

INFORMATION PROCESSING INSTITUTE FOR EDUCATION AND DEVELOPMENT

In 1982, as a result of a generous grant of over 47 million baht from the Japanese Government working together with the National Economic and Social Development Board, a modern computer center called Information Processing Institute for Education and Development (IPIED) was established. It serves the management of national rural development and the academic functions of the University. IPIED is comprised of 51 permanent staff members on computer affairs together with 14 permanent and 5 temporary employees. Joining the institute on an ad-hoc basis are those faculty members of the academic communities on computer science and MIS. This essential tool of today's environment not only speeds research through mass data storage and data analysis, but also illustrates the futuristic approach that Thammasat takes towards the higher education.

GRADUATE VOLUNTEER CENTER

The Center provides an opportunity for university graduates to be trained to work in the rural areas. The 12 month program consists of a three month academic training period, seven month period of work in the rural areas under guidance and supervision, and two month period of mini-dissertation writing. During this time the Center hopes to instill into the new graduate volunteers a sense of dedication and responsibility to help them develop initiative, skill, good human relations and a good understanding of conditions in the rural areas.

A graduate diploma is granted to those who fulfill all the requirements of the curriculum.

INSTITUTE FOR THE CONTINUING EDUCATION AND SOCIAL SERVICE

The Institute for the Continuing Education and Social Service was established on the 6th of February, 1986. Its previous status was the Continuing Education Program, designed to provide academic services to the general public. The program was initiated by a group of university instructors in 1974, and has been carried on ever since. The establishment of the program is based on the assumption that the majority of Thai people have little opportunity to gain access to higher education: they have obtained only primary education or a little higher level than that. The program has made all possible effort to offer courses that are closely related to the learners' daily living so that they will be able to put into use what they have studied from the program. It is expected that those who have attended classes provided by the Institute will be in a better position to get along well in their careers and can make a greater contribution to Thai society. In general, the courses offered are concerned with socio-economics and politics. Courses that provide the learners with knowledge of law, business, marketing, human relations, public speaking, mental health, population, and family planning are also offered.

ASSISTANCE FROM ABROAD

In order to achieve academic excellence and improve its facilities, Thammasat University has sought foreign assistance and established exchange programs and joint activities with various foreign universities.

Exchange agreements are established between Thammasat University and the following universities from Japan (Waseda, Keio, Kanagawa, Saitama,

Hitosubashi, the Ryukus, Hosen, Hiroshima, Chuo, Soka, Tokyo and The International University of Japan; France (Aix-Marseille, L'Institute National de Langues et Civilisation Orientales, The International Training Center for Water Resources Management, and L'Universite' des Sciences Sociales de Toulouse); Canada (British Columbia, York); United States (Northern Illinois, Missouri, Texas (Austin), California State University (Northridge), Pittsburg State University; and New Zealand (Auckland). Thammasat also participates in the International Student Exchange Program (ISEP) enabling Thai students to have firsthand contact with the cultural heritage of the United States.

Certain joint programs currently being developed include the Core University Project on Thai-Japanese Studies (Universities in Japan and Thammasat); the Study of Women's Issues in Thailand (the University of York and Thammasat); the project on the Prevention of Blindness in Thailand (the University of British Columbia and Thammasat); and, the Master's in Marketing (Gothenburg University, Sweden and Thammasat).

Other forms of support include scholarships, fellowships, grants, training programs, and technical assistance from government and private institutions, such as the Fulbright Foundation, Harvard-Yenching Institute, East-West Center, British Council, the World Bank, the John F. Kennedy Foundation, the Rockefeller Foundation, the Japan Foundation, the Urascnk Foundation, Mitsui Bank, Sanwa Bank, and the Osaka Chamber of Commerce and Industry.

PROGRAMS FOR FOREIGN STUDENTS

Thammasat University participates in the International Student Exchange Program (ISEP). Foreign students may participate in the regular degree programs if

they are fluent in Thai or they may pursue special programs offered in English.

- The Special Study Program: "Buddhism and Thai Society" is a four week annual seminar open to foreign students wishing to learn more about this subject.
- The Master's of Economics in English is a graduate studies degree or non-degree program for students interested in economics.
- The Master's in Marketing English Language Degree Program is for those students wanting to study marketing.

SOCIAL AND ACADEMIC SERVICES

There are various social and academic services carried out by the faculties. These include Legal Counseling for the General Public by the Faculty of Law, the Mini M.B.A. by the Faculty of Commerce and Accountancy, Training of Senior Executives by the Faculty of Political Science, on-the-job training for journalists by the Faculty of Journalism and Mass Communication, the use of computer in day-to-day business by the Faculty of Science and Technology, etc.

FACILITIES AND SERVICES

STUDENT HOUSING

The University runs two student hostels. The one for men, called "Rachadapisek," can house 300. The women's hostel in the Tung Mahamek District opened in 1983 and can house a maximum of 284. These two hostels give service to students at the "Taprachan" Campus.

HEALTH SERVICE

Medical and dental services are provided free of charge to students and university staff from 7:00 am. to 4:30 pm. every week day, and doctors and dentists are always available for consultation.

The office is located on the second floor of the Administration Building.

THE GUIDANCE SERVICE

The Guidance Services, set up in 1975 and located on the seventh floor of the Anekprasong (Multi-purpose) Building, provides information and advice to students regarding suitable careers and the availability of jobs. It also assists in finding part-time as well as full-time employment for undergraduate and graduate students. In order to fulfill the need of the university to developing the students' potential for learning, individual counseling, group counseling, the Human Relation workshop and psychological testing are offered to students and alumni.

RESERVE OFFICERS TRAINING CORPS (ROTC)

The University encourages the male students to enroll in the ROTC course by offering the registration services for them at the beginning of each academic year. Students who complete the ROTC course are exempted from government military conscription.

LIBRARIES

The University maintains a central library with branch libraries at the various faculties. Thammasat University has the largest library collection among the academic libraries in Thailand. Altogether it has 463,000 books

and 1,953 periodicals. The central library houses the central services and cataloguing and an open stack collection of 270,393 volumes in Thai, English, and other foreign languages. Also 1,049 journals, magazines, periodicals and newspapers are available in various sections. Audiovisual equipment, such as filmstrips, slides, tapes, records, microfilms and movie projectors are also provided by the library.

All the libraries follow the Congress Classification with the exception of the Faculty of Law Library which follows the Schiller System.

THE UNIVERSITY PRESS

Textbooks and other educational materials are printed in the University Press for use in all faculties and departments. A University appointed committee is responsible for the academic quality of the university publications, which are sold to students and staff at reasonable prices.

THAMMASAT UNIVERSITY BOOKSTORE

Thammasat University Bookstore caters to the needs of the students and the public by providing books at low cost. Included in the list of books sold at the store are journals, research publications, magazines, novels, children's books etc. It also sells stationery and other necessary educational equipment.

THAMMASAT UNIVERSITY RADIO STATION

TUR Station was founded in 1965 and now operating as : (1) a sound lab for practicum of the Broadcasting Journalism Courses of the Faculty of Journalism and Mass Communication, and (2) as an academic broadcasting for the general public.

The station serves 598 students from 15 broadcasting courses annually, and broadcasts 5 hrs. daily by 10 Kws., AM. Transmitter, at a frequency of 981 Kilohertz.

SCHOLARSHIPS AND FINANCIAL AID

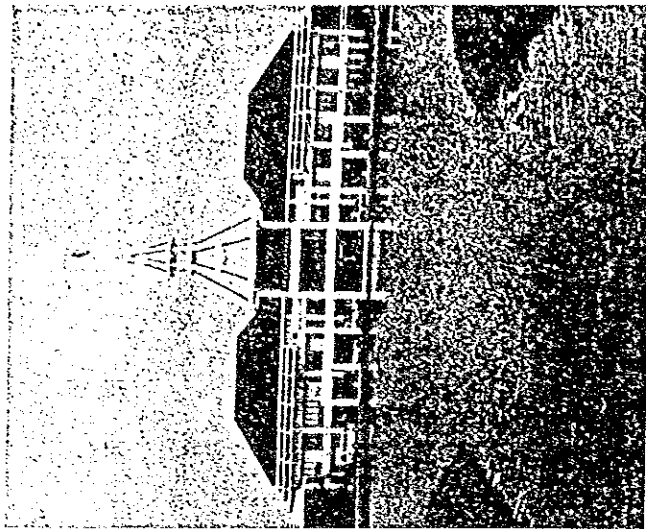
There are quite a number of scholarships available each year to students at Thammasat in need of financial assistance. Most of them have been donated by individuals, institutions, associations or organizations, and are administered by the University. Their availability and conditions are announced by the University at the beginning of each academic year.

To be sure that an equal opportunity for a higher education is afforded to all, Thammasat University initiated a project to provide scholarships to needy rural youth in 1980. This program came about as a result of a study by the Ministry of University Affairs which showed that only 7% of the successful applicants were children of farmers although this group made up 75% of the total population. Fifty such scholarships are awarded each year so that the number of recipients remains at 200.

In 1989, another program was initiated to admit students with an outstanding academic record and possessing leadership qualities from 26 provinces in the North, the South and the North-East. The selection is through a written examination and an interview. The program began to admit students in 1990. About 50 students are admitted each year which amounts to 2% of the total number of enrollment.

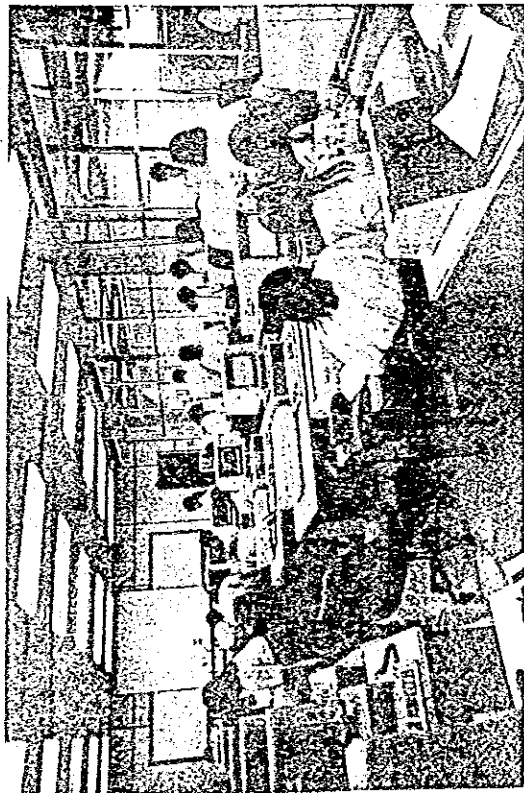
In addition, the University sets aside a certain amount of money to employ students to work during their free time, and also to loan to students in urgent need of immediate financial assistance.

THE RANGSIT CAMPUS



Always keeping abreast new developments and demands of the country, Thammasat University has been extending its facilities to the new campus in Rangsit, Patumtani Province. The new campus was opened in 1986 and has become the seat of extension and development activities for the university.

For over 50 years Thammasat University has been well known for its expertise in the Social Sciences and Humanities. However, to meet the country's demands the University has set up new faculties: The Faculty of Sciences and Technology (1986), The Faculty of Engineering (1990), and The Faculty of Medicine (1991).



LIVING FACILITIES

Approximately one thousand students are living on campus. There are five dormitories to accommodate first year students as well as the 2nd, 3rd and 4th year students of the new faculties. Each dormitory is equipped with furnished rooms and modern facilities. In 1991 three more dormitories will be built so that approximately 650 more students will be able to live on campus.

In addition to students' dormitories, 89 living units are also provided for faculty and staff who are living on campus. Within another 2 years the university will add apartment units to accommodate more staff and their families.

DINING FACILITIES

A large cafeteria serving a wide variety of food, snacks and drinks is available on campus. There are also 3 small food centers serving snacks, drinks and bakery items.

HEALTH AND COUNSELING SERVICES

At the Dome Administration Building medical services are provided free of charge for students and university staff every day during office hours. In case of an emergency an emergency vehicle is available night and day for transportation to Thammasat Chalermprakiat Hospital.

Counseling services are available 24 hours daily from staff of the Students' Affairs Section. Also, professional counselors are available at the hospital during working hours.

The Rangsit Campus is now in full operation, offering the foundation courses for all first year students. The Campus is also well equipped with adequate facilities and services to sustain comfortable living.

Thammasat Chalermprakiat Hospital, a small hospital of 100 beds, which was set up in 1987, is being expanded to a 500 bed hospital to serve students, university staff and people in the nearby areas. It is also a part of the Faculty of Medicine and will become the training center for medical, nursing and pharmaceutical students.

In addition to new development, the Rangsit Campus is also serving as the site for other academic and training centers, such as the East Asian Studies Institute and the Graduate Volunteer Center.

LIBRARY SERVICE

To meet the needs of students, faculty and staff at Rangsit Campus, Thammasat University has extended its library service to the Rangsit Campus to include over 30,000 books, journals and periodicals, as well as printed matter.

SPORT FACILITIES

Rangsit Campus has become an excellent place for sport-lovers. Facilities for sports such as football, volleyball, basketball, tennis and petong are available for students and staff. Construction of a complete sports-complex with a gymnasium and a swimming-pool is to be begun soon with the expectation that it will be opened within the next two years.

THAMMASAT CHALERM-PRAKIJAT MUSEUM

During the auspicious occasion of the King's 60th Birthday Dr. Vinit Vinitaiyapak and Kurying Punnee Vinitaiyapak donated more than 2,000 pieces of antique and artistic works to the University. The University therefore established Thammasat Chalerm-prakiat Museum at the Research and Academic Services Building to display these valuable artifacts. The collection consists of Buddha images of various eras; metal money and coins dated from the Ayudhdhaya Period; ancient China and ceramics; objects of art made from carved ivory; Banchieng pots; musical instruments of the olden times, etc.

The Thammasat Chalerm-prakiat Museum Building will be opened in 1992. The museum will be one of the best museums in Southeast Asia. Also, the building will house the University Learning Resource Center, the administrative and study areas of the Faculty of Sociology and Anthropology etc.

TU CHILDCARE CENTER ; THAMMASAT ELEMENTARY SCHOOL ; AND THAMMASAT KLONGLUANG WIDDAYAKOM

As part of the University welfare program, a childcare center has been set up near the staff living quarters to serve members of the Rangsit Campus as well as the community nearby. In agreement with the University the Ministry of Education has built and operates Thammasat Elementary School on Campus. In addition, the University is affiliated with Thammasat Klongluang Widdayakom, a local secondary school situated not too far from the campus.

The University plans to set up a senior high school (belonging to the Ministry of Education) on Campus. The school will also be part of the welfare program to serve the community of Patumtani and the nearby provinces. The school will emphasize the sciences and mathematics.

DEGREES OFFERED

Bachelor of Law
 Bachelor of Business Administration
 Bachelor of Arts in Political Science
 Bachelor of Arts in Economics
 Bachelor of Social Work
 Bachelor of Arts in Journalism and
 Mass Communication
 Bachelor of Arts in Sociology and Anthropology
 Bachelor of Arts in Psychology
 Bachelor of Arts in Library Science
 Bachelor of Arts in History
 Bachelor of Arts in Philosophy
 Bachelor of Arts in Linguistics
 Bachelor of Arts in English
 Bachelor of Arts in English Language and Literature
 Bachelor of Arts in French
 Bachelor of Arts in Thai
 Bachelor of Arts in Japanese
 Bachelor of Arts in Drama
 Bachelor of Arts in Geography
 Bachelor of Science in Environmental Science
 Bachelor of Science in Health Science
 Bachelor of Science in Rural Technology
 Bachelor of Science in Agricultural Technology
 Bachelor of Science in Computer Science
 Bachelor of Science in Mathematics
 Bachelor of Science in Statistics
 Bachelor of Science in Engineering

ACADEMIC REGULATIONS

ADMISSION

Each year in April-May, The Ministry of University Affairs, with the co-operation from all the universities

Undergraduate Programs



concerned, organizes a nationwide entrance examination for admission to all the state universities. Applicants must be high school graduates.*

Thammasat University admits approximately 2,600 students each year. They must make their choice of faculties from the beginning of their admission.

ADMISSION OF FOREIGN STUDENTS

Foreign students wishing to enroll at Thammasat University at the undergraduate level must fulfill the following conditions :

1. Fluency in the Thai language. Since instruction at the University is conducted in Thai, one needs to be sufficiently fluent in the language to be able to follow the lectures.
2. Statement of Financial Support. Since there is no scholarship or financial aid available for foreign students, the applicant must submit evidence of sound financial support.

Applicants must be graduates from high schools (12th grade), possessing comparatively good grades.

Admission may be obtained through the Registrar. Application forms and other necessary documents must be submitted to the Registrar by the end of December. Applicants will be required to sit for the Thai Language Proficiency Test (the test being administered by the Thai Embassy of the applicant's country of residence or by any other appropriate agency).

Tuition fees and other charges (library fees, etc.) are estimated at B 15,500 per year, approximately; living expenses vary from person to person (B 3,500 per month at the minimum).

*Schools in Thailand operate on 6-3-3 basis, i.e., 6 years of primary education, 3 years of lower secondary education and 3 years of upper secondary education.

Transferring of credits may be done at the discretion of the faculty concerned. A maximum of 36 credits may be transferred.

Only a limited number of foreign students may be admitted each year. Admitted students cannot seek full-time paid employment.

DEGREE REQUIREMENTS

In order to be eligible for a bachelor's degree from Thammasat University, students must have completed the required number of credits from the following :

- a) 30 credits of the University general education courses,
- b) a number of compulsory courses and electives for the selected major,
- c) 24 credits of compulsory courses and electives for the selected minor, and/or,
- d) a number of free electives.

The definite numbers of credits required in a), b), and c) vary according to each faculty's requirements. Generally, the total credits required is 135 credits.

COURSES AND CREDITS

All university courses are assigned a credit value. One credit represents one hour of class work per week per semester, including 2 hours of preparation.

GRADING SYSTEM

The work of undergraduate students is graded at the end of each semester in terms of the following grades: A (excellent), B (good), C (fair), D (barely passed) and F (failure). However, the grades B, C and D may be modified by a plus (+) suffix. In certain cases S (satisfactory) or U (unsatisfactory) may be awarded.

GRADE POINTS

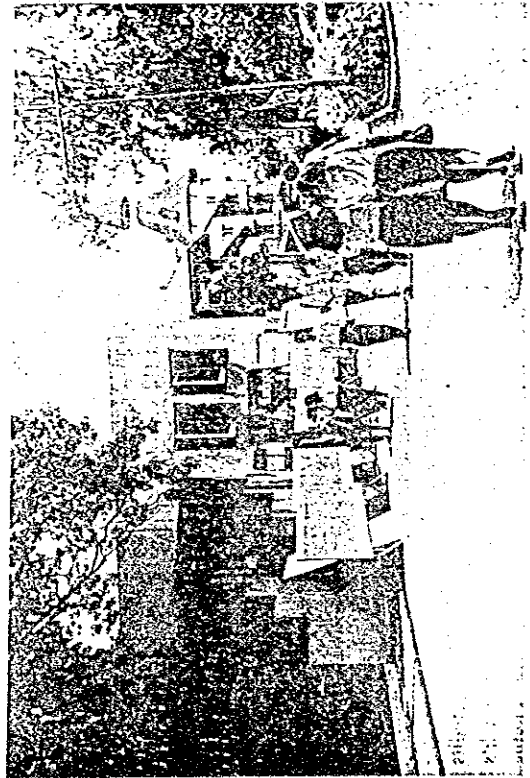
Grade points are assigned as follows : A=4, B⁺ = 3.5, B=3, C⁺ =2.5, C=2, D⁺ = 1.5, D=1 and F=0. Grades of S and U do not carry any grade points.

GRADE POINT AVERAGE

Each undergraduate is required to maintain a 2.0 (C) grade-point average to remain in good standing.

Each undergraduate student whose grade fall below a cumulative 2.0 (C) GPA in their courses will automatically be placed on academic probation for the following semester. Students on probation return to good standing by raising their cumulative GPA to 2.0 (C) or above during the semester of probation.

Failure to achieve a cumulative 2.0 GPA after 3 semesters of probation causes the students to be subject to academic suspension.



GENERAL EDUCATION

OBJECTIVES

1. To enhance the students' knowledge and perspectives about themselves and the world around them, and to understand the role of the individuals and their interaction with the social, cultural and natural environments.
2. To create an awareness of the interdisciplinary nature of all sciences, i.e. social sciences and humanities, languages, and natural sciences and technology.
3. To enhance the students' moral concepts and value judgement which will be valuable for their future studies and everyday life.

REQUIREMENTS

All students are required to take 30 credits of the General Education Courses as follows :

Humanities	6 credits
Social Sciences	6 credits
Science and Mathematics Languages (12 credits)	6 credits
Thai Language	6 credits
Foreign Language	6 credits
Total	30 credits

The following groups of courses are offered :

I. Humanities (6 credits)

A. Select 1 course from :

Thai Civilization	2 credits
Western Civilization	2 credits
Eastern Civilization	2 credits

B. Select 1 course from :

- Fundamentals of Philosophy 2 credits
- Fundamentals of Religions 2 credits
- Man and Literature 2 credits
- Man : Arts and Music 2 credits

and select another course from A or B

2. Social Sciences (6 credits)

Select 2 courses from :

- Man and Society 3 credits
- Society and Government 3 credits
- Society and Law 3 credits
- Society and Economy 3 credits

3. Sciences and Mathematics (6 credits)

Physical Science

Select 1 course from :

- Science and Society 2 credits
- Man and Physical Science 2 credits
- Development of Natural Science 2 credits

Biological Science

Select 1 course from :

- Man : Physiological and Psychological Basis 2 credits
- Man and Biological Science 2 - credits
- Life and Environment 2 credits

Mathematics

Select 1 course from :

- General College Mathematics 2 credits
- Fundamental Mathematics 2 credits
- General Concepts of Computer Mathematics Logic 2 credits
- Basic Mathematics 2 credits

For Science and Technology Students and Engineering Students see more details in Science and Technology Curriculum or Engineering Curriculum.

4. Languages (12 credits)

Students must take :

- Thai Usage I 2 credits
- Thai Usage II 2 credits

and select 2 courses (one language) from :

English

- English Course I no credits
- English Course II 3 credits
- English Course III 3 credits

French

- French I no credits
- French II 3 credits
- French III 3 credits

German

- German I 3 credits
- German II 3 credits

or

- German III 3 credits
- German IV 3 credits

Japanese

- Japanese I 3 credits
- Japanese II 3 credits

Russian

- Russian I 3 credits
- Russian II 3 credits

Chinese

- Chinese I 3 credits
- Chinese II 3 credits

PHYSICAL EDUCATION, SOCIAL SKILLS AND WORKING EXPERIENCES

OBJECTIVES

1. To promote students' health and enhance students' personalities.
2. To build up certain skills and experiences.

REQUIREMENTS

Courses in the curriculum may be chosen as free electives, according to the following groups :

1. Physical Education Group
2. Promotion of Social Skills and Working Experiences Group

A maximum of 3 credits may be chosen from each group, totalling 6 credits, according to the free electives requirement of each student's faculty.

1. Physical Education Group

A. Theory

- | | |
|--------------------------------------|-----------|
| Care and Prevention for Sport Injury | 2 credits |
| Organization of Sports Competition | 2 credits |
| Camping | 2 credits |

B. Practice

- | | |
|---------------|----------|
| Football | 1 credit |
| Volleyball | 1 credit |
| Basketball | 1 credit |
| Softball | 1 credit |
| Tennis | 1 credit |
| Table Tennis | 1 credit |
| Badminton | 1 credit |
| Takraw | 1 credit |
| Track & Field | 1 credit |

- | | |
|--------------------|----------|
| Thai Boxing | 1 credit |
| Boxing | 1 credit |
| Self Defence | 1 credit |
| Swimming | 1 credit |
| Minor Games | 1 credit |
| Body Conditioning | 1 credit |
| Social Dance | 1 credit |
| Movement Education | 1 credit |
| Judo | 1 credit |
| Rugby Football | 1 credit |

2. Promotion of Social Skills and Working

- | | |
|-------------------------------|----------|
| Experiences Group | 1 credit |
| Public Speaking | 1 credit |
| Using the Library | 1 credit |
| Principles of Office Machines | 1 credit |
| Traffic and Driving | 1 credit |



LANGUAGE INSTITUTE

The Language Institute offers the curriculum of "English for Special Purposes" to serve all the faculties and departments.

OBJECTIVES

The Language Institute's objective is to enhance the students' skills in listening, speaking, reading and writing. The graduates will be equipped with the necessary skills that will be applicable to their future careers.

LIST OF COURSES

English for Law I	3 credits
English for Law II	3 credits
Communication Business English I	3 credits
Communication Business English II	3 credits
English for Political Science I	3 credits
English for Political Science II	3 credits
English for Social Work I	3 credits
English for Social Work II	3 credits
English for Mass Communications I	3 credits
English for Mass Communications II	3 credits
English for Sociology and Anthropology I	3 credits
English for Sociology and Anthropology II	3 credits

Faculty of Engineering

Thammasat University, Rangsit Campus
 Khlong Luang, Pathum Thani 12121, Tel. 516-0974
 Dean : Assoc. Prof. Naksitte Coovattianachai

STUDY PROGRAMS

DEPARTMENT OF ELECTRICAL ENGINEERING

OBJECTIVES :

To produce graduates who have :

1. a knowledge and capability to pursue a profession in the field of electrical engineering.
2. an intention and a capability to conduct R&D in the area of electrical engineering.
3. skills and readiness for technology transfer in order to facilitate successful industrialization.
4. enthusiasm, creativity, responsibility, and leadership.
5. virtue and responsibility to society.

DEGREE REQUIREMENTS

1. General Education Courses 48 credits
 - 1.1 Humanities, Social Sciences and Languages (24 credits)
 - 1.2 Basic Sciences and Mathematics (24 credits)
2. Specialized Courses 96 credits
 - 2.1 Core Courses (43 credits)
 - 2.2 Compulsory Courses (47 credits)
 - 2.3 Elective Courses (6 credits)
3. Free Electives 3 credits
4. Training - credits
- Total 147 credits

LIST OF COURSES

General Education Courses

Basic Sciences and Mathematics

- | | |
|------------|-----------|
| Calculus 1 | 3 credits |
| Calculus 2 | 3 credits |
| Calculus 3 | 3 credits |

- | | |
|--------------------------------|-----------|
| Ordinary Differential Equation | 3 credits |
| Fundamental Chemistry | 4 credits |
| Physics for Engineers 1 | 4 credits |
| Physics for Engineers 2 | 4 credits |

Core Courses

- | | |
|--|-----------|
| Introduction to Engineering | 2 credits |
| Engineering Drawing 1 | 2 credits |
| Engineering Drawing 2 | 2 credits |
| Engineering Tools and Operations | 2 credits |
| Materials Science for Engineers | 3 credits |
| Manufacturing Processes | 3 credits |
| Introduction to Computer | 3 credits |
| Engineering Mechanics 1 | 3 credits |
| Engineering Mechanics 2 | 3 credits |
| Engineering Management | 3 credits |
| Introduction to Electrical Engineering | 3 credits |
| Thermodynamics 1 | 3 credits |
| Statistics for Engineers | 3 credits |
| Fluid Mechanics | 4 credits |
| Introduction to Mechanical Engineering | 4 credits |

Compulsory Courses

- | | |
|---|------------|
| Electronic Measurement and Instruments | 3 credits |
| Electrical Circuit Analysis | 3 credits |
| Digital Circuit and Logic Design | 3 credits |
| Electronics Engineering | 3 credits |
| Network Theory | 3 credits |
| Electromechanical Energy Conversion 1 | 3 credits |
| Electromagnetic Theory | 3 credits |
| Switching System Design | 3 credits |
| Principle of Communications | 3 credits |
| Electromechanical Energy Conversion 2 | 3 credits |
| Industrial Training on Electrical Engineering | no credits |

Microprocessors	4 credits
Feedback Control Systems	3 credits
Noise Reduction in Electronics Systems	3 credits
Communication Networks and Transmission Lines	3 credits
Seminar on Electrical Engineering	1 credit
Project on Electrical Engineering	3 credits
Elective Courses	
Integrated Circuit 1	3 credits
Integrated Circuit 2	3 credits
Digital Electronics	3 credits
Power Electronics	3 credits
Antenna Engineering	3 credits
Radio Engineering	3 credits
System Programming	3 credits
Algorithm	3 credits
Software Engineering	3 credits

DEGREE REQUIREMENTS

1. General Education Courses	48 credits
1.1 Humanities, Social Sciences and Languages (24 credits)	
1.2 Basic Sciences and Mathematics (24 credits)	
2. Specialized Courses	96 credits
2.1 Core Courses (43 credits)	
2.2 Compulsory Courses (38 credits)	
2.3 Elective Courses (15 credits)	
3. Free Electives	3 credits
4. Training	— credits
Total	147 credits

LIST OF COURSES

General Education Courses

Basic Science and Mathematics

Calculus 1	3 credits
Calculus 2	3 credits
Calculus 3	3 credits
Ordinary Differential Equation	3 credits
Fundamental Chemistry	4 credits
Physics for Engineers 1	4 credits
Physics for Engineers 2	4 credits

Core Courses

Introduction to Engineering	4 credits
Engineering Drawing 1	2 credits
Engineering Drawing 2	2 credits
Engineering Tools and Operations	2 credits
Materials Science for Engineers	3 credits
Manufacturing Processes	3 credits
Introduction to Computer	3 credits
Engineering Mechanics 1	3 credits
Engineering Mechanics 2	3 credits

DEPARTMENT OF INDUSTRIAL ENGINEERING

OBJECTIVES :

To produce graduates who have :

1. a knowledge and capability to pursue a profession in the field of industrial engineering.
2. an intention and a capability to conduct R&D in the area of industrial engineering.
3. skills and readiness for technology transfer in order to facilitate successful industrialization.
4. enthusiasm, creativity, responsibility, and leadership.
5. virtue and responsibility to society.

Engineering Management	3 credits	Fibre Science	3 credits
Introduction to Electrical Engineering	3 credits	Introduction to Textile Technology	3 credits
Thermodynamics 1	3 credits	Introduction to Textile Wet-Processing	3 credits
Statistics for Engineers	3 credits	Chemistry of Dyes and Pigments	3 credits
Fluid Mechanics	4 credits	Water Effluents in the Textile Industry	3 credits
Introduction to Mechanical Engineering	4 credits	Computer in the Textile Industry	3 credits
		Management in the Textile Industry	3 credits
Compulsory Courses			
Manufacturing Process Analysis	3 credits		
Quality Control	3 credits		
Industrial Safety	3 credits		
Engineering Economy	3 credits		
Industrial Work Study	3 credits		
Operations Research for Engineers	3 credits		
Industrial Training	no credits		
Production Planning and Control	3 credits		
Industrial Cost Analysis and Budgeting	3 credits		
Work Measurement	2 credits		
Industrial Plant Design	3 credits		
Computer for Industrial Engineers	3 credits		
Industrial and Commercial Laws	2 credits		
Seminar on Industrial Engineering	1 credit		
Project on Industrial Engineering	3 credits		
Elective Courses			
System Engineering	3 credits		
Industrial Fire Protection	3 credits		
Industrial Packaging	3 credits		
Quantitative Analysis for Marketing Management	3 credits		
Principle of Management Science	3 credits		
Value Engineering	3 credits		
Ergonomics	3 credits		
Automation	3 credits		
Project Feasibility Study	3 credits		
Human Relation in Industry	3 credits		
Introduction to the Textile Industry	3 credits		

FACULTY MEMBERS

Associate Professors

1. Naksitte Coovattanachai

Lecturers

1. Sunee Coovattanachai
2. Nophadol Inna
3. Danai Wantanakorn
4. Burachat Chatveera
5. Vasin Oradidolcheth
6. Unnop Limpai boon
7. Surasak Suranuntchai
8. Chairath Tantipaibulvit
9. Sanya Mitaim
10. Parichat Baisak
11. Chivaluk Pongburanakit
12. Kumthon Bunyok
13. Jaree Chaicharn

THE UNIVERSITY COUNCIL

Prof. Prapasna Auychai	Chairman
Assoc. Prof. Noranit Setabutr	Rector
Mr. Anan Anantakool	Honorary member
Mr. Chuan Leekpai	Honorary member
Mr. Panas Simasatien	Honorary member
Mr. Prachuab Chaiyasan	Honorary member
Mr. Pramual Sapawasu	Honorary member
Mr. Prayoon Chindapradit	Honorary member
Mr. Manit Sooksomchitra	Honorary member
Mr. Marut Bunnak	Honorary member
Mr. Sanga Sappasri	Honorary member
Pol. Gen. Sawaeng Theeraswasdi	Honorary member
Mr. Sukvit Rangsitpol	Honorary member
Asst. Prof. Jaruporn Viyanant	Vice-Rector for Finance and Property Management
Asst. Prof. Dr. Surat Meetheekul	President of Faculty Senate
Prof. Dr. Aree Valyasevi	Dean, Faculty of Medicine
Assoc. Prof. Dr. Naksitte Coovattanachai	Dean, Faculty of Engineering
Asst. Prof. Prajot Thammakornbunjut	Dean, Faculty of Science and Technology
Asst. Prof. Wongchan Phinainitisatra	Dean, Faculty of Liberal Arts
Assoc. Prof. Yupha Kanchanadul	Dean, Faculty of Commerce and Accountancy
Assoc. Prof. Dr. Chulacheep Chinwanno	Director, Institute of East Asian Studies
Dr. Pensri Guaysuwan	Director, Thammasat - University Library
Dr. Charnvit Kasetsiri	Member

Asst. Prof. Dr. Chavivun Prachuabmoh
 Assoc. Prof. Niputh Jitprasonk
 Asst. Prof. Nuanchan Intaravicha
 Asst. Prof. Dr. Pirom Chantaworn
 Mr. Show Ubonwat
 Mrs. Yuwance Supasilpa
 Asst. Prof. Dr. Preecha Suwannathat

Member
Member
Member
Member
Member
Secretary, Vice-Rector
for Student Affairs

APPENDIX II

ADMINISTRATIVE OFFICERS

Assoc. Prof. Noranit Setabutr	<i>Rector :</i>
Mr. Surin Ronakiet	<i>Vice-Rector for General Administration :</i>
Asst. Prof. Dr. Vatchareeya Thosanguan	<i>Vice-Rector for Academic Affairs :</i>
Asst. Prof. Dr. Somjai Phagaphasvivat	<i>Vice-Rector for Planning and Development :</i>
Asst. Prof. Hariruk Sutabutra	<i>Vice-Rector for Personnel Administration :</i>
Asst. Prof. Jaruporn Viyanant	<i>Vice-Rector for Finance and Property Management :</i>
Asst. Prof. Dr. Preecha Suwannathat	<i>Vice-Rector for Student Affairs :</i>
Asst. Prof. Dr. Vibulpong Poonprasit	<i>Vice-Rector for External Relations :</i>
Asst. Prof. Nangnoi Chaionnom	<i>Vice-Rector (Rangsit Campus) :</i>
Asst. Prof. Somyot Chuathai	<i>Dean, Faculty of Law :</i>
Assoc. Prof. Yupha Kanchanadul	<i>Dean, Faculty of Commerce and Accountancy :</i>
Assoc. Prof. Visuth Pothitaeen	<i>Dean, Faculty of Political Science :</i>
Assoc. Prof. Nipa S. Tumornsoontorn	<i>Dean, Faculty of Social Administration :</i>
Assoc. Prof. Dr. Varakorn Samakoses	<i>Dean, Faculty of Economics :</i>
Asst. Prof. Wongchan Phinainitisatra	<i>Dean, Faculty of Liberal Arts :</i>
Asst. Prof. Dr. Boonrak Boonyakatmaia	<i>Dean, Faculty of Journalism and Mass Communication :</i>
Asst. Kamala Sangsritong	<i>Dean, Faculty of Sociology and Anthropology :</i>

Asst. Prof. Prajot Thammakornbunjut	<i>Dean, Faculty of Science and Technology :</i>
Assoc. Prof. Dr. Naksittie Coovattanachai	<i>Dean, Faculty of Engineering :</i>
Prof. Dr. Aree Valyasevi	<i>Dean, Faculty of Medicine :</i>
Asst. Prof. Dr. Apornpan Chansawang	<i>Dean, Graduate School :</i>
Asst. Prof. Xat Kichtham	<i>Director, Thai Khadi Research Institute :</i>
Assoc. Prof. Dr. Chira Hongladarom	<i>Director, Human Resources Institute :</i>
Assoc. Prof. Dr. Thanet Norabhoompipat	<i>Director, The Information Processing Institute for Education and Development :</i>
Assoc. Prof. Dr. Chulacheeb Chinwanno	<i>Director, Institute of East Asian Studies :</i>
Asst. Prof. Sukum Attavavutichai	<i>Director, Graduate Volunteer Center :</i>
Asst. Prof. Chawalit Panyalakshana	<i>Director, Registration Office:</i>
Dr. Pensri Guaysuwan	<i>Director, Thammasat University Library :</i>
Assoc. Prof. Bamroong Sukphan	<i>Director, Center for Continuing Education and Social Services :</i>
Dr. Owat Suttivatnarupur	<i>Director, Language Institute :</i>

TABLE 1
TOTAL NUMBER OF UNIVERSITY STAFF IN ACADEMIC YEAR 1990
CLASSIFIED BY TYPE OF STAFF AND DEGREE

Surveyed on February 27, 1991

Type of Staff	Total	Ph. D.			Master's			Bachelor's			Others		
		Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Academic Staff	683	102	78	180	140	324	464	17	22	39	—	—	—
Semi-Academic Staff	223	1	2	3	21	58	79	40	99	139	—	2	2
Non-Academic Staff	593	—	—	—	6	8	14	35	85	120	105	354	459
Total	1499	103	80	183	167	390	557	92	206	298	105	356	461

TABLE 2
TOTAL NUMBER OF TEACHING STAFF CLASSIFIED BY ACADEMIC POSITION AND SEX

Surveyed on February 27, 1991

Faculty and Others	Academic Position	Prof.		Assoc. Prof.		Assist. Prof.		Lecturer		Total	
		Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
1. Law		—	—	4	1	24	7	15	4	43	12
2. Commerce and Accountancy		—	4	12	17	5	28	14	19	31	68
3. Political Science		1	—	10	3	9	6	8	7	28	16
4. Economics		1	—	19	11	9	17	17	7	46	35
5. Social Administration		—	—	1	14	3	10	6	5	10	29
6. Liberal Arts		1	3	6	33	3	56	16	60	26	152
7. Journalism and Mass Communication		—	—	5	6	8	7	1	12	14	25
8. Sociology and Anthropology		1	—	3	2	4	12	4	2	12	16
9. Science and Technology		2	—	4	8	10	19	13	21	29	48
10. Engineering		—	—	1	—	—	—	12	4	13	4
11. Language Institute		—	—	—	4	3	4	1	8	4	16
12. Graduate Volunteer Center		—	—	—	—	1	1	2	1	3	2
13. Library Center		—	—	—	—	—	—	—	1	—	1
Total		6	7	65	99	79	167	109	151	259	424

TABLE 3
TOTAL NUMBER OF STUDENT ENROLMENT IN 1990 AND THE GRADUATE OF 1989

Faculty	Undergraduate			Graduate		
	Total	Enrolment	Graduation	Total	Enrolment	Graduation
Law	3,028	776	501	60	103	373
Commerce and Accountancy	2,149	526	441	367	394	1,250
Political Science	1,118	270	260	36	148	549
Economics	1,402	341	267	21	62	229
Social Administration	389	91	84	41	57	196
Liberal Arts	1,796	450	383	38	94	203
Journalism and Mass Communication	755	182	155	26	40	182
Sociology and Anthropology	267	77	67	16	21	81
Science and Technology	740	227	139	—	9	48
Engineering	94	94	—	—	—	—
Volunteer Center	—	—	—	38	50	110
Total	11,738	3,034	2,297	643	978	3,221

TABLE 4
TOTAL NUMBER OF BUILDING, SURFACE AND AREA IN EACH SITE, ACADEMIC YEAR 1990

Site	Number of Building	Surface (Square Metre)	Area		
			Rai	Ngan	Square Wa
1. Taprachan	16 buildings and 1 cluster of building	91,786	49	1	13
2. Rangsit Campus	27 buildings and 1 cluster of building	75,734	2,744	3	71
3. Thawon- Usa Phornprapha Campus	—	—	565	3	35
4. Gynnasium	1	2,362	1	3	78
5. Female Hostel	1	8,730	3	—	60
6. Rachadapisek Hostel	1	3,939	5	3	71
Total	46 buildings and 2 clusters of buildings	182,551	3,371	—	28

TABLE 5
COURSES OF STUDY, ACADEMIC YEAR 1989

Faculty	Number of Courses Offered			Total
	Undergraduate	Graduate Diploma	Master Degree	
Law	73	9	100	182
Commerce and Accountancy	144	13	59	216
Political Science	129	—	78	207
Economics	64	—	50	114
Social Administration	54	7	60	121
Liberal Arts	560	13	112	685
Journalism and Mass Communication	81	—	25	106
Sociology and Anthropology	89	—	74	163
Science and Technology	212	—	31	243
Thammasat Graduate Volunteer	—	18	—	27
Language Institute	5	—	2	7
Total	1,406	60	591	2,057

付属資料4 タマサート大学第1工学部カリキュラム

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ACADEMIC YEAR

The academic year of Thammasat University is divided into two 16-week semesters. The first semester starts from the second week of June to the end of September. The second semester starts from the first week of November to the end of March. Summer courses are also offered for a period of six weeks during the months of April and May.

University Calendar

First Semester

First semester begins	Second week of June
The University's Foundation Day	June 27
Instruction ends	Last week of September
Examinations begin	First week of October
First semester ends	Second week of October

Second Semester

Second semester begins	First week of November
Instruction ends	Last week of February
Examinations begin	First week of March
Second semester ends	Second week of March

Background

Founded in 1934, Thammasat University was originally dedicated to the teaching of humanities and social sciences. Today, it has become one of the most prestigious institution which enjoys national reputation in many areas.

Over the past decade, there has been a very rapid growth of industries which leads to a severe shortage of engineers in Thailand. The current demand for engineers is approximately 7,000 engineers per year, whereas the production capacity of all universities is only 3,000 engineers per year.

Recognizing this fact, Thammasat University thus established the Faculty of Engineering on August 19, 1989. It began to admit students to the Department of Electrical Engineering and Department of Industrial Engineering in 1990. In 1991, students were admitted to the Department of Civil Engineering. The Department of Chemical Engineering and the Department of Mechanical Engineering will begin to admit students in the following years.

It is the intention of the Faculty to provide appropriate engineering education and training to its students. The curriculum thus places emphasis on both theory and practice, using industrial firms in the nearby area of the Rangsit Campus as the site for practice. This is meant so that graduates of the Faculty will be qualified to help develop appropriate technology to serve the country's need.

The emphasis will also be made on faculty research on information technology and related fields in order to achieve academic excellence, to support undergraduate teaching and learning, and to serve as a basis for future development of graduate programs.

ADMINISTRATION

Dean of the Faculty:

Assoc. Prof. Naksitta Coovattanachai

Associate Dean for Academic Affairs:

Dr. Nophadol In-na

Assistant Dean for Student Affairs:

Wanchai Pijitrojana

Assistant Dean for General Affairs:

Danai Wantanakorn

Head of Department of Civil Engineering:

Dr. Somnuek Preparatanatorn

Head of Department of Electrical Engineering:

Mr. Vasin Oradidolchest

Head of Department of Industrial Engineering:

Ms. Montalee Nagswasdi

Head of Department of Mechanical Engineering:

Asst. Prof. Sunee Coovattanachai

Undergraduate Programs

Admission Requirements

To be eligible for admission, an applicant must satisfy the following requirements:

1. he must hold a Mathayom Suksa 6 certificate of a high school or other equivalent which the University recognizes as being acceptable,

2. he must have passed the competitive entrance examination held annually by the University Entrance Examination Board.

Degrees Offered:

Bachelor of Engineering	(Electrical Engineering)
Bachelor of Engineering	(Industrial Engineering)
Bachelor of Engineering	(Civil Engineering)
Bachelor of Engineering	(Chemical Engineering)
Bachelor of Engineering	(Mechanical Engineering)

CREDITS

All university courses are assigned a credit value. One credit represents one hour of class work per week per semester, including two hours of preparation.

GRADING SYSTEM

The work of undergraduate students is graded at the end of each semester in terms of the followings:

Grade	Definition	Grade Point
A	excellent	4
B+		3.5
B	Good	3
C+		2.5
C	Fair	2
D+		1.5
D	Poor	1
F	Fail	0

In certain cases, the following non-quality grades may be awarded:

Grade	Definition
S	Satisfactory
U	Unsatisfactory
EXE	Exempted
I	Incomplete
ACK	Acknowledge
W	Withdrawal

ACADEMIC DISCIPLINE

Each undergraduate student is required to maintain a 2.0 (C) grade point average to remain in good standing.

Undergraduate students whose grades fall below a cumulative 2.0 (C) GPA in their courses will automatically be placed on academic probation for the following semester. Students on probation return to good standing by raising their cumulative GPA to 2.0 (C) or above during the semester of probation.

Failure to achieve a cumulative 2.0 GPA after 3 semesters of probation causes the students to be dismissed from the university.

The University's General Education Program

Students are required to take courses from the University's General Education Program: 17 credits in Humanities, Social Sciences and languages; and 29 credits in Sciences and Mathematics.

Humanities 2 credits

Select 1 course (2 credits) from the followings :

TU. 111	Thai Civilization	2 credits
TU. 112	Western Civilization	2 credits
TU. 113	Fundamentals of Philosophy	2 credits
TU. 114	Fundamentals of Religions	2 credits
TU. 115	Man and Literature	2 credits
TU. 116	Man : Arts and Music	2 credits
TU. 117	Eastern Civilization	2 credits

See course description of the University's General Education Program.

Social Sciences 9 credits

2 compulsory courses (6 credits)

IE. 201	Engineering Management	3 credits
IE. 302	Engineering Economy	3 credits

See course description of the Department of Industrial Engineering

Select 1 course (3 credits) from the following :

TU. 121	Man and Society	3 credits
TU. 122	Society and Government	3 credits
TU. 123	Society and Law	3 credits
TU. 124	Society and Economy	3 credits

See course description of the University's General Education Program.

AC. 201	Fundamental Financial Accounting	3 credits
BA. 291	Introduction to Business	3 credits

See course description of the Faculty of Commerce and Accountancy.

EC. 210	Introductory Economics	3 credits
EC. 212	Economic Principles II	3 credits

See course description of the Faculty of Economics.

Languages 6 credits

2 compulsory English courses (6 credits)

EL. 070	English I	0 credit
EL. 171	English II	3 credits
EL. 172	English III	3 credits

See course description of the University's General Education Program.

Sciences and Mathematics 29 credits

9 compulsory courses (29 credits)

MA. 101	Mathematics I	3 credits
MA. 102	Mathematics II	3 credits
MA. 203	Mathematics III	3 credits
MA. 204	Mathematics IV	3 credits
MA. 305	Numerical Methods	3 credits
SC. 124	Chemistry for Engineers I	4 credits
SC. 125	Chemistry for Engineers II	2 credits

SC. 133	Physics for Engineers I	4 credits
SC. 134	Physics for Engineers II	4 credits

See course description of the Faculty of Science and Technology.

Department of Electrical Engineering

Electrical engineering is fundamental to many fields of high technology such as information technology and electronic design as well as to the efficient use of energy. It is likely to continue to be growth areas and to offer worthwhile careers to well qualified graduates.

The undergraduate curriculum of the Department of Electrical Engineering provides preparation in the basic electrical and physical sciences, electronics, computer science and engineering, information processing, control, as well as humanities and social sciences.

The Department offers programs of study in four major areas: computer, control, electronics, and telecommunication.

Head:

Vasin Oradidolchost	M.S. (Engineering-Economic systems), Stanford University, U.S.A.
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Lecturers:

Jarrec Chaicharn	B.Eng. (Electrical Engineering), Khon Kaen University
Somchart Chokchaitan	B.Eng. (Electrical Engineering), Chulalongkorn University
Tanee Domeechai	B.Eng. (Electrical Engineering) Chulalongkorn University
Taweesak Kijkanjanarat	M.Eng. (Computer Science), Asian Institute of Technology
Sanya Mitain	B.Eng. (Control Engineering), King Mongkut's Institute of Technology Ladkrabang
Paiboon Nakmahachalasint	B.Eng. (Industrial Instrumentation), King Mongkut's Institute of Technology Ladkrabang

Curriculum Outline

Total credit requirements	150 credits
1. General Basic Courses	46 credits
1.1 Humanities	2 credits
1.2 Social Sciences	9 credits
1.3 Languages	6 credits
1.4 Sciences and Mathematics	29 credits
2. Engineering Courses	101 credits
2.1 Core Courses	27 credits
2.2 Major Courses	74 credits
2.2.1 Compulsory Courses	59 credits
2.2.2 Elective Courses	15 credits
2.3 Training (no credits)	
3. Free Electives	3 credits

Detail of Curriculum

1. <u>General Basic Courses</u>	46 credits
1.1 <u>Humanities</u> - 1 course	2 credits
TU.111	TU.112
TU.113	TU.114
TU.115	TU.116
TU.117	
1.2 <u>Social Sciences</u> - 3 courses	9 credits
2 compulsory courses (6 credits):	
IE.201	IE.302

Select 1 course (3 credits) from the followings:

TU.121	TU.122	TU.123	TU.124
AC.201	BA.291	EC.210	EC.212

1.3 Languages - 2 courses 6 credits

2 compulsory English courses:

EL.171	EL.172
--------	--------

1.4 Sciences and Mathematics - 9 courses 29 credits

9 compulsory courses:

MA.101	MA.102	MA.203	MA.204
MA.305	SC.124	SC.125	SC.133
SC.134			

2. Engineering Courses 101 credits

2.1 Core Courses 27 credits

LE.121	IE.121	IE.158	IE.261
CE.102	CE.202	AE.211	ME.111
ME.112	ME.221	ME.241	

2.2 Major Courses 74 credits

2.2.1 Compulsory Courses 59 credits

LE.201	LE.202	LE.211	LE.212
LE.221	LE.242	LE.301	LE.302
LE.303	LE.304	LE.305	LE.311
LE.312	LE.313	LE.314	LE.322
LE.331	LE.341	LE.351	LE.352
LE.353	LE.401	LE.402	LE.441
ME.391			

2.2.2 Elective Courses

15 credits

Select from the following:

LE.403	LE.404	LE.411	LE.412
LE.413	LE.414	LE.415	LE.416
LE.417	LE.418	LE.419	LE.421
LE.422	LE.423	LE.424	LE.425
LE.426	LE.427	LE.431	LE.432
LE.433	LE.434	LE.435	LE.436
LE.437	LE.438	LE.442	LE.443
LE.444	LE.445	LE.446	LE.447
LE.448	LE.449	LE.451	LE.452
LE.453	LE.454	LE.455	LE.456
LE.457	LE.458	LE.459	LE.551

2.3 Training (no credits)

3. Free Electives

3 credits

Free electives offered by Thammasat University.

Course Planning for Electrical Engineering Students

First Year

<u>Course Number</u>	<u>Title</u>	<u>Credits</u> (lecture-lab-self study)
----------------------	--------------	--

Semester 1

LE.121	Computer for Engineers	2(2-0-4)
CE.102	Introduction to Engineering	1(1-0-2)
ME.111	Engineering Drawing I	2(1-3-2)
SC.124	Chemistry for Engineers I	4(3-3-6)
SC.133	Physics for Engineers I	4(3-3-6)
MA.101	Mathematics I	3(3-0-6)
EL.xxx	English Course x	<u>3(5-0-4)</u>
		<u>19(18-9-30)</u>

Semester 2

IE.121	Material Science I	3(3-0-6)
IE.150	Engineering Tools & Operations	2(1-3-2)
ME.112	Engineering Drawing II	2(1-3-2)
MA.102	Mathematics II	3(3-0-6)
SC.125	Chemistry for Engineers II	2(2-0-4)
SC.134	Physics for Engineers II	4(3-3-6)
EL.xxx	English Course x	<u>3(5-0-4)</u>
		<u>19(18-9-30)</u>

Second Year

<u>Course Number</u>	<u>Title</u>	<u>Credits</u> (lecture-lab-self study)
----------------------	--------------	--

Semester 3

EE.201	Basic Electrical Engineering Laboratory	1(0-3-0)
EE.211	Electrical Circuit Analysis	3(3-0-6)
EE.221	Digital Circuit Design	3(2-3-4)
EE.261	Engineering Statistics	3(3-0-6)
CE.202	Engineering Mechanics I	3(3-0-6)
AE.211	Thermodynamics I	3(3-0-6)
MA.203	Mathematics III	3(3-0-6)
		<u>19(17-6-34)</u>

Semester 4

EE.202	Electromechanical Energy Conversion Laboratory I	1(0-3-0)
EE.212	Basic Electronic Circuits and Devices	3(3-0-6)
EE.242	Electromechanical Energy Conversion I	3(3-0-6)
ME.221	Engineering Mechanics II	3(3-0-6)
ME.241	Mechanics of Fluids I	3(3-0-6)
MA.204	Mathematics IV	3(3-0-6)
MA.305	Numerical Methods	3(3-0-6)
		<u>19(18-3-36)</u>

Third Year

<u>Course Number</u>	<u>Title</u>	<u>Credits</u> (lecture-lab-self study)
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Semester 5

LE. 301	Electronic Circuits Laboratory	1(0-3-0)
LE. 302	Electromechanical Energy Conversion Laboratory II	1(0-3-0)
LE. 311	Measurement and Instrumentations	3(3-0-6)
LE. 312	Network Theory	3(3-0-6)
LE. 313	Electronic Circuits	3(3-0-6)
LE. 314	Physics Electronics	3(3-0-6)
LE. 341	Electromechanical Energy conversion II	3(3-0-6)
LE. 351	Electromagnetics Theory	<u>3(3-0-6)</u>
		<u>20(18-6-36)</u>

Semester 6

LE. 303	Telecommunication Engineering Laboratory	1(0-3-0)
LE. 304	Instrumentations and Control Systems Laboratory	1(0-3-0)
LE. 322	Microprocessors	3(3-0-6)
LE. 331	Feedback Control Systems	3(3-0-6)
LE. 352	Principles of Communications	3(3-0-6)
LE. 353	Communication Networks and Transmission Lines	3(3-0-6)
LE. xxx	Technical Electives	3(3-0-6)
ME. 391	Fundamentals of Mechanical Engineering	<u>3(3-0-6)</u>
		<u>20(18-6-36)</u>

LE. 305	Industrial Training (Not less than 240 hours)	0 credit
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Fourth Year

<u>Course Number</u>	<u>Title</u>	<u>Credits</u> (lecture-lab-self study)
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Semester 7

LE.401	Project I	2(0-6-0)
LE.441	Power Systems	3(3-0-6)
LE.xxx	Technical Electives	3(3-0-6)
LE.xxx	Technical Electives	3(3-0-6)
IE.201	Engineering Management	3(3-0-6)
IE.302	Engineering Economy	3(3-0-6)
TU.xxx	Social Sciences Electives	<u>3(3-0-6)</u>
		<u>20(18-6-36)</u>

Semester 8

LE.402	Project II	3(0-9-0)
LE.xxx	Technical Electives	3(3-0-6)
LE.xxx	Technical Electives	3(3-0-6)
TU.xxx	Humanities Electives	2(2-0-4)
XX.xxx	Free Electives	<u>3(3-0-6)</u>
		<u>14(11-9-22)</u>

Description of Courses in Electrical Engineering

- LE 121 Computer for Engineers 2 (2-0-4)
Computer organization; introduction to data processing; data structures; software design and development for engineering using Pascal, C, or other high-level languages.
- LE 201 Basic Electrical Engineering Laboratory 1 (0-3-0)
Prerequisite or Corequisite : LE 211
A laboratory work on electric circuits and measurements to illustrate the topics covered in LE 211.
- LE 202 Electromechanical Energy Conversion Laboratory I 1 (0-3-0)
Prerequisite or Corequisite : LE 242
A laboratory work on electromechanical devices and machines to illustrate the topics covered in LE 242.
- LE 211 Electrical Circuit Analysis 3 (3-0-6)
Prerequisite : SC 134 or permission from instructor.
Circuit elements; kirchhoff's laws; elementary concepts of network graphs; resistive circuits; node and mesh analysis; Thevenin and Norton theorems; first-order and second-order circuits; responses; exponential excitations; elementary transfer functions; periodic waveforms; phasor representations; impedance and admittance; sinusoidal steady-state analysis; frequency responses; three-phase circuits; introduction to DC and AC machines; transformer; diode; diac; triac.
- LE 212 Basic Electronics Circuits and Devices 3 (3-0-6)
Prerequisite : LE 211
Energy bands in semiconductors; semiconductor characteristics; p-n junction; types of diodes; characteristics and application of diodes; transistors; transistor biasing; small signal circuit analysis; field effect transistors; multistage applications; frequency responses and amplifiers.

- LE 221 Digital Circuit Design 3 (2-3-4)
 Prerequisite : -
 Elementary switching circuit theory; Boolean algebra; logic gates; truth table; Karnaugh maps; flip-flops; counters; shift registers; design of synchronous, asynchronous and pulse sequential circuits, combinational circuits; encoders and decoders; multiplexers; demultiplexer; A/D and D/A; introduction to microprocessors.
- LE 241 Introduction to Electrical Engineering 3 (2-3-4)
 Prerequisite : SC 134 or permission from instructor.
 Introduction to electrical systems; DC systems; AC single-phase and three-phase systems; domestic and industrial electrical equipments; transformers; transformer connections and efficiency; DC and AC motors and their applications; control circuits for motors and generators; elevator and escalator control; security systems; short-circuit protection of electrical systems.
- LE 242 Electromechanical Energy Conversion I 3 (3-0-6)
 Prerequisite : SC 134 or permission from instructor.
 Energy and energy conversion; magnetic forces; induced emf's, magnetic circuits; eddy current and hysteresis; energy conversion in DC machines; DC machine characteristics; paralleling of DC generators; DC machine control and operation; DC machine selection; ideal and actual transformers; transformer equivalent circuits; transformer connections.
- LE 301 Electronic Circuits Laboratory 1 (0-3-0)
 Prerequisite : LE 212
 Corequisite : LE 313
 A laboratory work on electronic circuits designed to illustrate the topics covered in LE 212 and LE 313.

LE 302 Electromechanical Energy Conversion Laboratory II 1 (0-3-0)
Prerequisite or Corequisite : LE 341

A laboratory work on electromechanical devices to illustrate topics covered in LE 341.

LE 303 Telecommunication Engineering Laboratory 1 (0-3-0)
Prerequisite or Corequisite : LE 352, LE 353

A laboratory work on communication measuring instruments and systems, designed to illustrate the topics covered in LE 352 and LE 353.

LE 304 Instrumentation and Control System Laboratory 1 (0-3-0)
Prerequisite : LE 311

Corequisite : LE 331

A laboratory work on measuring instruments and control systems to illustrate the topics covered in LE 311 and LE 331.

LE 305 Industrial Training 0 (0-0-0)

Prerequisite : Third year standing or consent of faculty

This is a 240-hour industrial training in a company or factory during the summer vacation. The aim is to allow a student to experience disciplines in the factory and the practice of the engineering profession. This course is mandatory and a satisfactory report and seminar are required.

LE 311 Measurement and Instrumentations 3 (3-0-6)

Prerequisite : LE 211

Units and standard instruments; principles and operations of measuring instruments; precision; safety; reliability; voltage, current, and power measurements; impedance measurements; transducer; magnetic measurements; industrial measuring instruments; construction of measuring systems; conversion of measuring quantities; errors and calibration; noise reduction devices.

- LE 312 Network theory 3 (3-0-6)
 Prerequisite : LE 211
 Linear time-invariant circuits; sinusoidal steady state analysis; impulse responses; tellegen's theorem; network graphs; node and cut-set analysis; loop and mesh analysis; state equations; natural frequencies; network functions; network theorems; two-port networks; series and parallel realizations of the image parameter method.
- LE 313 Electronic Circuits 3 (3-0-6)
 Prerequisite : LE 212
 Properties and applications of operational amplifiers; feedback amplifiers; oscillators; signal generators; synthesizer circuits; introduction to power electronics.
- LE 314 Physical Electronics 3 (3-0-6)
 Prerequisite : SC 134
 Atomic physics and theory of energy bands in solids; Energy bands and charge carriers in semiconductors; excess carriers in semiconductors; p-n junction and devices; metal-semiconductor contact; BJT; FET; MOSFET; UJT; PNP diode; SCR; photo-devices; lasers; switching devices; microwave; integrated circuit fabrication.
- LE 322 Microprocessors 3 (3-0-6)
 Prerequisite : LE 221
 Logic circuits; arithmetic circuits; flip-flops; registers; memory units; fundamentals of microprocessors for examples: instruction sets, programming, fetch, execute; controller units; clock circuits; indirect memory addressing; jump, operate instructions; decoder; branch and move using stack pointer; application and programming of microprocessors; microprocessor types; instruction set method; programming for applications of microprocessor control to electrical equipment: machinery systems, telephone systems, communication systems.

LE 331 Feedback Control Systems 3 (3-0-6)

Prerequisite : MA 204 , LE 312

Closed-loop and opened-loop control systems; mathematical models of physical systems; block diagrams; signal flow graphs; time-domain and frequency-domain analysis; stability analysis by Routh-Hurwitz, Nyquist, Bode and root-locus methods and Nichol's charts; basic control actions; compensation; introduction to state space representation of control system; PLC and Computer in control systems.

LE 341 Electromechanical Energy conversion II 3 (3-0-6)

Prerequisite : LE 242

Energy conversion in AC machines; rotating magnetic fields; synchronous machine characteristics; parallel operation of synchronous generators; single-phase and poly-phase induction motor characteristics; AC machines control and operation; special use of synchronous and induction machines; protection of electrical machines; introduction to linear induction motors.

LE 351 Electromagnetics Theory 3 (3-0-6)

Prerequisite : MA 204

Vector analysis; electrostatic fields; static magnetic fields; time-varying fields; conductors and dielectrics; capacitance; convection and conduction currents; magnetic fields due to currents; force and torque on a current loop in a magnetic field; inductance; electromagnetic induction; displacement current; Maxwell's equations; electromagnetic waves in isotropic media; waveguides; wave polarization; wave reflection; refraction; introduction to transmission lines antennas.

- LE 352 Principles of Communications 3 (3-0-6)
 Prerequisite : LE 351
 History of electrical communications; signal analysis and processing; analog and digital modulation and detection systems; communication theory; transmission bandwidth; noise and its effects on performance of communication systems; principles of common communication systems and information transmission.
- LE 353 Communication Networks and Transmission Lines 3 (3-0-6)
 Prerequisite : LE 351
 Network theorems; equivalent one-port and two-port networks; analysis and design of various communication networks; impedance transformation and matching networks; microwave in telephone network approach to theory of transmission lines; various types of wave filter network; utilization of transmission lines for impedance matching.
- LE 401 Project I 2 (0-6-0)
 Prerequisite : Senior standing or permission from instructor.
 Research and development project on an electrical engineering problem are carried out by an individual student or a group of students under supervision of one or more academic staff members. The student must submit reports and give seminars on the project.
- LE 402 Project II 3 (0-9-0)
 Prerequisite : LE 401
 A continuation of LE 401 PROJECT I to the final stage of writing up a full report and giving a final presentation.
- LE 403 Special Topics in Electrical Engineering I 3 (3-0-6)
 Prerequisite : Senior standing or permission from instructor.
 Topics of current interest and new developments in various fields of electrical engineering

LE 404 Special Topics in Electrical Engineering II 3 (3-0-6)
Prerequisite : Senior standing or permission from instructor.
Topics of current interest and new developments in various fields of electrical engineering

LE 411 Electronic Circuit Analysis 3 (3-0-6)
Prerequisite : LE 313
Constant-current stages and current mirrors; bi-polar and MOS differential amplifiers; multiplier circuits; high frequency circuits; broad band amplifiers and matching circuits; digital integrated circuit analysis; voltage reference source and output stages; introduction to IC design techniques and IC computer-aided design; LSI and VLSI.

LE 412 Power Electronics 3 (3-0-6)
Prerequisite : LE 313
Characteristics of switching diodes, thyristors and transistors; device protection; basic theory of power electronics; filters; regulators; converters; inverters; switching amplifiers; induction heating; motor drives.

LE 413 Integrated Circuits Fabrication 3 (3-0-6)
Prerequisite : LE 212, LE 314
Integrated circuit fabrication technology : crystal growth; vapor phase epitaxy; liquid phase epitaxy; molecular beam epitaxy; thermal oxidation; solid-state diffusion; ion implantation; metallization; lithography, etc; semiconductor physics : non-equilibrium state; carrier injection; semiconductor surface theory; inversion layer in MOS structure; surface effect devices; properties of silicon-silicon dioxide system, etc.

LE 414 Opto-Electronics 3 (3-0-6)

Prerequisite : LE 314

Physics of optical radiation; interaction between optical radiation and matters; principles and applications of opto-electronic devices : light sources; detectors; materials; optical communication systems; integrated optics, etc.

LE 415 Bio-Medical Electronics 3 (3-0-6)

Prerequisite : LE 411

Electrical signal in human body; action potential in cells; electrodes; amplifiers; transducers; electronic monitoring systems such as ECG, EEG, EMG, etc; blood pressure and blood flow measurement; catheterization; electrical hazards and prevention; medical instrumentations; computer in medicine.

LE 416 Pulse Digital and Wave Shaping Circuit Design 3 (3-0-6)

Prerequisite : LE 221, LE 313

Introduction and design of large signal circuits used in computer and communication systems; design of logic gates and flip-flops; concepts in integrated circuit design; design of counting and timing circuits using ICs; pulse, sweep and wave shaping circuits.

LE 417 RF Circuit Design 3 (3-0-6)

Prerequisite : LE 411

Wideband amplifiers; low-noise amplifiers; analog switches and sample-and-hold circuits; analog multipliers and demodulators; phase-locked-loop circuits; RF input circuits and impedance matching; small-signal RF amplifiers; IF amplifiers; Mixer and local oscillators; RF power amplifiers.

LE 418 Active Network Theory

3 (3-0-6)

Prerequisite : LE 312

Review of analysis tools; n-port description; linear passive RC networks; active elements and their properties; analysis of active network approximation; synthesis using controlled sources; sensitivity; operational amplifiers as a network element; gyrator.

LE 419 Lasers

3 (3-0-6)

Prerequisite : LE 314

A review of fundamental theory, i.e., energy states in atoms, electron-population inversion, spontaneous emissions, stimulated emissions; principles of lasers; coherent light; gas lasers; solid state lasers, semiconductor lasers; applications of lasers in medical sciences; precision measurement, telecommunication, material processing, spectroscopy, display hologram, and nonlinear optics.

LE 421 Introduction to Artificial Intelligence

3 (3-0-6)

Prerequisite : Senior standing or permission from instructor.

Concept in AI; languages used for programming : LISP, PROLOG, FORTH; survey of current AI techniques.

LE 422 Software Engineering

3 (3-0-6)

Prerequisite : Senior standing or permission from instructor.

Design tools and techniques; top-down design; modular design; software tools; debugging, test data; software reliability; theory and concepts; errors and faults and estimating, reliability models; availability models; management techniques; cost estimation, software maintenance.

- LE 423 Digital computer Systems 3 (3-0-6)
 Prerequisite : LE 322
 CPU architecture structure; Control unit organization; firmware; ALU structure and data path control with microcode; memory hierarchy; primary and mass storage system characteristics; Cache; associative memory; interleaving; virtual memory; I/O system architecture; DASD, storage directors and I/O channels; bus structure and interrupt handling; digital system design techniques; concept of chip type; Designing with bit slice devices; Array logic; parallel processing systems; pipelining; replication of processing elements; multiprocessing; engineering and system aspects.
- LE 424 System Programming 3 (3-0-6)
 Prerequisite : Senior standing or permission from instructor
 Computer architecture; machine and assembly languages; assembler construction; macroassembler; loader; programming languages; compilers and interpreters construction; general view of system programming.
- LE 425 Computer Networks 3 (3-0-6)
 Prerequisite : Senior standing or permission from instructor.
 Network structures; network models; network architectures; seven-layer architecture; methods and procedures of each layer.
- LE 426 Computer Interfacing Techniques 3 (3-0-6)
 Prerequisite : LE 322
 Introduction to computer interfacing techniques; interface to switches and displays; keyboard scanning and multiplexing techniques; parallel I/O devices : PIO, PPI, PIAs; interrupt I/O; interrupt polling and priorities; programmable interrupt controllers; memory interface; address decoding and memory system design; DMS, DMA serial I/O interface; Video display interface; bus systems and standards.

LE 434 Industrial Control and Instrumentations 3 (3-0-6)

Prerequisite : LE 331

Industrial instrumentation : analog and digital devices; studies of industrial control techniques in actual industrial systems to provide competence in the analysis, design, selection and maintenance of industrial control systems; applications to electromechanical, pneumatic, and hydraulic systems.

LE 435 Optimization Techniques 3 (3-0-6)

Prerequisite : LE.331

Principles and terminology on optimization; various optimization techniques of unconstrained continuous function; optimization of constrained objective function using Simplex Method; non-linear programming application.

LE 436 Robotics and Automations 3 (3-0-6)

Prerequisite : LE 331, LE 322

Overview of automated systems; microprocessor organization and interfacing; real-time implementation of controllers; robotic coordinate systems and kinematics; dynamics and path control; robot control techniques and implementation; sensors and intelligent robots.

LE 437 Digital Control Systems 3 (3-0-6)

Prerequisite : LE 432

Introduction to digital control; difference equations and Z-transforms; conventional digital control system design via transform techniques; digital filtering and digital compensator design; sampling; state-space analysis of digital control systems; effects of quantization and errors; state-space approach to control system design; and linear discrete-time optimal control.

LE.438 Digital Signal Processing 3 (3-0-6)
Prerequisite : Senior standing or permission from instructor.
Discrete-time signals and systems; Z-transform; discrete Fourier transform; algorithm for Fast Fourier transform; Fourier analysis of discrete-time signals and systems; design techniques of digital filter sampling; homomorphic signals; power spectrum analysis.

LE 441 Power Systems 3 (3-0-6)
Prerequisite : LE 242

Introduction to power systems : sources of electric energy; structure of electric power systems; load characteristics; electric power plants; electric energy transmission; transmission line impedances; relationship between currents and voltages; regulation of voltages; transmitted power and losses; electric energy distribution; networks; construction of transmission and distribution lines; power system equipment; standard and safety.

LE 442 High Voltage Engineering 3 (3-0-6)
Prerequisite : LE 351

Generation and measurement of high voltages and currents; electric fields in homogeneous and heterogeneous materials; gaseous discharges; electric arcs; breakdown in liquid and solid dielectrics; high voltage test of electrical apparatus; lightning discharges and protections.

LE 443 Illumination Engineering 3 (3-0-6)
Prerequisite : LE 314

Physical radiant and photometric quantities; measurements of light; radiation from incandescent sources; gaseous conduction and phosphorescence; lamps and lighting fittings; light properties of construction materials; lighting calculations for interior and exterior.

LE 444 Transformers 3 (3-0-6)

Prerequisite : LE 241

General design and cost considerations of transformers; general principle of transformers; physical features of transformers; magnetic leakage; leakage inductance; voltage regulation; efficiency and rating; auto transformers; self and mutual inductance; frequency characteristics; special application of transformers in power systems; three-phase connection; harmonic phenomena in three-phase circuits; features of three-phase and multicircuit transformers; connections for three-phase transformers; parallel operation of transformers.

LE 445 Power Systems Analysis 3 (3-0-6)

Prerequisite : LE 441

Representation of power systems; power system equations and analysis; load flow studies; economic operation of power systems; symmetrical components, symmetrical and asymmetrical faults; over-voltages in power systems; stability of simple power systems; protection devices in power systems.

LE 446 Electrical Systems Design 3 (3-0-6)

Prerequisite or Corequisites : LE 441

Types of electrical systems; system design concept and criteria; electrical devices; installation materials; symbol and circuit diagrams; load characteristics; power supplies; power distribution and wiring design; infrastructural system design : lighting, heating, air conditioning, grounding and safety; motor load and motor control; specifications and cost estimation; case studies : residential and commercial electrical system design.

LE 447 Electrical Machines Design 3 (3-0-6)

Prerequisite : LE 242

Electrical materials : conductor, insulator, and magnetic materials; excitation characteristics; losses; design of transformers; thermal property of heat flow; design of machines; electrical transients in synchronous and induction machines; repulsion motors; universal motors; special machines; overload and short-circuit protection of machines; generalized machine theory; design concept of electrical machines.

LE 448 Power Plants and Substations 3 (3-0-6)

Prerequisite : Senior standing or permission from instructor.

Introduction to substation systems; substation devices; substation design; substation drawing and planning; steam power stations; gas turbine; diesel power station; nuclear power station; hydropower dispatching centers and control systems.

LE 449 Electric Drives 3 (3-0-6)

Prerequisite : LE.242

Starting, speed control and braking of electrical drives; choice and ratings; DC motor control with rectifiers and choppers; inverters and AC motor control; electrical traction; mechanics of train movement; specific energy; tractive motors; traction supply systems.

LE 451 Noise Reduction in Electronic Systems 3 (3-0-6)

Prerequisite : LE 351

Interference; shielding of conductors; capacitive and inductive coupling; effects of magnetic fields; shield factor; shielded twisted pair; braided shields; grounding; safety grounds; signal and multi-point ground systems; high and low frequency grounding; amplifier shield; isolation transformers; optical couples; guard shields and guarded meters; various types of cables and connectors; balancing; decoupling range of passive components; contact protection; printed circuit board layout.

- LE 452 Telephone Engineering 3 (3-0-6)
Prerequisite : Senior standing or permission from instructor.
Introduction to telephone systems; signalling and switching techniques; traffic theory; public telephone network; electro-mechanical switching systems; computer controlled switching systems; private telephone systems; telex; introduction to optical communication systems.
- LE 453 Radio Systems 3 (3-0-6)
Prerequisite : LE 351, LE 313
Propagation of radio wave; terrestrial and satellite systems; effects of ionosphere layer on radio wave; optical distance and frequency of wave propagation; radio systems; AM, FM, and SSB radio system; telegraph; pulse data communication.
- LE 454 Data Communications 3 (3-0-6)
Prerequisite : Senior standing or permission from instructor.
Uses of data communications; data transmission and characteristics of transmission media; modulation; types of lines and network configurations; data communication hardware and software; error detection, correction, and control; system design considerations.
- LE 455 Telecommunication Engineering 3 (3-0-6)
Prerequisite : LE 352
Introduction to telecommunication services and communication engineering; PCM systems in communication networks; terrestrial microwave systems; satellite communication systems; optical fiber system; PABX; traffic analysis in telephone system; traffic estimation; OSI models of data communication; packet switching; and introduction to ISDN.

LE 456 Satellite Communication Systems 3 (3-0-6)

Prerequisite : LE 351

Radio waves for satellite communication; INTELSAT; PALAPA; LANDSAT; orbit of satellites; communication technology; multiple access; earth stations; S/N ratio; satellite networks; antenna systems; tracking systems; low noise amplifiers; high power amplifiers.

LE 457 Television Engineering 3 (3-0-6)

Prerequisite : Senior standing or permission from instructor.

Introduction to television systems and standards; colour television signal processing techniques; image pick-up and display devices; NTSC, PAL, and SECAM systems; television signal transmission and reception; television signal recording and playback; MATV, CATV, and CCTV systems.

LE 458 Communication Systems Design 3 (3-0-6)

Prerequisite : LE 352

Symbols and diagrams; study of communication components and their functions; protection of communication systems; design of communication systems for commercials forecasting of future traffic and planning; cost calculation and estimation.

LE 459 Principles of Antennas 3 (3-0-6)

Prerequisite : LE 351

Isotropic point sources; power patterns; field patterns; directivity and gain; radiation impedance; wave polarization; radiation from current elements; radiation properties of half-wave dipoles, quarter-wave monopoles; loop antennas, Yagi antennas, longwire and rhombic antennas; log-periodic antennas and aperture antennas; linear arrays; antenna feeding and baluns.

LE 551 Microwave Engineering

3 (3-0-6)

Prerequisite : LE 453

A Brief review of Electromagnetics; fields and propagation characteristics in rectangular and cylindrical waveguides; cavity resonators; microwave circuits and networks; use of scatter matrices in microwave circuit analysis; microwave measurement principles; passive and active microwave devices; microstrip transmission lines; electromagnetic radiation; types and characteristics of antennas; microwave transmission principles; terrestrial and satellite systems; optical fibers; optical communication systems.

Department of Industrial Engineering

The key word in industry today is "productivity". Significant productivity improvements demand that the industrial engineer focus on an understanding of the technology involved in manufacturing processes as well as a knowledge of the management techniques.

The industrial engineering program is built upon a solid foundation in physical sciences, mathematics, engineering, humanities, and social sciences. It offers two major areas: production engineering and engineering management. The Department has extensive and well supported workshops, laboratories, and computing facilities, thus providing the students with a capability for working in various industries.

Organizations employing industrial engineers include independent consultants, manufacturers, banks, hospitals, transportation industries, energy suppliers, retail corporations, government/military and educational institutions.

Head:

Montalce Nagswasdi
M.S. (Industrial Engineering),
University of Pittsburgh

Lecturers:

Chaupen Anuratananon
B.Eng. (Production Engineering),
King Mongkut's Institute of
Technology Thonburi

Parichal Baisak
B.Eng. (Industrial Engineering),
Khon Kaen University

Kamthon Bunyok
B.Eng. (Industrial Engineering),
Kasetsart University

Chaosuan Kanchanowai
B.Eng. (Industrial Engineering),
Kasetsart University

Surasak Suranuntchai

B.Eng. (Production Engineering),
King Mongkut's Institute of
Technology Thonburi

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Chairath Tantipaibulvut

B.Eng. (Production Engineering),
King Mongkut's Institute of
Technology Thonburi

Curriculum Outline

Total credit requirements	150 credits
1. General Basic Courses	46 credits
1.1 Humanities	2 credits
1.2 Social Sciences	9 credits
1.3 Languages	6 credits
1.4 Sciences and Mathematics	29 credits
2. Engineering Courses	101 credits
2.1 Core Courses	27 credits
2.2 Major Courses	74 credits
2.2.1 Compulsory Courses	62 credits
2.2.2 Elective Courses	12 credits
2.3 Training (no credits)	
3. Free Electives	3 credits

Detail of Curriculum

1. General Basic Courses 46 credits

1.1 Humanities - 1 course 2 credits

Select 1 course from the followings:

TU.111	TU.112	TU.113	TU.114
TU.115	TU.116	TU.117	

1.2 Social Sciences - 3 courses

9 credits

2 compulsory courses (6 credits):

IE.201 IE.302

Select 1 course (3 credits) from the followings:

TU.121 TU.122 TU.123 TU.124
AC.201 BA.291 EC.210 EC.212

1.3 Languages - 2 courses

6 credits

2 compulsory English courses:

EL.171 EL.172

1.4 Sciences and Mathematics - 9 courses

29 credits

9 compulsory courses:

MA.101 MA.102 MA.203 MA.204
MA.305 SC.124 SC.125 SC.133
SC.134

2. Engineering Courses

101 credits

2.1 Core Courses

27 credits

IE.121 IE.121 IE.158 IE.261
CE.102 CE.202 AE.211 NE.111
HE.112 HE.221 HE.241

2.2 Major Courses 74 credits

2.2.1 Compulsory Courses 62 credits

IE. 241	IE. 222	IE. 291	IE. 263
IE. 303	IE. 311	IE. 331	IE. 332
IE. 351	IE. 352	IE. 353	IE. 354
IE. 362	IE. 364	IE. 390	IE. 412
IE. 413	IE. 433	IE. 444	IE. 492
IE. 494	CE. 221	ME. 302	

2.2.2 Elective Courses 12 credits

Select from the followings:

Production

IE. 434	IE. 435	IE. 436	IE. 455
IE. 456	IE. 457	IE. 496	ME. 322
ME. 391	ME. 392	ME. 415	ME. 425

Management

IE. 404	IE. 414	IE. 415	IE. 416
IE. 442	IE. 443	IE. 465	IE. 466
IE. 495	IE. 496		

2.3 Training (no credits)

3. Free Electives 3 credits

Free electives offered by Thammasat University.

Course Planning for Industrial Engineering Students

First Year

<u>Course Number</u>	<u>Title</u>	<u>Credits</u>
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(lecture-lab-self study)

Semester 1

LE.121	Computer for Engineers	2(2-0-4)
CE.102	Introduction to Engineering	1(1-0-2)
ME.111	Engineering Drawing I	2(1-3-2)
MA.101	Mathematics I	3(3-0-6)
SC.124	Chemistry for Engineers I	4(3-3-6)
SC.133	Physics for Engineers I	4(3-3-6)
EL.xxx	English Course x	<u>3(5-0-4)</u>

19(18-9-30)

Semester 2

IE.121	Material Science I	3(3-0-6)
IE.158	Engineering Tools & Operations	2(1-3-2)
ME.112	Engineering Drawing II	2(1-3-2)
MA.102	Mathematics II	3(3-0-6)
SC.125	Chemistry for Engineers II	2(2-0-4)
SC.134	Physics for Engineers II	4(3-3-6)
EL.xxx	English Course x	<u>3(5-0-4)</u>

19(18-9-30)

Second Year

<u>Course Number</u>	<u>Title</u>	<u>Credits</u> (lecture-lab-self study)
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Semester 3

IE.201	Engineering Management	3(3-0-6)
IE.261	Engineering Statistics	3(3-0-6)
LE.241	Introduction to Electrical Engineering	3(2-3-4)
CE.202	Engineering Mechanics I	3(3-0-6)
AE.211	Thermodynamics I	3(3-0-6)
MA.203	Mathematics III	3(3-0-6)
TU.xxx	Social Sciences Electives	<u>3(3-0-6)</u>
		<u>21(20-3-40)</u>

Semester 4

IE.222	Material Science II	3(3-0-6)
IE.263	Experimental Design	3(3-0-6)
CE.221	Mechanics of Solids I	3(3-0-6)
ME.221	Engineering Mechanics II	3(3-0-6)
ME.241	Mechanics of Fluids I	3(3-0-6)
MA.204	Mathematics IV	3(3-0-6)
MA.305	Numerical Methods	<u>3(3-0-6)</u>
		<u>21(21-0-42)</u>

Third Year

<u>Course Number</u>	<u>Title</u>	<u>Credits</u> (lecture-lab-self study)
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Semester 5

IE.302	Engineering Economy	3(3-0-6)
IE.311	Work Study	3(2-3-4)
IE.331	Tool Engineering	3(2-3-4)
IE.351	Manufacturing Process & Technology I	3(2-3-4)
IE.362	Quality Control	3(3-0-6)
ME.302	Mechanical Engineering Laboratory I	2(0-4-2)
IE.231	Industrial Safety	3(3-0-6)
		<u>20(15-13-32)</u>

Semester 6

IE.303	Industrial Cost Analysis & Budgeting	3(3-0-6)
IE.332	Value Engineering	3(3-0-6)
IE.352	Manufacturing Process & Technology II	3(2-3-4)
IE.353	Automation	3(2-3-4)
IE.354	Basic Instrumentation	3(2-3-4)
IE.364	Operations Research I	3(3-0-6)
IE.xxx	Technical Electives	3(3-0-6)
		<u>21(18-9-36)</u>

IE.390	Industrial Training (Not less than 180 hours)	0 credit
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Fourth Year

<u>Course Number</u>	<u>Title</u>	<u>Credits</u> (lecture-lab-self study)
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Semester 7

IE.412	Production Planning & Control	3(3-0-6)
IE.413	Project Feasibility Study	3(3-0-6)
IE.433	Industrial Plant Design	3(2-3-4)
IE.492	Industrial Engineering Project I	1(0-0-3)
IE.xxx	Technical Electives	3(3-0-6)
IE.xxx	Technical Electives	<u>3(3-0-6)</u>
		<u>16(14-3-31)</u>

Semester 8

IE.444	Environmental Control	3(3-0-6)
IE.494	Industrial Engineering Project II	2(0-0-6)
IE.xxx	Technical Electives	3(3-0-6)
TU.xxx	Humanities Electives	2(2-0-4)
XX.xxx	Free Electives	<u>3(3-0-6)</u>
		<u>13(11-0-28)</u>

Description of Courses in Industrial Engineering

IE. 121 Material Science I 3 (3-0-6)

Prerequisite :-

Properties and structure of materials: metals, alloys, ceramics and polymers. Studies of microstructures in relationship with mechanical properties of metallic materials; phase equilibrium diagrams and their application; effects of heat treatment on microstructure of alloys. Fracture, Corrosion, Degradation and Failure analysis.

IE. 158 Engineering Tools & Operations 2 (1-3-2)

Prerequisite :-

Basic engineering tools and measurement, emphasizing proper application and safety. Students acquire skills in fitting, machine tools, welding, foundry and fabrication.

IE. 201 Engineering Management 3 (3-0-6)

Prerequisite :-

Provides basic concepts and theories of modern management, human behavior, and human relation in organization. Topics include: methods of increasing productivities; industrial safety; basic concepts of engineering economy, finance, marketing, and project management.

IE. 222 Material Science II 3 (2-3-4)

Prerequisite :- IE 121

Production of iron; alloy steels; case hardening of steels; powder metallurgy; tool steels; heat treatment of tool steels; stainless steels; cast iron; carbon steels; high and low alloy steels; aluminum; magnesium; copper; zinc; white iron; nickel; and plastic technology.

IE. 231 Industrial Safety 3 (3-0-6)

Prerequisite :-

Natures and prevention of hazards in industrial production; principles of industrial environmental control; safety laws; principles of safety management; planning for safety such as plant layout, machine guarding, and maintenance; legal concepts relevant to the technical professional.

IE. 261 Engineering Statistics 3 (3-0-6)

Prerequisite :-

Probability theory and statistical distributions; sampling Theory; estimation theory; hypothesis testing; nonparametric statistics; regression and correlation; analysis of variance; and engineering applications of statistics.

IE. 263 Experimental Design 3 (3-0-6)

Prerequisite :- IE. 261

Principles of experimental design, and its application to engineering problems; data collection; and data analysis.

IE. 302 Engineering Economy 3 (3-0-6)

Prerequisite :-

Time value of money; engineering project analysis using economic approaches; depreciation; evaluation of replacement alternatives; and decisions under risks and uncertainty.

IE. 303 Industrial Cost Analysis & Budgeting 3 (3-0-6)

Prerequisite :- IE. 302

Introduction to financial reports; basic techniques of financial report analysis; cost analysis for planning; control and decision making; standard costing; and budgeting.

IE. 311 Work Study 3 (2-3-4)

Prerequisite :- IE. 261

Studies of material handling behavior; movement of operation in the workplace; process chart; activity chart; man-machine chart; simo-chart; micromotion study; motion economics; work sampling; direct time study; predetermination of time standard using rating factor and contingency allowances; analysis of work for improving production methods; wage payment; and incentive planning.

IE. 331 Tool Engineering 3 (2-3-4)

Prerequisite :- IE. 121, IE. 158

Design of cutting tools; materials selection and dimensional tolerances; design of jig and fixture for machine tool works and welding works; design of tools for inspection and gaging; press tools; plastics blowing/injection processes and equipments; die design and making; mold design and making; heat treatment of tool dies and mold.

IE. 332 Value Engineering 3 (3-0-6)

Prerequisite :-

Value engineering methods; application of value engineering technique in product design; procurement and manufacturing to reduced costs without loss of quality.

IE. 351 Manufacturing Process & Technology I 3 (2-3-4)

Prerequisite :-

Material removal processes in machine tool engineering; engineering measurement and metrology; standards and accuracy of measurement; interchangeability: limits, fits, tolerances and allowances. Welding: principles; processes; equipment and accessories, design, inspection and precautions. Fabrication: tools; equipment and accessories; techniques. Industrial and decorative finishings: operations and applications including anodizing and electroplating.

IE. 352 Manufacturing Process & Technology II 3 (2-3-4)

Prerequisite :- IE. 351

Technology of forming processes with reference to rolling; forging; tube and wire drawing; extrusion; equipments, materials, methods of estimating force, torque and pressure. Foundry: casting processes, mold, pattern and core, liquid metal, solidification of casting, casting design; plastics forming; and die casting.

IE. 353 Automation 3 (2-3-4)

Prerequisite :-

Overview of various kinds of pneumatic instrument; and APT III programming.

IE. 354 Basic Instrumentation 3 (2-3-4)

Prerequisite :-

Concepts and definition of process measurement and control; temperature measurement; pressure measurement; flow measurement; level measurement; analytical measurement such as ion concentration and pH; electromagnetic radiation measurement; standard symbols for process instrumentation drafting; electronic controller; pneumatic controller; control valve; use of instrument manual; and maintenance procedure.

IE. 358 Manufacturing Processes 3 (3-0-6)
(for mechanical engineering students)

Classification of manufacturing processes and technologies: machine tools, foundry, welding, forming processes; equipments and accessories; material selection; engineering measurement and metrology; inspection; standard and accuracy of measurement.

IE. 362 Quality Control 3 (3-0-6)
Prerequisite :- IE. 261

Quality control techniques; engineering reliability for quality control; quality control management; motivation and human relation for quality improvement; quality control circles; and zero-defects program for quality improvement.

IE. 364 Operations Research I 3 (3-0-6)
Prerequisite :- IE. 261 or permission from instructor.

Introduction to operations research techniques: linear programming; transportation problems; assignment problems; queuing theory; simulation; and game theory.

IE. 390 Industrial Training 0 (0-0-0)
Prerequisite :- junior standing or permission from instructor

Practical training in industry not less than 180 days during summer vacation of the third year. Students must submit report to his advisor who will decide for the final grade (satisfactory (S) or unsatisfactory (U)).

IE. 404 System Engineering 3 (2-3-4)

Prerequisite :- HA. 204, IE. 201

Introduction to the basic concepts of system engineering; system engineering approaches in planning, organizing and managing; system analysis and modelling.

IE. 412 Production Planning and Control 3 (3-0-6)

Prerequisite :- IE. 261, IE. 364 or permission from instructor.

Characteristics of production processes; techniques of demand forecasting with an emphasis on statistical methods; studies of controlling and managing major factors in production processes to lower production costs and idle time; Pert and CPM analysis.

IE. 413 Project Feasibility Study 3 (3-0-6)

Prerequisite :- IE. 302, IE. 303

Basic concepts of project feasibility study: marketing study; engineering study; management study; financial study; and other effects. Case studies are also discussed.

IE. 414 Computer Simulation 3 (3-0-6)

Prerequisite :- IE 261 or permission from instructor.

Random number generation; tests on random number; data analysis; simulation using GPSS, FORTRAN etc; applications of simulation in queuing systems, and industrial problems.

IE. 415 Management Information Systems 3 (3-0-6)

Prerequisite : LE 121

Introduction to management information systems concepts and structure; developing and planning systems analysis and design; systems testing, implementation and maintenance.

IE. 416 Maintenance Management 3 (3-0-6)

Prerequisite :-

Maintenance concepts; technology; preventive maintenance; corrective maintenance; planning and control of maintenance activities; materials and spare part management; reliability and failure statistics; application of waiting line theory to maintenance problems; critical path scheduling; measurement and evaluation of maintenance performance.

IE. 433 Industrial Plant Design 3 (2-3-4)

Prerequisite :-

Facilities planning and design; information and man-machine requirement analysis; location analysis; materials handling analysis; storage and warehousing; design economics; line balancing and physical distribution.

IE. 434 Computer Aided Manufacturing 3 (3-0-6)

Prerequisite:- senior standing

Machine and mechanical hardware; part programming; algorithms of interpolation and control; digital control; industrial robots; and flexible manufacturing system.

IE. 435 Nondestructive Testing 3 (3-0-6)

Prerequisite :- senior standing

Concepts, objective, types, and application of nondestructive testing; types and dangers of defects and fracture; inspection techniques and application.

IE. 436 Failure Analysis 3 (3-0-6)

Prerequisite :- senior standing

Techniques, method, and sequence of failure analysis; material behavior under different types of mechanical loads under various circumstances; temperature effects; pressure effects; causes, results and direction of failure; physical and mechanical properties of mechanical design that affect the failure; types of corrosion.

IE. 442 Ergonomics 3 (3-0-6)

Prerequisite :-

Introduction to ergonomics; human body as a working system: bones, joints, muscles, metabolism, nervous system; body measurement; working environment including temperature, humidity, noise, visual perception, and vibrations. Equipment design: seating, controls, displays; human factors in inspection, ages, shift work, motivation, and fatigues.

IE. 443 Industrial Hygiene 3 (2-3-4)

Prerequisite :-

Studies of general industrial hygiene principles. Toxicology; environmental risk factors on workers' health and prevention; protective clothing and equipment; first aid.

IE. 444 Environmental Control 3 (3-0-6)

Prerequisite :-

Studies of pollution from industries: air pollution, wastewater, noise pollution; emphasis on sources and effects; engineering design for pollution control and protection.

IE. 455 Welding Engineering 3 (3-0-6)

Prerequisite :- IE. 351, IE. 352

Welding processes and their application; welding metallurgy; welds and their characteristics; defects and inspection; welding control through design under influence of mechanical loads, stress and strain, shrinkage and distortion; and weld design for various types of works.

IE. 456 Foundry Engineering 3 (3-0-6)

Prerequisite :- IE. 351, IE. 352

Metal casting processes; thermodynamics of foundry work; solidification of liquid metal in casting; control for sound casting; iron and steel making; alloy steel casting; and foundry plant.

IE. 457 Principles of Metal Cutting 3 (3-0-6)

Prerequisite :- IE. 351, IE. 352

Analysis of metal cutting: mechanism of chip formation; mechanics of metal cutting; experimental and theoretical determination of cutting forces; dynamometry; and thermal aspects of metal cutting. Tool materials; tool wear; tool life; and machinability. Mechanics of grinding surface quality and dimensions control. Economics of machining.

- IE. 485 Advanced Quality Control 3 (3-0-6)
 Prerequisite :- IE. 362
 Studies of interesting topics and applications of quality control.
- IE. 466 Operations Research II 3 (3-0-6)
 Prerequisite :- IE. 364
 Dynamic programming; Markov analysis; decision theory;
 nonlinear programming.
- IE. 492 Industrial Engineering Project I 1 (0-0-3)
 Prerequisite :-
 Students carry out industrial engineering projects of interest,
 either individually or by group. A presentation is required.
- IE. 494 Industrial Engineering Project II 2 (0-0-6)
 Prerequisite :- IE 492
 Continuation of industrial engineering project from IE 492
 to the final stage and a presentation.
- IE. 495 Industrial Packaging 3 (3-0-6)
 Prerequisite :-
 Basic principles of industrial packaging and its significance in
 industry. Studies of properties of packaging materials, design, analysis,
 and development of industrial packaging.
- IE. 496 Special Topics in Industrial Engineering 3 (3-0-6)
 Prerequisite :-
 Studies of interesting topics or current issues in industrial
 engineering.

Department of Civil Engineering

The civil engineering profession is responsible for not only the creativity of physical structures but also the promotion of convenient and modern life concerning environmental, social, political and economic welfare.

The Civil Engineering Department offers a semi Theoretical-Practice-Oriented courses in the planning, design, construction and management of civil works as well as the environmental control. The Department aims to produce the civil engineer with highest academic and practical ability in the following professional fields:

- (a) Structural Engineering
- (b) Soil Engineering
- (c) Transportation Engineering
- (d) Surveying Engineering, and
- (e) Water Resources and Environmental Engineering

The undergraduate program begins by providing studies in physical sciences, mathematics, humanities and social sciences, then proceeds to the fundamental aspects of civil engineering. The curriculum also provides a wide range of elective subjects suited to the student's goals of career. Thus the student is prepared to work effectively in any of the several branches of civil engineering or to pursue his or her education at the graduate level.

Head

Somnuke Praparatanatorn D.Eng. (Architectural Engineering),
Osaka University, Japan

Lecturers :

Burachat Chatveera H.Eng. (Structural Engineering),
Asian Institute of Technology

Nophadol In-na Ph.D. (Water Resources and
Hydrology), McGill University,
Canada

Tanyarat Katekinta	B.Eng. (Environmental Engineering), Khon Kaen University
Chivaluck Pongburanakit	B.Eng. (Civil Engineering), Kasetsart University
Kasemchart Sriwalai	B.Eng. (Water Resources Engineering), Kasetsart University
Danai Wantanakorn	M.Sc. (Construction Engineering & Management), University of Missouri Columbia, U.S.A.

Curriculum Outline

Total credit requirements	148 credits
1. General Basic Courses	46 credits
1.1 Humanities	2 credits
1.2 Social Sciences	9 credits
1.3 Languages	6 credits
1.4 Sciences and Mathematics	29 credits
2. Engineering Courses	99 credits
2.1 Core Courses	27 credits
2.2 Major Courses	72 credits
2.2.1 Compulsory Courses	62 credits
2.2.2 Elective Courses	10 credits
2.3 Training (no credits)	
3. Free Electives	3 credits

Detail of Curriculum

1. General Basic Courses 46 credits

1.1 Humanities - 1 course 2 credits

Select 1 course from the followings:

TU.111 TU.112 TU.113 TU.114

TU.115 TU.116 TU.117

Social Sciences - 3 courses 9 credits

2 compulsory courses (6 credits):

IE.201 IE.302

Select 1 course (3 credits) from the followings:

TU.121 TU.122 TU.123 TU.124

AC.201 BA.291 EC.210 EC.212

1.3 Languages - 2 courses 6 credits

2 compulsory English courses:

EL.171 EL.172

1.4 Sciences and Mathematics - 9 courses 29 credits

9 compulsory courses:

MA.101 MA.102 MA.203 MA.204

MA.305 SC.124 SC.125 SC.133

SC.134

2. Engineering Courses 99 credits

2.1 Core Courses 27 credits

LE.121	IE.121	IE.158	IE.261
CE.102	CE.202	AE.211	NE.111
NE.112	NE.221	NE.241	

2.2 Major Courses 72 credits

2.2.1 Compulsory Courses 62 credits

LE.241	CE.201	CE.211	CE.221
CE.231	CE.311	CE.312	CE.321
CE.322	CE.331	CE.341	CE.351
CE.352	CE.361	CE.362	CE.371
CE.372	CE.373	CE.399	CE.421
CE.431	CE.491	CE.499	NE.322

2.2.2 Elective Courses 10 credits

Select from the followings:

CE.411	CE.422	CE.423	CE.424
CE.425	CE.426	CE.432	CE.433
CE.434	CE.435	CE.441	CE.442
CE.443	CE.461	CE.462	CE.463
CE.471	CE.472	CE.473	CE.474

2.3 Training (no credits)

3. Free Electives 3 credits

Free electives offered by Thammasat University.

Course Planning for Civil Engineering Students

First Year

<u>Course Number</u>	<u>Title</u>	<u>Credits</u> (lecture-lab-self study)
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Semester 1

LE.121	Computer for Engineers	2(2-0-4)
CE.102	Introduction to Engineering	1(1-0-2)
ME.111	Engineering Drawing I	2(1-3-2)
MA.101	Mathematics I	3(3-0-6)
SC.124	Chemistry for Engineers I	4(3-3-6)
SC.133	Physics for Engineers I	4(3-3-6)
EL.xxx	English Course x	<u>3(5-0-4)</u>
		<u>19(18-9-30)</u>

Semester 2

IE.121	Material Science I	3(3-0-6)
IE.158	Engineering Tools & Operations	2(1-3-2)
ME.112	Engineering Drawing II	2(1-3-2)
MA.102	Mathematics II	3(3-0-6)
SC.125	Chemistry for Engineers II	2(2-0-4)
SC.134	Physics for Engineers II	4(3-3-6)
EL.xxx	English Course x	<u>3(5-0-4)</u>
		<u>19(18-9-30)</u>

Second Year

<u>Course Number</u>	<u>Title</u>	<u>Credits</u> (lecture-lab-self study)
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Semester 3

CE.202	Engineering Mechanics I	3(3-0-6)
CE.231	Concrete Technology I	2(1-3-2)
LE.241	Introduction to Electrical Engineering	3(2-3-4)
IE.201	Engineering Management	3(3-0-6)
IE.261	Engineering Statistics	3(3-0-6)
AE.211	Thermodynamics I	3(3-0-6)
MA.203	Mathematics III	3(3-0-6)
		<u>20(18-6-36)</u>

Semester 4

CE.201	Civil Engineering Laboratory	1(0-3-0)
CE.211	Surveying I	3(2-3-4)
CE.221	Mechanics of Solids I	3(3-0-6)
ME.221	Engineering Mechanics II	3(3-0-6)
ME.241	Mechanics of Fluids I	3(3-0-6)
MA.204	Mathematics IV	3(3-0-6)
MA.305	Numerical Methods	3(3-0-6)
		<u>19(17-6-34)</u>

Third Year

<u>Course Number</u>	<u>Title</u>	<u>Credits</u> (Lecture-lab-self study)
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Semester 5

CE.311	Surveying II	3(2-3-4)
CE.321	Structural Analysis I	3(3-0-6)
CE.351	Soil Mechanics I	3(2-3-4)
CE.371	Hydrology	2(2-0-4)
CE.372	Hydraulic Engineering I	3(2-3-4)
ME.322	Mechanics of Solids II	3(3-0-6)
TU.xxx	Social Sciences Electives	3(3-0-6)
		<u>20(17-9-34)</u>

Semester 6

CE.322	Structural Analysis II	3(3-0-6)
CE.331	Reinforced Concrete Design I	3(3-0-6)
CE.341	Construction Engineering & Management	3(3-0-6)
CE.352	Soil Mechanics II	3(2-3-4)
CE.361	Highway Engineering	3(3-0-6)
CE.362	Highway Materials	2(1-3-2)
CE.373	Environmental Engineering	3(2-3-4)
		<u>20(17-9-34)</u>
CE.399	Industrial Training on Civil Engineering (Not less than 200 hours)	0 credits

Fourth Year

<u>Course Number</u>	<u>Title</u>	<u>Credits</u> (lecture-lab-self study)
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Semester 7

CE. 312	Engineering Geology	3(3-0-6)
CE. 421	Timber and Steel Design	3(3-0-6)
CE. 431	Reinforced Concrete Design II	3(3-0-6)
CE. 491	Seminar	1(0-3-0)
CE. xxx	Technical Electives	2(2-0-4)
CE. xxx	Technical Electives	3(3-0-6)
IE. 302	Engineering Economy	3(3-0-6)
		<u>18(17-3-34)</u>

Semester 8

CE. 499	Civil Engineering Project	3(0-6-3)
CE. xxx	Technical Electives	3(3-0-6)
CE. xxx	Technical Electives	2(2-0-4)
TU. xxx	Humanities Electives	2(2-0-4)
xx. xxx	Free Electives	3(3-0-6)
		<u>13(10-6-23)</u>

Description of Courses in Civil Engineering

- CE 101 Fundamental of Civil Engineering 3 (2-3-4)
Prerequisite : For non-civil engineering students
Surveying: introduction to surveying; surveying equipments; theories of measurement and errors; principle and practice of leveling. Concrete technology: properties of concrete, concrete mix design and quality control, testing of concrete. Soil: Physical properties and classification of soils, testing of soil. Reinforced concrete design: design of reinforced concrete structures such as beams, footings and abutments.
- CE 102 Introduction to Engineering 1 (1-0-2)
Prerequisite : -
Engineering Background, curriculum and courses in engineering, problem solving in engineering, mathematical and scientific tools, units and dimensions, tests and experiments, computers in engineering: interaction with people and society; the engineer and environment.
- CE 201 Civil Engineering Laboratory 1 (0-3-0)
Prerequisite : CE 221
Test of tension, shear, compression, properties of steels, aluminum, timber, brick and rock. Instruments for: strain measurement; beam testing; studies of elastical behavior of various structural models and experiments in fluid mechanics.
- CE 202 Engineering Mechanics I 3 (3-0-6)
Prerequisite : SC 133
Force Systems, resultants, and equilibrium, of structures and machines. Center of gravity, theorems of Pappus, beams, fluid mechanics, friction, principle of virtual work, stability, moment of inertia, analysis of bending moment and shear force, deflections of beams.

CE 211 Surveying I 3 (2-3-4)

Prerequisite : -

Introduction to surveying, theory of measurement and error, theodolite and traversing, stadia surveying, measurement of horizontal and vertical angles, directions in surveying, chain surveying, compass surveying, leveling, plane tabling, contouring, tacheometry.

CE 221 Mechanics of Solids I 3 (3-0-6)

Prerequisite : CE 202

Relations among loads, stresses and deformations, strains, stress-strain relationship, torsion, bending in elastic range, analysis of bending moment, shear force and deflection of beams, impact, eccentric force, buckling theory, analysis of stress and strain, testing for common engineering materials.

CE 231 Concrete Technology I 2 (1-3-2)

Prerequisite : -

Product Background, classification and properties of cements. Concrete ingredients, types, handling and storage, acceptance tests, standard specifications, aggregates and additives. Properties of concrete, mix design, control of concrete quality, special types of concrete, admixtures, high strength concrete and high density concrete, ready mix concrete, testing of concrete and ingredients.

CE 311 Surveying II 3 (2-3-4)

Traversing, topographic mapping, triangulation and trilateration, intersection and resection, trigonometric levelling, curve ranging, profile and cross-sectioning, route surveying, reconnaissance survey, preliminary survey, volume of earthwork, mass diagram, horizontal curves, vertical curves, superelevation and widening, sight distances, introduction and basic principles of photogrammetry, remote sensing fundamental.

CE 312 Engineering Geology 3 (3-0-6)

Prerequisite : CE 211

Scope of geology, the universe and the earth, surface features of the earth's crust and the geological processes, deformation of the earth's crust, rock structures, problems of dip and strike, vein intersection, faulting and folding, geological maps and sections, field techniques in geological mapping, collection of field specimens, well logging and drill core, geological dam sites and reservoirs, route geology, preparation of geological maps and reports.

CE 321 Structural Analysis I 3 (3-0-6)

Prerequisite : CE 221

Introduction to structural analysis, reactions, shears and moments in statically determinate structures, influence lines, analysis of stresses in trusses, graphic statics, structures subjected to moving loads, deflections of beams and frames, determination of deflections by analytical and graphical methods, space trusses, cable structures, analysis of statically indeterminate structures by method of consistent deformation and introduction to approximate methods of structural analysis.

CE 322 Structural Analysis II 3 (3-0-6)

Prerequisite : CE 321

Analysis of indeterminate structures; methods of virtual work and strain energy; elastic load methods; slope-deflection and moment distribution methods; influence lines for continuous beams and frames; column analogy; introduction to plastic analysis; introduction to matrix methods of structural analysis and introduction to vibration structures.

CE 331 Reinforced Concrete Design I 3 (3-0-6)

Prerequisite : CE 221, CE 321

Behavior of structural elements subjected to bending moments, shear forces, torsion, axial loads, and combined actions. Design of reinforced concrete structures by working stress; application to beams, slabs, stairs, columns, footings, retaining walls and frames, secondary effects, reinforcements, bonding stresses, properties of concrete and reinforcing steel, project design of building structures.

CE 341 Construction Engineering and Management 3 (3-0-6)

Prerequisite : IE 203

An introduction into the business aspects of construction management including organization and financial concerns during entry into business and for continued operation; architects, engineers and builders relationship and organization of their work, construction planning and control by critical path method, contracts and tendering, control tools, construction laws and regulations, safety in construction.

CE 351 Soil Mechanics I 3 (2-3-4)

Prerequisite : -

Formation of soils, soil classification, soil exploration, permeability of soils and seepage problems. Stresses and stress distribution within a soil mass, principle of effective stress, and shear strength of soil. Flow through porous media, consolidation theory, and soil testing.

CE 352 Soil Mechanics II 3 (2-3-4)

Prerequisite : CE 351

Soil boring, soil sampling, physical and engineering properties of soils. Earth pressure problems, retaining structures sheet piles, earth dam; bearing capacity; stress distribution in earth masses; settlement analysis; slope stability of soils; design of shallow foundations; pile and caisson foundation; soil exploration; introduction to soil dynamics.

CE 361 Highway Engineering 3 (3-0-6)

Prerequisite : CE 211, CE 351

Characteristic modes of transport; interaction between traffic demand and land use; planning, surveying, location and design of roads in rural and urban areas; highway and street classification; geometric design and operations; properties of bitumen; introduction to pavement design; use of aerial photographs in road design.

CE 362 Highway Materials

2 (1-3-2)

Prerequisite : CE 361

Properties and characteristics of bitumens, asphalt; types and grades of asphalt; asphalt cement, asphalt concrete; mix compositions, aggregates, fillers; types of mixes and application; mix design; standard specification and method of testing of highway materials; method of production, construction and control; stabilization for highway engineering purposes; asphalt construction equipment.

CE 371 Hydrology

2 (2-0-4)

Prerequisite : -

The hydrologic cycle; atmospheric circulation and data collections precipitation, in-filtration, overland flow, runoff, evapo-transpiration; rain and stream gauging; hydrograph analysis, unit hydrograph; synthesis of design storms; flood estimation, flood routing; soil and ground water hydrology; long term catchment, yield and storage determination; probability concepts in design.

CE 372 Hydraulic Engineering I

3 (2-3-4)

Prerequisite : ME 241

Open-channel flow; flow in pressured conduits; surges, water hammer; uniform and non-uniform flows; critical flow steady and unsteady flows; gradually varied flow; hydraulic jump, back water curves, cavitation; hydraulic model; reservoir, sedimentation; Hydraulic structures such as dams, spillways, gates, tunnels, penstocks, stilling basins etc; open channel system design.

CE 373 Environmental Engineering

3 (2-3-4)

Prerequisite : -

Chemistry and microbiology of water and wastewater; water quality and pollution; water processing and distribution systems; wastewater flows and characteristics; wastewater processing and collection systems; pollution control and regulation.

CE 399 Industrial Training on Civil Engineering 0 (0-0-0)

Prerequisite : -

Students whose cumulative credits have reached 88 credits or above are required to seek relevant training in civil engineering in the following summer, for a minimum of 6 weeks duration; The training chosen must be approved by the department; Each student is required to submit the report graded in S or U by the advisor.

CE 411 Surveying III 2 (2-0-4)

Prerequisite : CE 311

Basic principle of photogrammetry; geometry of aerial photographs; photogrammetric optics; stereoscopic viewing and parallax measurement; flight planning; ground control; mosaic; rectification; underground surveying; hydrological surveying; measurement by electronic instrument; introduction to astronomy.

CE 421 Timber and Steel Design 3 (3-0-6)

Prerequisite : CE 322

Elastic and strength properties of wood, laminated wood, plywood; design of beams, compression members, tension members, joints; Durability and fire resistance; codes and specifications of steel design; design of beams, girders, laterally unsupported beams, columns, built-up columns, steel frames; design of bolted, riveted and welded connections. introduction to plastic design of steel structures.

CE 422 Theory of Elasticity and Plasticity 3 (3-0-6)

Prerequisite : ME 322

Theory of elasticity plasticity; criteria of yielding, flow rule and convexity of the yield surface; slip line field; problems with spherical and axial symmetrical elements.

CE 423 Plastic Design of Steel Structures 3 (3-0-6)

Prerequisite : CE 322

Basic hypothesis of plastic theory; plastic collapse and basic theorems; methods for plastic design and estimate of deflections; minimum weight design; shake down theorem.

- CE 424 Theory of Elastic Stability 3 (3-0-6)
 Prerequisite : CE 322
 Elastic buckling of column; and beam-columns; exact and approximate method of solutions; buckling of frame by exact solution and by matrix stiffness method; buckling of columns and frames by slope deflection method; torsional buckling of thin-walled open sections; buckling of thin plates; energy method applied to buckling problems.
- CE 425 Theory of Plates and Shells 3 (3-0-6)
 Prerequisite : ME 322
 Bending of rectangular plates to cylindrical surfaces; pure bending of plates; small deflection theory for plates; general theory for cylindrical shells; shells having the form of a surface of revolution.
- CE 426 Structural Vibration 3 (3-0-6)
 Prerequisite : ME 221, CE 322
 Analysis of lumped-mass single degree and multi-degree systems. numerical analysis of simple systems. Structures with distributed mass and loads. Structures subjected to harmonic and transient disturbing load.
- CE 431 Reinforced Concrete Design II 3 (3-0-6)
 Prerequisite : CE 322, CE 331
 Ultimate strength design method; analysis and design of rectangular beams, Tee beams, and L-beams with tension and compression reinforcement; diagonal tension, bond, and web reinforcement; design of one-way slab, two-way slab and flat slabs; concentrically and eccentrically loaded columns; design of footings, stairs, retaining walls, water tanks, and rigid frames; basic yield line analysis; introduction to prestressed concrete.

- CE 432 Concrete Technology II 2 (2-0-4)
 Prerequisite : CE 231
 Properties, testings and applications of pozzolan cement. Properties of hardened Portland cement concrete such as permeability, durability, modulus of elasticity, creep, shrinkage. Effects of creep on stress distribution in reinforced concrete structures. Concreting during hot and cold weather. Admixtures for concrete. Non-destructive testings. Properties, testings and applications of lightweight concrete. Design of lightweight concrete mixes. Formwork for concrete. Inspection of concrete work. Field testings of concrete. Load test of reinforced concrete structures.
- CE 433 Civil Engineering Design 2 (2-0-4)
 Prerequisite : CE 331
 The design cycle. Value and criterion selection. Generation of proposal. Analysis of proposal. Selection of design. Specification Design projects on selected topics such as bridges, buildings, reservoirs (steel and concrete), dams, swimming pools, water and sewerage treatment plants, airports.
- CE 434 Prestressed Concrete Design 3 (3-0-6)
 Prerequisite : CE 431
 Concept of prestressing. Materials and prestressing systems. Specifications of allowable stresses. Loss of prestresses. Analysis and design of simple and continuous beams, frames, precast slabs, piles.
- CE 435 Bridge Design 2 (2-0-4)
 Prerequisite : CE 322, CE 431
 Theories of load distribution and applications. Selection of bridge types and dimensions. Bridges in reinforced concrete, prestressed concrete and steel. Analysis and design of bridge superstructures and substructures. Bridge economy.

- CE 441 Contract, Specification and Estimation 3 (3-0-6)
 Prerequisite : CE 331
 Types and forms of contract. Contract documents. Specification for construction works. Bill of quantities. Principles of estimating, gross estimate and detailed estimate. Unit cost and cost analysis. General problems of field inspection and supervision. Professional ethics and legal liability.
- CE 442 Principle of Architectural Design and Construction Technique 3 (3-0-6)
 Prerequisite : (senior standing)
 Consideration of architectural planning with the attention to space and function. Selection of structural types, piping systems, water-supply, wastewater. Electrical system. Selection of materials and construction techniques. Components of building. Structural components such as woods, steels, reinforced concretes. Decoration materials and installations.
- CE 443 Construction Methods and Equipment 2 (2-0-4)
 Prerequisite : CE 341
 Methods and equipment used in residential building, heavy and industrialised construction. Selection and efficient use of equipments. Equipment management and maintenance.
- CE 461 Traffic Engineering 3 (2-3-4)
 Prerequisite : -
 Behavior and theory of traffic, roads, vehicles; travel time and delay; traffic volume and traffic flow Road capacity; overpass. intersection; road accidents; traffic signs and signal devices; design of traffic signals; traffic operation and control.

CE 462 Urban Transportation Planning 3 (3-0-6)

Prerequisite : -

Relationship between transportation and economical and social development. Transportation by highways, railways, air, sea, pipelines and belts. Process of urban transport planning. Travel-demand forecasting. Trip generation, distribution and assignment. Choice of travel mode. Transport-land use models. Urban transport technology. Evaluation of transport investment.

CE 463 Pavement Engineering & Design 3 (3-0-6)

Prerequisite : CE 351, CE 361

Development of road pavement; pavement structures, and pavement types; pavement components; moving loads; traffic. Design of flexible pavement; design of earth and gravel roads; design of concrete pavement; pavement drainage. Skid resistance of wearing surface. Evaluation of pavement for maintenance.

CE 471 Water Resources Engineering 2 (2-0-4)

Prerequisite : CE 371

Introduction to water resources engineering. Groundwater development. Planning process and alternative planning in water resources development. Concept in selection and design of water resources development project. Feasibility study. Cost-benefit analysis.

CE 472 Hydraulics Engineering II 3 (3-0-6)

Prerequisite : CE 372

Flow in natural and non-prismatic channels. Sedimentation transport theory. Erodable channels. Scouring problem and protection. River engineering; flow frequency analysis; Runoff analysis; model analysis. Introduction to coastal engineering and estuarine hydraulics.

- CE 473 Environmental Engineering Design 3 (3-0-6)
 Prerequisite : CE 373
 Analysis and design of environmental control measures; demand forecast; water distribution system; wastewater collection and disposal facilities; solid wastes disposal; treatment processes for water supply and wastewater.
- CE 474 Coastal Engineering 3 (3-0-6)
 Prerequisite : CE 372
 Wave generation and propagation; small amplitude wave theory. Finite amplitude waves; changes in shallow water; wave reflection and diffraction; coastal processes; prediction and measurement of waves. Coastal engineering; wave forces and design of marine structures. Hydraulic model analysis.
- CE 491 Seminar 1 (0-3-0)
 Prerequisite : senior standing
 Students must be able to practice doing research, analysis, discussion, writing report and present the result in front of the class. The topic is selected by the student and presented in the class.
- CE 499 Civil Engineering Project 3 (0-6-3)
 Prerequisite : senior standing
 An individual project on the interesting topics of current researches and/or practical problems in various fields of civil engineering as approved by the instructor with the consent of the Head of the Department. The project must be supervised by the instructor. The student must submit the proposal before beginning the project. A copy of a final report must be kept by the Department. A report must be written with the correct Thai grammar and in the form of formal report.

Department of Mechanical Engineering

Mechanical engineering is concerned with energy utilization and the design of mechanical systems. Mechanical engineers are involved in design, development, research, management and other related responsibilities in these fields. Frontiers and opportunities in mechanical engineering are of no limits. Preparation for careers in mechanical engineering requires a thorough understanding of basic sciences and engineering application.

The Department of Mechanical Engineering offers a four-year course leading to the degree of Bachelor of Engineering. The Department curriculum has been planned to give students a sound knowledge of basic sciences and engineering so that they can tackle not only current technical problems but also those that will arise in the technologies of the future.

Head.

Sunee Coovattanachai M.Eng. (Mechanical Engineering),
University of Alberta, Canada

Associate Professors :

Waksitte Coovattanachai Ph.D. (Mechanical Engineering),
University of London King's
College, U.K.

Assistant Professors

Sunee Coovattanachai M.Eng. (Mechanical Engineering),
University of Alberta, Canada

Curriculum Outline

Total credit requirements	150 credits
1. General Basic Courses	46 credits
1.1 Humanities	2 credits
1.2 Social Sciences	9 credits
1.3 Languages	6 credits
1.4 Sciences and Mathematics	29 credits

2. Engineering Courses	101 credits
2.1 Core Courses	27 credits
2.2 Major Courses	74 credits
2.2.1 Compulsory Courses	65 credits
2.2.2 Elective Courses	9 credits
2.3 Training (no credits)	
3. Free Electives	3 credits

Detail of Curriculum

1. <u>General Basic Courses</u>	46 credits
1.1 <u>Humanities</u> - 1 course	2 credits
Select 1 course from the followings:	
TU.111 TU.112 TU.113 TU.114	
TU.115 TU.116 TU.117	
1.2 <u>Social Sciences</u> - 3 courses	9 credits
2 compulsory courses (6 credits):	
IE.201 IE.302	
Select 1 course (3 credits) from the followings:	
TU.121 TU.122 TU.123 TU.124	
AC.201 BA.291 EC.210 EC.212	
1.3 <u>Languages</u> - 2 courses	6 credits
2 compulsory English courses:	
EL.171 EL.172	

1.4 Sciences and Mathematics - 9 courses 29 credits

9 compulsory courses:

HA.101	HA.102	HA.203	HA.204
HA.305	SC.124	SC.125	SC.133
SC.134			

2. Engineering Courses 101 credits

2.1 Core Courses 27 credits

LE.121	IE.121	IE.158	IE.261
CE.102	CE.202	AE.211	ME.111
ME.112	ME.221	ME.241	

2.2 Major Courses

2.2.1 Compulsory Courses 65 credits

LE.201	LE.202	LE.211	LE.212
LE.242	IE.358	CE.221	ME.201
ME.202	ME.302	ME.303	ME.304
ME.313	ME.322	ME.323	ME.324
ME.331	ME.332	ME.342	ME.405
ME.406	ME.407	ME.414	ME.425
ME.433	ME.434	ME.435	

2.2.2 Elective Courses 9 credits

Select from the followings:

ME.415	ME.416	ME.417	ME.426
ME.427	ME.436	ME.437	ME.443
ME.444	ME.445	ME.451	ME.452
ME.453	ME.454	ME.481	ME.482
ME.483	ME.484		

2.3 Training (no credits)

3. Free Electives

3 credits

Free electives offered by Thammasat University.

Course Planning for Mechanical Engineering Students

First Year

<u>Course Number</u>	<u>Title</u>	<u>Credits</u> (lecture-lab-self study)
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Semester 1

LE.121	Computer for Engineers	2(2-0-4)
ME.111	Engineering Drawing I	2(1-3-2)
CE.102	Introduction to Engineering	1(1-0-2)
MA.101	Mathematics I	3(3-0-6)
SC.124	Chemistry for Engineers I	4(3-3-6)
SC.133	Physics for Engineers I	4(3-3-6)
EL.xxx	English Course x	3(5-0-4)
		<u>19(18-9-30)</u>

Semester 2

ME.112	Engineering Drawing II	2(1-3-2)
IE.121	Material Science I	3(3-0-6)
IE.158	Engineering Tools & Operations	2(1-3-2)
MA.102	Mathematics II	3(3-0-6)
SC.125	Chemistry for Engineers II	2(2-0-4)
SC.134	Physics for Engineers II	4(3-3-6)
EL.xxx	English Course x	3(5-0-4)
		<u>19(18-9-30)</u>

Second Year

<u>Course Number</u>	<u>Title</u>	<u>Credits</u> (lecture-lab-self study)
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Semester 3

ME.201	Basic Mechanical Engineering Laboratory	1(0-3-0)
LE.201	Basic Electrical Engineering Laboratory	1(0-3-0)
LE.211	Electrical Circuit Analysis	3(3-0-6)
IE.201	Engineering Management	3(3-0-6)
IE.261	Engineering Statistics	3(3-0-6)
CE.202	Engineering Mechanics I	3(3-0-6)
AE.211	Thermodynamics I	3(3-0-6)
MA.203	Mathematics III	3(3-0-6)

20(18-6-36)

Semester 4

ME.202	Automotive Technology	2(1-3-2)
ME.221	Engineering Mechanics II	3(3-0-6)
ME.241	Mechanics of Fluids I	3(3-0-6)
LE.212	Basic Electronic Circuits and Devices	3(3-0-6)
CE.221	Mechanics of Solids I	3(3-0-6)
MA.204	Mathematics IV	3(3-0-6)
MA.305	Numerical Methods	3(3-0-6)

20(19-3-38)

Third Year

<u>Course Number</u>	<u>Title</u>	<u>Credits</u> (lecture-lab-self study)
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Semester 5

ME. 302	Mechanical Engineering Laboratory I	2(0-4-2)
ME. 322	Mechanics of Solids II	3(3-0-6)
ME. 323	Mechanics of Machines	3(3-0-6)
ME. 331	Thermodynamics II	3(3-0-6)
ME. 342	Mechanics of Fluids II	3(3-0-6)
IE. 358	Manufacturing Process	3(3-0-6)
TU. xxx	Social Sciences Electives	<u>3(3-0-6)</u>
		<u>20(18-4-38)</u>

Semester 6

ME. 303	Mechanical Engineering Laboratory II	2(0-4-2)
ME. 313	Mechanical Design I	3(2-3-4)
ME. 324	Mechanical Vibrations	3(3-0-6)
ME. 332	Heat Transfer	3(3-0-6)
LE. 202	Electromechanical Energy Conversion Laboratory	1(0-3-0)
LE. 242	Electromechanical Energy Conversion I	3(3-0-6)
TU. xxx	Humanities Electives	2(2-0-4)
ME. xxx	Technical Electives	<u>3(3-0-6)</u>
		<u>20(16-10-34)</u>

ME. 304	Industrial Training (Not less than 6 consecutive weeks)	0 credit
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Fourth Year

<u>Course Number</u>	<u>Title</u>	<u>Credits</u> (lecture-lab-self study)
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Semester 7

ME.405	Mechanical Engineering Laboratory III	2(0-4-2)
ME.406	Projects Seminar	0(0-3-0)
ME.414	Mechanical Design II	3(2-3-4)
ME.425	Automatic Control System	3(3-0-6)
ME.433	Refrigeration and Air Conditioning	3(3-0-6)
ME.434	Power Plant Engineering	3(3-0-6)
IE.302	Engineering Economy	3(3-0-6)
		<u>17(14-10-30)</u>

Semester 8

ME.407	Mechanical Engineering Project	3(0-6-3)
ME.435	Internal Combustion Engines	3(3-0-6)
ME.xxx	Technical Electives	3(3-0-6)
ME.xxx	Technical Electives	3(3-0-6)
XX.xxx	Free Electives	3(3-0-6)
		<u>15(12-6-27)</u>

Description of Courses in Mechanical Engineering

ME 111 Engineering Drawing I 2 (1-3-2)

Prerequisite : -

The significance of drawing. Instruments and their uses. Lining and lettering; work preparation; applied geometry; dimensioning and description; orthographic projection; pictorial drawing; freehand sketching; sectioning; allowance and tolerance; and computer aided drawing.

ME 112 Engineering Drawing II 2 (1-3-2)

Prerequisite : ME 111

Basic descriptive geometry. Engineering drawing in some specific fields. Assembly and detailed drawing. Welding drawing.

(1 hour lecture and 3 hour practice per week)

ME 201 Basic Mechanical Engineering Laboratory 1 (0-3-0)

Prerequisite : -

Measurements of some mechanical engineering quantities i.e. temperature, pressure, flow, energy.

ME 202 Automotive Technology 2 (1-3-2)

Prerequisite : IE 158

Principles of internal combustion engines: cycles of operation; types and components of engine; ignition; fuelling; lubrication; cooling systems. Practical training in dismantling and assembling of engine; performance testing; maintenance and trouble shooting.

ME 221 Engineering Mechanics II 3 (3-0-6)

Prerequisite : CE 202

Revision of basic principles governing the laws of motion. Kinematics of particles and rigid bodies: displacement; velocity; and acceleration. Absolute and relative motion. Kinetics of particles and rigid bodies: Newton's second law of motion; force; mass; acceleration; work and energy; impulse and momentum; centripetal motion. Introduction to vibration.

ME 241 Mechanics of Fluids I 3 (3-0-6)

Prerequisite : SC 133

Properties of fluids. Fluid statics, buoyancy, momentum equation, energy equation, moment of momentum equation and its application to turbomachinery. Kinematics of incompressible and non-viscous fluid flow. Dimensional analysis and dynamic similitude. Incompressible and viscous fluid flow. Control volume. Fluid measurement. Compressible flow.

ME 302 Mechanical Engineering Laboratory I 2 (0-4-2)

Prerequisite : ME 241, AE 211, CE 221

Basic experiments in mechanics of fluids; thermodynamics and mechanics of solids; introduction to instrumentation and experimental procedures. Analysis of data and result. Report preparation.

ME 303 Mechanical Engineering Laboratory II 2 (0-4-2)

Prerequisite : ME 302, ME 322, ME 323, ME 331, ME 342

Additional experiments in mechanics of fluids, thermodynamics, mechanics of solids and mechanics of machinery.

ME 304 Industrial Training 0 (0-0-0)

Prerequisite : Junior standing

Students must be trained at least six consecutive weeks in industry or similar sector. Submission of report is required together with comment or certification from the trainer.

ME 313 Mechanical Design I 3 (2-3-4)

Prerequisite : ME 322, ME 112

Principles and significance of design; philosophy and method; factors affecting design. Theory of failure; stress concentration; failure under unsteady load; design of simple machine elements i.e. spring, power screws, riveted joints, bolted joints, welded joints etc.

ME 322 Mechanics of Solids II 3 (3-0-6)

Prerequisite : CE 221

Deflection of composite beams : variable cross sectioned beams and curved beams; Mohr's circle; analysis of beam deflection by energy method; unsymmetrical sectioned; shear stress and shear centre. Torsion of non-circular cross sectioned members; torsion of thin-walled cylinder of open and closed sections. Stress in thick walled cylinders and rotating discs. Analysis of statically indeterminate structures by superposition, energy, and three-moment equation methods. Theories of failure. Introduction to theories of elasticity, plasticity, and visco-elasticity. Repeated load. Fatigue in metal.

ME 323 Mechanics of Machines 3 (3-0-6)

Prerequisite : ME 221

Basic mechanisms and terminology. Kinematics of rigid bodies. Relative motion. Mathematical and graphical analyses of kinematics of gear trains, cams, linkages, and some power transmission mechanisms. Kinetics of rigid bodies; D'Alembert's principle; analysis of forces in mechanisms; balancing of machinery. Flywheel. Gyroscope.

ME 324 Mechanical Vibrations 3 (3-0-6)

Prerequisite : MA 204, ME 323

The behavior of lumped systems with single degrees of freedom, natural frequency and damping effects. Principles of vibration isolation and vibration measuring instruments. Lumped systems with two degrees of freedom: natural frequencies, modes, and mode shapes. Principle of dynamics vibration absorbers. Lumped systems with several degrees of freedom. Whirling of shafts. Introduction of distributed parameter systems. Introduction to non-linear systems.

ME 331 Thermodynamics II 3 (3-0-0)

Prerequisite : AE 211

Irreversibility and availability. Power cycles and refrigeration cycles. Thermodynamics relation. Mixtures and solutions. Combustion processes and analysis of combustion products.

ME 332 Heat Transfer

3 (3-0-6)

Prerequisite : ME 331, ME 342

Conduction : steady state; one and two-dimensional heat conduction; one dimensional unsteady state conduction. Convection: dimensional analysis in convection heat transfer; natural convection on plane and cylindrical surfaces; forced convection on circular pipe; plane surface and in conduits; simplified analysis in convection heat transfer. Relationship between heat transfer and fluid friction. Condensation and boiling. Radiation: absorption and emission characteristics; angle factor; radiation of black and gray bodies. Heat exchangers.

ME 342 Mechanics of Fluids II

3 (3-0-6)

Prerequisite : ME 241

Kinematics of fluid flow; steady and unsteady; uniform and non uniform flows. Dimensions of flow; streamlines; path lines and stream function. Fluid strain and rotation. Flownets; circulation and rotational flow. Radial flow. Equations of motion and energy. Laminar flows in closed conduits and shear stresses. Annulus flow and flow between parallel walls. Shear stresses in turbulent flows. Velocity distribution. Laminar and turbulent boundary layers. Flow past submerged bodies. Separation, circulation and lift force.

ME 391 Fundamentals of Mechanical Engineering

3 (3-0-6)

Prerequisite : ME 221, ME 241, AE 211 (non-ME students)

Analysis of engineering cycles with applications to steam power plants, gasturbine plants, internal-combustion engine plants, refrigeration plants, air conditioning plants, and heat pump. Basic heat transfer: conduction; convection; radiation; and heat exchangers. Kinematics of rigid bodies. Analysis of linkages, cams, gear trains, and power transmission devices.

ME 392 Machine Design 3 (2-3-4)

Prerequisite : CE 221, IE 121 (non-ME students)

Metallurgical and mechanical properties of engineering materials. Analysis of stress, strain and deflection. Theory of failure of materials. Design of machine elements such as shafts, keys, splines, conplings. Lubrication. Roller bearing and journal bearing. Gear trains, clutch, brake, belt, chain, spring, power screws. Bolted joints and riveted joints. Welding joints.

ME 405 Mechanical Engineering Laboratory III 2 (0-4-2)

Prerequisite : ME 303, ME 324, ME 332

Additional experiments in the fields of power plant engineering; heat transfer; automatic control system; mechanical vibrations and gas dynamics.

ME 406 Projects Seminar 0 (0-3-0)

Prerequisite : Senior standing having passed all basic courses and core courses

This course is concurrent with ME 407. Students will be trained in presenting technical reports to an audience. The report must be related to the work in ME 407.

ME 407 Mechanical Engineering Project 3 (0-6-3)

Prerequisite : ME 406

Students must undertake projects of various topics in mechanical engineering under the supervision of a staff member.

ME 414 Mechanical Design II 3 (2-3-4)

Prerequisite : ME 313

The design of machine elements for power transmission such as shafts, keys and keyways seals, flywheels, couplings, clutches, brakes, bearings, belts, chains, gears and cams. Design projects.

ME 415 Plant Engineering 3 (3-0-6)

Prerequisite : Senior standing

Plant location and layout; design; installation; control and maintenance of various systems such as electrical system, hot water system, chilled water system, steam system, compressed air and gas system, fire protection system.

ME 416 Engineering Piping System Design 3 (3-0-6)

Prerequisite : Senior standing

Design and specification of piping systems in building such as hot and chilled water piping, compressed air and gas piping, drainage and vent piping, steam and condensate piping, steam trapping, pressure reduction in pipes.

ME 417 Automotive Engineering 3 (3-0-6)

Prerequisite : ME 201

Basic principles; electrical; ignition; instrumentation and control systems. Car components; chassis types; suspension; transmission and brake systems. Repair and maintenance.

ME 425 Automatic Control System 3 (3-0-6)

Prerequisite : ME 324

Introduction to control systems. Basic system components; linear systems and feedbacks; mathematical modelling of systems; response solutions and response characteristics of systems; transient behavior and performance criteria; stability of systems; error coefficients and error criteria; analysis of linear control systems by the root-locus and the frequency-response methods; basic control actions; improving system performance using compensation techniques; introduction to the state variable method of analysis.

ME 426 Mechanics of Solids III 3 (3-0-6)

Prerequisite : ME 322

Beams on elastic foundation; theory of thin plates and shells, and methods of solution. Experimental stress analysis: photoelasticity; resistant strain gauges; and other methods of strain measurements. Introduction to theories of elasticity and plasticity with engineering applications.

ME 427 Agricultural Machinery 3 (3-0-6)

Prerequisite : with consent of lecturer.

Basic principles. Types, structure, operation and maintenance of farm machinery. Selection and performance testing. Specification of some selected machinery.

ME 433 Refrigeration and Air Conditioning 3 (3-0-6)

Prerequisite : ME 332

Review of thermodynamics principles. Methods of refrigeration and refrigeration systems. Single stage and two stages mechanical vapor compression refrigeration cycles. Main components: compressor; condenser; evaporator; refrigerant flow control. Auxiliary equipment. Refrigerants. Psychrometrics. Air conditioning system design.

ME 434 Power Plant Engineering 3 (3-0-6)

Prerequisite : ME 331

Types and characteristic of power plants. Load system and load distribution. Economics of electricity generation. Hydro plant. Diesel power plant. Steam power plant; steam turbine; boiler; condenser; feed water heater and auxiliary equipment. Characteristic and limitation of gas turbine power plant. Combined cycle power plant. Introduction to nuclear power plant; nuclear fuel; direct and indirect cycles. Other types of power plant.

ME 435 Internal Combustion Engines 3 (3-0-6)

Prerequisite : ME 331

Engine components and testings. Thermodynamics of spark ignition and compression ignition engines. Combustion processes, detonation and knock. Power output, smoke limit. Exhaust gas analysis and pollution control. Equilibrium charts. Fuels, carburetion and injection systems, supercharging. Engine performance analysis and design.

ME 436 Gas Turbine Theory 3 (3-0-6)

Prerequisite : ME 331, ME 342

Gas turbine cycle producing shaft power output; components; performance improvement; aircraft gas turbines; compressors; combustion systems performance analysis at various operating conditions.

ME 437 Advanced Refrigeration and Air Conditioning 3 (3-0-6)

Prerequisite : ME 433

Refrigerants. Analysis of multi-stages vapor compression cycles. Design of cold storage. Cryogenics. Air liquefaction. Refrigeration system control. Air conditioning system design in various types of building.

ME 443 Mechanics of Fluids III 3 (3-0-6)

Prerequisite : ME 342

Dynamics of fluid flow: force on a submerged cylinder, and Joukowski transformation. Airfoil characteristics and applications to turbine blade design. Three-dimensional wing theory: induced drag and airfoil sections. Gas dynamics, one-dimensional and isentropic flow of perfect gas. Isentropic flow through ducts of variable cross-sectioned areas, choking effects and normal shock wave. Flow in constant-area ducts with friction and heat transfer. Oblique shock wave. Prandtl-Meyer flow and methods of analysis.

ME 444 Turbo Machinery 3 (3-0-6)

Prerequisite : ME 241

Principles of fluid mechanics when applied to fluid machinery. Theory of positive displacement pumps and performance characteristics. Dimensional analysis and characteristic performance of turbomachines. Classification of centrifugal fluid machines, pumps and compressors. Design of impeller casing and piping circuits. Two-dimensional cascade: lift and drag forces, optimum space-chord ratio. Theory of axial-flow machines.

ME 445 Fluid Power 3 (3-0-6)

Prerequisite : ME 241

Fundamentals of fluid power system and applications. Hydraulic and pneumatic circuit. Design and equipment selection such as pumps, compressors, valves. Characteristic and performance of the system. Installation, maintenance, testing and troubleshooting.

ME 451 Energy Conversion 3 (3-0-6)

Prerequisite : ME 331

Conversion to mechanical energy from various sources such as tidal energy, wind energy, heat energy from fossil fuels and nuclear reaction. Magneto hydrodynamic conversion.

ME 452 Non-Conventional Energy 3 (3-0-6)

Prerequisite : with consent of lecturer

Potential and applications of solar energy, tidal energy. Design and performance testing of solar water heater, solar still and wind turbine. Energy conversion from biomass.

ME 453 Energy Management in Building 3 (3-0-6)

Prerequisite : with consent of lecturer

Energy auditing program for building and facilities. Design of building and related mechanical systems for optimization of energy consumed. Utilization of computer in energy management.

ME 454 Energy Management in Industry 3 (3-0-6)

Prerequisite : ME 331

Energy balance of various equipment in industry; efficiency improvement; waste heat recovery methods; analysis of second law of thermodynamics; electricity generation; cogeneration; energy management.

ME 481 Special Topics in Mechanical Engineering I 3 (3-0-6)

Prerequisite : With consent of lecturer

Studies on the new technology and modern development of topics of special interest in mechanical engineering.

ME 482 Special Topics in Mechanical Engineering II 3 (3-0-6)

Prerequisite : With consent of lecturer

Studies on the new technology and modern development of topics of special interest in mechanical engineering.

ME 483 Special Topics in Mechanical Engineering III 3 (3-0-6)

Prerequisite : With consent of lecturer

Studies on the new technology and modern development of topics of special interest in mechanical engineering.

ME 484 Special Topics in Mechanical Engineering IV 3 (3-0-6)

Prerequisite : With consent of lecturer

Studies on the new technology and modern development of topics of special interest in mechanical engineering.

Department of Chemical Engineering

Curriculum Outline

Total credit requirements	150 credits
1. General Basic Courses	44 credits
1.1 Humanities	2 credits
1.2 Social Sciences	9 credits
1.3 Languages	6 credits
1.4 Sciences and Mathematics	27 credits
2. Engineering Courses	103 credits
2.1 Core Courses	27 credits
2.2 Major Courses	76 credits
2.2.1 Compulsory Courses	67 credits
2.2.2 Elective Courses	9 credits
2.3 Training (no credits)	
3. Free Electives	3 credits

Details of Curriculum

1. <u>General Basic Courses</u>	44 credits
1.1 <u>Humanities</u> - 1 course	2 credits

Select 1 course from the followings:

TU.111	TU.112	TU.113	TU.114
TU.115	TU.116	TU.117	

1.2 Social Sciences - 3 courses 9 credits

2 compulsory courses (6 credits):

IE 201 IE 302

Select 1 course (3 credits) from the followings:

TU.121 TU.122 TU.123 TU.124
AC.201 BA.291 EC.210 EC.212

1.3 Languages - 2 courses 6 credits

2 compulsory English courses:

EL.171 EL.172

1.4 Sciences and Mathematics - 8 courses 27 credits

8 compulsory courses:

MA.101 MA.102 MA.203 MA.204
MA.305 SC.124 SC.133 SC.134

2. Engineering Courses 103 credits

2.1 Core Courses 27 credits

LE.121 IE.121 IE.158 IE.261
CE.102 CE.202 AE.211 ME.111
ME.112 ME.221 ME.241

2.2 Major Courses 76 credits

2.2.1 Compulsory Courses 67 credits

LE.241 IE.231 CE.221 AE.101
AE.201 AE.202 AE.203 AE.204
AE.212 AE.303 AE.304 AE.305
AE.321 AE.322 AE.323 AE.324
AE.381 AE.382 AE.391 AE.425
AE.426 AE.427 AE.428 AE.492
AE.493

2.2.2 Elective Courses 9 credits

Select from the followings:

AE.431	AE.432	AE.433	AE.441
AE.451	AE.452	AE.453	AE.461
AE.471			

2.3 Training (no credits)

3. Free Electives 3 credits

Free electives offered by Thammasat University.

Course Planning for Chemical Engineering Students

First Year

<u>Course Number</u>	<u>Title</u>	<u>Credits</u> (lecture-lab-self study)
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Semester 1

LE.121	Computer for Engineers	2(2-0-4)
CE.102	Introduction to Engineering	1(1-0-2)
ME.111	Engineering Drawing I	2(1-3-2)
SC.124	Chemistry for Engineers I	4(3-3-6)
SC.133	Physics for Engineers I	4(3-3-6)
MA.101	Mathematics I	3(3-0-6)
EL.xxx	English Course x	<u>3(5-0-4)</u>
		<u>19(18-9-30)</u>

Semester 2

IE.121	Material Science I	3(3-0-6)
IE.158	Engineering Tools & Operations	2(1-3-2)
ME.112	Engineering Drawing II	2(1-3-2)
SC.134	Physics for Engineers II	4(3-3-6)
AE.101	Physical Chemistry	4(3-3-6)
MA.102	Mathematics II	3(3-0-6)
EL.xxx	English Course x	<u>3(5-0-4)</u>
		<u>21(19-12-32)</u>

Second Year

<u>Course Number</u>	<u>Title</u>	<u>Credits</u> (lecture-lab-self study)
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Semester 3

AE.201	Material and Energy Balance I	2(2-0-4)
AE.211	Thermodynamics I	3(3-0-6)
LE.241	Introduction to Electrical Engineering	3(2-3-4)
IE.201	Engineering Management	3(3-0-6)
CE.202	Engineering Mechanics I	3(3-0-6)
MA.203	Mathematics III	3(3-0-6)
AE.203	Analytical Chemistry	<u>4(3-3-6)</u>
		<u>21(19-6-38)</u>

Semester 4

AE.202	Material and Energy Balance II	2(2-0-4)
AE.212	Chemical Engineering Thermodynamics	3(3-0-6)
CE.221	Mechanics of Solids I	3(3-0-6)
ME.221	Engineering Mechanics II	3(3-0-6)
ME.241	Mechanics of Fluids I	3(3-0-6)
MA.204	Mathematics IV	3(3-0-6)
AE.204	Organic Chemistry	<u>4(3-3-6)</u>
		<u>21(20-3-40)</u>

Third Year

<u>Course Number</u>	<u>Title</u>	<u>Credits</u> (lecture-lab-self study)
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Semester 5

AE.303	Fundamentals of Heat Transfer	3(3-0-6)
AE.304	Fluid Analysis	3(3-0-6)
AE.321	Chemical Engineering Unit Operation Design I	3(3-0-6)
AE.322	Chemical Engineering Kinetics and Reactor Design	3(3-0-6)
AE.381	Chemical Engineering Laboratory I	1(0-3-0)
IE.261	Engineering Statistics	3(3-0-6)
IE.302	Engineering Economy	3(3-0-6)
		<u>19(18-3-36)</u>

Semester 6

AE.305	Fundamentals of Mass Transfer	3(3-0-6)
AE.323	Chemical Engineering Unit Operation Design II	3(3-0-6)
AE.324	Chemical Engineering Reactor Design	3(3-0-1) f1u00000000<08v
TU.xxx	Humanities Electives	<u>2(2-0-4)</u>
		<u>18(17-3-34)</u>

AE.391	Industrial Training (Not less than 180 hours)	0 credit
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Fourth Year

<u>Course Number</u>	<u>Title</u>	<u>Credits</u> (lecture-lab-self study)
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Semester 7

AE.425	Chemical Engineering Unit Operation Design III	3(3-0-6)
AE.426	Process Dynamics Control	3(3-0-6)
AE.427	Chemical Engineering Plant Design	3(3-0-6)
AE.428	Biochemical Engineering	3(3-0-6)
AE.492	Chemical Engineering Seminar	1(0-3-0)
AE.xxx	Technical Electives	3(3-0-6)
TU.xxx	Social Sciences Electives	<u>3(3-0-6)</u>
		<u>19(18-3-36)</u>

Semester 8

AE.493	Chemical Engineering Project	3(0-6-3)
AE.xxx	Technical Electives	3(3-0-6)
IE.231	Industrial Safety	3(3-0-6)
xx.xxx	Free Electives	<u>3(3-0-6)</u>
		<u>12(9-6-21)</u>

Description of Courses in Chemical Engineering

- AE.101 Physical Chemistry 4 (3-3-6)
Prerequisite : SC.124, SC.133
Basic concept of thermodynamics; criterion of equilibrium; chemical kinetics; rate of reaction; the catalysis reaction in chemical process industries.
- AE.201 Material and Energy Balance I 2 (2-0-4)
Prerequisite : SC.124
Introduction to chemical engineering calculation; properties of fluids and solids; ideal gas and Real gas; vapor pressure; humidity; phase equilibrium mass balance calculation.
- AE.202 Material and Energy Balance II 2 (2-0-4)
Prerequisite : SC.124, AE.201
Heat Capacity; enthalpy; energy balance calculation; heat of reaction; energy balance calculation.
- AE.203 Analytical Chemistry 4 (3-3-6)
Prerequisite :
Principles and theory of analytical chemistry; uses of analytical chemistry; steps in chemical analysis; error and deviation and accuracy of an analysis; gravimetric and volumetric methods of analysis; colorimetric and spectrophotometric methods of analysis; acid-base chemical equilibrium; precipitate formation and complex-formation titration; theory of oxidation reduction reactions; electrical methods of separation and analysis; potentiometric determinations with ion-selective electrodes; general principles of extraction; basic principles of chromatography; ion exchange in analytical chemistry and analytical applications of ion exchange.

- AE.204 Organic Chemistry 3 (3-3-3)
 Prerequisite :
 Basic concepts of chemistry pertaining to chemical bonds; nature of chemical reactions; acid and bases in organic chemistry; structure; nomenclature; and identification of organic compounds; general principles and theories of organic chemistry; preparation; properties and reactions of saturated hydrocarbons and unsaturated hydrocarbons; aromatic hydrocarbons; organic halides; alcohols; phenols; and ether; aldehydes and ketones; carboxylic acids and derivatives; fats; oils; waxes; soaps and detergents; stereoisomerism and optical activity; carbohydrates; amines and dyes; amino acid; and proteins.
- AE.211 Thermodynamics 1 3 (3-0-6)
 Prerequisite : SC.133, CE.102
 Definitions and concepts; properties of pure substance; ideal gas; work and heat; the first law and the second law of thermodynamics; entropy.
- AE.212 Chemical Engineering Thermodynamics 3 (3-0-6)
 Prerequisite : AE.211
 Single-phase multicomponent systems; multicomponent phase equilibrium; equilibrium in homogeneous and heterogeneous chemically reactive systems.
- AE.303 Fundamentals of Heat Transfer 3 (3-0-6)
 Prerequisite : AE.212
 Heat conduction for steady state and transient state; energy equation in temperature form; forced and free convection; heat transfer coefficient; radiation.

AE.304 Fluid Analysis 3 (3-0-6)
Prerequisite : MA.203, MA.204
Type of flow; forces on submerged surfaces; analysis of mass balance equation; momentum and energy of fluid in system; Newtonian and Non-newtonian fluids; Shell momentum balance. Relation of dimensionless analysis and momentum transfer; flow around immersed body; application to various problems.

AE.305 Fundamentals of Mass Transfer 3 (3-0-6)
Prerequisite : AE.101, AE.303
Fundamental concepts of mass transfer; mass transfer by diffusion and convection; continuous mass transfer equation; two components mass transfer; applications of mass transfer in chemical processes; multicomponent mass transfer.

AE.321 Chemical Engineering Unit Operation Design I 3 (3-0-6)
Prerequisite : AE.201, AE.202, HE.241
Definition of operation and design in chemical engineering units involving : sedimentation; filtration; gravity separation, fluidization; separation of solid-liquid mixture; agitation and mixing.

AE.322 Chemical Engineering Kinetics and Reactor Design 3 (3-0-6)
Prerequisite : AE.201, AE.202
Thermodynamics of chemical reactions; basic concepts in chemical kinetics; determination of rate expression; reaction mechanism and interpretation of reaction rate data. Homogeneous of chemical reaction systems involving multiple reactions; introduction to reactor design; Stoichiometric relationship; reaction process variables and designing equations for ideal reactors.

AE.323 Chemical Engineering Unit Operation Design II 3 (3-0-6)
Prerequisite : AE.303, AE.321
Study of operation and design in chemical engineering units involving : heat exchanger, distillation, evaporation, dryer and other unit operations without chemical reaction, etc.

- AE.324 Chemical Engineering Reactor Design 3 (3-0-6)
 Prerequisite : AE.322
 Basic concepts in reactor design and ideal reactor models; selectivity and optimization considerations in the design of isothermal reactors; temperature and energy effects in chemical reactors; study of nonideal flow; reactor design for heterogeneous catalytic and non-catalytic reactions.
- AE.381 Chemical Engineering Laboratory I 1 (0-3-0)
 Prerequisite : AE.321
 Experiments in heat transfer, mass transfer, momentum transfer, chemical kinetics and other chemical Engineering subjects.
- AE.382 Chemical Engineering Laboratory II 1 (0-3-0)
 Prerequisite : AE.323
 Studies of experiments in heat transfer, mass transfer, momentum transfer, chemical kinetics and other chemical Engineering subjects.
- AE.391 Industrial Training 0 (0-0-0)
 Prerequisite :
 Students must undergo practical training during summer period for not less than 180 hours. Training report must be submitted to advisor. Measuring level is "S" or "U".
- AE.425 Chemical Engineering Unit Operation Design III 3 (3-0-6)
 Prerequisite : AE.305, AE.323
 Studies of operation and design in chemical engineering units involving: extraction absorption humidifier and dehumidifier column, cooling tower, crystallization column, ect.

AE.426 Process Dynamic Control

3 (3-0-6)

Prerequisite : AE.322, MA.203

Mathematical models for representation of processes and control components; linearization approximation Time-domain dynamics; analog computer simulation; Laplace-domain dynamics; block diagram algebra and transfer function; stability; root-locus analysis and design; frequency-response analysis and design; basic instrumentation; process applications.

AE.427 Chemical Engineering Plant Design

3 (3-0-6)

Prerequisite : IE.302

Principle of process design; flowsheets energy and material balances; design and selection of process equipments; cost estimating of equipment and the entire plant; economic evaluation and optimization.

AE.428 Biochemical Engineering

3 (3-0-6)

Prerequisite :

Biochemical and engineering principles of the industrial microbial and enzyme processes, intended for students with background in chemical and environmental engineering. The course will give brief outline on microbiology and biochemistry, review of kinetics of enzyme catalyzed reactions, biomass production, transport phenomena in microbial systems, and design and analysis of biological reactors.

AE.431 Food Science For Chemical Engineering

3 (3-0-6)

Prerequisite :

Chemical composition of food; spoilage of food caused by microorganisms and chemical reactions; human nutrition; food quality and its measurement.

AE.432 Food Manufacturing

3 (3-0-6)

Prerequisite :

Variety of food manufacturing processes; problems in food manufacturing.

- AE.433 Fermentation Processes 3 (3-0-6)
 Prerequisite : AE.212
 Detailed study of the processes, operations, and equipment involving in selected industrial fermentation processes directed towards the production of pharmaceuticals and industrial chemicals.
- AE.441 Industrial Waste Treatment 3 (3-0-6)
 Prerequisite : Senior standing or permission from instructor.
 Characteristics and composition of various industrial wastes; stream sanitation surveys; fundamentals of sewage treatment; processes of waste treatment; remedial measures for treatment and disposal of industrial waste.
- AE.451 Petroleum & Petrochemical Technology 3 (3-0-6)
 Prerequisite : AE.101
 Nature and chemistry of petroleum; refined products and their properties; refinery and distillation processes. Main processes synthesis from natural gas and refiner liquids and gases in petrochemical industries. Fuel testing Laboratories.
- AE.452 Natural Gas Processing 3 (3-0-6)
 Prerequisite : Senior standing or permission from instructor.
 Gas conditioning; processing of gas for its liquids; design of absorption and absorption facilities; fractionation design.
- AE.453 Polymer Technology 3 (3-0-6)
 Prerequisite : SC.124
 Classification of polymers. Mechanisms and kinetics of chain (addition); condensation; free radical and co-polymerization; molecular weight determination; polymer fractionation; principles of operation of polymer processing equipment; elementary stress/strain and rheological behaviours of polymers. Industrial polymers : plastics; resins; natural and synthetic rubbers.

AE.461 Corrosion Technology

3 (3-0-6)

Prerequisite : AE.101, AE.322

Corrosion phenomena and definitions; electrochemical aspects including reaction mechanisms, thermodynamics. Pourbaix diagrams, kinetics of corrosion processes. Cathodic and anodic protection, coatings and inhibitors. Materials selection and uses.

AE.471 Principles of Fibre and Textile Engineering

3 (3-0-6)

Prerequisite :

Physical and chemical properties, and crystalline structures of important fibres. Wet, wet, and dry spinning process of manmade fibres; yarn and fabric production; structures of woven knitted fabrics.

AE.492 Chemical Engineering Seminar

1 (0-3-0)

Prerequisite : Senior standing or permission from instructor.

This subject is related to chemical engineering project of students' interest. Grading includes reports and project presentation.

AE.493 Chemical Engineering Project

3 (0-6-3)

Prerequisite : AE.492

This is a continuous project from chemical engineering seminar with an emphasis on further studying, doing research, and writing final report which will be presented to the advisor of the project.

