# 付属資料５　タマサート大学第２工学部（EEP）案内

# ENGINEERING ENGLISH PROGRAM

1992 – 1993

THAMMASAT UNIVERSITY

Thammasat University

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# ENGINEERING ENGLISH PROGRAM

## HISTORICAL BACKGROUND

During the 9th Japan-Thailand Joint Trade and Economic Committee Meeting in Kobe, 1989, it was agreed by KEIDANREN and the Federation of Thai Industries (FTI) that there was a serious shortage of technical manpower to support the industrial and economic development of Thailand. More specifically, the shortage of well qualified engineers has become a bottle-neck of smooth technology transfer, which eventually effects Thailand's progress into advances of technology.

It was then concluded that there was an immediate need of a technical institute to produce such engineers, an institute which would eventually be developed in to an Engineering Center of Excellence.

It was subsequently agreed by both parties during the 10th Thailand–Japan Joint Trade and Economic Committee Meeting at Chiangmai in November, 1990, to established a Technical Institute which is to be funded by members of KEIDANREN and FTI, with the curriculum to be prepared by FTI and approved by KEIDANREN.

Thammasat University which is the most well known university in Thailand was then selected by both parties to operate the program.





## OBJECTIVES

- To produce engineering graduate in order to overcome the shortage of engineers hereby promoting further technology transfer
- To provide training in various engineering fields to meet the standards of leading international universities.
- To provide strong English background for engineers who work in international industries and environments.
- To offer opportunities in pursuing engineering degree for international students whose parents are assigned to Thailand. In order to attain the above-mentioned objectives, the institute can use various facilities at both Thammasat University in Rangsit and Asian Institute of Technology (AIT).

The Institute has privilege to award degrees granted by Thammasat University.

## THAMMASAT UNIVERSITY (TU)
## FACULTY OF ENGINEERING

Thammasat University was founded in 1934. It was originally dedicated to the teaching or humanities and social sciences. In the past, it has produced a large number of graduates who have greatly contributed to the society.

Consequently, the Faculty of Engineering at Thammasat University was established in 1990 in order to reduce the lack of well-trained engineers. It was located at Rangsit Campus of Thammasat University in Pathumthani Province.

In 1990, the Faculty of Engineering has enrolled students into two departments: Department of Electrical Engineering, and Department of Industrial Engineering. The Department of Civil Engineering has enrolled students in 1991. In addition, Department of Chemical Engineering and Department of Mechanical Engineering will be opened for students in 1993 and 1994, respectively.

## THE FEDERATION OF THAI INDUSTRIES (FTI)

Formerly, known as the Association of Thai Industries (ATI), the Federation of Thai Industries (FTI) came into existence since December 29, 1987. It was the transformed body of ATI which was created in 1967. FTI is an industrial private sector which brings together industrial leaders to promote Thailand's socioeconomic development.

The main objectives of FTI are to represent Thai manufacturers at both national and international levels, to help promote and develop industial enterprises, to work with the government in setting up national policy, and to offer consulting services to members.

FTI is a full-service organization that cooperates with the government to help more Thai industries reach international acts as a match maker between foreign industrialists and Thai sources to combine the financial strenght, planning ability, and persuasive powers of Thailand's industrialists.

## JAPAN FEDERATION OF ECONOMIC ORGANIZATION (KEIDANREN)

Keidanren (Japan Federation of Economic Organizations) is a private, non-profit economic organization representing virtually all branches of economic activities in Japan. Keidanren, maintaining close contact with both public and private sectors home and abroad, endeavors not only to find practical solutions to economic problems but also to contribute to the sound development of the economies of Japan and countries around the world.

Through the merger of several economic and industrial organizations active since prewar days, Keidanren was established in August 1946.

Since then Keidanren has grown into a nation-wide body with 120 associations and 925 corporate members as of July 1989.

Headed by internationally acknowledged leaders of the Japanese bussiness community, Keidanren plays an active and influential role in the achievement of harmonious economic prosperity for all mankind.





## ORGANIZATION STRUCTURE

- **Study Program**

All the courses will be taught in English by qualified instructors. Some instructors will be invited from Asian Institute of Technology (AIT), with which Thammasat University has cooperation agreement and others.

- **Study Period**

The program consists of eight semesters. Summer courses may be offered if appropriate.

- **Enrollment Requirements**

To be eligible for applying to the program, a student must:

(1) Earn a high school diploma as complied with the curriculum of Ministry of Education (grade 12 or equivalent), or equivalent at other countries, which has to be assessed and approved by the Director of program.
(2) Not carry any seriously contagious disease, any disease that would be detrimental to his/her education, or any mental disorder,
(3) Not have any kind of serious misbehavior, and
(4) Have never been charged with a criminal judgment, except that which occurred through negligence.

- **Admission Requirements**

To be admitted into the program, every student is required to take an entrance examination privately held by the program committee, the examination places an emphasis on general high school knowledge and English proficiency. In addition, Thai nationals are required to take national examination for admission to national universities. The result of this examination is partially considered as a partof privately held entrance examination.

- **Engineering Teaching Staff**

The Engineering Teaching Staff will consist of a set of permanent faculty preferably with minimum qualification of the doctoral degree, associated faculty members, and seconded faculty members.

- **The Start of the Institute and Its Program**

The program will be started in academic year beginning June, 1992. The institute will be established when KEIDANREN, the Federation of Thai Industries and Thammasat University agree on establishment. The date of establishment is desired to be in January 1992 so that an initial batch of students have sufficient time to prepare and take an entrance examination.

- **Number of Student**

The program will eventually admit 60 students to each department per year according to the following plan:

| Year | 1992 | 1993 | 1994 | 1995 | 1996 |
|---|---|---|---|---|---|
| Electrical Engineering | 30 | 60 | 60 | 60 | 60 |
| Industrial Engineering | 30 | 60 | 60 | 60 | 60 |
| Civil Engineering | 30 | 60 | 50 | 60 | 60 |
| Chemical Engineering | – | – | 50 | 60 | 60 |
| Mechanical Engineering | – | – | 50 | 60 | 60 |



ADMISSION PROCESSES

(1) Application forms (obtainable from the B.ENG. and FTI offices upon request. There is a 250-baht fee/form.
(2) A Non-refundable application fee of 500 baht must also accompany the application form.
(3) 2 Photocopies of Transcripts.

ENTRANCE EXAMINATION

Applicants are also requested to take an Entrance Exam privately held by the program's committee which includes:
(1) Mathematics
(2) Physics
(3) Chemistry
(4) English

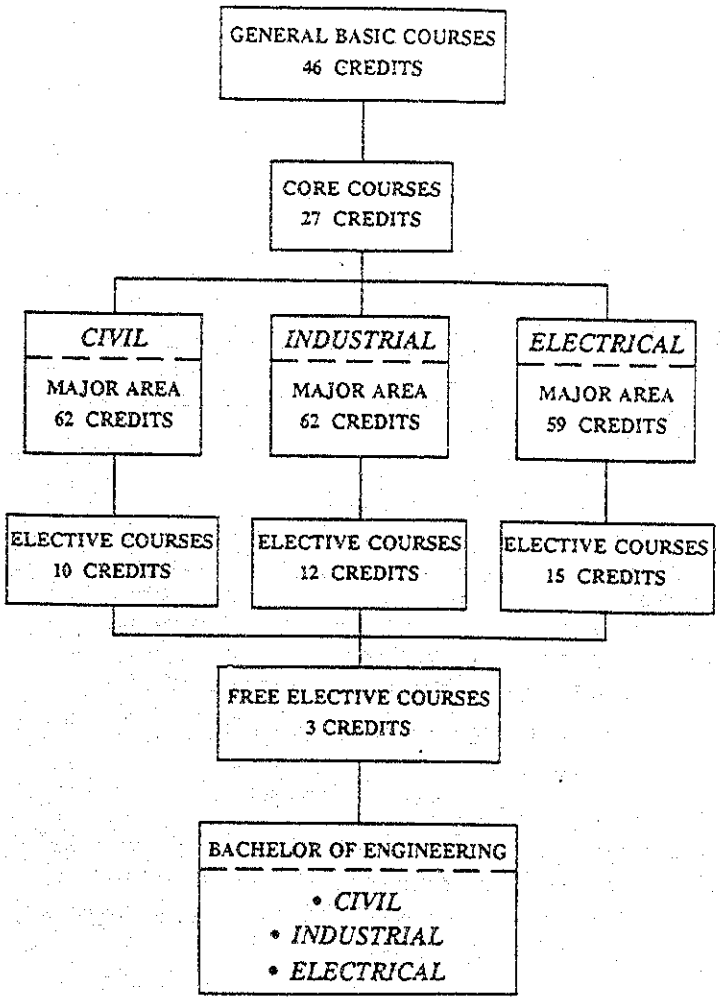


# Admission Schedule For 1992 Academic Year

| | |
|---|---|
| **Application Forms Available** | **March 2– April 7, 1992** |
| **Application Filing Period** | **March 23 – April 7, 1992** |
| **Written Exam Date** | **April 18 – 19, 1992** |
| **Announcement of Written Exam Results** | **May 4, 1992** |
| **Oral Exam Date** | **May 8 – 10, 1992** |
| **Announcement of Oral Exam Results** | **May 15, 1992** |
| **Program Starts** | **June 1992** |

## AREAS OF CONCENTRATION & COURSE REQUIREMENTS

The areas of concentration are electrical, industrial, and civil engineerings. Students are required to complete at least 148 credits including 46 credits from the general basic coureses, 27 credits from the core courses, 62 credits from major areas, 10 credits from the elective courses, and 3 credits from the free elective courses.








## EDUCATION SYSTEM

The sixteen week semester system will be used. The normal length of the program is 8 semesters. Summer semester may be offered, but it is not compulsory. It is expected that at least 50 out of 60 students will complete their degrees from each department every year.

## LENGHT OF STUDY

A minimum full time participation of 3–1/2 years (7 regular semesters) is required toward graduation (see Appendix A). The maximum time allowed is 7 years (See Appendix B).

## STUDENT SERVICES AND ACADEMIC FACILITY

Students in the Engineering English language program enjoy the same facilities and services as regular B.ENG. student. These include clubs, sports, and other extra curricular facilities.

The Faculty furnishes a microcomputer center with a large number of computers and software. In addition, a new building containing an excellent engineering library, offices, and classrooms will be constructed for the program through the funding of KEIDANREN and FTI.

## TUITION AND FEE

The calculation for tuition fee is based on an average of 37.5 credits per year

| | |
|---|---|
| Tuition fee | Baht 75,000/year |
| Annual fee | Baht 35,000/year |
| **Total fee** | **Baht 110,000/year** |

Annual fee accounts for the costs of using computer facilities, library, field-trips, training, laboratory, registration, and other facilities.

## CURRICULUM

The curriculum will initially be the same as that of the Faculty of Engineering at Thammasat University.

## REGISTRATION PROCEDURES

The registration procedure will follow the regulations issued by Thammasat University for undergraduate studies (see Appendix C).

## GRADING SYSTEMS AND GRADUATION REGUIREMENTS

Letter grades will be used. Both the grading systems and graduation requirements will also follow the regulation issued by Thammasat University.

## DEGREE OFFERED

**Bachelor of Engineering**

B.Eng (Civil Engineering)
B.Eng (Electrical Engineering)
B.Eng (Industrial Engineering)
B.Eng (Mechanical Engineering)
B.Eng (Chemical Engineering)





# CURRICULUM

# DEPARTMENT OF

# CIVIL ENGINEERING

# COURSE STRUCTURE

Total credit requirements 148 credits

1. General Basic Courses 46 credits
   - Humanities 2 credits
   - Social Sciences 9 credits
   - Languages 6 credits
   - Sciences and Mathematics 29 credits
2. Engineering Courses 99 credits
   - Core Courses 27 credits
   - Major Courses 72 credits
     - Compulsory Courses 62 credits
     - Elective Courses 10 credits
   - Training (no credits)
3. Free Electives 3 credits

## Course Requirements

1. **General Basic Courses** **46 credits**

Students are required to take basic courses as follows :

- 17 credits in Humanities, Social Sciences and Languages,
- 29 credits in Sciences and Mathematics

**Humanities 1 course (2 credits)**

Select 1 course (2 credits) 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

**Languages**

2 compulsory courses (6 credits)





English

EL.171 EL.172

**Sciences and Mathematics**

9 compulsory courses 29 credits)

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

2. **Engineering Courses** **99 credits**
   - **Core Courses** 99 credits

Students are required to take 27 credits of the following courses :

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

- **Major Courses**

Students are required to take 72 credits of the following courses :

- **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 ME.322

- **Elective Courses** 10 credits

Select from the following ones

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

- **Training** (no credits)

3. **Free Electives** **3 credits**

Free electives offered by Thammasat University

## Course Planning

Thammasat University has outlined the course plan for the Bachelor Degree program in Civil Engineering as follows:

### First Year

#### Semester 1

| Course Number | Title | Credits (lecture-lab-self study) |
|---|---|---|
| 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 | 3(5-0-4) |
| | | 19(18-9-30) |

#### Semester 2

| Course Number | Title | Credits (lecture-lab-self study) |
|---|---|---|
| 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 | 3(5-0-4) |
| | | 19(18-9-30) |





### Second Year

#### Semester 3

| Course Number | Title | Credits (lecture-lab-self study) |
|---|---|---|
| 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) |
| | | 20(18-6-36) |

#### Semester 4

| Course Number | Title | Credits (lecture-lab-self study) |
|---|---|---|
| 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) |
| | | 19(17-6-34) |

## Third Year

### Semester 5

| Course Number | Title | Credits (lecture-lab-self study) |
|---|---|---|
| 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) |
| | | 20(17-9-34) |

### Semester 6

| Course Number | Title | Credits (lecture-lab-self study) |
|---|---|---|
| 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) |
| | | 20(17-9-34) |

CE. 399 Industrial Training on Civil Engineering 0 credits
(Not less than 200 hours)





## Fourth Year

### Semester 7

| Course Number | Title | Credits (lecture-lab-self study) |
|---|---|---|
| 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) |
| | | 18(17-3-34) |

### Semester 8

| Course Number | Title | Credits (lecture-lab-self study) |
|---|---|---|
| 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) |
| | | 13(10-6-23) |

## COURSES DESCRIPTION

## Description of Courses in Civil Engineering

**CE 101 Fundamental of Civil Engineering** 3 Credits

Prerequisite : For non-civil engineering students

Surveying : introduction to surveying, surveying equipments, theories of measurement and errors, the 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.

(Lecture 2 hrs, Practice 3 hrs/week)

**CE 102 Introduction to Engineering** 1 Credit

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.

(Lecture 3 hrs/week)

**CE 201 Civil Engineering Laboratory** 1 Credit

Prerequisite : CE 221

Test of tension, shear, compression, properties of steels, aluminium, timber, brick and rock. Instruments for : strain measurement, beam testing, study of elastical behavior of various structural models and experiments in fluid mechanics.

(Practice 3 hrs/week)

**CE 202 Engineering Mechanics I** 3 Credits

Prerequisite : SC 133

Force Systems, resultants, and equilibrium, of structures and machines. Center of gravity, theorems of Pappus, beams, fluid mechanics, friction, priciple of virtual work, stability, moment to finertia, analysis of bending moment and shear force, deflections of beams.

(Lecture 3 hrs/week)

**CE 211 Surveying I** 3 Credits

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.

(Lecture 2 hrs, Practice 3 hrs/week)





**CE 221 Mechanics of Solids I** 3 Credits

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, eccentic force, buckling theory, analysis of stress and strain, testing to common engineering materials.

(Lecture 3 hrs/week)

**CE 231 Concrete Technology I** 2 Credits

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.

(Lecture 1 hr, Practice 3 hrs/week)

**CE 311 Surveying II** 3 Credits

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.

(Lecture 2 hrs, Practice 3 hrs/week)

**CE 312 Engineering Geology** 3 Credits

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.

(Lecture 3 hrs/week)

**CE 321 Structural Analysis I** 3 Credits

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.

(Lecture 3 hrs/week)

**CE 322 Structural Analysis II** 3 Credits

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, columnanalogy, introduction to plastic analysis, introduction to matrix methods of structural analysis and introduction to vibration structures.

(Lecture 3 hrs/week)

**CE 331 Reinforced Concrete Design I** 3 Credits

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.

(Lecture 3 hrs/week)

**CE 341 Construction Engineering and Management** 3 credits

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.

(Lecture 3 hrs/week)





**CE 351 Soil Mechanics I** 3 Credits

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.

(Lecture 2 hrs, Practice 3 hrs/week)

**CE 352 Soil Mechanics II** 3 Credits

Prerequisite : CE 351

Soil boring, soil sampling, physical and engineering properties for 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.

(Lecture 2 hrs, Practice 3 hrs/week)

**CE 361 Highway Engineering** 3 Credits

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.

(Lecture 3 hrs/week)

**CE 362 Highway Materials** 2 Credits

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.

(Lecture 1 hr, Practice 3 hrs/week)

**CE 371 Hydrology** 2 Credits

Prerequisite : -

The hydrologic cycle; atmospheric circulation and data collections precipitation, in-filtration, overland flow, runoff, evapotranspiration; 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.

(Lecture 2 hrs/week)

**CE 372 Hydraulic Engineering I** 3 Credits

Prerequisite : ME 241

Open-channel flow; Flow in pressured conduits; Surges, Water hammer; Unifrom and non-unifrom 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.

(Lecture 2 hrs, Practice 3 hrs/week)

**CE 373 Environmental Engineering** 3 Credits

Prerequisite : -

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

(Lecture 2 hrs, Practice 3 hrs/week)

**CE 399 Industrial Training on Civil Engineering** 0 Credit

Prerequisite : -

Students whose cumulative credit 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 by S or U to the advisor.

**CE 411 Surveying III** 2 Credits

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.

(Lecture 2 hrs/week)

**CE 421 Timber and Steel Design** 3 Credits

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.

(Lecture 3 hrs/week)





**CE 422 Theory of Elasticity and Plasticity** 3 Credits

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.

(Lecture 3 hrs/week)

**CE 423 Plastic Design of Steel Structures** 3 Credits

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.

(Lecture 3 hrs/week)

**CE 424 Theory of Elastic Stability** 3 Credits

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.

(Lecture 3 hrs/week)

**CE 425 Theory of Plates and Shells** 3 Credits

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.

(Lecture 3 hrs/week)

**CE 426 Structural Vibration** 3 Credits

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.

(Lecture 3 hrs/week)

**CE 431 Reinforced Concrete Design II** 3 Credits

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.

(Lecture 3 hrs/week)

**CE 432 Concrete Technology II** 2 Credits

Prerequisite : CE 231

Properties, testings and applications of pozzolan cement. Properties of hardened Portland cement concrete such as permeability, idurability, 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.

(Lecture 2 hrs/week)

**CE 433 Civil Engineering Design** 2 Credits

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.

(Lecture 2 hrs/week)

**CE 434 Prestressed Concrete Design** 3 Credits

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.

(Lecture 3 hrs/week)

**CE 435 Bridge Design** 2 Credits

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.

(Lecture 2 hrs/week)





**CE 441 Contract, Specification and Estimation** 3 Credits

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.

(Lecture 3 hrs/week)

**CE 442 Principle of Architectural Design and Construction Technique** 3 Credits

Prerequisite : (senior standing)

Consideration of architectural planning with the attention to space and function. Selection of structural types, piping systems, water-supply, waste-water. Electrical system. Selection of materials and construction techniques. Components of building. Structural components such as woods, steels, reinforced concretes. Decoration materials and installations.

(Lecture 3 hrs/week)

**CE 443 Construction Methods and Equipment** 2 Credits

Prerequisite : CE 341

Methods and equipment used in residential building, heavy and industrialzed construction. Selection and efficient use of equipments. Equipment management and maintenance.

(Lecture 2 hrs/week)

**CE 461 Traffic Engineering** 3 Credits

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.

(Lecture 2 hrs. Practice 3 hrs/week)

**CE 462 Urban Transportation Planning** 3 Credits

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.

(Lecture 3 hrs/week)

CE 463 **Pavement Engineering & Design** 3 Credits

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.

(Lecture 3 hrs/week)

CE 471 **Water Resources Engineering** 2 Credits

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-benifit analysis.

(Lecture 2 hrs/week)

CE 472 **Hydraulics Engineering II** 3 Credits

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.

(Lecture 3 hrs/week)

CE 473 **Environmental Engineering Design** 3 Credits

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.

(Lecture 3 hrs/week)

CE 474 **Coastal Engineering** 3 Credits

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.

(Lecture 3 hrs/week)





CE 491 **Seminar** 1 Credit

Prerequisite : (senior standing)

Students must be able to practise in doing research, analysis, discussion, writing report and present the result in front of the class. The tropic is selected by the student and presented in the class.

(Practice 3 hrs/week)

CE 499 **Civil Engineering Project** 3 Credits

Prerequisite : (senior standing)

An individual project on the interesting tropics 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 gramma and in the form of the formal report.

(Practice 6 hrs/week)

# DEPARTMENT OF

# ELECTRICAL ENGINEERING



## COURSE STRUCTURE

| | | |
|---|---|---|
| Total credit requirements | 150 | credits |
| 1. General Basic Courses | 46 | credits |
| • Humanities | 2 | credits |
| • Social Sciences | 9 | credits |
| • Languages | 6 | credits |
| • Sciences and Mathematics | 29 | credits |
| 2. Engineering Courses | 101 | credits |
| • Core Courses | 27 | credits |
| • Major Courses | 74 | credits |
| – Compulsory Courses | 59 | credits |
| – Elective Courses | 15 | credits |
| • Training | (no credits) | |
| 3. Free Electives | 3 | credits |

## Course Requirements

**1. General Basic Courses** 46 credits

Students are required to take basic courses as follows :

- 17 creditsinHumanities, Social Sciences and Languages.
- 29 credits in Sciences and Mathematics.

**Humanities 1 course** (2 credits)

Select 1 course (2 credits) 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

**Languages**

2 compulsory courses (6 credits)

English

EL.171 EL.172

**Sciences and Mathematics**

9 compulsory courses (29 credits)

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

**2. Engineering Courses 101 credits**

- **Core Courses** 27 credits

Students are required to take 27 credits of the following courses :

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

- **Major Courses** 74 credits

Students are required to take 74 credits of the following courses :

– **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

– **Elective Courses** 15 credits

Select from the following ones

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

- **Training** (no credits)

**3. Free Electives** 3 credits

Free electives offered by Thammasat University





## Course Planning

Thammasat University has outlined the course plan for the Bachelor Degree program in Electrical Engineering as follows:

### First Year

#### Semester 1

| Course Number | Title | Credits (lecture-lab-self study) |
|---|---|---|
| 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 | 3(5-0-4) |
| | | 19(18-9-30) |

#### Semester 2

| Course Number | Title | Credits (lecture-lab-self study) |
|---|---|---|
| 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 | 3(5-0-4) |
| | | 19(18-9-30) |

## Second Year

### Semester 3

| Course Number | Title | Credits (lecture-lab-self study) |
|---|---|---|
| LE. 201 | Basic Electrical Engineering Laboratory | 1(0-3-0) |
| LE. 211 | Electrical Circuit Analysis | 3(3-0-6) |
| LE. 221 | Digital Circuit Design | 3(2-3-4) |
| 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) |
| | | 19(17-6-34) |

### Semester 4

| Course Number | Title | Credits (lecture-lab-self study) |
|---|---|---|
| LE. 202 | Electromechanical Energy Conversion Laboratory I | 1(0-3-0) |
| LE. 212 | Basic Electronic Circuits and Devices | 3(3-0-6) |
| LE. 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) |
| | | 19(18-3-36) |

## Third Year

### Semester 5

| Course Number | Title | Credits (lecture-lab-self study) |
|---|---|---|
| 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 | 3(3-0-6) |
| | | 20(18-6-36) |

### Semester 6

| Course Number | Title | Credits (lecture-lab-self study) |
|---|---|---|
| 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 | 3(3-0-6) |
| | | 20(18-6-36) |
| LE. 305 | Industrial Training (Not less than 240 hours) | 0 credit |

## Fourth Year

### Semester 7

| Course Number | Title | Credits (lecture-lab-self study) |
|---|---|---|
| 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 | 3(3-0-6) |
| | | 20(18-6-36) |

### Semester 8

| Course Number | Title | Credits (lecture-lab-self study) |
|---|---|---|
| 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 | 3(3-0-6) |
| | | 14(11-9-22) |





## COURSES DESCRIPTION

## Courses provided by the Department of Electrical Engineering

**LE 121 Computer for Engineers** 2 credits

Computer Organization ; Introduction to data processing ; data structure ; Software design and development for Engineering using Pascal, C, or other high-level languages.

(Lecture 2 hrs/week)

**LE 201 Basic Electrical Engineering Laboratory** 1 credit

Prerequisite or Corequisite : LE 211

A laboratory work on electric circuits and measurements to illustrate the topics covered in LE 211.

(Practice 3 hrs/week)

**LE 202 Electromechanical Energy Conversion Laboratory I** 1 credit

Prerequisite or Corequisite : LE 242

A laboratory work on electromechanical devices and machines to illustrate the topics covered in LE 242.

(Practice 3 hrs/week)

**LE 211 Electrical Circuit Analysis** 3 credits

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.

(Lecture 3 hrs/week)

**LE 212 Basic Electronics Circuits and Devices** 3 credits

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.

(Lecture 3 hrs/week)

LE 221 **Digital Circuit Design** 3 credits

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.

(Lecture 2 hrs, Practice 3 hrs/week)

LE 241 **Introduction to Electrical Engineering** 3 credits

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.

(Lecture 2 hrs, Practice 3 hrs/week)

LE 242 **Electromechanical Energy Conversion I** 3 credits

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.

(Lecture 3 hrs/week)

LE 301 **Electronic Circuits Laboratory** 1 credit

Prerequisite : LE 212

Corequisite : LE 313

A laboratory work on electronic circuits designed to illustrate the topics covered in LE 212 and LE 313.

(Practice 3 hrs/week)

LE 302 **Electromechanical Energy Conversion Laboratory II** 1 credit

Prerequisite or Corequisite : LE 341

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

(Practice 3 hrs/week)





LE 303 **Telecommunication Engineering Laboratory** 1 credit

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.

(Practice 3 hrs/week)

LE 304 **Instrumentation and Control System Laboratory** 1 credit

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.

(Practice 3 hrs/week)

LE 305 **Industrial Training** 0 credit

Prerequisite : Third year standing or consent of faculty

This is a 240-hour industrial trainning 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 engineeringprofession. This course is mandatory and a satisfactory report and seminar are required.

LE 311 **Measurement and Instrumentations** 3 credits

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.

(Lecture 3 hrs/week)

LE 312 **Network theory** 3 credits

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.

(Lecture 3 hrs/week)

**LE 313 Electronic Circuits** 3 credits

Prerequisite : LE 212

Properties and applications of operational amplifiers; feedback amplifiers ; oscillators ; signal generators ; synthesizer circuits ; introduction to power electronics.

(Lecture 3 hrs/week)

**LE 314 Physical Electronics** 3 credits

Prerequisite : SC 134

Atomic physics and theory of energy bands in solids ; Energy bands and chargecarriers in semiconductors ; excess carriers in semiconductors ; p-n junction and devices ; metal-semiconductorcontact ; BJT ; FET ; MOSFET ; UJT ; PNPN diode ; SCR ; photo-devices ; lasers; switching devices ; microwave ; integrated circuit fabrication.

(Lecture 3 hrs/week)

**LE 322 Microprocessors** 3 credits

Prerequisite : LE 221

Logic circuits ; arithmatic 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.

(Lecture 3 hrs/week)

**LE 331 Feedback Control Systems** 3 credits

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.

(Lecture 3 hrs/week)





**LE 341 Electromechanical Energy Conversion II** 3 credits

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.

(Lecture 3 hrs/week)

**LE 351 Electromagnetics Theory** 3 credits

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.

(Lecture 3 hrs/week)

**LE 352 Principles of Communications** 3 credits

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.

(Lecture 3 hrs/week)

**LE 353 Communication Networks and Transmission Lines** 3 credits

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.

(Lecture 3 hrs/week)

**LE 401 Project I** 2 credits

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.

(Practice 6 hrs/week)

**LE 402 Project II** 3 credits

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.

(Practice 9 hrs/week)

**LE 403 Special Topics in Electrical Engineering I** 3 credits

Prerequisite : Senior standing or permission from instructor.

Topics of current interest and new developments in various fields of electrical engineering

(Lecture 3 hrs/week)

**LE 404 Special Topics in Electrical Engineering II** 3 credits

Prerequisite : Senior standing or permission from instructor.

Topics of current interest and new developments in various fields of electrical engineering

(Lecture 3 hrs/week)

**LE 411 Electronic Circuit Analysis** 3 credits

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 stage ; introduction to IC design techniques and IC computer-aided design ; LSI and VLSI.

(Lecture 3 hrs/week)

**LE 412 Power Electronics** 3 credits

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.

(Lecture 3 hrs/week)





**LE 413 Integrated Circuits Fabrication** 3 credits

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 : nonequilibrium state, carrier injection, semiconductor surface theory, inversion layer in MOS structure, surface effect devices, properties of silicon-silicon dioxide system, etc.

(Lecture 3 hrs/week)

**LE 414 Opto-Electronics** 3 credits

Prerequisite : LE 314

Physics of optical radiation ; interaction between optical radiation and matter ; principles and applications of optoelectronic devices ; light sources, detectors, matterials, optical communication systems, integrated optics, etc.

(Lecture 3 hrs/week)

**LE 415 Bio-Medical Electronics** 3 credits

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 presure and blood flow measurement; catheterization ; electrical hazards and prevention ; medical instrumentations ; computer in medicine.

(Lecture 3 hrs/week)

**LE 416 Pulse Digital and Wave Shaping Circuit Design** 3 credits

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

(Lecture 3 hrs/week)

**LE 417 RF Circuit Design** 3 credits

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.

(Lecture 3 hrs/week)

**LE 418 Active Network Theory** 3 credits

Prerequisite : LE 312

Review of analysistools ; 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.

(Lecture 3 hrs/week)

**LE 419 Lasers** 3 credits

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.

(Lecture 3 hrs/week)

**LE 421 Introduction to Artificial Intelligence** 3 credits

Prerequisite : Senior standing or permission from instructor.

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

(Lecture 3 hrs/week)

**LE 422 Software Engineering** 3 credits

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.

(Lecture 3 hrs/week)

**LE 423 Digital computer Systems** 3 credits

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 ; associativememory ; 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.

(Lecture 3 hrs/week)





**LE 424 System Programming** 3 credits

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.

(Lecture 3 hrs/week)

**LE 425 Computer Networks** 3 credits

Prerequisite : Senior standing or permission from instructor.

Network structures ; network models ; network architectures; seven-layer architecture ; methods and procedures of each layer.

(Lecture 3 hrs/week)

**LE 426 Computer Interfacing Techniques** 3 credits

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.

(Lecture 3 hrs/week)

**LE 427 Algorithm** 3 credits

Prerequisite : Senior standing or permission from instructor.

Algorithm for searching path and branch of tree ; Design and analysis of algorithm ; Internalandexternal sorting ; Merge sorting ; Memory management; Hashing ; Dynamic allocation; Multilink list data structure : Merge and sorting.

(Lecture 3 hrs/week)

**LE 431 Operations Research** 3 credits

Prerequisite : Senior standing or permission from instructor.

Mathematical models and Markov chains ; decision theory ; simulation and Monte-Carlo techniques ; queueing theory ; replacement theory ; stock control ; network analysis ; CPM and PERT ; linear programming ; dynamic programming ; game theory ; application to industrial study.

(Lecture 3 hrs/week)

LE 432 **Control Systems** 3 credits

Prerequisite : LE 331

A brief review of matrix algebra ; vectors and linear vector spaces ; eigenvalues and eigenvectors ; states and state space description of dynamic systems ; state space analysis of continuous-time and discrete-time linear systems ; controllability and observability of linear systems ; nonlinear systems and perturbation theory ; stability of linear and nonlinear systems ; design of linear feedback control systems ; an introduction to optimal control.

(Lecture 3 hrs/week)

LE 433 **Nonlinear Control Systems** 3 credits

Prerequisite : LE 331

Introduction to nonlinear control systems ; state space and phase plane analysis ; the method of harmonic linearization; describing functions ; piecewise linear analysis; time and frequnency-domain analysis of stablity : Liapunov's, Tsypkin's and Popov methods; computer simulation of nonlinear control systems.

(Lecture 3 hrs/week)

LE 434 **Industrial Control and Instrumentations** 3 credits

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.

(Lecture 3 hrs/week)

LE 435 **Optimization Techniques** 3 credits

Prerequisite : LE.331

Principles and terminology on optimization ; Various optimization techniques of unconstrained continuous function ; Optimzation of constrained objective function using Simplex Method ; Non-linear programming application

(Lecture 3 hrs/week)

LE 436 **Robotics and Automations** 3 credits

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.

(Lecture 3 hrs/week)





LE 437 **Digital Control Systems** 3 credits

Prerequisite : LE 432

Introduction to digital control ; difference equations and Z-transform ; 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.

(Lecture 3 hrs/week)

LE. 438 **Digital Signal Processing** 3 credits

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.

(Lecture 3 hrs/week)

LE 441 **Power Systems** 3 credits

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.

(Lecture 3 hrs/week)

LE 442 **High Voltage Engineering** 3 credits

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.

(Lecture 3 hrs/week)

**LE 443 Illumination Engineering** 3 credits

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.

(Lecture 3 hrs/week)

**LE 444 Transformers** 3 credits

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.

(Lecture 3 hrs/week)

**LE 445 Power Systems Analysis** 3 credits

Prerequisite : LE 441

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

(Lecture 3 hrs/week)

**LE 446 Electrical Systems Design** 3 credits

Prerequisite or Corequisits : 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.

(Lecture 3 hrs/week)





**LE 447 Electrical Machines Design** 3 credits

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.

(Lecture 3 hrs/week)

**LE 448 Power Plants and Substations** 3 credits

Prerequisite : Senior standing or permission from instructor.

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

(Lecture 3 hrs/week)

**LE 449 Electric Drives** 3 credits

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.

(Lecture 3 hrs/week)

**LE 451 Noise Reduction in Electronic Systems** 3 credits

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.

(Lecture 3 hrs/week)

LE 452 Telephone Engineering 3 credits

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.

(Lecture 3 hrs/week)

LE 453 Radio Systems 3 credits

Prerequisite : LE 351, LE 313

Propagation of radio wave ; Terrestrial and satellite systems ; Effects of lonosphere layer on radio wave ; optical distance and frequency of wave propagation ; Radio systems ; AM,FM, and SSB radio system ; Telegraph ; Pulse data communication.

(Lecture 3 hrs/week)

LE 454 Data Communications 3 credits

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.

(Lecture 3 hrs/week)

LE 455 Telecommunication Engineering 3 credits

Prerequisite : LE 352

Introduction to telecommunication service sand 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 ; Introduction to ISDN.

(Lecture 3 hrs/week)

LE 456 Satellite Communication Systems 3 credits

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

(Lecture 3 hrs/week)





LE 457 Television Engineering 3 credits

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

(Lecture 3 hrs/week)

LE 458 Communication Systems Design 3 credits

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.

(Lecture 3 hrs/week)

LE 459 Principles of Antennas 3 credits

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, quater-wave monopoles ; loop antennas, Yagi antennas, longwire and rhombic antennas ; log-periodic antennas and aperture antennas ; linear arrays ; antenna feeding and baluns.

(Lecture 3 hrs/week)

LE 551 Microwave Engineering 3 credits

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 ofantennas ; microwave transmission principles ; terrestrial and satellite systems ; optical fibers ; optical communication systems.

(Lecture 3 hrs/week)

# DEPARTMENT OF

# INDUSTRIAL ENGINEERING





## COURSE STRUCTURE

| | | |
|---|---|---|
| Total credit requirements | 150 | credits |
| 1. General Basic Courses | 46 | credits |
| • Humanities | 2 | credits |
| • Social Sciences | 9 | credits |
| • Languages | 6 | credits |
| • Sciences and Mathematics | 29 | credits |
| 2. Engineering Courses | 101 | credits |
| • Core Courses | 27 | credits |
| • Major Courses | 74 | credits |
| - Compulsory Courses | 62 | credits |
| - Elective Courses | 12 | credits |
| • Training | (no credits) | |
| 3. Free Electives | 3 | credits |

## Course Requirements

1. General Basic Courses 46 credits

Students are required to take basic courses as follows :

- 17 creditsinHumanities, Social Sciences and Languages.
- 29 credits in Sciences and Mathematics

**Humanities 1 course** (2 credits)

Select 1 course (2 credits) 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

**Languages**

2 compulsory courses (6 credits)

English

EL.171 EL.172

**Sciences and Mathematics** **(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**

- **Core Courses** **27 credits**

Students are required to take 27 credits of the following courses :

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

- **Major Courses** **74 credits**

Students are required to take 74 credits of the following courses :

– **Compulsory Courses** **62 credits**

LE.241 IE.222 IE.231 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

– **Elective Courses** **12 credits**

Select from the following ones

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

- **Training** **(no credits)**

3. **Free Electives** **3 credits**

Free electives offered by Thammasat University





## Course Planning

Thammasat University has outlined the course plan for the Bachelor Degree program in Industrial Engineering as follows:

### First Year

#### Semester 1

| Course Number | Title | Credits (lecture-lab-self study) |
|---|---|---|
| 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 | 3(5-0-4) |
| | | 19(18-9-30) |

#### Semester 2

| Course Number | Title | Credits (lecture-lab-self study) |
|---|---|---|
| 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 | 3(5-0-4) |
| | | 19(18-9-30) |

## Second Year

### Semester 3

| Course Number | Title | Credits (lecture-lab-self study) |
|---|---|---|
| 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 | 3(3-0-6) |
| | | **21(20-3-40)** |

### Semester 4

| Course Number | Title | Credits (lecture-lab-self study) |
|---|---|---|
| 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 | 3(3-0-6) |
| | | **21(21-0-42)** |





## Third Year

### Semester 5

| Course Number | Title | Credits (lecture-lab-self study) |
|---|---|---|
| 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) |
| | | **20(15-13-32)** |

### Semester 6

| Course Number | Title | Credits (lecture-lab-self study) |
|---|---|---|
| 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) |
| | | **21(18-9-36)** |
| IE. 390 | Industrial Training (Not less than 180 hours) | 0 credit |

## Fourth Year

### Semester 7

| Course Number | Title | Credits (lecture-lab-self study) |
|---|---|---|
| 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 | 3(3-0-6) |
| | | 16(14-3-31) |

### Semester 8

| Course Number | Title | Credits (lecture-lab-self study) |
|---|---|---|
| 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 | 3(3-0-6) |
| | | 13(11-0-28) |





## COURSES DESCRIPTION

## Courses Provided by the Department of Industrial Engineering

**IE. 121 Material Science I** 3 credits

Prerequisite :-

Properties and structure of materials; metals, alloys, ceramics and polymers. Study of microstructures in relationship with mechanical properties of metallic materials, Phase equilibrium diagrams and using methods; effects of heat treatment on microstructureof alloys. Fracture, Corrosion, Degradation and Failure analysis.

(Lecture 3 hrs/week)

**IE. 158 Engineering Tools & Operations** 2 credits

Prerequisite :-

Fundamental engineering tools and measurement especially using correctly and safely. Having skills in fitting, machine tools, welding, foundry and fabrication.

(Lecture 1 hrs, Practice 3 hrs/week)

**IE. 201 Engineering Management** 3 credits

Prerequisite :-

Study basic concepts and theories of modern management; Human behavior; human relation in organization; Learn the methods of increasing productivites; Industrial safety; Basic of engineering economy, finance, marketing, Project management.

(Lecture 3 hrs/week)

**IE. 222 Material Science II** 3 credits

Prerequistic :-

Production of iron; alloy steels; case hardening of steels; power metallurgy; typical of tool steels; heat treatment of tool steels; stainless steels; cast iron; carbonsteels; much and low element of steels; aluminium; magnesium; copper; zinc; white iron; nickel; plastic technology.

(Lecture 2 hrs, Practice 3 hrs/week)

**IE. 231 Industrial Safety** 3 credits

Prerequisite :-

Study of 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, maintenance.

(Lecture 3 hrs/week)

**IE. 261 Engineering Statistics** 3 credits

Prerequisite :-

Probability Theory and Statistical Distributions. Sampling Theory. EstimationTheory. HypothesisTesting. Nonparametric Statistics. Regression and Correlation. Analysis of Variance. Statistical Applications in Engineering Field.

(Lecture 3 hrs/week)

**IE. 263 Experimental Design** 3 credits

Prerequisite :- IE. 261

Principle of experimental design, application of experimental design to engineering problem; emphasis on method of experimental design, data collection, data analysis.

(Lecture 3 hrs/week)

**IE. 302 Engineering Economy** 3 credits

Prerequisite :-

The Time Value of money. Engineering Project Analysis in Economic Approaches. Depreciation; Evaluation of Replacement. Decisions under risk and uncertainty.

(Lecture 3 hrs/week)

**IE. 303 Industrial Cost Analysis & Budgeting** 3 credits

Prerequisite :- IE. 302

Introduction to Financial Reports. Basic Techniques of Financial Reports Analysis. Cost Analysis for Planning, Control and Decision-Making. Standard Costing. Budgeting.

(Lecture 3 hrs/week)

**IE. 311 Work Study** 3 credits

Prerequisite :- IE. 261

Study behavior of materials handling; Movement of operation in the workplace; Process chart, Activity chart, Man-machine-chart, simo-chart, micromotion study; Motion economic; work sampling; Direct time study; Pre-determine time standard by using rating factor and contingeney allowances. Analysis of work for improving production methods. Wage payment and incentive planning.

(Lecture 2 hrs, Practice 3 hrs/week)





**IE. 331 Tool Engineering** 3 credits

Prerequisite :- IE. 121, IE. 158

Tool design; 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 processesand equipments; Die design and making; Mold design and making; Heat treatment of tools dies and mold.

(Lecture 2 hrs, Practice 3 hrs/week)

**IE. 332 Value Engineering** 3 credits

Prerequisite :-

Value engineering methods; Application of value engineering technique in product design; Procurement and Manufacturing in order to reduce cost without loss of quality.

(Lecture 3 hrs/week)

**IE. 351 Manufacturing Process & Technology I** 3 credits

Prerequisite :-

Materialsremoval processes in machine tools 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 eletroplating.

(Lecture 2 hrs, Practice 3 hrs/week)

**IE. 352 Manufacturing Process & Technology II** 3 credits

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, patterns and core, liquid metal, solidification of casting, casting design; Plastics forming and Die casting.

(Lecture 2 hrs, Practice 3 hrs/week)

**IE. 353 Automation** 3 credits

Prerequisite :-

Study various kinds of pneumatic instrument; Study of APT III programming

(Lecture 2 hrs, Practice 3 hrs/week)

**IE. 354 Basic Instrumentation** 3 credits

Prerequisite :-

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

(Lecture 2 hrs, Practice 3 hrs/week)

**IE. 358 Manaufacturing Processes** 3 credits

For mechanical engineering students

Classification of manufacturing processes and technologies in various methods: machine tools, foundry, welding, forming processes; Equipments and accessories; Materials; Engineering measurementand Metrology; Inspection; Standard and accuracy of measurement.

(Lecture 3 hrs/week)

**IE. 362 Quality Control** 3 credits

Prerequisite :- IE. 261

Quality Control techniques; Engineering reliability for quality control; Quality control management; Motivation and human relation for quality improvement; The quality control circles and the zero-defects program for quality improvement.

(Lecture 3 hrs/week)

**IE. 364 Operations Research I** 3 credits

Prerequisite :- IE. 261 or permission from instructor.

Introduction to operations research Methods. Linear Programming. Transportation Problems. Assignmen: problems. Queueing Theory. Simulation and Game Theory.

(Lecture 3 hrs/week)

**IE. 390 Industrial Training** 3 credits

Prerequistie :-

Practical training in industry not less than 180 days during summer vacation.

**IE. 404 System Engineering** 3 credits

Prerequisite :- MA. 204. IE. 201

Introduction to basic concept of system engineering. System Engineering approaches in Planning, Organizing and Management. System Analysis and Modelling.

(Lecture 3 hrs/week)





**IE. 412 Production Planning and Control** 3 credits

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

Study characteristic of production processes; Techniques of demand forcasting emphasized on statistical method; study to control and manage major factor in production processes to low production cost and idle time; Pert and CPM analysis Methods.

(Lecture 3 hrs/week)

**IE. 413 Project Feasibility Study** 3 credits

Prerequisite :- IE. 302, IE. 303

Basic concept of Project Feasibility Study; Marketing study; Engineering study; Management study; Financial study and other effects; Case study.

(Lecture 3 hrs/week)

**IE. 414 Computer Simulation** 3 credits

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.

(Lecture 3 hrs/week)

**IE. 415 Management Information Systems** 3 credits

Prerequisite : LE 121

Introduction to management information systems Concepts and Structure. Developing; Planning; Systems Analysis and Design; Systems Testing. Implementation and Maintenance.

(Lecture 3 hrs/week)

**IE. 416 Maintenance Management** 3 credits

Prerequisite :-

Maintenance concepts; Torotechnoloty; Preventive maintenance; Corrective maintenance; Maintenance organization 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.

(Lecture 3 hrs/week)

**IE. 433 Industrial Plant Design** 3 credits

Prerequisite :-

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

(Lecture 3 hrs/week)

**IE. 434 Computer Aided Manufactering** 3 credits

Prerequisite:- Fourth year engineering students

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

(Lecture 3 hrs/week)

**IE. 435 Nondestructive Testing** 3 credits

Prerequisite :- Fourth year of engineering students

Concepts; Objective; Types; Applied examples in nondestructive testing; Type and danger of defects; Fracture; Inspection methods; Technique and application including comparison depending on materials and kinds of works.

(Lecture 3 hrs/week)

**IE. 436 Failure Analysis** 3 credits

Prerequisite :- Fourth year of engineering students

Technique; Method; Sequence of failureanalysis; Material behavior under mechanicalloadin various types and circumstances; Temperature effect; Pressureeffect; Cause and result, Direction of failure; Physical and mechanical properties of mechanical design that affect to failure; Corrosion and its defects

(Lecture 3 hrs/week)

**IE. 442 Ergonomics** 3 credits

Prerequisite :-

Introduction to Ergononics: Human body as a working system i.e. bones, joints, muscles, metabolism, nervous system; Body measurement; Working environment i.e. temperature, humidity, noise, visual perception, vibrations; Equipment design i.e., seating, controls, displays; Human factors in inspection, ages, shift work, motivations, fatiques.

(Lecture 3 hrs/week)

**IE. 443 Industrial Hygiene** 3 credits

Prerequisite :-

Study of General Industrial Hygiene Principles, Toxicoloty, Environmental risk factors on worker health and Prevention, Protective Clothing and Equipment, First aid.

(Lecture 2 hrs, Practice 3 hrs/week)





**IE. 444 Environmental Control** 3 credits

Prerequisite :-

Study of pollution from industries, Air pollution, Wastewater, Noise pollution, etc. Emphasis on Sources and Effects. Engineering design for Poliution control and Protection.

(Lecture 3 hrs/week)

**IE. 455 Welding Engineering** 3 credits

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 andstrain, shrinkage and distortion; Weld design in various works.

(Lecture 3 hrs/week)

**IE. 456 Foundry Engineering** 3 credits

Prerequisite :- IE. 351, IE. 352

Metal casting processes; Thermodynamics in foundry work; Solidification of liquid metal in casting; Control for sound casting; Iron and steel making; Alloy steel casting; Foundry plant.

(Lecture 3 hrs/week)

**IE. 457 Principles of Metal Cutting** 3 credits

Prerequisite :- IE. 351, IE. 352

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

(Lecture 3 hrs/week)

**IE. 465 Advanced Quality Control** 3 credits

Prerequisite :- IE. 362

Study of interesting topics and applications in Quality Control.

(Lecture 3 hrs/week)

**IE. 466 Operations Research 2** 3 credits

Prerequisite :- IE. 364 Operations Research 1

Dynamic Programming, Markov Analysis, Decision Theory, Nonlinear Programming.

(Lecture 3 hrs/week)

**IE. 492 Industrial Engineering Project I** 3 credits

Prerequisite :-

Basic study in interesting industrial engineering project and presentation.
(Lecture 1 hrs/week)

**IE. 494 Industrial Engineering Project II** 2 credits

Prerequisite :-

Study in interesting industrial engineering project from IE. 492 and presentation.
(Lecture 2 hrs/week)

**IE. 495 Industrial Packaging** 3 credits

Prerequisite :-

Basic principles of industrial packaging and its significance in industry. Studies of properties of packaging materials, design, analysis, and development of industrial packaging.
(Lecture 3 hrs/week)

**IE. 496 Special Topics in Industrial Engineering** 3 credits

Prerequisite :-

Studies of interesting topics in industrial engineering.
(Lecture 3 hrs/week)





## FACULTY MEMBERS

NOPHADOL INNA, B. Eng.(Hons.) (Civil), Khon Kaen University; M.Eng., A.I.T.; M.Sc.(First Class Honour), National University of Ireland, Ireland; Ph.D (Dean's Honour List), Post-Doctoral Fellow, McGill University, Canada

BIRASAK VARASUNDHAROSOTH, B.Eng.(Electrical), University of New South Wales, Australia.; Ph.D (Electrical), University of Canterbury, New Zealand.

FREDRIC WILLIAM SWIERCZEK, BA., Temple University; MA., Ph.D, Pittsburg, U.S.A.

KRISHNAMURTHY RAMANATHAN, B.Sc.(Eng.), Sri Lanka; M.Eng., D.Eng., A.I.T., Thailand

WORSAK KANOKNUKULCHAI, B.Eng., Chulalongkorn; M.Eng., A.I.T.; Ph.D, California (Berkeley), U.S.A.

PRIDA WIBULSWAS, DIC, Imperial College, London; Ph.D, London, U.K.

JOHN TANG, B.S., M.S., Ph.D., Florida, U.S.A.

CHULAPONG CHULLAPODI, B.Eng., University of New South Wales, Australia; M.Eng., Liverpool, Ph.D, Manchester, U.K.

TAWEEP CHAISOMPHOB, B.Eng.(First Class Honour) (Civil), Chulalongkorn; M.Eng., D.Eng., University of Tokyo, Japan

ANOTHAI RATTARANGSI, B.Eng.(Hons), M.Eng., Ph.D (Electrical), University of Wisconsin, U.S.A.

SUPACHART CHUNGPAIBULPATANA, B.Eng. (Industrial), Prince Songkla University; M.Eng, D.Eng., A.I.T., Thailand

SOMCHAI CHUNCHAONA, B.Eng.(First class Honour) (Mech), KMIT; M.Eng., A.I.T.; Ph.D(Mech), University of Auckland, New Zealand

JUMNONG SORAPIPAT, B.Eng.(Industrial), Prince Songkla University, M.Eng., D.Eng., A.I.T., Thailand

# APPENDIX A

Regulation issued by Thammasat University for undergraduate studies (1971)

21.1 To be qualified for graduation, a student must complete all the course requirements in his/her field of study with a minimum GPA of 2.00, and has become a student for at least 7 regular semesters.

For a student who has been with the university for at least 6 regular semesters, and who has been exempted from taking some courses or has been able to transfer some credits, he/she may be specially considered for graduation by the Chancellor of the university.

The seven-semester requirement according to the first paragraph does not apply to a student under category 6.5 and 6.6.





# APPENDIX B

Regulation issued by Thammasat University for undergraduate studies (1971)

5.7 If a student has completed seven years of regular studies of ten years of part-time studies and has not fulfilled the graduation requirements, he/she will be withdrawn from being a student at the university. None of the accumulated credits can be used for further studies at Thammasat University.

# APPENDIX C

Regulation issued by Thammasat University for undergraduate studies (1971)

**9.3 Registration, drop/add process**

During regular semeter, a student can register for a minimum of 9 credits, but no more than 19 credits. For a law student who has passed the examination for 24 credits of general subjects, he/she can register for no more than 22 credits. For the Faculty of Science and Technology and the Faculty of Engineering, a student can register for a maximum of 21 credits.

A student can register for less than the minimum credit requirements only under the following conditions:

- when a permission from the dean is made in the case of a student's illness, or
- when it is expected to be the student's last semester.

A student can register for more than the maximum credit requirements only when it is expected to be his/her last semester, but no more than 21 credits.

A student can register in the summer only if he/she has a minimum GPA of 2.00, or except the student obtains pesmission from the dean. The maximum credit limit for the summer is 6 credits.

At least half of the credits registered in each semester must be in the student's field of study, except for those who have completed all the courses in the major field.