



Bachelor of Engineering Program in Energy Engineering

(International Program)

(2019 New Program)

The Faculty of Engineering

King Mongkut's Institute of Technology Ladkrabang

**Bechelor of Engineering in Energy Engineering
(International Program)
(2019 New Program)**

Name of Institution King Mongkut's Institute of Technology Ladkrabang
Faculty / Campus /College Faculty of Engineering
Department Energy Engineering

Part 1 General Information

1. Program Title : Bachelor of Engineering Program in Energy Engineering

2. Degree and Field Title

Full name : Bachelor of Engineering (Energy Engineering)
Abbreviation : B.Eng. (Energy Engineering)

3. Major or Minor Subjects (If any)

-

4. Total Credits

143 credit

5. Type of the Program

5.1 Type

- 4 Year Bachelor's Degree Program (Interdisciplinary Program)
- 5 Year Bachelor's Degree Program
- Other (specify).....

5.2 Program Type

- Academic Bachelor's Degree Program
- Adanced Academic Bachelor's Degree Program
- Professional or Operational Program
- Professional or Operational Advancement Program

5.3 Language

- Thai
- Foreign language (specify the language).....English.....
- Thai and foreign language (specify the language).....

5.4 Admission

- Only Thai students
- Only international students
- Both Thai and foreign students

5.5 Cooperation with Other Institutions

- Program issued specifically by KMITL
- Cooperation with other institutions
 - ⇒ Institution name.....
 - ⇒ The form of cooperation.....
- Joint course with other institutions
 - ⇒ Institution name..... Country.....
 - ⇒ The form of joining
 - Cooperate by the institute gives the degree.
 - Cooperate by the other institutes give the degree.
 - Cooperate by the student may receive a degree from two institutes (or more than 2 institutes).

5.6. Degree Conferment

- One degree from KMITL
- Giving the degree more than one field (For example Dual degree)
- Other (specify).....

6. Status of the Program and Consideration for the Authorization/Agreement

- New Program Course begins onAugust2017.....

The program has been deliberated and endorsed by the Academic Committee of KMITL in its meeting No.11...../2018.....
on.....20.....November.....2018

The program has been approved by the Academic Committee of KMITL in its meeting No.11...../.....2018.....
on.....28.....November.....2018

Revised Program Course begins on

The program has been deliberated and endorsed by the Academic Committee of KMITL in its meeting No. /

on.....

The program has been approved by the Academic Committee of KMITL in its meeting

No. /

on.....

The course was certificated by.....

on.....

7. Expected Date for Thai Qualifications Register (TGR)

Academic Year 2021

8. Career Paths

1. Energy Engineering
2. Energy Expert
3. Energy Auditor
4. Project Engineer
5. Maintenance Engineer
6. Technical Service Engineer
7. Design Engineer
8. Environmental Engineering
9. QC-Engineer
10. Safety Engineer
11. Factory Engineer
12. Power plant Engineer
13. Production Engineer
14. Entrepreneur

9. Instructor Details

Name-Surname (Academic Position)	Qualification (Field of Study) Year of Graduation	University
1. Asst. Prof. Dr. Kiattisak Roonprasang (Food science) x-xxxx-xxxx-xx-x	Dr.-Ing. (Processing Machines and Processing Technology), 2008 M.Eng. (Thermal Engineering), 2001 B.Eng. (agricultural engineering), 1997	TU Dresden, Germany King Mongkut's Institute of Technology Thonburi King Mongkut's Institute of Technology Ladkrabang
2. Assoc.Prof.Dr.Pongjet Promvonge (Mechanical Engineering) x-xxxx-xxxx-xx-x	Ph.D. (Mechanical Engineering), 1997 M.Sc. (Mechanical Engineering), 1992 M.Eng. (Mechanical Engineering), 1984 B.Eng. (Mechanical Engineering), 1978	Imperial College, University of London, UK. Imperial College, University of London, UK. Chulalongkorn University Khon Kaen University
3. Assoc.Prof.Dr.Surin Khomfoi (Electrical Engineering) x-xxxx-xxxx-xx-x	Ph.D (Electrical Engineering), 2006 M.Eng. (Electrical Engineering), 2001 B.Eng. (Hons) (Electrical Engineering), 1997	University of Tennessee Knoxville King Mongkut's Institute of Technology Ladkrabang King Mongkut's Institute of Technology Ladkrabang
4. Dr. Prattana Kaewpet. x-xxxx-xxxx-xx-x	Ph.D. (Chemical Engineering), 2014 M.Sc. (Renewable Energy Development), 2017 M.Sc. (Industrial Chemistry), 2007 B.Sc. (Hons) (Industrial Chemistry), 2005	Imperial College London, London, UK. Heriot-Watt University, Scotland, United Kingdom Chiang Mai University Chiang Mai University
5. Assoc.Prof. Kunlanan Kiatkittipong (Chemical Engineering) x-xxxx-xxxx-xx-x	Ph.D. (Chemical Engineering), 2012 B.Sc. (Chemical Engineering), 2008	The University of New South Wales, Australia Chulalongkorn University

10. Location of Study

- King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand
- King Mongkut's Institute of Technology Ladkrabang (Prince of Chumphon Campus)
- Off-site at.....

11. External Situations of Development Needed to be Considered for the Planning of the Program

11.1 Economic Situation/Development

According to the current situation, the government and the private sector are highly demand to develop energy technology, so the government has implemented 3 legislation and policies: the Energy Conservation Promotion Act B.E. 2535 (additional revision B.E. 2550), Thailand Integrated Energy Blueprint, and other ministerial regulations and ministry announcements regarding the demands for personnel who specialize in energy. Also, as Thailand is a part of ASEAN community, Thailand has to support students in science, energy, technology, and foreign language skills. Thus, the students will acquire abilities which are necessary for technology advancement and innovation as well as be prepared for the industrial competition.

More importantly, the occurrence of industrial disruption has immediately transformed the feature of technology, resulting in energy engineering such as the arrival of electric vehicle technology, other categories of energy generation which are different from burning carbon-based fuels, and battery energy storage. Therefore, preparing the students to be capable of energy science and proficient in foreign language skills is obviously crucial.

11.2 Social and Cultural Situation/Development

The energy technology development and the demands for energy for developing the country are related to a social and cultural change of community undeniably. Therefore, the qualified engineers are not only required to be proficient at engineering skills, but they are also required to be aware of society and the environment, have effective communication, and have a conscience regarding professional ethics. Thus, the living condition of a community around the industry will get less impacts.

12. Effects from 11.1 and 11.2 on the Development of the Program and the Relation to the Mission of the Institute

12.1 Program Development

- Develop programs in order to equip students with expertise on energy engineering combined with knowledge and abilities of other subject fields, especially of mechanical engineering, electrical engineering, computer science and information technology system. Thus, the students will be the mainspring for developing businesses and industries that use advanced technology.
- Improve the program regularly in response to the Thailand's National Strategy regarding country progression and the development of science and technology in the future.

12.2 Relation to the Missions of the Institute

King Mongkut's Institute of Technology Ladkrabang is renowned for developing engineers, technologists and scientists to drive the country and serve the society. Hence, the program developments is concerned with missions and visions of the institution which aim to equip graduates with excellent quality, and be the institution of scientific and technological research. Also, the institution aims to achieve the excellence in applying technology and create innovation that support self-reliance for sustainable development.

13. Relation (if any) with Other Programs Open in the Faculty / Other Departments of the Institute (i.e. Subjects Open for the Service of the Faculties / Departments or to be Studied with Other Faculties / Departments)

13.1 Subjects/ Subject Groups in the Program Open by the Other Faculties / Departments / Programs

- General Education Courses
- Specific Courses
- Free Electives

**13.2 Subjects / Subject Groups in the Program Open and Required to be Studied
by Other Faculties / Departments / Programs**

General Education Courses

Specific Courses

Free Electives

None

13.3 Management of the Cooperation

Curriculum committee of the program are determined to coordinate with lecturers from other related subject fields and faculties to run courses.

Curriculum

Curriculum

Total Credit Points	143	Credits
----------------------------	------------	----------------

Curriculum Structure

A. General Education Courses	30	Credits
B. Specific Courses	107	Credits
B.1 Major Compulsory Courses	98	Credits
Foundation Science and Mathematics Courses	21	Credits
Foundation Engineer Courses	12	Credits
Core Courses	68	Credits
Alternative Study Coruses	6	Credits
B.2 Major Electives	6	Credits
C. Free Electives	<u>6</u>	Credits

Subject in the Curriculum

A. General Education Courses	30	Credits
-------------------------------------	-----------	----------------

- General-Education Compulsory Courses	21	Credits
--	----	---------

Code	Title	Credits	
			(lecture/practice/self-study)
01006510	INTRODUCTION TO ECONOMICS	3 (3-0-6)	
01006512	ASIAN STUDY	3 (3-0-6)	
01006513	INTERPRETATION AND ARGUMENTS	4 (4-0-8)	
01006515	DESIGN METHODS FOR INNOVATIONS	4 (4-0-8)	
01006517	LEAN STARTUP AND AGILE BUSINESS	4 (4-0-8)	
01006520	LEADERSHIP AND PERSONAL DEVELOPMENT	3 (3-0-6)	

- General-Education Elective Courses	9	Credits
--------------------------------------	---	---------

Code	Title	Credits	
			(lecture/practice/self-study)
01006502	PROFESSIONAL ETHICS	3 (3-0-6)	
01006503	INTRODUCTION TO PSYCHOLOGY	3 (3-0-6)	
01006504	PHILOSOPHY OF SCIENCE	3 (3-0-6)	

01006505	CREATIVE THINKING	3 (3-0-6)
01006506	CRITICAL THINKING	3 (3-0-6)
01006507	PERSONAL ECONOMICS	3 (3-0-6)
01006508	DIGITAL ECONOMY	3 (3-0-6)
01006509	ENGINEERING AND PUBLIC POLICY	3 (3-0-6)
01006511	THAI SOCIETY AND CULTURE	3 (3-0-6)
01006514	INNOVATIVE COMMUNICATION	4 (4-0-8)
01006516	INNOVATION MANAGEMENT	4 (4-0-8)
01006518	EMERGING TRENDS IN ENGINEERING	1 (1-0-2)
01006519	INTRODUCTION TO ENVIRONMENTAL PRINCIPLES	3 (3-0-6)
01006521	MEDITATION FOR LIFE DEVELOPMENT	3 (3-0-6)

- Elective Courses

Students whose levels of English language proficiency are below a specified level will be required to take and pass the following non-credit courses:

Code	Title	Credits (lecture/practice/self-study)
01006500	ACADEMIC LISTENING AND SPEAKING **Audits**	4 (4-0-8)
01006501	ACADEMIC READING AND WRITING **Audits**	4 (4-0-8)

B. Specific Courses

B.1 Major Compulsory Courses	107	Credits
include		
Foundation Science and Mathematics Courses	21	Credits
Divided into		

Foundation Science Courses		12	Credits
Code	Title		Credits
			(lecture/practice/self-study)
01006702	PHYSICS I *		4 (3-3-8)
01006703	PHYSICS II *		4 (3-3-8)
01006708	CHEMISTRY *		4 (3-3-8)

Foundation Mathematics Courses		9	Credits
Code	Title		Credits
			(lecture/practice/self-study)
01006710	INTRODUCTION TO CALCULUS *		3 (3-0-6)
01006711	ADVANCED CALCULUS *		3 (3-0-6)
01006712	DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA *		3 (3-0-6)

Foundation Engineer Courses		12	Credits
Code	Title		Credits
			(lecture/practice/self-study)
01006801	INTRODUCTION TO ENGINEERING PROGRAMMING *		3 (2-2-5)
01006802	ENGINEERING DRAWING *		3 (2-2-5)
01006803	ENGINEERING MECHANICS		3 (3-0-6)
01006804	ENGINEERING MATERIALS *		3 (3-0-6)
01006805	INDUSTRIAL INTERNSHIP		0 (0-45-0)

Core Courses		68	Credits
Code	Title		Credits
			(lecture/practice/self-study)
01516001	THERMODYNAMICS		3 (3-0-6)
01516002	HEAT AND MASS TRANSFER		3 (3-0-6)
01516003	REFRIGERATION AND AIR CONDITIONING		3 (3-0-6)

2. Cooperative Education

Code	Title	Credits (lecture/practice/self-study)
01006301	COOPERATIVE EDUCATION	6 (0-45-0)

3. Oversea Training or Study Abroad

This Alternative Study is divided into 2 alternatives: Oversea Training and Study Abroad (Students must selected only one of the indicated alternatives).

Code	Title	Credits (lecture/practice/self-study)
01006005	OVERSEA TRAINING	6 (0-45-0)

(Students who select Study Abroad can transfers credits of not more than 6 CP from oversea institutes, according to proclamation of King Mongkut's Institute of Technology Ladkrabang)

-OR-

Code	Title	Credits (lecture/practice/self-study)
01006302	STUDY ABROAD	6 (6-0-12)

B.2 Major Electives

6

Credits

Code	Title	Credit (lecture/practice/self-study)
01516101	AUTOMATION AND CONTROL IN ENERGY ENGINEERING	3 (3-0-6)
01516102	ELECTROMAGNETIC ENERGY	3 (3-0-6)
01516103	ELECTROCHEMICAL ENERGY SYSTEMS	3 (3-0-6)
01516104	FAN, PUMP AND PIPING SYSTEM DESIGN	3 (3-0-6)
01516105	FLUID POWER SYSTEM DESIGN	3 (3-0-6)
01516106	INDUSTRIAL POLLUTION CONTROL AND WASTE TREATMENT	3 (3-0-6)

01516107	DRYING TECHNOLOGY	3 (3-0-6)
01516108	STEAM BOILER TECHNOLOGY	3 (3-0-6)
01516109	ENERGY LAW	3 (3-0-6)

C. Free Electives

6

Credits

Take any undergraduate courses in international programs offered at KMITL totaling 6 CP as free electives.

Study Plan

1st Year, semester 1

Code	Course Title	Credits (lecture/practice/self-study)
01006710 I	INTRODUCTION TO CALCULUS	3 (3-0-6)
01006702	PHYSICS 1	4 (3-3-8)
01006708	CHEMISTRY	4 (3-3-8)
01006801	INTRODUCTION TO ENGINEERING PROGRAMMING	3 (2-2-5)
01006804	ENGINEERING MATERIALS	3 (3-0-6)
01006513	(GENED ELECTIVE): INTERPRETATION AND ARGUMENT	4 (4-0-8)
01006500	(ESL) ACADEMIC LISTENING AND SPEAKING **Audits**	4 (4-0-8)
Total		21

1st Year, semester 2

Code	Course Title	Credits (lecture/practice/self-study)
01006703	PHYSICS 2	4 (3-3-8)
01006711	ADVANCED CALCULUS	3 (3-0-6)
01006802	ENGINEERING DRAWING	3 (2-2-5)
01006803	ENGINEERING MECHANICS	3 (3-0-6)
01006510	(GENED ELECTIVE): INTRODUCTION TO ECONOMICS	3 (3-0-6)
01516021	1 DATA ANALYTICS AND AI FOR ENERGY ENGINEERING	3 (3-0-6)
01006XXX	(GENED ELECTIVE)	3 (3-0-6)
01006501	(ESL) ACADEMIC READING AND WRITING **Audits**	4 (4-0-8)
Total		22

2nd Year, semester 1

Code	Course Title	Credits (lecture/practice/self-study)
01516001	THERMODYNAMICS	3 (3-0-6)
01516011	FUNDAMENTAL OF ELECTRICAL CIRCUITS ANALYSIS	3 (3-0-6)
01516004	FLUIDS MECHANICS	3 (3-0-6)
01006XXX	(GENED ELECTIVE)	3 (3-0-6)
01516025	INTRODUCTION TO RENEWABLE ENERGY	3 (3-0-6)
01006712	DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA	3 (3-0-6)
01006512	(GENED ELECTIVE): ASIAN STUDY	3 (3-0-6)
Total		21

2nd Year, semester 2

Code	Course Title	Credits (lecture/practice/self-study)
01516002	HEAT AND MASS TRANSFER	3 (3-0-6)
01516003	REFRIGERATION AND AIR CONDITONING	3 (3-0-6)
01516012	INTRODUCTION TO ELECTRIC POWER SYSTEMS	3 (3-0-6)
01516026	ENERGY GENERATION AND STORAGE SYSTEMS	3 (3-0-6)
01516014	POWER ELECTRONICS	3 (3-0-6)
01516015	PHOTOVOLTAIC AND APPLICATIONS	3 (3-0-6)
01006517	(GENED ELECTIVE): LEAN STARTUP AND AGILE BUSINESS	4 (4-0-8)
Total		22

3rd Year, semester 1

Code	Course Title	Credits (lecture/practice/self-study)
01516022	ENERGY ECONOMICS	3 (3-0-6)
01516023	ENERGY CONSERVATION AND MANAGEMENT	3 (3-0-6)
01516005	POWER PLANT ENGINEERING	3 (3-0-6)
01516013	ELECTRICAL POWER AND MACHINES	3 (3-0-6)
01516027	ENERGY IN BUILDING	3 (3-0-6)
01XX6XXX	(ENGINEERING ELECTIVE)	3 (3-0-6)
01516031	ENERGY ENGINEERING LABORATORY 1	1 (0-3-2)
Total		19

3rd Year, semester 2

Code	Course Title	Credits (lecture/practice/self-study)
01516006	THERMAL SYSTEMS DESIGN	3 (3-0-6)
01516028	ENERGY IN TRANSPORTATION SYSTEMS	3 (3-0-6)
01516024	MEASUREMENT AND ENERGY AUDIT	3 (3-0-6)
01516029	ENERGY AND RECOVERY SYSTEMS	3 (3-0-6)
01006515	(GENED ELECTIVE): DESIGN METHODS FOR INNOVATIONS	4 (4-0-8)
01516109	(ENGINEERING ELECTIVE) : ENERGY LAW	3 (3-0-6)
01516032	ENERGY ENGINEERING LABORATORY 2	1 (0-3-2)
Total		20

3rd Year, semester 3

Code	Course Title	Credits (lecture/practice/self-study)
01006805 I	INDUSTRIAL INTERNSHIP	0 (0-45-0)
Total		0

4th Year, semester 1

Study plan for students who select **Special Project**

Code	Course Title	Credits (lecture/practice/self-study)
01516201	ENERGY ENGINEERING PROJECT 1	3 (3-0-6)
XXXXXXXX	FREE ELECTIVE COURSE	3 (X-X-X)
01006XXX	(GENED ELECTIVES)	3 (3-0-6)
Total		9

-OR-

Study plan for students who select **Cooperative Education**

Code	Course Title	Credits (lecture/practice/self-study)
01006301	COOPERATIVE EDUCATION	6 (0-45-0)
Total		6

-OR-

Study plan for students who select **Overseas Training or Study Abroad**

Code	Course Title	Credits (lecture/practice/self-study)
01006302	STUDY ABOARD	6(6-0-12)
Total		6

-OR-

Code	Course Title	Credits (lecture/practice/self-study)
01006005	OVERSEA TRAINING	6(0-45-0)
Total		6

4th Year, semester 2

Study plan for students who select **Special Project**

Code	Course Title	Credits (lecture/practice/self-study)
01516202	ENERGY ENGINEERING PROJECT 2	3 (3-0-6)
01006520	(GENED ELECTIVE): LEADERSHIP AND PERSONAL DEVELOPMENT	3 (3-0-6)
XXXXXXXX	FREE ELECTIVE COURSE	3 (X-X-X)
Total		9

-OR-

Study plan for students who select Cooperative Education, or Oversea Training or Study Abroad

Code	Course Title	Credits (lecture/practice/self-study)
01006520	(GENED ELECTIVE): LEADERSHIP AND PERSONAL DEVELOPMENT	3 (3-0-6)
01006XXX	(GENED ELECTIVES)	3 (3-0-6)
XXXXXXXXX	FREE ELECTIVE COURSE	3 (X-X-X)
XXXXXXXXX	FREE ELECTIVE COURSE	3 (X-X-X)
Total		12

Total number of credits:

143 CP

Course Descriptions

A: General Education Courses

01006500 ACADAMIC LISTENING AND SPEAKING**Audits** 4 (4-0-8)
(4 credits, 3-hour lecture, 1-hour recitation)

PREREQUISITE: NONE

The course provides ESL students guidance and extensive practice in listening and speaking in academic and professional settings. Listening focuses on understanding spoken English in formats such as college lectures and news broadcasts. Note-taking tasks are also included to reinforce aural comprehension. Students learn to recognize organizational patterns. Students also practice outlining main ideas and supporting details through audio taped, videotaped and live presentations. Speaking focuses on increased fluency and communicative strategies used by native speakers in academic and professional settings.

01006501 ACADEMIC READING AND WRITING**Audits** 4 (4-0-8)
(4 credits, 3-hour lecture, 1-hour recitation)

PREREQUISITE: NONE

This course is designed to improve the reading and writing skills of ESL students. Students receive practice on reading and vocabulary development. Reading practice will emphasize paraphrasing, summarizing, and the simple analysis of texts to identify main ideas and distinguish fact from opinion. Writing practice includes writing of simple and compound sentences, using compound tenses and correct word forms, word order, spelling, and punctuation. Students will also develop the ability to write varied, complex sentences and effective paragraphs in standard written English.

01006502 PROFESSIONAL ETHICS 3 (3-0-6)
(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This course introduces the theory and the practice of professional and engineering ethics, including code of conducts and regulations in academic, professional and technical fields. Students also learn about different approaches to ethical problems and examine real-life case studies, drawn from a variety of professional contexts. This course helps students develop skills and knowledge to manage and engage with ethical issues in their working lives.

01006503 INTRODUCTION TO PSYCHOLOGY 3 (3-0-6)
(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This course introduces a broad survey of psychological science including: sensation and perception; learning, memory, intelligence, language, and cognition; emotions and motivation; development, personality, health and illness, and social behavior. Students will study and discuss relations between the brain, behavior, and experience as well as learning the process of discovering new ideas and empirical results in the field.

01006504 PHILOSOPHY OF SCIENCE 3 (3-0-6)
(3 credits, 3-hour lecture)

PREREQUISITE: NONE

The course provides a study of the thing we call “science”, together with its nature and methodology. The topics cover the meaning of science, reality, the nature of scientific observations, scientific theories and their discovery and formation, scientific explanations and predictions, the problem of induction, scientific rationality, the nature of scientific knowledge, concepts of truth, hypothesis testing, hypothesis confirmation, hypothesis falsification, logic of scientific method, and scientific progress.

01006505 CREATIVE THINKING

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This course explores approaches to "How might we proceed when confronted by problems, situations too ambiguous, complex, or messy or impossible to be addressed directly through logical strategies?" It seeks to increase the participants' understanding of creativity, to improve their creative problem-solving skills and to enhance their ability to promote these skills in others, in a variety of educational settings. Students participate in activities designed to help develop their own creativity, and discuss the creative process from various theoretical perspectives. Readings are on such topics as creative individuals, environments that tend to enhance creative functioning, and related educational issues. Discussions with artists, scientists and others particularly involved in the creative process focus on their techniques, and on ways in which creativity can be nurtured.

01006506 CRITICAL THINKING

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This course explores issues about the nature and techniques of critical thought, viewed as a way to establish a reliable basis for our claims, beliefs, and attitudes about the world. We explore multiple perspectives, placing established facts, theories, and practices in tension with alternatives to see how things could be otherwise. Views about observation and interpretation, reasoning and inference, valuing and judging, and the production of knowledge in its social context are considered. Special attention is given to translating what is learned into strategies, materials, and interventions for use in students' own educational and professional settings.

01006507 PERSONAL ECONOMICS

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This course introduces students to the concept of personal economics. Students will learn to apply the economic way of thinking to manage their scarce resources. Employs economic concepts to understand: financial planning and income management; saving and investing; stocks, bonds, and mutual funds; risk-return tradeoff and diversification; interest rates and credit.

01006508 DIGITAL ECONOMY

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This course will develop and utilize economic principles to better understand and explain the expansion and integration of information and communications technologies into the global economies. It will provide an introduction to concepts and theories useful in analyzing economic aspects of the digital and information technology revolutions.

01006509 ENGINEERING AND PUBLIC POLICY

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This course examines the processes of public and private decision making which affects the evolution of a technology. While technology has an important role in shaping today's society, the social forces often plays a central role in the evolution of a technology. This course will study an engineering-related technology and its related policies. Students will discuss the technological and institutional issues, their interaction, the possible need for public policy and the factors that govern the policy.

01006510 INTRODUCTION ECONOMICS

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This course gives an overview of economics, covering basic concepts and theories of microeconomics and macroeconomics. Topics in microeconomics studied include demand and supply, price elasticities, consumer behavior theory, production and cost theory, and perfect and imperfect competitions. Macroeconomics topics studied include aggregate demand and supply, macroeconomic data (e.g. gross domestic product, national income, etc.), management of economic growth, inflation problems, unemployment problems, money and banking systems, fiscal and monetary policy, taxation, international trades, and exchange rates.

01006511 THAI SOCIETY AND CULTURE

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This course covers a study of Thai social identity and culture, development and inheritance of Thai culture, evolution of Thai society, as well as relation of Thai society and culture to societies and cultures of other countries.

01006512 ASIAN STUDY

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This course covers a study of an Asian country's language, social identity and culture. The course will discuss development and evolution of an Asian country, their economic prospect, cultural settings, societies and relations to the society and cultures of other countries.

01006513 INTERPRETATION AND ARGUMENTS 4 (4-0-8)
(4 credits, 3-hour lecture, 1-hour recitation)

PREREQUISITE: NONE

This course provides the study of interpreting and analyzing written and visual arguments. Students will learn to identify the underlying values, definitions, and assumptions in those arguments. The students also learn how to synthesize a multiplicity of competing perspectives, and to articulate fundamental disagreements between those perspectives. Ultimately, students will advance their own contributions to discussions in engineering, business innovations, and technology studies.

01006514 INNOVATIVE COMMUNICATION 4 (4-0-8)
(4 credits, 3-hour lecture, 1-hour recitation)

PREREQUISITE: NONE

This course provides the study and practice of different communication skills including technical, professional and creative writing; infographics design; and delivering presentation. The students will study relevant techniques and learn to combine a range of skills in order to effectively communicating technical or specialized concepts. They will be able to explore and translate the benefit, the uniqueness, and the credibility of innovative ideas to a target audience.

01006515 DESIGN METHODS FOR INNOVATIONS 4 (4-0-8)
(4 credits, 3-hour lecture, 1-hour recitation)

PREREQUISITE: NONE

This course consists of structural design process to create innovative products or services. The students will study the process to gather trends and information such as global direction, public opinions, technology, business, society and economic; learn how to extract context of interested area to find opportunities; study the processes used to gather behaviors, generate intense understanding about areas that lead to innovative concepts, produce innovative solutions and finally offering innovative products and services.

01006516 INNOVATION MANAGEMENT

4 (4-0-8)

(4 credits, 3-hour lecture, 1-hour recitation)

PREREQUISITE: NONE

This course introduces students to the concepts of innovative thinking and innovation management practices. This course prepares students with the insights and instruction necessary to successfully lead worldwide enterprises or local ventures. Covered topics include organization, strategy planning, policy development, communities, research and development and product management. Students are exposed to issues that challenged realworld organizations. Students will learn best practices used by engineering leaders who successfully develop commercially viable products and services, create efficient operating processes, manage profitable organizations, and transform companies into industry leaders.

01006517 LEAN STARTUP AND AGILE BUSINESS

4 (4-0-8)

(4 credits, 3-hour lecture, 1-hour recitation)

PREREQUISITE: NONE

This course covers the basic principles of lean startup and agile business practice. Students will learn how to create an innovation accounting system to build products that meets customer demands; find the easiest and fastest ways to build minimum viable products to reduce time-to-market; learn tactics for improvement and measure customers' needs such as experimenting landing pages, A/B tests, MVPs on real customers; study how to implement an agile culture in business environments and learn how to develop business structures in order to keep the business functioning on constantly-moving units.

01006518 EMERGING TRENDS IN ENGINEERING 1 (1-0-2)
(1 credits, 1-hour lecture)

PREREQUISITE: NONE

This course consists of a series of lectures given by different faculty members and distinguished speakers from the academic and industries. The lectures are designed to provide students a good understanding of each curriculum structure and the courses in each subject areas. Students will be introduced to emerging trends in Engineering and the relevance of our courses. New courses and research opportunities will be presented, including the faculty's research fields. The course also discusses basic learning and working ethics and prepares students career-making skills. Pass/Fail, required to graduate.

01006519 INTRODUCTION TO ENVIRONMENTAL PRINCIPLES 3 (3-0-6)
(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This course provides students general principles of environmental engineering and science. Basics of the physical processes involved in the interactions between water, soil, climate, and vegetation. Natural and human activity as it impacts the environment, weather and climate, pollution.

01006520 LEADERSHIP AND PERSONAL DEVELOPMENT 3 (3-0-6)
(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This course provides students fundamental skills for success in careers and team environments. The course will cover topics such as goal setting, career Skills, leadership skills, teamwork, effective communication, and public speaking. Learning methods will consist of hands on activities and projects, group work, lecture, discussion, reading, writing, and presenting.

01006521 MEDITATION FOR LIFE DEVELOPMENT

3 (3-0-6)

(3 credits, 3-hor lecture)

PREREQUISITE: NONE

This course introduces theory and practice of meditation including : meaning of meditation, objectives, methods, the beginning, process characteristics of reciting and meditating, benefits of meditation, meditation resistances and applying meditation in daily life, meditation as related to education and working purposes, objectives, methods, characteristics of the states of absorption (jhana) and insight knowledge (Nana), fundamental knowledge about insight meditation (Vipassana), differences between foundation meditation (Summata) and insight meditation (Vipassana), layout of foundation meditation (Summata) and insight meditation (Vipassana), insight mediation as related to world population.

B: Specific Courses

Foundation Science and Mathematics Courses

01006702 PHYSICS I

4 (3-3-8)

(4 credits, 3-hour lecture, 3-hour lab)

PREREQUISITE: NONE

This course covers basic physics and mechanics including a study of motion, space and time, kinematics, Newton's law of motion, forces, energy and momentum, work, power, conservation laws, systems of particles, linear momentum, circular motion, rotation, torques, harmonic oscillation and gravitation.

01006703 PHYSICS II

4 (3-3-8)

(4 credits, 3-hour lecture, 3-hour lab)

PREREQUISITE: 01006702 PHYSICS I

This course provides the physical science required to analyze electrical and electronic devices. Covered topics include electrostatics and electromagnetics, electric field and potential, conductors, insulators, capacitors, dielectrics, electric current, electric circuits, magnetic fields and electromagnetism.

01006708 CHEMISTRY

4 (3-3-8)

(4 credits, 3-hour lecture, 3-hour lab)

PREREQUISITE: NONE

This course provides a study of fundamental principles of chemistry and its applications. The subject matter includes principles of atomic structure, intermolecular forces and bonding, chemical reactions, kinetics, thermodynamics, and equilibrium. Relevant examples will be drawn from such areas as environmental, materials, and biological chemistry.

01006710 INTRODUCTION TO CALCULUS

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

Function, Limit, Continuity and their applications, Mathematical induction, Introduction to derivative, Differentiation, Applications of derivative, Definite integrals, Antiderivative integration, Application of definite integral, Indeterminate forms, Improper integrals, Numerical integration, Sequences and series of numbers, Taylor series expansions of elementary functions vector analysis.

01006711 ADVANCED CALCULUS

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: 01006710 INTRODUCTION TO CALCULUS

Functions of several variables and their applications, Vector algebra in three dimensions, Polar coordinates, Calculus of real - valued functions of two variables, Differentiation and integration of real - valued and vector - valued functions of multiple real variables, Introduction to line integrals, Lines, planes and surfaces in three-dimensional space, Calculus of real - valued functions in three-dimensional space, Principal theory for applications such as Green's theorem, divergence theorem, Gauss theorem, Stokes theorem, etc.

01006712 DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA

3(3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

Systems of linear equations and solutions. vector and space, Matrices, Solution of linear equations by matrices, bases, orthonormal bases and applications in Fourier series, etc. Linear transformations: Laplace transformation, z-transformation Fourier-transformation, complex function and transformation, Introduction to differential equations, linear and nonlinear differential equation, Ordinary differential equations, Application of ordinary differential equation for engineering problems, initial value problems.

01006804 ENGINEERING MATERIALS

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

Study of relationship between structures, properties, production processes and applications of main groups of engineering materials i.e. metals, polymers, ceramics and composites; phase equilibrium diagrams and their interpretation, mechanical properties and materials degradation.

01006805 INDUSTRIAL INTERNSHIP

0 (0-45-0)

(0 credits)

PREREQUISITE: NONE

During their four-year selected studies, students are required to complete a short-term industrial placement within professional selected environments. It takes place during a summer period. This course allows students to put into practice under conditions reflecting their future activities and responsibilities. The work, carried out under the responsibility of the firm involved, is presented in a written report.

Core Courses

01516001 THERMODYNAMICS

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This course will cover the conservation of mass and energy and entropy balance; the properties, equations of state, and the processes and cycles for reversible and irreversible thermodynamic systems; and modes of energy transfer. Thermodynamic Carnot cycles, power cycles, refrigeration cycles, the Otto cycle and the Diesel cycle, the gas-turbine process are also explored in the course. Thermodynamic principles will be applied to modern engineering systems to solve problems in the field of steam cycles, internal combustion engines, air compressors and refrigeration. The course is augmented by a wide range of engineering problems and examples in both ideal and real situations.

01516002 HEAT AND MASS TRANSFER

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This course will cover the introduction to heat transfer, steady heat conduction in one dimension and multi-dimension, unsteady one-dimensional heat conduction, principle of convection heat transfer, heat exchangers, radiation heat transfer, boiling and condensation, and numerical solutions of heat transfer problems.

01516003 REFRIGERATION AND AIR CONDITONING

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: THERMODYNAMICS

This course introduces the basic refrigeration processes, such as vapor compression refrigeration, air refrigeration and absorption refrigeration systems. Topics include terminology, function of components, psychrometric properties of air and estimation of cooling load of desired space. Understanding and analyzing the air conditioning process on psychrometric chart as well as designing of piping and air duct system, this course gives students the opportunity to apply their learning with some open source computational program.

01516004 FLUIDS MECHANICS

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

Properties of fluid, fluid statics, fluid dynamics, fluid kinematics, continuity equation, momentum equation, energy equation, dimensional analysis and similitude, viscous flow in pipes, drag force and lift force, introduction to CFDs.

01516005 POWER PLANT ENGINEERING

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: THERMODYNAMICS

The course will include thermodynamic and power plant cycle analysis such as Rankine cycle, Brayton cycle and cogeneration cycle. Technique in promoting power plant efficiency will be investigated also especially re-heat and regeneration techniques. Furnaces, boilers, heat exchangers, turbine and auxiliary units are also studied in the course. Fuel types, fossil and non-fossil fuel, and their impacts on environment are focused. Moreover, Design and performance of power plants for the generation of electric power; nuclear fuels and alternative fuels and power plant economics are too discussed. Moreover, the entire power plant will be simulated by open sourced computer program to see the effect of some parameters. Additionally, students will visit some power plants for more understanding at the end of the course.

01516006 THERMAL SYSTEMS DESIGN

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: THERMODYNAMICS

This course is a concern of steady state simulation and optimization of thermal system, dynamic performance, probabilities in system design. Thermodynamics, fluid mechanics, and heat transfer principles are applied using a systems perspective to enable students to analyze and understand how interactions between components of piping, power, 14 refrigeration, and thermal management systems affect the performance of the entire system. Moreover, the course will cover mathematical methods needed to analyze the systems and will then explore optimization approaches that can be used to improve designs and operations of the thermal systems to minimize, for example, energy consumption or operating costs.

01516014 POWER ELECTRONICS

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

Characteristics of power electronics devices, power diode, SCR, GTO, power bipolar, power MOSFET, IGBT, characteristics of magnetic material, transformer core, ferrite core, iron powder core, converters, AC to DC converters, DC-DC converters, AC-AC converters, DC-AC converters.

01516015 PHOTOVOLTAIC AND APPLICATIONS

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

Fundamentals of photoelectric conversion: charge excitation, conduction, separation, and collection. This course covers commercial and emerging photovoltaic technologies and cross-cutting themes, including conversion efficiencies, loss mechanisms, characterization, manufacturing, systems, reliability, life-cycle analysis, risk analysis, and technology evolution in the context of markets, policies, society, and environment.

01516021 DATA ANALYTICS AND AI FOR ENERGY ENGINEERING

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This course is about how to extract useful knowledge from data, and draws on methods especially from statistics and computer science, focus on the ability to handle large scale data. It covers algorithms, machine learning, AI and different applications of data science.

01516022 ENERGY ECONOMICS

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This course explores the theoretical and empirical perspectives on individual and industrial demand for energy, energy supply, energy markets, and public policies affecting energy markets. It discusses aspects of the oil, natural gas, electricity, and nuclear power sectors and examines energy tax, price regulation, deregulation, energy efficiency and policies for controlling emission.

01516023 ENERGY CONSERVATION AND MANAGEMENT

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This course covers fundamentals of thermodynamics, chemistry, flow and transport processes as applied to energy systems. Topics include analysis of energy conversion in thermomechanical, thermochemical, electrochemical, and photoelectric processes in existing and future power and transportation systems, with emphasis on efficiency, environmental impact and performance. Systems utilizing fossil fuels, hydrogen, nuclear and renewable resources, over a range of sizes and scales are discussed. Applications include fuel reforming, hydrogen and synthetic fuel production, fuel cells and batteries, combustion, hybrids, catalysis, supercritical and combined cycles, photovoltaics, etc. The course also deals with different forms of energy storage and transmission, and optimal source utilization and fuel-life cycle analysis.

01516024 MEASUREMENT AND ENERGY AUDIT

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This course will cover definition and characteristic of measurement; data recording and distribution; analysis of accuracy, precision, error and uncertainty; sensor and transducer; Electrical and mechanical measurements of physical quantities such as temperature, strain, displacement, pressure, flow rate and level; measurement and

instrumentation practices such as electrical, temperature, displacement, strain, pressure, and flow rate in pipe. This course also includes energy audits supply the information needed to manage a building's energy use, determine how energy is being used, identify areas for improvement, and provide a benchmark for future building performance. Take the first step to make your building occupants more comfortable while saving money with an energy audit.

01516025 INTRODUCTION TO RENEWABLE ENERGY 3 (3-0-6)
(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This course introduces renewable energy technologies. Emphasizes exploration of principles and concepts as well as the application of renewable energy technologies (RET). Explores topics such as energy consumption, the pros and cons of renewable energy, energy production and cons, energy conversion, environmental issues and concerns, biomass and biofuels, geothermal, wind, power, solar power, nuclear power, and hydropower systems.

01516026 ENERGY GENERATION AND STORAGE SYSTEMS 3 (3-0-6)
(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This course is mainly related to energy supply and storage system that are commonly used in our society. It covers fundamentals and operational principles of conventional and renewable energy conversion system. Especially, Energy storage techniques involves electrochemical, mechanical and emerging options.

01516027 ENERGY IN BUILDING

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This design-based subject provides a first course in energy and thermo-sciences with applications to sustainable energy-efficient architecture and building technology. Topics include introductory thermodynamics and heat transfer, the leading order factors in building energy use, and the understanding of energy fundamentals and knowledge of building energy use in innovative building design projects.

01516028 ENERGY IN TRANSPORTATION SYSTEMS

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This course will prepare students to meet the expectations of employers in this industry and to interact and relate to others. It covers the technologies used to provide products and services in a timely manner including the interaction between various vehicle systems, engines, transmissions, brakes, fuel, cooling, and electrical. Students will also need to understand the logistics used to move goods and services to consumers, as well as the components of transportation infrastructure.

01516029 ENERGY AND RECOVERY SYSTEMS

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE : NONE

This course will cover waste heat sources, selection criteria for waste heat recovery technologies, recuperative and regenerative heat exchangers for waste heat recovery, waste heat boilers ,types of heat pumps, adsorption and absorption refrigerator. Topics include economic analysis of cogeneration and waste heat recovery systems.

01516031 ENERGY ENGINEERING LABORATORY 1 1 (0-3-2)
(3 credits, 3-hour lecture)

PREREQUISITE: NONE

Study and observe experiments which related to energy engineering, fundamental theory of energy engineering in all fields such as thermodynamics, heat transfer, fluid mechanic, and energy management will be revealed by experimentation.

01516032 ENERGY ENGINEERING LABORATORY 2 1 (0-3-2)
(3 credits, 3-hour lecture)

PREREQUISITE: ENERGY ENGINEERING LABORATORY 1

Study and observe experiments which related to energy engineering such as electrical machines and electrical machine drives, electrical materials, power electronic circuits.

Major Electives

01516101 AUTOMATION AND CONTROL IN ENERGY ENGINEERING 3 (3-0-6)
(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This course covers fundamental of automation and control design in energy engineering including how to install and maintain complex machines and systems.

01516102 ELECTROMAGNETIC ENERGY 3 (3-0-6)
(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This course discusses applications of electromagnetic and equivalent quantum mechanical principles to classical and modern devices. It covers energy conversion and power flow in both macroscopic and quantum- scale electrical and electromechanical systems, including electric motors and generators, electric circuit elements, quantum

tunneling structures and instruments. It studies photons as waves and particles and their interaction with matter in optoelectronic devices, including solar cells, displays, and lasers.

01516103 ELECTROCHEMICAL ENERGY SYSTEMS 3 (3-0-6)
(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This course introduces principles and mathematical models of electrochemical energy conversion and storage. Students study equivalent circuits, thermodynamics, reaction kinetics, transport phenomena, electrostatics, porous media, and phase transformations. In addition, this course includes applications to batteries, fuel cells, supercapacitors, and electro kinetics.

01516104 FAN, PUMP AND PIPING SYSTEM DESIGN 3 (3-0-6)
(3 credits, 3-hour lecture)

PREREQUISITE: NONE

Principle of fluid mechanics, application of fan and pump, performance curve, system operation, system design and selection, piping system design.

01516105 FLUID POWER SYSTEM DESIGN 3 (3-0-6)
(3 credits, 3-hour lecture)

PREREQUISITE: NONE

Fundamentals of pneumatic system, pneumatic application in food industry, compressed air system, air compressor, compressed-air preparation, working device, control valve, design of circuit control system and application, energy cost analysis in compressed-air system, principle of hydraulic system and hydraulic system components.

regulatory regimes governing natural gas, electricity, and nuclear power; and the implications of new climate change and renewable energy mandates for the electric power sector.

Alternative Study Courses

1. Special Project

01516201 ENERGY ENGINEERING PROJECT 1 3 (0-9-0)
(3 credits, 9-hour lab)

PREREQUISITE : NONE

The research on selected topics in energy engineering or related fields for the students to do research under the supervision of an advisor, a progress report and oral presentation before the end of the semester.

01516202 ENERGY ENGINEERING PROJECT 2 3 (0-9-0)
(3 credits, 9-hour lab)

PREREQUISITE : 01XX6XXX

This course following the 01XX6XXX Energy Engineering Project I, a progress report and oral presentation before the end of the semester.

2. Cooperative Education

01516301 COOPERATIVE EDUCATION 6 (0-45-0)
(6 credits)

PREREQUISITE: NONE

This course demands the student to work in an innovative company or a government/ private organization, which is approved by the program committee for working on an innovative project for at least 16 weeks. The work of the student is under supervision of a faculty member, who is regarded as the student's supervisor. The student must report progress to the supervisor regularly. Upon completion, the student must prepare and deliver oral presentations describing the work from the program.

3. Oversea Training or Study Abroad

01006005 OVERSEAS TRAINING

6 (0-45-0)

(6 credits)

PREREQUISITE: NONE

Students enroll in the overseas training course to train and conduct special projects relating to their academic background. The training may occur in an institute or an industry that can be either public or private. Any relating issue should conform to the proclamation from the Faculty of Engineering.

XXXXXXXXX STUDY ABROAD

6 (0-45-0)

(6 credits)

PREREQUISITE: NONE

This course is reserved for students who participate in the study abroad program. Upon the completion of the program, the students must prepare and deliver oral presentations describing their experience from the program.