research in food technology at the bachelor’s degree level and compile into report.

<table>
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<td>04801499</td>
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<td><strong>Pre:</strong> 01052322</td>
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Specialized field practices in food industry.
AGRO-BIORESOURCES
(04804xxx)

04804111  Overview of Integrated Agriculture  3(3-0)
Significance and model of integrated agricultural system; relationship of economics, society, politics and environment to evolution of the system; sustainability of natural resources and environment in relation to utilization of factors affecting crop cultivation, animal raising, fishery and forest management. Product structure of the integrated agriculture system in relation to farmers’ welfare and household industry.

04804121  Principles of Biology I  3(2-3)
Origin of life, energy transformations, morphology, physiology and concept of animal diversity, genetics, evolution, natural selection, ecology and animal behavior.

04804122  Principles of Biology II  3(2-3)

04804221  General Microbiology  3(3-0)
Pre: 04804121
Principles of microbiology; general survey of microorganisms; cell structures, genetics, growth and metabolism and classification. Significance of agriculture, food, industry, environment, sanitation and medical science.

04804222  Laboratory in General Microbiology  1(0-3)
Pre: 04804221 or together
Laboratory for General Microbiology

04804223  Principles of Ecology  3(3-0)
Pre: 04804121 and 04804122
Principles of ecosystems, evolution, behavior, population, community and application. Resources and patterns of utilization. Pollutants in ecosystems.

04804281  Environmental Science and Technology  3(3-0)
Overview of environmental science, world over population. Resources and problems related to possible depletion of some resources, chemicals in environment, the human health and environment in relation to hazardous wastes, pesticides, water and air pollution and solid waste disposal.

04804299  Practicum I  3
Practical training relevant to the field of specialization.

04804331  Agricultural Machinery and Equipment  3
Equipment and agricultural machinery technology for soil preparation, planting, crop maintenance, crop processing and animal husbandry; development and testing. And standard of agricultural machinery.

04804341  Plant Protection and Pest Control  3(2-3)
Pre: 04804122

04804342  Animal Health and Sanitation  3(3-0)
Pre: 04804121
Effect of animal health and animal sanitation on productivity and economic lost in livestock and aquatic animals production. Etiology, symptoms and mitigation of health problems from environmental stress, nutrition, toxic substances,
parasite and microbial infections. Hazard potential and alleviation of chemical and drug
residue in animal products and the environment.

04804361 Science and Technology in Animal Production 3(3-0)
Pre : 04804121
Integration of livestock, aquaculture and other agricultural production systems. Livestock
and aquaculture farming management practices. Farm product quality and marketing
strategies.

04804362 Laboratory in Science and Technology in Animal Production 1(0-3)
Pre : 04804361 or together
Techniques in animal holding and animal restraint. Cattle barn and
poultry pen designs. Fence and electrical fence installation. Dehorning, grooming, hoof
trimming, debeaking and branding. Artificial insemination and milking of dairy cattle.
Poultry hatchery technique. Pond and hatchery design for aquaculture farming. Fish pond
water quality assessments and controls.

04804363 Science and Technology in Plant Production 3(3-0)
Pre : 04804122
Significances of plants to ecosystems, socio-economics and environment,
classification, nomenclature and origin. Principles of plant production and improvement,
propagation, cultural practices and management. Harvesting and postharvest technology,
conditioning, transportation and storage.

04804364 Laboratory in Science and Technology in Plant Production 1(0-3)
Pre : 04804363 or together
Planning and management in plant production, planting, cultural
practices, yield assessment; plant’s growth conditioning, harvest, and postharvest
management, processing, storage and utilization.

04804371 Principles of Genetics 3(3-0)
Pre : 04804121
Cell and organelles related to genetics; heredity inheritance during
mitosis and meiosis; Mendelian inheritance and probability; the extension of Mendelian
laws. Genetics materials, replication and repair, function and regulation; gene and
chromosome mutation. Quantitative and population genetics; extranuclear inheritance.

04804372 Laboratory in Principles of Genetics 1(0-3)
Pre : 04804371 or together
Laboratory for Principles of Genetics.

04804381 Computer Application in Agriculture 1(0-3)
Computer of computer network and operating systems. Agricultural
management with computer programming. Principles of agriculture information system.
Agricultural programming and problem solving.

04804399 Practicum II 3
Practical training relevant to the field of specialization.

04804411 Integrated Agricultural Systems 3(3-0)
Pre : 04804361 and 04804363
Agro-bioresources management to obtain sustainable agriculture by
considering 4 categories : natural resource capacity, bioresource recycling, biodiversity
and economic efficiency.

04804421 Principles of Animal Physiology 3(2-3)
Pre : 04804121 and 04821251
Functions and controls of various organ systems in the body of animals, homeostasis and responsiveness.

**04804422  Principles of Plant Physiology**  
*Pre: 04804122 and 04821251*  
Plant physiology: plant-water relations, mineral nutrition, metabolism, growth and development.

**04804451  Agricultural Extension and Technology Transfer**  
*Pre: 04804411*  
Concept, meaning, philosophy and principles in agricultural extension. Principles and process of learning. Principles of communication and the process of media utilization in technology transfer; analysis of agricultural problems for sustainable agricultural extension planning; innovation and adoption process of farmers; principles and strategies in technology transfer to target person; sources of agricultural information.

**04804461  Feed and Feeding**  
*Pre: 04804121*  
Classifications and nutritive values of feed ingredients and mixed feeds. Digestive systems, digestion and utilization of feed nutrients. Problems associated with imbalance and/or insufficient nutrient intake in animals. Feed formulation and feed processing techniques. Raw materials and mixed feeds quality modification and storage. Appropriate feeding programs for individual animal classes.

**04804462  Small Scale Agricultural Products Industry**  
Processing of agricultural products for small scale industry. Agricultural products that utilized as main raw material, postharvest handling, processing, package and storage, quality and quality control.

**04804467  Raw Material and Agricultural Product Quality Assurance**  
Quality, quality factors, demand and acceptability of agricultural products that are utilized as raw material and as human consumption. Standardization and quality assurance.

**04804481  Water Resources and Management**  
*Pre: 04804281*  
Importance and some properties of water; water cycle and its component. Water resources and management systems in humid tropics; water management for aquaculture, irrigated and rainfed agriculture. Stream, lakes and reservoirs management and restoration. Assessment of water resource plans.

**04804482  Agricultural Biotechnology**  
*Pre: 04804371*  
Principles and application of biotechnology in agriculture and agro-industry. Control, field trial and patent application of biotechnological products.

**04804491  Research Methods in Agriculture**  
*Pre: 04804361 and 04804363*  
Principles and application of scientific instrument for agricultural research, writing research proposal, research report writing, discussion and research assessment.

**04804496  Selected Topics in Agro – bioresources**  
Selected topics in agro-bioresources at the bachelor level. Topics are subject to be changed each semester.

**04804497  Seminar**  
Presentation and discussion on current interested topics in agro-bioresources at the bachelor level.
**Special Problems**  
Study and research in agro-bioresorces at the bachelor level and compiled to reports and presentation.

**FACULTY OF SCIENCE AND ENGINEERING**

**CIVIL AND ENVIRONMENTAL ENGINEERING**  
(04811xxx)

**Construction Materials and Testing**  
04811321  
Pre : 01203221  
Physical properties of construction materials; steel, non-ferrous metals, wood, aggregates, concrete, masonry material, bituminous material; laboratory tests of construction material properties include compression, tension, shear, torsion, flexure and hardness; production of Portland cement; hydration process; types and testing of hydraulic cement; admixtures; properties of aggregates; fresh concrete; strength of concrete; testing of concrete.

**Laboratory in Environmental Engineering**  
04811341  
Pre : 01210211  
Water and wastewater treatment unit operations; settling, filtration, adsorption, disinfection, physical and biological treatment processes in laboratory.

**Civil and Environmental Engineering Project Preparation**  
04811495  
Pre : 04811495  
Preparation of project proposal, literature review and progress report.

**Selected Topics in Civil and Environmental Engineering**  
04811496  
Pre : 04811495  
Selected topics in civil and environmental engineering at the bachelor’s degree level. Topics are subject to change each semester.

**Seminar**  
04811497  
Pre : 04811495  
Presentation and discussion on current interesting topics in civil and environmental engineering at the bachelor's degree level.

**Special Problems**  
04811498  
Pre : 04811495  
Study and research in civil and environmental engineering at the bachelor's degree level and compile into a written report.

**Civil and Environmental Engineering Project**  
04811499  
Pre : 04811495  
Interesting project in various disciplines of civil and environmental engineering.

**ELECTRICAL AND COMPUTER ENGINEERING**  
(04812xxx)

**Electrical and Computer Practice**  
04812291  
Pre : 04811495  
Interesting project in various disciplines of civil and environmental engineering.
Workshop practice in basic electrical equipment, computer equipment and wiring installation.

04812495 Electrical and Computer Engineering Project Preparation 1(0-3)
Preparation of project proposal, literature review and progress report.

04812496 Selected Topics in Electrical and Computer Engineering 1-3
Selected topics in electrical and computer engineering at the bachelor’s degree level. Topics are subject to change each semester.

04812497 Seminar 1
Lecture and discussion on interesting topics in electrical and computer engineering at the bachelor’s degree level.

04812498 Special Problems 1-3
Study and research in electrical and computer engineering at the bachelor’s degree level and compile into a written report.

04812499 Electrical and Computer Engineering Project 1(0-3)
Pre: 04812491
Interesting projects in various disciplines of electrical and computer engineering.

MECHANICAL AND MANUFACTURING ENGINEERING
(04813xxx)

04813281 Engineering Workshop Practice 1(0-3)
Practice in work-piece measuring, layout, machine tools, bench works, sheet metal works, gas and electric welding, safety in workshop and maintenance of machine tools.

04813282 Engineering Materials 3(3-0)
Utilization of metal, polymer, ceramic, asphalt, wood and concrete as engineering materials; phase equilibrium diagrams and their interpretation; testing and meaning of engineering materials properties; macrostructures and microstructures in relationships with properties; engineering materials; production processes for products using engineering materials.

04813361 Machine Design 4(3-3)
Pre: 01208261
Fundamental of Mechanical design, properties of materials; theories of failure, design of simple machine elements, analysis and design of complex machine elements, design project.

04813371 Fluid Power Control 3(3-0)
Pre: 01208342
Fluid power control theory; structures of fluid power system, principles of equipment operation in hydraulics and pneumatics systems; design of hydraulics and pneumatics systems; application of hydraulics and pneumatics systems; analysis of hydraulics and pneumatics systems for industries; solving techniques of hydraulics and pneumatics systems for industries.

04813381 Mechanical and Manufacturing Engineering Laboratory I 1(0-3)
Pre: 01208222
Experimental work in engineering materials, heat transfer, mechanics of solids, mechanics of machinery, internal combustion engines and engineering mechanics.
04813481 Mechanical and Manufacturing Engineering Laboratory II 1(0-3)
Pre: 04813381 and 01208341
Experimental work in refrigeration, mechanical vibrations, fluid power systems, automatic control and fluid mechanics.

04813495 Mechanical and Manufacturing Engineering Projects Preparation 1(0-3)
Preparation of project proposal, literature review and progress report.

04813496 Selected Topics in Mechanical and Manufacturing Engineering 1-3
Selected topics in mechanical and manufacturing engineering at the bachelor's degree level. Topics are subject to change each semester.

04813497 Seminar 1
Presentation and discussion of current topics of interesting in mechanical and manufacturing engineering at the bachelor's degree level.

04813498 Special Problems 1-3
Study and research in mechanical and manufacturing engineering at the bachelor's degree level and compile into written reports.

04813499 Mechanical and Manufacturing Engineering Project 1(0-3)
Pre: 04813495
Interesting projects in various disciplines of mechanical and manufacturing engineering.

CHEMISTRY / BIOCHEMISTRY (04821xxx)

04821112 Laboratory in Fundamental of Chemistry 1(0-3)
Pre: 04821113 or together
Laboratory for Fundamental of Chemistry.

04821113 Fundamental Chemistry for Engineers 3(3-0)
Atoms and electrons in atoms, electronic structures of atoms, periodic system, representative elements, nonmetal and transition metals, chemical bonds, chemical reactions and stoichiometry, gas, liquid and solid, solution, fundamental thermodynamics, chemical kinetics, chemical equilibrium, ionic equilibrium and electrochemistry.

COOPERATIVE EDUCATION (850xxx)

850390 Cooperative Education Preparation 1(1-0)

850490 Cooperative Education 6
On the job training as a temporary employee according to the assigned project including report writing and presentation.
SUPHANBURI CAMPUS
(199xxx and 901xxx – 950xxx)

PUBLIC HEALTH
(199xxx)

199116 Public Health Sociology 3(3-0)
The knowledge of sociology, culture, family systems, kinship, social institution, social order, social stratification, socialization, socio-cultural change, social problems and strategies for problem solving, scopes of public health sociology, health belief and illness, health-seeking behavior, the patient-physician relationship, the organization of health care, health care delivery system, health systems, the medical profession and health and their roles in health care development.

199122 Public Health Biostatistics 3(3-0)
Definition, application and usage of biostatistics, statistic methods, sample size, method of sample selection, data collection, interpretation, presentation, frequency distribution, rate, ratio, proportion, measures of central tendency, shapes of frequency distribution, population and application for public health service.

199211 Public Health Economics 2(2-0)
Economic concepts and application on public health economics, pattern of health services by using economic plan. The relationship between public health service and national economic development plan.

199251 Environmental Health 3(2-2)
Environmental health, water supply, waste water treatment, sewage and excreta disposal treatment, refuse treatment, food sanitation, prevention and control of air pollution, prevention and control of animals and insects vector, housing sanitation, environmental management. Investigation technique for quality of air and water.

199262 Health Promotion 3(3-0)
Health promotion concept in Thailand and overseas, health situation on risk behavior related to health status and environmental factors. Appreciation implementation, creation, consciousness creation in health promotion, behaviors and environment adjusted for inter-personal, family, community and other institutes. Public policies to encourage the community on health promotion.

199311 Basic Health Care 3(2-2)
Pathology and disease in human, history taking and physical examination, assessment of patients, diagnosis and classification of diseases, sign and symptoms of disease, basic medical care, first aid, emergency care, accidental care, multi-casualty care, disaster management, referral system, roles of health personals on basic medical care. Field practice on disease prevention and control, basic technical skills on health care as assigned by Ministry of Public Health.

199331 Health Education and Behavioral Science 3(3-0)
Health education and behavioral science, concepts, objectives of health behavior analysis, behavior theories, applied theories on health behavioral change, health educational
plan project, health educational program and evaluation, concepts and strategies used for health education and behavioral science.

199361  **Occupational Health and Safety**  3(2-2)
- Operational guideline for occupational health, diseases and hazard, symptoms and signs. Occupational health service, international standards, laws and regulations of occupational health and safety. Roles of government officers for occupational health and safety.

199362  **Mental Health**  3(2-2)
- Human behaviors and adaptation process, factors related to mental health, development and changing of behaviors and mental health, cause of problems and predisposing factors of mental illness in community and trends. Case detection, promotion and prevention of mental health in the community, mental health service, integration of primary care and counseling.

199363  **Reproductive Health**  3(3-0)
- Trend and factors related to population change, population policies, consequence of population change on public health and country development. Scope and guideline for reproductive health implementations, family planning, maternal and child health, infertility, abortion and complication, aids and reproductive tract infection, sex education, reproductive cancer, teenage health, menopause and elderly.

199364  **Consumer Protection in Public Health**  3(2-2)

199391  **Statistics for Public Health Research**  3(2-2)
- Pre: 199122
  - Hypothesis testing, interpretation and presentation validity and reliability, testing of instrument. Using statistical package to analyze data in the public health research work.

199421  **Epidemiology**  3(3-0)
- Scope of epidemiology, occurrence of disease, distribution, surveillance, investigation studies and basic measures in epidemiology. Causation in epidemiology applied for medical and public health aspects, public health services and policies.

199451  **Community Health**  3(2-2)
- Public health policies of Thailand, concepts of community, factors related to civil society, community development, process of public health problem solving, community preparation, community public health problem diagnosis, roles of health personnel in community implementations, encouragement of civil society for participation, data collection and analysis, community health report.

199471  **Public Health Environment Management**  3(3-0)
- Situation use and deterioration of national resources, environmental pollution impact on health, laws agencies and organizations community respond to health environment protection, principle and environmental impact assessment, national environment health plan.

199472  **Planning and Administration in Public Health**  3(3-0)
- Principle, objectives and goal in public health planning, implementations, monitoring and controlling, evaluation of public health project in the past, present and future, public health planning for integrated rural development, policy for public health planning,
transformation of policies into practice, operational plan. Principle and development of public health care delivery system, public health administration of Thailand and international health organization and health care reform.

**199491 Research Methods in Public Health** 3(3-0)
Research classification, formulation of problems, objectives, hypothesis, theories and literature review, variables, conceptual framework, study setting, study assumptions, population and subjects, sample size, instruments construct, instruments testing, data collection, analysis planning and statistical methods, proposal writing, report writing and application of the findings for public health problems solving.

**199495 Independent Study** 5(0-30)
Independent study on public health problem. Report required.

**199497 Seminar** 1
Presentation and discussion on current interesting topics in public health at bachelor degree level.

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**ANATOMY (901xxx)**

**901211 Cell and Molecular Biology** 3(3-0)
*Pre: 726111*
Structures and functions of molecules, cells and organelles in higher organisms. Cell membrane, molecular organization of cell, cell organelles, cytoskeleton, cell metabolism, cell division, cell cycle and cell growth, genetic mechanism of cell, transport mechanism of cell, cell communication, cell specialization, response to energy and techniques in the study of cell.

**901221 Comparative Anatomy and Principles of Embryology** 3(2-3)
*Pre: 726111*
Homologous structures of various systems in different classes of vertebrates. Evolutionary aspect of the vertebrate. Concepts of gene expression, gametogenesis, fertilization, induction, cell differentiation and organogenesis.

**901321 Human Development** 2(1-2)
*Pre: 726111*
The processes of human reproduction, cellular differentiation, morphogenesis of tissues and organs. Considerations on the mechanism of germ cell differentiation. Process of fertilization, fetal membrane formation, germ layer formation and organ development along with anomalies. Demonstration and models are available.

**901322 Gross Anatomy** 6(3-9)
*Pre: 901221 or 901321*

**901323 Microanatomy** 4(2-6)
Microscopic as well as electron microscopic level of cells, tissues and organs. Relationships between the structure with physiology and biochemistry. Electron microscopy techniques, microscopic and cytochemical techniques. Slide preparation of various tissues and organs.

**Neurobiology**

Pre : 726111

Structural and functional aspects of the nervous system. Various nuclei in the brain and spinal cord and neuronal pathways. Excitation and synaptic transmission, receptors, coding of information, spinal and supraspinal reflexes, general and special senses, integrative functions of the central nervous system, relationships between the nervous system and the endocrine systems, fundamental knowledge about analysis of the disorder of neurobiological diagnosis with neurological case presentations.

**PHYSIOLOGY**

(902xxx)

**Medical Physiology I**

Pre : 726111

Principles, meaning and phenomena involving normal function of tissues and organs of nervous, muscular, circulatory and respiratory systems.

**Medical Physiology II**

Pre : 902341

Principles, meaning and phenomena involving normal function of tissues and organs of urinary, gastrointestinal, endocrine and reproductive systems.

**BIO-CHEMISTRY**

(903xxx)

**Medical biochemistry I**

Pre : 726111


**Medical Biochemistry II**

Pre : 903331

Chemistry and biological properties of blood, urine and hormones. Roles of vitamins, hormones and minerals in biological processes.
MICROBIOLOGY – PARASITOLOGY
(904xxx)

904451 Medical Microbiology 4(3-3)
Pre: 726111
Medical microbiology includes all aspects of virus, bacteria, clamydia, rickettsia and fungus. Basic principle on communicable diseases, mechanism of infection, specific property of each micro-organism, pathogenesis, infectivity and carriers, detail on micro-organism of medical important. Principles of laboratory diagnosis of microbial infections. Prevention and control of microbial infections.

904452 Medical Parasitology 3(2-3)
Pre: 726111
Human endoparasites and ectoparasites. Adult, young forms and life cycle of parasites in Protozoa, Platyheinemthes, Nematoda and Arthropoda phyla. Parasite and host interactions, pathophysiology and immunology in association with parasites, and principles of parasitic treatment.

PHARMACOLOGY
(905xxx)

905431 Medical Pharmacology I 4(3-3)
Pre: 903331
Principles of pharmacology, pharmacokinetics, structure and function relationships, the importance of therapeutic drug monitoring, pharmacological effects, mechanism of drug action, therapeutic uses and adverse drug reactions. Drugs acting on peripheral and central nervous systems, cardiovascular system, respiratory system, gastrointestinal system, endocrine system and therapeutic uses of hormones.

905432 Medical Pharmacology II 3(3-0)
Pre: 905431
Narcotics, analgesics, NSAID, muscle relaxant, general and local anesthetics, antimicrobial, antiparasitics, antiviral and anticancer drugs, immunosuppressive drugs. Toxicology and drug interactions according to national essential drug list.

PHATOLOGY
(906xxx)

906351 General Anatomical Pathology 4(3-3)
Transformation of diseased structures of human body: degenerative changes, death, abnormality of blood circulation and lymph, various minerals and pigments, inflammation, abnormality in growth of cells or organs, pathology of tumors. Visualization
and study with light or electron microscope from diseased specimens or specimens from autopsy. Preparation of specimens together with steps involve in pathogenesis and prognosis of the disease. Pathology in certain diseases from food deprivation, physical, chemical means, and immune diseases.

906352  Systemic Anatomical Pathology  3(2-3)
Pre : 906351
Pathology of disease in every system of the body. Clinicopathological correlation diseases of cardiovascular system, respiratory tract system, gastrointestinal system, liver, bile duct, pancreas, and diseases of the urinary tract. Clinicopathological correlation of cases from autopsies, clinical history, pathology of an interesting diseases.

906451  Clinical Pathology  3(2-3)
Pre : 903331
Application of laboratory techniques in clinical diagnosis, emphasizing mainly the diseases that affect Thai populations.

IMMUNOLOGY
(907xxx)

907461  Medical Immunology  3(2-3)
 Principles of human immunity, antigen and antibody interaction. Humoral immune response, cellular basis of the immune response, effector mechanisms including complement and cytokines, immunity to infection, control mechanisms of the immune response, self-nonself discrimination and autoimmunity. Immunological mechanism of tissue damage and inflammatory responses. Roles of immune system in clinical medicine and immunological basis of vaccines.

CENTER COURSE
(910xxx)

910291  Research Methods in Medical Science  2(1-3)
Experimental design, gathering basic and previous informations for undergraduate research, including library search.

910495  Research  2(0-6)
Pre : 910291
Carry out experiment, data collection, conclude the result for research in undergraduate level.

910499  Special Project  3(2-3)
Pre : 910291
Basic medical science research. Use of past experience in identification of research title, planning and carrying research work in order to generate new knowledge and enhance competency.
## PHYSICAL THERAPY

(941xxx)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>941241</td>
<td>Therapeutic Exercise I</td>
<td>2(1-3)</td>
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<tr>
<td></td>
<td>Principles of body movement and therapeutic exercise for basic treatment; exercise for increasing range of joint motion, muscle power, endurance, muscle co-ordination and relaxation, the use of exercise equipments.</td>
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<tr>
<td>941242</td>
<td>Principles of First Aid</td>
<td>1(1-0)</td>
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<td></td>
<td>Principles, techniques and procedures of basic nursing care, observation of vital signs; first aid, nursing care of common medical emergencies and resuscitation</td>
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<tr>
<td>941261</td>
<td>Code of Ethics and Administration in Physical Therapy</td>
<td>2(2-0)</td>
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<tr>
<td></td>
<td>The role of physical therapist, code of ethics, physical therapy act and related legislation, professional development in Thailand and other countries, general principles of administration and administration of physical therapy unit.</td>
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<tr>
<td>941292</td>
<td>Clinical Practice I</td>
<td>1(0-6)</td>
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<td></td>
<td>Scope of physical therapy practice, process of patient care in physical therapy and application of physiology and neurobiology to explain uncomplicated disorders. Observation of patient's appearance, assessment of patient's activities of daily living. Measurement of joint range of motion, muscle power, including transfer and positioning techniques.</td>
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<tr>
<td>941311</td>
<td>Electrotherapy I</td>
<td>3(2-2)</td>
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<td>Use of low and medium frequency current for stimulating normal and abnormal muscles and nerves. Principles of equipment selection, maintenance and trouble shooting, by electrodiagnosis method of examination, evaluation and diagnosis of muscles and nerves conditions.</td>
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<tr>
<td>941312</td>
<td>Electrotherapy II</td>
<td>3(2-2)</td>
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<td></td>
<td>Pre : 941311</td>
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<tr>
<td></td>
<td>Use of short wave and microwave diathermy, magnetic wave, ultrasound, laser and thermotherapy, cryotherapy. Equipment selection, maintenance and trouble shooting.</td>
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<tr>
<td>941313</td>
<td>Manipulation and Massage I</td>
<td>1(0-3)</td>
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<tr>
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<td>Principles and techniques of massage of muscles and soft tissues in different parts of the body including indication, contra-indication and precaution.</td>
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<tr>
<td>941314</td>
<td>Manipulation and Massage II</td>
<td>3(2-3)</td>
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<tr>
<td></td>
<td>Pre : 941313</td>
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<tr>
<td></td>
<td>Principles and techniques of peripheral and spinal mobilization and manipulation for improving assessment and treatment skill of joints, muscles and other tissues by manual and machine.</td>
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<tr>
<td>941315</td>
<td>Daily Life Activity</td>
<td>1(0-3)</td>
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<td></td>
<td>Practice of independent activities of daily living: side lying from supine, sitting up from supine, standing up from sitting, dressing and use of ambulatory aids. Techniques in transferring patients and lifting heavy object, techniques of safety falling.</td>
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<tr>
<td>941321</td>
<td>Physical Therapy in Musculoskeletal System I</td>
<td>3(2-2)</td>
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</tbody>
</table>
Disorders of musculoskeletal system, assessment, treatment planning, and application of medical and physical procedures and splinting in fracture and joint dislocation. Practicing of support and fixing instruments and soft cast.

**941322 Physical Therapy in Musculoskeletal System II**  
Pre : 941321  
Assessment, treatment planning, physical therapy in patients with soft tissue injuries and musculoskeletal and joint diseases, physical therapy in amputee. Practicing special diagnostic and application in patients.

**941323 Physical Therapy in Neurological System I**  
Pre : 941321  
Application of movement control theory, postural control and learning, recovery of nervous system, normal and abnormal movement component in activities of daily living, clinical decision making process in the management of neurological patient, technique of evaluation and assessment and control movement in daily living.

**941324 Physical Therapy in Cardiopulmonary System I**  
Diseases and disorders of the cardiopulmonary system, medical and physical therapy procedures, physiological change of cardiopulmonary system in abnormal conditions, clinical decision making in cardiopulmonary physical therapy, practice in evaluation, assessment and treatment techniques, pre- and post- pleuro-pericardial thoracic surgery physical therapy.

**941325 Physical Therapy in Specific Health Problems**  
Medical and physical procedures in evaluation, assessment and treatment in burn, pre-and post-partuition, pre-and post-mastectomy, physical therapy in elderly, physical therapy of workers in industrial plants.

**941341 Therapeutic Exercise II**  
Pre : 941241  
Principles and techniques of individual and group exercises, exercise for correcting posture, the use of music and recreation in exercise. Hydro-exercise: indication, contra-indication, preparation of patients and equipments for hydro-exercise.

**941342 Therapeutic Exercise III**  
Pre : 941341  
Principles of neurophysiology and biofeedback in exercise for therapy and enhancement of co-ordination to improve the movement to normal condition, techniques of therapeutic exercise in patients with abnormal peripheral circulation and in spinal disorders.

**941343 Principles of Evaluation and Assessment in Physical Therapy**  
Concepts in clinical decision making, the relationship between pathology, impairment and compromised functions, method of data collection from the patient, planning of physical examination, goal setting, evaluation for screening problems in musculoskeletal, neurological, cardiopulmonary, and other systems.

**941344 Selected Medical Conditions for Physical Therapy**  
Medical assessment and treatment of the skin, ear, eye, throat and nose conditions and related diseases for physical therapy.

**941392 Clinical Practice II**  
Pre : 941292  
Skills in physical therapy care of patients with musculoskeletal disorders using clinical decision making process includes utilizing information obtain from history.
taking, medical record and physical examination for screening and analyzing the patient's problems. Therapeutic exercise, electrotherapy, massage and positioning techniques.

941393  Clinical Practice III  3(0-18)
Pre : 941392
Skills in physical therapy care of patients with musculoskeletal, neurological, cardiopulmonary disorders and vascular disorders. Therapeutic exercise, electrotherapy, massage, positioning, mobilisation, motor control and sputum drainage.

941423  Physical Therapy in Neurological System II  3(2-2)
Pre : 941323
Diseases and disorders of the nervous system, medical and physical therapy procedures used in the evaluation and assessment of the disorders in cerebrovascular accident, spinal cord injury, head injury, parkinsonism, chorea, athetosis, flaccidity, pain control in peripheral nerve injury, peripheral nerve injury and motor neuron diseases.

941424  Physical Therapy in Cardiopulmonary System II  2(1-2)
Pre : 941324
Diseases and disorders of the cardiopulmonary system, medical and physical therapy procedures used in the evaluation, assessment and treatment of chronic obstructive pulmonary diseases, pneumonia, empyema, pneumothorax, hemothorax, emphysema, asthma, rehabilitation in chronic pulmonary diseases, heart failure and cardiac rehabilitation.

941431  Physical Therapy in Pediatrics  2(1-2)
Normal motor development and common physical and mental impairments in children including medical management. Physical therapy management with the emphasis on the assessment, treatment procedures, prevention and promotion of efficient movement of the children in various communities.

941432  Physical Therapy in Community  2(1-3)
Physical therapy roles for health promotion, prevention, treatment and rehabilitation in the communities in order to analyze physical problems and give appropriate advices or physical treatments.

941451  Rehabilitation Team  2(2-0)
The roles of health personnel involving in patient's rehabilitation and co-ordination between physical therapist and other members of the team which include physician, specialists in occupational therapy, speech pathology, recreational therapy, psychology, social worker, vocational training and sports activities for the handicapped.

941491  Research Methodology  2(1-3)
Principles of research in science and sociology with application to physical therapy, ethical consideration and research methodology. Practice writing research proposal, conducting research and presenting a final report.

941492  Clinical Practice IV  3(0-18)
Pre : 941393
As in clinical practice III with more emphasis on increasing skills and efficiency in clinical decision making process under closed supervision.

941493  Clinical Practice V  3(0-18)
Pre : 941492
Skills in pediatrics physical therapy and more complicated neurological, cardiopulmonary and musculoskeletal disorders.
Physical therapy practice in hospitals and communities locate in various regions of the country to experience the environment and cultural differences that may affect the delivery of physical therapy service and administration of the physical therapy unit.

**MEDICAL TECHNOLOGY**

(942xxx)

**942211 Introduction to Diagnostic Laboratory Medicine**  
1(1-0)  
Scope and importance of diagnostic laboratory medicine in disease diagnosis, treatment follow up, controlling of diseases, and epidemiology. Relation to various public health work, the ethics and laws dealing with the profession.

**942241 Hematology I**  
3(2-3)  
Hematology dealing with hemopoiesis; blood cells, structure and function of all human blood cells. An introduction to coagulation system; anemia and hematologic malignancies.

**942242 Methods in Hematology I**  
3(2-3)  
Techniques used in hematologic examination; red blood cell, white blood cells and platelets counting both manual and automation; red blood cell indices determination; red blood cell fragility testing; erythrocyte sedimentation rate.

**942251 Principles and Techniques in Clinical Laboratory I**  
3(2-3)  
Fundamental techniques used in clinical laboratories of the hospitals. Safety of health care units. Collection and handling of clinical specimens; reagent preparation; aseptic techniques; use of light microscope and preparation of specimen for microscopic study. Sample preparation for detection by spectrophotometer technique, centrifuges. Fundamental of quality control.

**942252 Clinical Laboratory Instrumentations and Maintenance**  
2(1-3)  
Theoretical function of laboratory instruments, usage, maintenance, preliminary repair. Efficacy testing of common clinical laboratory instruments, water bath, incubator, hot air oven, centrifuge, spectrophotometer, balance, pH meter, and microscope.

**942291 Research Methodology in Medical Sciences**  
1(1-0)  
Principles of research which specially focus to medical sciences, types of research, use of statistics in research, ethics in research, presentations of research work.

**942321 Urinalysis and Laboratory Investigation of Body Fluids**  
3(2-3)  
Urine examination for supporting diagnosis of diseases, microscopic examination of urine sediments, qualitative and semiquantitative examination of chemicals. Administrative and management and quality control of urine examination and biological fluids from patients including cerebrospinal fluid, semen, synovial fluid, peritoneal fluid, pleural fluid and other transudeate and exudate and laboratory examination in forensic medicine.

**942331 Clinical Chemistry I**  
3(2-3)
Chemical and biochemical changes in various human diseases, role of clinical laboratory in diagnosis of diseases of kidney, liver, heart and endocrine glands. Abnormality in metabolisms, fluid and electrolytes imbalance, acid-base imbalance including disorders due to drugs, narcotics and toxic substances.

**942332 Methods in Clinical Chemistry I**
Techniques for analysis of biochemical substances in metabolism of carbohydrates, proteins, lipids, minerals, vitamins, enzymes and other biochemical molecules being marker of organ junction likes liver, kidneys and heart. Analysis of volatile substances, heavy metals, drugs and narcotics, electrolytes by procedures other than colorimetry.

**942333 Clinical Chemistry II**
Practice integrally by using simulating conditions. Students can integrate knowledge about analytical techniques in clinical chemistry laboratory to theory of diseases and to the use of laboratory in clinical diagnosis. Skill practice in laboratory procedures, laboratory management concurrently with group process and problem solving.

**942334 Methods in Clinical Chemistry II**
Advanced techniques for determination of biological substances involve in controlling body metabolism; arterial blood gas analysis, osmolar pressure measurement and assay for hormones, quality control of this analytical techniques. Principles and practice on special analysis in clinical chemistry. Chromatographic techniques, electrophoresis, electrochemical, immunochemical techniques, chemiluminescent techniques, bioluminescent techniques, immobilized enzymes, biosensor.

**942341 Hematology II**
Pre: 942241, 942242
Hematologic changes in various diseases, abnormal of red blood cell, white blood cell and platelets; blood coagulation system. Bone marrow transplantation.

**942342 Methods in Hematology II**
Pre: 942241, 942242
Examination of abnormal red blood cell, white blood cell and platelets including coagulation system.

**942343 Immunohematology and Blood Banking**
Pre: 942241, 942242
Theoretical study of blood banking and immunohematology; immunology of blood cells, blood donor bleeding, preparation and storage of donor blood and blood components; cross matching, problem solving in blood transfusion reaction. The tissue antigen-antibody, organ transplantation, quality control and scope of blood-bank responsibility.

**942344 Methods in Blood Banking**
Techniques routinely and specially used in blood banking, donor bleeding, blood group determination, cross matching, blood donation, blood component preparation, demonstration of tissue antigen identification. Identification of problems and problem solving in transfusion reaction, tissue typing.

**942351 Principles and Techniques in Clinical Laboratory II**
Pre: 942251
Special techniques used in more advanced clinical laboratories of the hospitals. Detection by fluorescent microscopic technique; immunoassay technique for
biological molecules; separation and detection of biological molecules; cell counting using flow cytometry; automatic analyzer.

942352 Methods in Clinical Immunology 3(2-3)
Pre: 907301

Techniques for quantitative determination of antibodies and complement in the plasma of patients which will be used in diagnosis, laboratory examination for cell mediated immunity status and treatment, follow-up of cell mediated immunological diseases.

942391 Basic Techniques in Molecular Biology 2(1-3)

Molecular biology techniques, gene cloning, restriction enzymes, gene splicing, DNA and RNA labeling, hybridization technology, polymerase chain reaction technology. Application of molecular biology technique in forensic science, diagnosis of various hereditary diseases or other diseases involve in bio-molecular levels.

942421 Laboratory Analysis and Clinical Relation 2(2-0)

Significance of clinical analysis, result of medical laboratory diagnosis and validation of data, correlation of laboratory results with clinical signs and symptoms of patients.

942461 Laboratory Administration, Management and Quality Assurance 2(1-3)

Principle of general administration and management, management system of clinical laboratory in modern hospital by use of information technology for effectiveness, quality control and quality assurance of clinical laboratory both in broad and depth views, laboratory accreditation and standardization of clinical laboratory, ethical and related laws.

942497 Seminar 1

Presentation and discussion on current interesting topics in medical technology at the bachelor degree level.

942498 Medical Technology Project 2(0-6)

Meaning, criteria and research methodology. Use of scientific process for research design and conducting of various types of research in medical technology. Scientific paper writing and report of scientific works.

942499 In-Service Training in Clinical Laboratory 6(0-36)

Training of routine laboratory work in both simulated clinical laboratory and in those of hospital from various regions in the area of clinical chemistry, clinical microbiology, clinical immuno-serology, parasitology, clinical microscopy and blood banking. Accreditation of analysis, stills in venupuncture and patient communication, stills in laboratory work and the use of technology for analysis.

RADIOLOGICAL TECHNOLOGY
(943xxx)

943221 Radiological Technology Profession 2(2-0)

Role of the three radiological technology professions namely radiation diagnosis, radiation therapy and nuclear medicine; historical background, interrelationship among medical and paramedical personnel; scope of work, responsibility, right and duty including professional organization, medical ethics, code and regulation and legal concerned.

943222 Radiobiology 2(2-0)
Free radical generation, energy transfer. Direct and indirect effect of ionizing radiation on cells at molecular level and systemic. Acute effect and chronic effect on living organisms; skin, bone marrow, gastrointestinal, respiratory, urinary, reproductive, skeletal, muscular and nervous systems.

**943223 Medical Radiation Physics**  
*Pre : 733119*  
Mechanism of ionizing radiation, physical properties and factors affecting radiation properties. Interaction of radiation with medical related substances. Application of physical properties for medical radiation

**943311 Instrumentation in General Diagnostic Radiology**  
*Pre : 943223*  

**943312 Physics and Instrumentation in Radiation Therapy I**  
*Pre : 943223*  
Basic principles of instrument and equipment use in radiation therapy. Far and near radiotherapeutic beam generators. Planning of radiation therapy as to obtain the maximum possible of radiation. Homogeneous dispersion of radiation on target site with minimal irradiation of the tissues nearby

**943313 Physics and Instrumentation in Radiation Therapy II**  
*Pre : 943223*  

**943314 Instrumentation in Nuclear Medicine I**  
*Pre : 943223*  
Concept and techniques in the use of nuclear medicine instruments, electronic components for counting of radioactivity, counting statistic, counting instrument, gamma camera, care and quality control, maintenance and the effect of environmental conditions on nuclear medicine instruments.

**943315 Instrumentation in Nuclear Medicine II**  
*Pre : 943223*  
Design and principles of nuclear medicine instruments for imaging and non-imaging purpose, system detection, electronic components and related computers, gamma counter, beta counter, statistic and monitoring efficiency of counting and counting system, image processing theory in gamma camera, SPECT, PET, design and the use of collimator in terms of sensitively and resolution, quality control, and the appropriate use of nuclear medicine instrumentation, radio nuclides and radio pharmaceutical compounds.

**943321 Electronics for Radiologic Technology**  
*Pre : 733119*  
Theory in electric circuits and electronics, analog circuits, digital circuit and its applications, measuring instruments, circuit/net work analysis and system troubleshooting.

**943322 Radiographic Imaging**  
3(2-3)
Pre : 728111, 728112

Basic principles of radiographic imaging by analog systems, equipment for imaging theory of film and screen, instruction and maintenance sensitometry, mechanism of imaging on film and process of picture formation, dark room and film processing using manual, automatic and daylight systems, silver recovery, factors affect quality of radiographic image, exposure techniques, duplication, subtraction. Film fault

943323  Digital Imaging Processing  2(1-2)
Pre : 729112

Digital imaging, digital image recording, TV-image recording, laser image processing, image processing in 3-dimension, image archiving and communication system in digital imaging networks.

943324  Radiographic Anatomy and Radiographic Pathology  3(2-2)
Pre : 901202

Normal anatomical identification from X-ray film obtained by general radiography. The abnormal anatomical identification according to congenital anomalies or accidental or pathologies.

943325  Ultrasonography  3(2-2)
Pre : 901202 and 943223

Physical principles of instrumentation, technique of clinical applications and quality control of medical diagnostic ultrasound. Radiographic anatomy and pathological relations of images.

943326  Stereotactic Radiosurgery  3(3-0)
Pre : 943223

Theory of radiosurgery, equipments included gamma knife and the use with linear accelerator, immobilization, tumor localization and planning, localizing isocenters, treatment sites and doses, vital structures, advantages and disadvantages.

943327  Radioassay and Related Procedures in Medicine  2(1-2)
Pre : 943223

General principles in radioimmunoassay, antigen-antibody production, chemical purification, precipitation and sedimentation by immunological techniques. Selection of appropriate radionuclide for labelling, purification, quality control of radioassays, usefulness of radioassay for diagnosis of diseases, and follow up of treatment in patient with thyroid dysfunctions, infections diseases, carcinoma, allergic diseases, diseases of vascular system and metabolic disorders.

943328  Radiopharmaceuticals  2(1-2)
Pre : 943223

Chemical and biological properties and chemical radiation of labelled radionuclides. Pharmacodynamics of radiopharmaceuticals, biological effects, toxicity and chemical purity, toxicity and radiation purity, quality control, biological test, pyrogenic test, calculation and measurement of radiopharmaceutical dose for patient diagnosis and treatment. National and international law and regulation control for radiopharmaceutical by international organization in terms of code and practice.

943329  Clinical Nuclear Medicine  3(2-3)
Pre : 943322

**943331 Radiographic Techniques and Positioning**
*Pre: 901202*
Positioning techniques used in radiography of the upper and lower extremities, bony thorax, spinal column, pelvic girdle, respiratory system, abdomen, skull, paranasal sinus, facial bone, temporal bone, mastoids, mandible and dental. X-rays of accidental patients, children and dental X-rays, posture demonstration, film reading and posing with models.

**943332 Special Radiographic Techniques**
*Pre: 901202*
Physical principles of instrumentation, technique of clinical applications and quality control of the special radiographic procedures. Fluoroscopy, tomography, digital radiography and network system in diagnostic radiology. Contrast agents in diagnostic radiology. Radiographic anatomy and pathological relations of images.

**943333 Mammography**
*Pre: 943223*
Physical principles of instrumentation, technique of clinical applications and quality control of mammography. Radiographic anatomy and pathological relations of images.

**943334 Radionuclide Techniques in Clinical Investigation**
*Pre: 901202 and 943223*
Autoradiography, electrophoresis strips, chromatogram, tracer technique, compartment analysis, blood flow study, blood volume and mass measurement by isotopic dilution technique, static and dynamic uptake measurement of organs, red blood cell dating, ferrokinetics technique without tracer, activation analysis and X-ray fluorescence.

**943335 Dosimetry in Diagnostic Radiology**
*Pre: 943223*
Radiation units and radiation dosimeters. Radiation measurements applied to diagnostic radiology.

**943336 Dosimetry in Radiation Therapy**
*Pre: 943223*
Basic concepts of radiation dosimetry and clinical dose calculation in radiation therapy. Radiation units, exposure, absorbed doses in kerma, units use in radiation protection. Dosimetry, the physical structure properties and instruction, calibration method of radiotherapeutic dosimeters.

**943337 Dosimetry in Clinical Radiation**
*Pre: 943223*

**943341 Basic Radiation Protection**
*Pre: 943223*
Effect of radiation on human. Safety measures for operators and the patients. Criteria and limitation of radiation exposure for various personnel. Planning and thickness calculation of shielding to control and prevent harmful effect from radiation according to physical criteria. Use of radiation protection equipment.

943342 Radiation Protection in Radiation Therapy 2(2-0)
Pre : 943223

943343 Radiation Protection in Nuclear Medicine 1(1-0)
Pre : 943223
Man-made and natural radionuclide, local and whole body irradiation, definition, symbols and units for quantification, dosimeters for radiation dosage and contamination radioactives decontamination methods, radiation protection for patients, medical personnel and those high-risk grow to exposure. Radioactive waste disposal management, design and precaution procedure use in nuclear medicine laboratory, location for nuclear instruments installation national and international rules and regulation standard for possession of radioactive substances.

943351 Patient Care in Radiology 2(1-2)
Pre : 726114
Responses of patients with acute or chronic diseases to radiation. Evaluation of patients, care of patient due to cardiac arrest, vital signs, aseptic conditions, mobilization of patients according to body kinetics, preparation of patient physical and mental conditions prior to radiation diagnosis, prevention of complications post radiation. Patient care before, during and post-radiation therapy. First-aids and resusitation.

943352 Clinical Radiation Oncology 3(3-0)
Pre : 726114

943353 Technical Radiation Therapy 3(3-0)
Pre : 901202
Technique and applications of equipment for positioning and boundaries of lesion to be irradiated. Simulation of radiation treatment for organs in each system. Technique of positioning, the use of equipments in positioning and immobilizing the patients. Patient care during treatment and invention of supporting units. Data recording.

943361 Quality Assurance in X-Ray Radiography 2(1-3)
Pre : 943223
Quality assurance in X-ray radiography, meanings in quality assurance and quality control. Objectives, steps, procedures and evaluation of X-ray radiography, normal and mobile, dental X-ray including cameras, film-box, film developer and dark room process. Permissible values accepted internationally, calibration of testing instruments.

943421 X-Ray Computed Tomography 3(2-3)
Pre : 729112 and 943223

II-485
Physical principles of instrumentation, technique of clinical applications and quality control of X-ray computed tomography. Radiographic anatomy and pathological relations of images.

**943422 Magnetic Resonance Imaging**  
*Pre: 729112 and 943225*

Physical principles of instrumentation, technique of clinical applications and quality control of magnetic resonance imaging. Radiographic anatomy and pathological relations of images.

**943431 Computer in Nuclear Medicine**  
*Pre: 729112*

The basic criteria in the computer system and its network in nuclear medicine data storage, image display, image processing in body section, 3D image processing, back projection, filtered back projection, image filtration techniques. Factor involved in image quality, image cut off, scattered effect, motion artifacts, image quality upgrading, data analysis and quantification of image processing in clinical diagnosis.

**943461 Quality Assurance in Radiation Therapy**  
*Pre: 943312 and 943313*

Quality assurance in radiation therapy. Quality assurance of instrument and equipments, process, treatment procedure, dose, follow-up evaluation.

**943462 Quality Assurance in Nuclear Medicine**  
*Pre: 943314 and 943315*


**943497 Seminar**  

Presentation and discussion on current interesting topics in radiological technology at the bachelor degree level.

**943498 Radiological Technology Project**  

Undertake an investigative project under supervision of advisor. Selection of research topics in accordance with major subject. Increasing skill and ability to work independently, analysis, interpreting and conclusion of data. Report writing and presentation result in the meeting.

**943499 Practical Work**  

Practical works in clinical area under supervisor of radiation technologists and medical radiologists.
NUSING SCIENCE
(198xxx)

198111 Mathematics                                2(2-0)
Principles, concepts, basic theories in mathematics; series, function, inverse
function and calculus, theory of probability, relationship of mathematics and other
subjects. Application of mathematics in living and nursing practice.

198112 Chemistry                                 3(2-2)
Principles and basic concepts of chemistry, acid, base, salt and buffer, nuclear
chemistry, molecular structure, physical and chemical properties of organic substances,
biomolecular, results form the changes that occur form the prosperity of chemistry
knowledge, relationship of chemistry and other branches of knowledge, application of
chemistry to be useful to the living and nursing practice.

198113 Physics                                  3(2-2)
Basic concepts, principles and rules in physics regarding measurement, mass,
force, movement, energy, principles of machine and the use of machines in nursing and
curing, properties of substances, pressure of fluid, heat, light, sound, magnetic, electric,
and electronic nuclear physics, and biographic system, changes resulted from advance in
physics, relationship of physics and other branches of knowledge, application of physics
to be useful to the living and nursing practice.

198114 Information and Method of Inquiry                        1(1-0)
Meaning and significance of information, source of information, application
of information technology; selection, synthesis and presentation of information,
promotion of enthusiasm active learning, self study and selection of information
receiving.

198121 Philosophy and Religions                            2(2-0)
Meaning, scope of content, important philosophical thoughts such as realism
materialism and naturalism, study of concepts and philosophical thoughts that appear in
buddhism, christian, islam, chinese philosophy, japanese philosophy, application of
philosophical thoughts in the society to be relevant to the real situation.

198122 Environmental Study                             2(2-0)
Concepts and National Policy of Environment, the environment that affects
health, control environmental quality, investigation of quality of environment,
improvement of quality of environment; roles of individual, community and organization
on natural and environmental conservation, and the involved legislation.

198131 Group Dynamics                              2(2-0)
Natures, structure of group; factors influent the process of group work. Roles
of group leaders, group members. Pattern of team work, analysis of team work and self
develop- ment in team work, creation of group power, the development of efficient team
work.

198132 Psychology                                 3(3-0)
Concepts of psychology, psychology of various groups, maturity, perception, learning, memory, forgetting, thinking and wisdom, emotion, motivation, self-concept, attitude, habit, personality, adjustment, physical, intellectual, emotional, societal and ethical development of human in different age groups, factors that influence the development and behavioral changes.

198133 Sociology and Social Problems 2(2-0)
Basic concepts of the society in social structure, system, institution, norm of society, change of social traits, present situations of thai society and world society, analysis of social problems and their effects on people’s health, and methods of solution.

198141 Microbiology and Parasitology 4(3-2)
Types, appearance, nature, properties and physiology of micro-organism and parasites that affect health, diseases onset and spreading, disease prevention; damage and growth inhibition of micro-organism and parasite; infection, and immunity

198142 Anatomy 4(3-2)
Components, structure and function of cells, tissue, organs and systems of the somatic anatomy, including sits and relation of each organ in the body.

198143 Physiology 3(2-2)
Mechanism and relation of the functions of organs in various systems in maintaining and controlling of normalization of the body and the adaptation to body injury.

198144 Nutrition 3(2-2)
Types and value of essential nutrients to the body of the individual in each age groups, calculation of quantity and energy of various food substances, preservation of nutrition in food, cooking and food arrangement suitable for the individual either when healthy or ill, including provision of nutritional education.

198145 Biochemistry 3(2-2)
Types, structure, attributes; processes of digestion, absorption and combustion of protein, carbohydrate, lipid, nucleic acid and the utilization of various nutrients including vitamins, minerals hormones, enzymes; and acid-base balance of the body.

198151 Basic Concepts and Principles of Nursing I 3(2-2)
Concepts of health, illness, roles, functions, and scope of responsibility of nurses in health promotion, diseases prevention, curative and, rehabilitation of the individual, family and community concerning physical, mental and spiritual. Nursing theories, nursing process, principles of nursing, and promotion of people’s self care.

198152 Basic Concepts and Principles of Nursing II 3(2-4)
Pre : 198151
Nursing techniques for helping people who have health problems, nursing record, practice providing care to the individual, family, with deviate health condition using nursing process and nursing techniques.

198153 Basic Concepts and Principles of Nursing III 2(0-8)
Pre : 198152
Practice using the nursing process in providing nursing care to individual, family, and community both in normal condition and deviate health condition.

198181 Nursing Professional Development 2(2-0)
Evolution in Nursing service and education, administration and nursing research, economical change, science and technology, social and education that influence nursing development, roles and functions of nurses in professional development, professional organizations and related organizations both in the country and foreign counties.
goals of life.

**198221 Health Anthropology** 2(2-0)
Basic concepts and processes of anthropology relationship between the human, environment and culture related to health, believe, health behavior, Thai’s wisdom and health care, influence of the change in sciences and technology which affect life; living and health.

**198222 Communication and Public Relations** 2(2-0)
Meaning, significance, components and processes of communication, application of various models of communication, principles and methods of public relations, development of Public Relations quality, influence of sciences and technology towards communication and public relations.

**198241 Pharmacology** 3(3-0)
Basic knowledge in Pharmacology, reaction of the drug to the body, absorption, diffusion, side effect and toxication of drugs, reaction towards each other of the drugs, elimination of the drugs, precaution of drugs use, factors that influence the utilization of drugs, principles of drugs administration and caring of drugs use, national list of the drugs and the drug list of ministry of public health, and scope and responsibility of nurses in drugs use.

**198242 Pathophysiology** 3(3-0)
Basic reaction of changing processes of cells and tissue, processes of disease onset in each system of the body, pathology that effects the functions of various systems, and symptoms and signs of the diseases from that change.

**198243 Clinical Pharmacology** 2(2-0)
Drugs used in clinic; doses and actions of drugs used for specific diseases; addicted drugs; chemotherapeutic drugs and their actions, reaction, toxicity, and side effects; roles and responsibilities of nurses in drug administration; basic medical care; intervention for drug side effects, allergies, and toxicity.

**198251 Mental Health and Psychiatric Nursing I** 3(2-4)
Concepts, principles and theories of psychiatric nursing, roles and responsibilities of psychiatric nurses, self concept factors that has effect on health, self therapy, nursing process, guidance in helping and creating relationship with a person who has psychiatric problems, practice using nursing process in caring of the person who has psychiatric problems and adaptation.

**198261 Community Health Nursing I** 3(3-0)
Concepts, principles, roles, functions, and responsibilities of community health nurses, public health problems, national pubic health development plan, primary health care, administration structure and national health care delivery system, principles in teaching and consulting about health, nursing process in health promotion, prevention curation and rehabilitation to the individual, family and community. Family health, school health, environmental health, dental public health, principles of epidemiology and surveillance, information system and referal system in Public Health.

**198262 Community Health Nursing II** 2(0-8)
*Pre: 198261*
Practice teaching and counselling in Health, using nursing process in health promotion, prevention, curation and rehabilitation to the individual, family and community. Family health, school health environmental health, dental public health, promote and support the primary health care work.

**198263 Adult Nursing I** 4(4-0)
II-490

Concepts and principles in providing Nursing care to the person in late adolescent stage to adult stage, preparation of the patient for diagnostic examination and therapy of the person who has health problems related to changing in growth of cells, integumentary system, ear, eye, nose, throat, tropical diseases, communicable diseases, non-communicable diseases, gastro-intestinal tract, blood and lymph, urinary tract, reproductive organs; in acute stage, critical stage, chronic stage and terminal stage, helping the person who has injury from accident and natural disaster using nursing process in solving problems covering physical, mental, social spiritual aspects of the person.

198264 Adult Nursing II
Pre: 198263
Practice using the nursing process in providing nursing care to people who have health problems in the late adolescent to adult age for diagnostic examination; drug therapy; and surgery; covering the physical, mental, social, spiritual aspects regarding the change in growth of cell, integumentary system, eye, ear, nose, throat, tropical diseases, communicable diseases, non-communicable diseases, diseases of gastro-intestinal tract, blood and lymph, urinary tract, reproductive organ, in acute stage, critical stage, chronic stage and terminal stage, and helping the person with injury from accident and disaster.

198266 Geriatric Nursing
Concepts and Principles of nursing of the elderly who has change in physical, mental, social and spiritual aspects; promotion of development in each age, theory of elder, practice using of nursing process in caring of the elderly in normal and deviate health condition, health promotion. Prevention, curation and rehabilitation; roles of family and community towards the elderly, rights of the elderly and sources of health services for the elderly.

198271 Obstetric Nursing I
Concepts and principles in family health promotion, roles of father to the family, family planning, and pregnancy; assessment of health condition and change of pregnant woman, screening and referring of pregnant women who are at risk, practice counseling to support family health promotion, family planning, and using nursing process in caring of pregnant women.

198272 Obstetric Nursing II
Pre: 198271
Assessment of health condition and the change of mother and neonate in every stage of labor. Assessment of the progress of labor, normal delivery, nursing care of all stages of Labor, helping of the new born infant, promotion of mother and infant attachment, nursing of mothers and infants after normal labor.

198273 Pediatric Nursing I
Concepts and principles of pediatric nursing; roles, functions, and responsibilities of nurses in health promotion, disease prevention, cure, and rehabilitation of clients from being born to early adolescent stage; roles of family on pediatric health and care; community resources and factors influencing health of children and their families; assessment of growth and development; pediatric health promotion; nursing process of children with health problems and referring; Practice assessing growth and development, health promotion and disease prevention, application of nursing process to care of children with health problems and referring.

198274 Pediatric Nursing II
Pre: 198273
Nursing process in caring of new born to early adolescent age clients who are at risk or have abnormalities of growth and development, deformities, complicate health problems in acute stage, critical stage, chronic stage and terminal stage.

198281 Ethics for Nurses 2(2-0)
Meaning and significance of ethics, ethics, relationship between religion and ethics, ethics by principle of religion, ethics in nursing profession, human rights, problems and guidance for solving ethical problems in nursing, happiness related to the goals of life.

198326 Thai 2(2-0)
Writing reports, articles, summary, conclusion, and article critique; conservation, idioms, and spelling of difficult words.

198327 English I 3(2-2)
Principles of conclusion from reading and listening; translation, listening skill, using English in daily life and work.

198328 English II 3(2-2)
Principles and practice of using the English language: reading, listening, speaking, writing and summarizing about professional practice.

198329 English III 3(2-2)
Reading, listening, speaking, writing and summarizing reports and researches in the Nursing Professing.

198331 Thai Culture 2(2-0)
The ways of living of the thai people, culture, traditions, values, believes, value of thai wisdom. Influence of religions, arts, language and literature towards the institute and social structure. The difference between of culture city and country, the change of thai culture resulted from being a world community including the way of selection for integration, conservation and development of thai culture relevant to the change without loosing Thai identity.

198335 Social Psychology 2(2-0)
The way of thinking, emotion, and people’s behaviors when they are in group or among others, study of group’s phenomena and human’s behaviors resulted from social stimulation.

198341 Pathophysiology 2(2-0)
Causes and mechanisms of cell injury, change in biochemistry and functions of various systems of the body in response to diseases according to periods and severity; signs of common diseases.

198342 Introduction to Statistics 2(2-0)
Concepts and methodology of statistics, methods of data collection, frequency distribution, measurements of central tendency and dispersion, data presentation, hypothesis testing, analysis of regression and simple correlation, vital statistics, and application of statistics into nursing.

198349 Teaching and Learning Process in Health 2(2-0)
Basic concepts of teaching and learning processes in health, learning theories, learning and teaching psychology, and related factors; principles, process, and techniques in teaching, teaching media, evaluation and measurement, learning and teaching plan, and teaching process.

198351 Basic Concepts and Principles of Nursing 2(1-4)
Nursing theories and nursing process, principles of nursing care of people who have complicate health problems; assistance of individuals and groups who have health problems that need urgent care; techniques of assisting investigation that need
special device or interment; practice using nursing process in providing care to patients who have complicate health problems; practice assisting physicians in using specific divide for investigation.

198352 Mental Health and Psychiatric Nursing I  
2(2-0)
Care of individuals or groups who have mental and emotional disorder; using nursing process in helping and curing individuals, families, and groups who have mental disorder focussing on rehabilitation.

198353 Mental Health and Psychiatric Nursing II  
2(0-8)
Practices using the nursing process in providing care to and build up relationship with the person who has mental disorder, psychiatric therapy, work collaboratively with psychiatric staff, plan and implement or promote the work of community psychiatry.

198361 Community Health Nursing I  
2(2-0)
Concepts, principles and processes of community development, community investigation, project planning, public health service, participation to the government and private organizations, and public health supervision and evaluation.

198363 Adult Nursing III  
3(3-0)
Pre : 198264
Nursing care of people in late adolescent to adult age who have health problems related to musculo-skeleton system, respiratory system, cardio-vascular system, endocrine system, nervous system; in acute stage, critical stage, chronic stage and terminal stage; using the Nursing process in solving the problem covering physical, mental, social and spiritual aspects in every stage of disease, and Nursing therapy according to the Ministry of Public Health Regulations.

198364 Adult Nursing IV  
3(0-12)
Pre : 198363
Practice using the Nursing process in providing Nursing care to people in the late adolescent to adult age who have health problems covering physical, mental, social, spiritual aspects, regarding musculo-skeleton system, respiratory system, cardio-vascular system, nervous system; in acute stage, critical stage, chronic stage, terminal stage, and practice therapeutic nursing intervention according to the Ministry of Pubic Health Regulations.

198365 Adult and Elderly Nursing I  
3(3-0)
Concepts and principles of care of late adolescence, adult, and elderly who has complicate medical, surgical and gynecological health problems at all stages including critical stage, and chronic stage, as well as application of new technology in providing health care.

198371 Obstetric Nursing III  
2(0-8)
Pre : 198272
Practice using the nursing process in providing care to mothers and fetus in every stage of labor, normal delivery, assess the condition of new born infant and helping promotion of attachment between mother and infant after delivery.

198372 Obstetric Nursing IV  
3(3-0)
Pre : 198371
Nursing process for pregnant women who have health problems, or complications in pregnancy stage, intrapartum stage, and peuperium stage; helping mother and infant who receive special instruments in diagnostic examination and operative obstetrics, helping and referring the newborn who has risk condition.
Pre : 198371
Practice using the nursing process in providing care to pregnant women who have health problems, or complications during pregnancy stage, intrapartum stage, peuerperium stage, episiotomy and repair perineum, caring of mother and infant who receive the operative obstetrics; assess the risk condition of the new born infant, giving basic helping and referral.

198374 Obstetric Nursing I  2(2-0)
Care of pregnant women who are at risk or have complications or need special instruments for investigation throughout prenatal, intrapartum, and peuerperium stages; and care of neonates born with complications.

198375 Obstetric Nursing II  2(0-8)
Practice using nursing process in caring pregnant women and promoting their health; diagnosis of high risk and complicate pregnancy; normal delivery; and providing care to postpartal mothers in health service institutions and community.

198377 Pediatric Nursing III  2(0-8)
Pre :198274
Practice using the Nursing process in caring of the new born infant to early adolescent clients who are at risk or have disorder of growth and development, deformity, complicated health problems in acute stage, critical stage, chronic stage and terminal stage.

198421 Aesthetics  2(2-0)
The beauty of nature and arts, aesthetics of the visible and aucoustic, aesthetics and quality of life and society.

198441 Introduction to Health Economics  2(2-0)
Basic concepts in economics, factors that stipulate the demand and supply of goods, health care delivery system, consumer’s behaviors in using health care services, relationship between income and health care services consuming, influence of change in economy towards health, and health insurance and social security.

198461 Community Health Nursing III  3(1-8)
Pre : 198262
Community Health Nursing process, relationship between Community Health Development and Community Development, roles of Nurses in community development and Occupational health, practice using Community Health Nursing Process, and participation in community development.

198462 Community Health Nursing II  2(0-8)
Practice working in community including community investigation; community health problems solving and planning; implementation of project in health development for individual, family, and community; supervision and evaluation of community health; and cooperation with community health team and relevant persons for community health development.

198463 Adult and Elderly Nursing II  3(0-12)
Practice using the nursing process in caring of people in the late adolescent adult and elderly stage who have complicated health problems including medical, surgical and gynecological areas in severe stage, critical stage, and chronic stage; care of the patient who need special equipments; and rehabilitation and referring.

198471 Obstetric Nursing III  2(0-8)
Practice using the nursing process in caring woman in prenatal, intrapartal stages, and postpartal who have health problems; assist abnormal delivery or using special instrument in delivery; care of a newborn who has complications; and referring.

198481 Nursing Administration I  2(2-0)
Concepts, principles, component, and administration theories. administration process, Nursing organization administration, authority and responsibilities of the administrator, management in all levels of Public Health premise, Nursing quality insurance, principle and strategies of effective administration, leader’s roles, nursing personnel and organizing development.

198482 Nursing Administration II 1(0-4)
Pre : 198481
Practice administration, arrangement of Nursing Service system and all levels of Public Health premise.

198483 Nursing Administration 2(1-4)
Concepts, principles, components and administration theories; nursing organizing administration, authority and responsibility of the administrator, Nursing quality assurance, principles and strategies of effective administration, leader’s roles, nursing personnel and organization development; practice performing nursing administration in health service organizations and community.

198484 Law and Nursing Profession 1(1-0)
Basic knowledge about laws, the Nursing and Midwifery Acts and other related laws, working in the profession that legal problems may arise, guidance for problem prevention and trends in practice when the legal problems arises.

198485 Therapeutic Nursing Intervention 2(1-4)
Data assessment for decision making in health problems and choosing appropriate drugs, and treatments for solving health problems under scope of nursing practice. Practice diagnosing and identifying nursing activities in solving health problems for individual, family, and community; practice performing physical examination, diagnosis, and basic medical care under the Ministry of Public Health Regulations.

198491 Nursing Research 3(3-0)
Significance and character of Nursing Research, research methodology, proposal writing and basic research report, application of research result in Nursing.

198497 Seminar in Issues and Trends in Nursing Profession 2(2-0)
Principles and methods of seminar, issues and trends of political factors, economics, science and technology, society and education that influence Nursing profession in service, administration, education and Nursing research.
INTERDISCIPLINARY COURSES FOR GENERAL EDUCATION
(999XXX)

SCIENCE AND MATHEMATICS

999011  Food for Mankind  3(3-0)
Relationship between food and requirement based on population, varieties and sources of food supply. Food production systems and losses. Consumer preference and its importance to correct food consumption for body growth, principle of food processing and preservation, organization and their roles concerning food policy.

999012  Health for Life  3(3-0)

999211  Mathematics and Computers in Everyday Life  3(2-2)
Functions and graphs, systems of linear equations, linear programming, probability, sampling, mean and variation, data presentation, business application in everyday life on the basis of mathematics and statistics, introduction to computer in calculation, data presentation, information searching and communicating.

999212  Concepts of Sciences and Philosophy  3(3-0)
Philosophy, principles and basic concepts in mathematics, physical sciences and biological sciences, applications of scientific ideas. Field trips included.

999213  Environment, Technology and Life  3(3-0)
Environment, technology, life and their interaction, evolution of technology and environmental impact, application of science and technology for quality of life and sustainable resources utilization. Case study and field trip.

SOCIAL SCIENCES

999041  Economics for Better Living  3(3-0)
Relationship between economics-business administration and better living. Roles and human living in economic society at household, community and societal levels. Learning about entrepreneurship, economic composition management. Key models and issues in economics and management.

999042  Students Development  3(2-3)
**HUMANITIES**

999141 Man and Society 3(3-0)

**HUMANITIES**

999031 The Heritage of World Civilizations 3(3-0)
World heritage of socio-economics, governments, intellectual knowledge, religious beliefs, arts, literature and human communications from prehistory to the present to gain an appreciation of the creative works of humanity.

999032 Thai Studies 3(3-0)
History, religions, language, literature, arts, local wisdom, and the lifestyle of Thai; in the past, present and future trend.

999033 Arts of Living 3(3-0)
Living in society, understanding one’s self and others, creative problem solving skills, personality development, social etiquette, the art of communication, the roles and responsibilities of the individual in the family, in society, and in the workplace.

**LANGUAGE**

999021 Thai Language for Communication 3(3-0)
Communication of the Thai language, thoughts and language usage, language and society, and the skill development of the Thai language for communication.