



Bachelor of Engineering in Mechanical Engineering
(International Program)
(2019 New Program)

Faculty of Engineering
King Mongkut's Institute of Technology Ladkrabang
(Approved by Federation of Professional)

5.4 Admission

- Only Thai students
- Only International students
- Both Thai and Foreign students

5.5 Collaborations with Other Institutes

- 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 of 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 on August 2019.
 - The program has been endorsed by the University Academic committee in its meeting No.10th/2019 on the 16 October 2018.
 - The program has been endorsed by the Academic Committee of KMITL in its meeting No. 11/2018 on 28 November 2018
- The course was certificated by
 - On..... ..

7. Expected date for Thai Qualifications Register (TQR)

Academic Year 2021

8. Careers Paths

1. Mechanical/ Mechatronic/ Production/ Process/ Factory/ Maintenance/ Technical Service/ Design/ Piping/ Sale/ Purchasing/ Project/ Production Planning/ Research and Development/ Safety Engineer
2. Entrepreneur
3. Freelancer in Mechanical Field

9. Instructure Details

Name-Surname Academic position	Qualification (Field of study)	University
1. Asst.Prof.Dr. Akapot Tantrapiwat (Mechanical Engineer)	B.Eng. (Mechanical Engineering)	KMITL,Thailand, 1997
	M.S. (Mechanical Engineering)	Lehigh University,USA, 2005
	Ph.D. (Mechanical Engineering)	Lehigh University,USA, 2005
2. Assoc.Prof.Dr. Pongjet Promvonge	B.Eng. (Mechanical Engineering)	Khon Kaen University, 1978
	M.S. (Mechanical Engineering)	Chulalongkorn University, 1993
	Ph.D. (Mechanical Engineering)	Imperial College,University of London, Uk, 1997
3. Asst.Prof.Dr. Chinda Charoenphonpanich	B.Eng. (Mechanical Engineering)	KMITL,Thailand, 1997
	M.Eng. (Mechanical Engineering)	Tokai University,JAPAN, 1994
	D.Eng. (Mechanical Engineering)	Tokai University,JAPAN, 2004
4. Dr.Nattawut Ruangtrakoon	B.Eng. (Mechanical Engineering)	Silpakorn University, 2006
	D.Eng. (Mechanical Engineering)	Sirindhorn International Institute of Technology, Thammasat University, Thailand, 2014
5. Dr.Ponepen Laphirattanakul	B.Eng. (Mechanical Engineering)	KMITL,Thailand, 2010
	M.Eng. (Mechanical Engineering)	KMITL,Thailand, 2013
	D.Eng. (Mechanical Engineering)	KMITL,Thailand, 2017

10. Location of Study

- King Mongkut's Institute of Technology Ladkrabang
- Off-site at.....

11. External Situation of Developments Needed to be Considered for Planning of the Program

11.1 Economic Situation/Development

As Thailand is facilitating the national development with the use science and technology as instruments for enhancing innovations applied in government or private organizations to raise the national gross deomestic product, many entrepreneurs has to replace unskilled labour with skilled labour and automatical equipment and machinery. Thus, that leads to the rapid change of science and technology—integrated science and technology, so labour who can apply their knowledge of various fields is on demands more than the ones who has expertise in only one field. Furthermore, since Thailand has become a part of ASEAN Economics Community (AEC), there is the measures facilitating the exchange of skilled labour and business cooperation between countries. Therefore, it is crucial to equip graduates with expertise in science, technology, English skills and expertise in their profession in response to

international competition, so that Thailand will be developed in accordance with the policy mentioned above.

11.2 Social and Cultural Situation/Development

According to the statistical figures, Thailand is increasingly entering an aging society, while the number of working labour, the main driving force of the country, are decreasing respectively. Thus, the current and the future society relies on the automatic or semi-automatic technology and facilities that are available. Similarly, apart from technology and facilities mentioned above, the information technology is also important to citizens' way of life as it helps citizens to communicate with others, help broaden knowledge, and support citizens to acquire knowledge on their own. Additionally, due to the international community exchange in many ways, the society has more opened leading to increasing cultural integration, communication and migration.

12. Effect 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 the curriculum to prepare students to be capable of mechanical engineering and be able to combine their expertise with skills in other fields, especially in computer science and automation, so the students will be an important force in business development, and industries that use advanced technology.

- Regularly update courses to respond to changes in national strategies and development in science and technology in the future.

12.2 Relation to the missions of the Institute

The institution aims at preparing graduates to have outstanding qualifications in accordance with the institute's guidelines. The institute also aims to educate graduates to have self-improvement as well as life-long learning, and offer them the opportunity to perform real assigned tasks, so they will be diligent and patient. Students will also be equipped with honesty and ethics. More importantly, the students will have necessary qualifications for driving country progression which is the main objective of the institute.

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 Subject
- Elective Courses

13.2. Subjects / Subject Groups in the Program Open and Required to be Studied by Other Faculties / Departments / Programs/ General Education subjects/ Specific subjects/ Free Electives

- General Education Courses
- Specific Subject
- Elective Courses
- None

13.3 Management

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

Curriculum

Curriculum

Total Credits **147 Credits**

Curriculum Structure

A. General Education courses	30	Credits
B. Specialized Education courses	111	Credits
Required courses	108	Credits
Fundamentals of science and mathematics	21	Credits
Fundamentals of engineering	24	Credits
Core courses	57	Credits
Elective prescribed courses	6	Credits
Alternative Study Subjects	3	Credits
C. Free elective courses	6	Credits

Subjects in the curriculum

A. General Education courses **30 Credits**

- Required courses 21 Credits

Code	Subjects	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)
01006517	DESIGN METHODS FOR INNOVATIONS	4(4-0-8)
01006520	LEAN STARTUP AND AGILE BUSINESS	4(4-0-8)
01006520	LEADERSHIP AND PERSONAL DEVELOPMENT	3(3-0-6)

- Required courses 9 Credits

Code	Subjects	Credits (Lecture-Practice-Self Study)
01006502	PROFESSIONAL ETHICS	3 (3-0-6)
01600503	INTRODUCTION TO PSYCHOLOGY	3 (3-0-6)
01600504	PHILOSOPHY OF SCIENCE	3 (3-0-6)

01600505	CREATIVE THINKING	3 (3-0-6)
01600506	CRITICAL THINKING	3 (3-0-6)
01600507	PERSONAL ECONOMY	3 (3-0-6)

- Required courses 9 Credits

Code	Subjects	Credits Lecture-Practice-Self Study)
01600508	DIGITAL ECONOMY	3 (3-0-6)
01600509	ENGINEERING AND PUBLIC POLICY	3 (3-0-6)
01600511	THAI SOCIETY AND CULTURE	3 (3-0-6)
01600514	INNOVATIVE COMMUNICATION	4 (4-0-8)
01500516	INNOVATION MANAGEMENT	4 (4-0-8)
01600518	EMERGING TRENDS IN ENGINEERING	1 (1-0-2)
01600519	INTRODUCTION TO ENVIRONMENTAL PRINCIPLES	3 (3-0-6)
01600521	MEDIATION FOR LIFE DEVELOPMENT	3 (3-0-6)

-Alternative Study Subjects

For students who have lower English skills than required level. Students have to these subjects without credit counts.

Code	Subjects	Credits (Lecture-Pratice-Self Study)
01006500	ACADEMIC LISTENING AND SPEAKING	4 (4-0-8) Audit
01006501	ACADEMIC READING AND WRITING	4 (4-0-8) Audit

B. Specialized Education courses 111 Credits

- Required courses 108 Credits

Fundamentals of Science and Mathematics Subjects	21	Credits
Fundamental Science Subjects	12	Credits
Fundamental Mathematics Subjects	9	Credits

Fundamental Science Subjects

12 Credits

Code	Subjects	Credits (Lecture-Pratice-Self Study)
01006702	PHYSICS I	4 (3-3-8)
01006703	PHYSICS II	4 (3-3-8)
01006708	CHEMISTRY	4 (3-3-8)

Fundamental Mathematic Subjects

9 Credits

Code	Subjects	Credits (Lecture-Pratice-Self Study)
01006710	INTRODUCTION TO CALCULUS	3 (3-0-6)
01006711	ADVANCED CALCULUS	3 (3-0-6)
01006712	DIFERENTIAL EQUATIONS AND LINEAR ALGEBRA	3 (3-0-6)

Fundamental Engineering Subjects

35 Credits

Code	Subjects	Credits (Lecture-Practice-Self Study)
01006801	INTRODUCTION TO ENGINEERING PROGRAMMING	3 (2-2-5)
01006802	ENGINEERING DRAWING	3 (2-2-5)
01006804	ENGINEERING MATERIALS	3 (3-0-6)
01006805	INDUSTRIAL INTERNSHIP	0 (0-45-0)
01426001	ENGINEERING STATICS *	3 (3-0-6)
01426002	ENGINEERING DYNAMICS *	3 (3-0-6)
01426003	COMPUTATIONAL PRACTICE	1 (0-3-2)
01426004	THERMODYNAMICS I *	3 (3-0-6)
01426005	MECHANICS OF MATERIALS *	3 (3-0-6)
01426006	MANUFACTURING PROCESSES *	3 (3-0-6)
01426007	FLUID MECHANICS *	3 (3-0-6)
01426008	MECHANICAL DRAWING AND COMPUTER GRAPHICS	2 (2-1-3)
01426009	MECHANICAL PRACTICE I	1 (0-3-2)
01426010	MECHANICAL PRACTICE II	1 (0-3-2)
01426011	THERMODYNAMICS II	3 (3-0-6)

Specific course

40 credits

Code	Subjects	Credits (Lecture-Practice-Self Study)
01426012	INTRODUCTION TO MECHATRONICS	3 (3-0-6)
01426013	MECHANICS OF MACHINERY *	3 (3-0-6)
01426014	NUMERICAL COMPUTATION FOR MECHANICAL ENGINEERS	3 (3-0-6)
01426015	MECHANICAL ENGINEERING DESIGN	3 (3-0-6)
01426016	HEAT AND MASS TRANSFER *	3 (3-0-6)
01426017	MECHANICAL VIBRATION *	3 (3-0-6)
01426018	COMPUTER AIDED MECHANICAL ENGINEERING DESIGN*	3 (3-0-6)
01426019	MECHANICAL BUILDING SYSTEMS	3 (3-0-6)
01426020	MECHANICAL ENGINEERING LABORATORY I	1 (0-3-2)
01426021	MECHANICAL ENGINEERING LABORATORY II	1 (0-3-2)
01426022	REFRIGERATION AND AIR CONDITIONING *	3 (3-0-6)
01426023	AUTOMATIC CONTROL *	3 (3-0-6)
01426024	POWER PLANTS *	3 (3-0-6)
01426025	AUTOMOTIVE ENGINEERING	3 (3-0-6)
01426026	INDUSTRIAL EXPERIENCE PREPARATION	2 (2-1-3)

Elective Subjects

9 Credits

Selected from following subjects

Elective Subjects for general engineering

Code	Subjects	Credits (Lecture-Practice-Self Study)
01426101	RESEARCH METHODOLOGY AND SCIENTIFIC WRITING	3 (3-0-6)

Elective Subjects for heat and fluid engineering

Code	Subjects	Credits (Lecture-Practice-Self Study)
01426110	CONDUCTION AND RADIATION HEAT TRANSFER	3 (3-0-6)
01426111	CONVECTION HEAT TRANSFER	3 (3-0-6)
01426112	COMBUSTION	3 (3-0-6)

01426113	THERMAL SYSTEM DESIGN	3 (3-0-6)
01426114	GAS TURBINE	3 (3-0-6)
01426115	AERODYNAMICS	3 (3-0-6)
01426116	FLUID MACHINERY	3 (3-0-6)
01426117	PINCH POINT TECHNOLOGY	3 (3-0-6)

Elective Subjects for design and manufacture engineering

Code	Subjects	Credits (Lecture-Practice-Self Study)
01426120	PLUMBING SYSTEM DESIGN	3 (3-0-6)
01426121	PIPING DESIGN FOR INDUSTRIAL PLANTS	3 (3-0-6)
01426122	COMPUTER-AIDED MANUFACTURING (CAM)	3 (3-0-6)
01426123	INTRODUCTION TO ROBOTICS	3 (3-0-6)
01426124	MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE	3 (3-0-6)
01426125	INTEGRATED PRODUCT DESIGN	3 (3-0-6)
01426126	OPERATION RESEARCH	3 (3-0-6)

Elective Subjects for energy and environmental engineering

Code	Subjects	Credits (Lecture-Practice-Self Study)
01426130	RENEWABLE AND SUSTAINABLE ENERGY	3 (3-0-6)
01426131	ENERGY CONSERVATION AND MANAGEMENT	3 (3-0-6)
01426132	WASTE WATER TREATMENT	3 (3-0-6)

Elective Subjects for materials and mechanics engineering

Code	Subjects	Credits (Lecture-Practice-Self Study)
01426140	FRACTURE MECHANICS AND FAILURE ANALYSIS	3 (3-0-6)
01426141	INTRODUCTION TO SMART MATERIALS	3 (3-0-6)

Elective Subjects for automotive engineering

Code	Subjects	Credits (Lecture-Practice-Self Study)
01426150	INTERNAL COMBUSTION ENGINES	3 (3-0-6)
01426151	ADVANCED AUTOMOTIVE ENGINEERING	3 (3-0-6)
01426152	INTRODUCTION TO HYBRID AND ELECTRIC VEHICLES	3 (3-0-6)
01426153	AUTONOMOUS AND INTELLIGENT VEHICLE	3 (3-0-6)
01426154	UNMANNED AIR VEHICLE SYSTEMS	3 (3-0-6)

Alternative Study

Alternative Study is divided in to 3 choices. Students can choose one of the choices that appropriate for themselves. 6 Credits as follow.

1. Special Project

Code	Subjects	Credits (Lecture-Practice-Self Study)
01426201	MECHANICAL ENGINEERING PROJECT I	3 (0-9-0)
01426202	MECHANICAL ENGINEERING PROJECT II	3 (0-9-0)

2. Cooperative Education

Code	Subjects	Credits (Lecture-Practice-Self Study)
01006301	COOPERATIVE EDUCATION	6 (0-45-0)

3. Study Aboard or Overseas Training

This alternative study is divided in to 2 choices which are Study Aboard or Overseas Training. Students have to choose one of the choice.

Code	Subjects	Credits (Lecture-Practice-Self Study)
01006005	OVERSEA TRAINING	6 (0-45-0)

(Students who chose Study Aboard can transfer credits from overseas education institute follow the institution announcement not over 6 credits)

Or

Code	Subjects	Credits (Lecture-Practice-Self Study)
01006302	STUDY ABROAD	6 (6-0-12)

Study Plan

1st Year, 1st Semester

Code	Subjects	Credits (Lecture-Practice-Self Study)
01006710	INTRODUCTION TO CALCULUS	3 (3-0-6)
01006702	PHYSICS I	4 (3-3-8)
01006708	CHEMISTRY	4 (3-3-8)
01006801	INTRODUCTION TO ENGINEERING PROGRAMMING	3 (2-2-5)
01006510	INTRODUCTION TO ECONOMICS	3 (3-0-8)
01006513	INTERPRETATION AND ARGUMENTS	4 (4-0-8)
01006500	(ESL) ACADEMIC LISTENING AND SPEAKING**Audits**	**4 (4-0-8)
Total		21

1st Year, 2nd Semester

Code	Subjects	Credits (Lecture-Practice-Self Study)
01006703	PHYSICS II	4 (3-3-8)
01006711	ADVANCED CALCULUS	3 (3-0-6)
01006802	ENGINEERING DRAWING	3 (2-2-5)
01006804	ENGINEERING MATERIALS	3 (3-0-6)
01426003	COMPUTATIONAL PRACTICE	1 (0-3-2)
01426001	ENGINEERING STATICS	3 (3-0-6)
01006512	ASIAN STUDY	3 (3-0-6)
01006501	(ESL) ACADEMIC READING AND WRITING**Audits**	**4 (4-0-8)
Total		20

2nd Year, 1st Semester

Code	Subjects	Credits (Lecture-Practice-Self Study)
01006712	DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA	3 (3-0-6)

Code	Subjects	Credits (Lecture-Practice-Self Study)
01426004	THERMODYNAMICS I	3 (3-0-6)
01426005	MECHANICS OF MATERIALS	3 (3-0-6)
01426007	FLUID MECHANICS	3 (3-0-6)
01426002	ENGINEERING DYNAMICS	3 (3-0-6)
01426008	MECHANICAL DRAWING AND COMPUTER GRAPHICS	2 (2-1-3)
01426009	MECHANICAL PRACTICE I	1 (0-3-2)
010065xx	(GEN-ED ELECTIVES)	3 (3-0-6)
Total		21

2nd Year, 2st Semester

Code	Subjects	Credits (Lecture-Practice-Self Study)
01426011	THERMODYNAMICS II	3 (3-0-6)
01426012	INTRODUCTION TO MECHATRONICS	3 (3-0-6)
01426013	MECHANICS OF MACHINERY	3 (3-0-6)
01426014	NUMERICAL COMPUTATION FOR MECHANICAL ENGINEERS	3 (3-0-6)
01426010	MECHANICAL PRACTICE II	1 (0-3-2)
01426006	MANUFACTURING PROCESSES	3 (3-0-6)
01006517	LEAN STARTUP AND AGILE BUSINESS	4 (4-0-8)
Total		21

3rd Year, 1st Semester

Code	Subjects	Credits (Lecture-Practice-Self Study)
01426020	MECHANICAL ENGINEERING LABORATORY I	1 (0-3-2)
01426015	MECHANICAL ENGINEERING DESIGN	3 (3-0-6)
01426016	HEAT AND MASS TRANSFER	3 (3-0-6)
01426017	MECHANICAL VIBRATION	3 (3-0-6)
01426018	COMPUTER AIDED MECHANICAL ENGINEERING DESIGN	3 (3-0-6)
01426019	MECHANICAL BUILDING SYSTEMS	3 (3-0-6)
01006515	DESIGN METHODS FOR INNOVATIONS	4 (4-0-8)
Total		20

3rd Year, 2st Semester

Code	Subjects	Credits (Lecture-Practice-Self Study)
01426021	MECHANICAL ENGINEERING LABORATORY II	1 (0-3-2)
01426022	REFRIGERATION AND AIR CONDITIONING	3 (3-0-6)
01426023	AUTOMATIC CONTROL	3 (3-0-6)
01426024	POWER PLANTS	3 (3-0-6)
01426025	AUTOMOTIVE ENGINEERING	3 (3-0-6)
014261xx	ENGINEERING ELECTIVE	3 (3-0-6)
01426026	INDUSTRIAL EXPERIENCE PREPARATION	2 (2-1-3)
010065xx	(GEN-ED ELECTIVES)	3 (3-0-6)
Total		21

3rd Year, 2st Semester

Code	Subjects	Credits (Lecture-Practice-Self Study)
01006805	INDUSTRIAL INTERNSHIP	0 (0-45-0)
Total		0

4th Year, 1st Semester

Study plans for students who choose a special project

Code	Subjects	Credits (Lecture-Practice-Self Study)
01426201	MECHANICAL ENGINEERING PROJECT I	3 (3-0-6)
014261xx	ENGINEERING ELECTIVE	3 (3-0-6)
xxxxxxxx	FREE ELECTIVE COURSE	3 (X-X-X)
010065xx	(GEN-ED ELECTIVES)	3 (3-0-6)
Total		12

Cooperative Education

Code	Subjects	Credits (Lecture-Practice-Self Study)
01006301	Cooperative Education	6 (0-45-0)
Total		6 (0-45-0)

Study Aboard

Code	Subjects	Credits (Lecture-Practice-Self Study)
01006302	STUDY ABOARD	6 (0-45-0)
Total		6 (0-45-0)

OR

Code	Subjects	Credits (Lecture-Practice-Self Study)
01006005	OVERSEA TRAINING	6 (0-45-0)
Total		6 (0-45-0)

4th Year, 2st Semester

Special Project

Code	Subjects	Credits (Lecture-Practice-Self Study)
01426202	MECHANICAL ENGINEERING PROJECT II	3 (3-0-6)
014261xx	ENGINEERING ELECTIVE	3 (3-0-6)
xxxxxxxx	FREE ELECTIVE COURSE	3 (X-X-X)
01006520	LEADERSHIP AND PERSONAL DEVELOPMENT	3 (3-0-6)
Total		12

Cooperative Education or Study Aboard

Code	Subjects	Credits (Lecture-Practice-Self Study)
014261xx	ENGINEERING ELECTIVE	3 (3-0-6)
014261xx	ENGINEERING ELECTIVE	3 (3-0-6)
xxxxxxxx	FREE ELECTIVE COURSE	3 (X-X-X)
xxxxxxxx	FREE ELECTIVE COURSE	3 (X-X-X)
01006520	LEADERSHIP AND PERSONAL DEVELOPMENT	3 (3-0-6)
010065xx	(GEN-ED ELECTIVES)	3 (3-0-6)
Total		18

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 real-world 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.

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.

01006801 INTRODUCTION TO ENGINEERING PROGRAMMING**3 (2-2-5)****(3 credits, 2-hour lecture, 2-hour lab)****PREREQUISITE: NONE**

This course introduce basic concepts of computer programming such as elementary programming, data types, expressions, simple algorithms and problem solving involving sequential statements, conditionals and iterations. Students learn routines or methods as fundamental concepts and practice using strings, arrays, lists, maps or dictionaries, predefined libraries and classes, abstraction mechanisms and basic object oriented programming concepts. Students will practice related activities of software development life cycle such as system requirement analysis, debugging, testing and validation.

01006802 ENGINEERING DRAWING**3(2-2-5)****(3 credits, 2-hour lecture, 2-hour lab)****PREREQUISITE: NONE**

Lettering, orthographic projection, orthographic drawing and pictorial drawings, dimensioning and annotations, sections, auxiliary views, development, freehand sketches, detail and assembly

drawings, diagram and symbols, fit and tolerancing, basic GD&T, computer aided drawing, project based assignments on design and fabrication of solid and hollow parts.

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 course

01426001 ENGINEERING STATICS

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

Study of the concepts of engineering based on forces in equilibrium. Topics include force systems, resultant, concentrated forces, distributed forces, forces due to friction, and inertia as they apply to trusses, frames, machines, structures, and systems. The resultant force of a pressure loading by a fluid. Upon completion and using computer software, students should be able to solve problems which require the ability to analyze systems of forces in static equilibrium and fluid static.

01426002 ENGINEERING DYNAMICS

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This course introduces the dynamics of mechanical systems including kinematic and kinetic analysis of mechanical linkages and mechanisms as particles and rigid bodies. Topics covered

rectilinear and curvilinear motions of a particle; force, mass and acceleration; work-energy concepts; impulse-momentum formulation for systems of particles and rigid bodies in planar motion, moving coordinate systems with relative motion; kinematics of rigid bodies; general planar rigid body kinematics and kinetics. Students will have skill of using graphical, analytical, and computer methods for the kinematic and dynamic analysis of mechanical linkages.

01426003 COMPUTATIONAL PRACTICE

1 (0-3-2)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This is the course that will prepare students for basic computational skills which will be used for most subjects in the program. Widely used mechanical engineering software such as Matlab, Labview, and other computational methods are introduced. Learning how to acquire student license software, installation and maintenance of these programs. Also many useful open source program such as Pythons and Wolfram program will be introduced and practiced in this course.

01426004 THERMODYNAMICS I

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 gasturbine 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. Some open source computational program will be introduced for solving Thermodynamics problems. Students will learn how to use computer as a tool for the analyses.

01426005 MECHANICS OF MATERIALS

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: 01426001 ENGINEERING STATICS

Mechanical properties of materials; stress and strain; axial load, bending; shear; torsion; design of beam and shaft; defection of beam and shaft, buckling; pressured vessels; combined

stresses; Mohr's circle; failure theory; using software program for calculation stresses and displacements due to different cases of loads.

01426006 MANUFACTURING PROCESSES

3 (3-0-6)

(3 credits, 3-hour lab)

PREREQUISITE: NONE

Basic manufacturing processes; Fundamental properties of materials; Fundamental and metal casting processes; Forming and shaping processes of metals and polymer; Fundamental and machining processes; Machine tool; Cutting-tool technology; Fundamental of manufacturing cost; Joining processes, welding and assembly; Introduction of modern manufacturing processes and computer technology in manufacturing

01426007 FLUID 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.

01426008 MECHANICAL DRAWING AND COMPUTER GRAPHICS

2 (2-1-3)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

Using computer graphic in the application of mechanical drawing in order to construct mechanical component drawings with orthographic projection, section drawing and standard components annotation, interpretation of shop drawing and assembly drawing including standard code and symbol including the geometric dimensioning and tolerance. Learn how to use available open-source program such as FreeCAD or other similar software in mechanical design and drafting.

01426009 MECHANICAL PRACTICE I

1 (0-3-2)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

Introduction to basic workshop and machine tool practices. Conventional lathe, drill and tap, milling, sawing, sheet metal working, welding, and bench work are introduced. The production of mechanical components and workpieces are assigned to be the hand-on practice.

01426010 MECHANICAL PRACTICE II**1 (0-3-2)****(3 credits, 3-hour lecture)****PREREQUISITE: NONE**

Introduction to advanced processes such as computer numerical control machining and programming, this includes working with CNC-lathe, CNC-machining center and laser cutting. Basic mechatronic practice such as PCB making, pneumatic design and fabrication are also learned. A product manufacturing using various materials and processes is assigned as the term project.

01426011 THERMODYNAMICS II**3 (3-0-6)****(3 credits, 3-hour lecture)****PREREQUISITE: 01426004 THERMODYNAMICS I**

Exergy; power cycles and refrigeration cycles; thermodynamics property relations; gas mixtures and psychrometry; chemical reactions; chemical and phase equilibrium; compressible fluid flow

01426012 INTRODUCTION TO MECHATRONICS**3 (3-0-6)****(3 credits, 3-hour lecture)****PREREQUISITE: NONE**

The integration of mechanics, electronic and computer disciplines. Learning of basic elements which are necessary for the embedded system. Various sensors, actuators and controllers are introduced. Study on the important factors and techniques to design mechatronic system. Learning the automations and mechatronic technology which complies with the development strategie of Thailand 4.0 is included in this course.

01426013 MECHANICS OF MACHINERY**3 (3-0-6)****(3 credits, 3-hour lab)****PREREQUISITE: 1426002 ENGINEERING DYNAMICS**

This is a continuous course of 1426002. In this course students will learn various motions of machines and mechanisms. Displacements, velocities, accelerations of machine components and mechanism member will be analyzed using the graphical method, vector polygon, instantaneous center of rotation etc. Static and dynamic force associated with the motion and interaction of machine component will be determined.

01426014 NUMERICAL COMPUTATION FOR MECHANICAL ENGINEERS**3 (3-0-6)****(3 credits, 3-hour lecture)****PREREQUISITE: 01426003 COMPUTATIONAL PRACTICE**

Introduction of computational method for solving mechanical engineering problem, definition of error. Mathematical modeling for problems in mechanical engineering; such as heat and fluid flow, structure analysis, system dynamics etc. Roots of functions. Numerical method for solving system of linear and non-linear equations. Numerical differentiation and integration. Numerical method for ordinary and partial differential equation. Use of professional computer software for solving complex problems in mechanical engineering.

01426015 MECHANICAL ENGINEERING DESIGN**3 (3-0-6)****(1 credits, 3-hour lab)****PREREQUISITE: 01426005 MECHANIC OF MATERIALS**

Application of solid mechanics in prediction of part and component failure, criteria of failure theories, design and selection of standard components such as rolling bearings, fasteners, springs, gears, and other transmission components. Computational analysis of complex parts in mechanical design is also introduced. Learning the automations machines which complies with the development strategie of Thailand 4.0 is included in this course.

01426016 HEAT AND MASS TRANSFER**3 (3-0-6)****(1 credits, 3-hour lab)****PREREQUISITE: 01426007 FLUID MECHANICS**

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, numerical solutions of heat transfer problems.

01426017 MECHANICAL VIBRATION**3 (3-0-6)****(3 credits, 3-hour lecture)****PREREQUISITE: NONE**

Definition of vibration motion; mathematical modeling of vibration system free and forced vibrations of a single degree of freedom system, transient forced vibrations of a single degree of freedom system; free and forced vibrations of multiple degree of freedom system; methods to reduce and control vibration; analyze the mechanical vibration problems using commercial software.

01426018 COMPUTER AIDED MECHANICAL ENGINEERING DESIGN**3 (3-0-6)****(3 credits, 3-hour lecture)****PREREQUISITE: NONE**

Advanced computer analysis in mechanical engineering that can be integrated with other tools and methods will be introduced along with numerical solution analysis using computer programming such as MatLab and Labview. Also coding in open source programs such as Pythons in order to analyze and design in mechanical problems. Computational software in mechanical engineering will be used to design and analyze case studies. Learning the computer control in automation which complies with the development strategie of Thailand 4.0 is included in this course.

01426019 MECHANICAL BUILDING SYSTEMS**3 (3-0-6)****(3 credits, 2-hour lecture, 2-hour lab)****PREREQUISITE: NONE**

Introduction of mechanical systems in buildings and constructions, it includes plumbing system, fire alarm system, elevators, escalators, heating and air conditioning systems, learning how to design the system, installation and maintenance. Also basic electrical equipment which relate to the building system are introduced.

01426020 MECHANICAL ENGINEERING LABORATORY I**1 (0-3-2)****(3 credits, 3-hour lecture)****PREREQUISITE: NONE**

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

01426021 MECHANICAL ENGINEERING LABORATORY II**1 (0-3-2)****(3 credits, 3-hour lecture)****PREREQUISITE: NONE**

Study and observe experimentations on applied science in mechanical engineering, applications such as pneumatic, hydraulic, vibration, system dynamic and control are introduced via experimentations. Also the integration of applied mechanics and control such as mechatronics will be studied.

01426022 REFRIGERATION AND AIR CONDITIONING**3 (3-0-6)****(3 credits, 3-hour lecture)****PREREQUISITE: NONE**

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.

01426023 AUTOMATIC CONTROL**3 (3-0-6)****(3 credits, 3-hour lecture)****PREREQUISITE: NONE**

Introduction of design and modelling of a control system, theory of transfer functions, poles, zeros, block diagram algebra, transient response analysis of first and second order systems, PID control, root locus techniques, application of MATLAB or other engineering software in automatic control.

01426024 POWER PLANTS**3 (3-0-6)****(3 credits, 3-hour lecture)****PREREQUISITE: NONE**

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.

01426025 AUTOMOTIVE ENGINEERING**3 (3-0-6)****(1 credits)****PREREQUISITE: NONE**

Introduction to types of street vehicles and their history, learning the principle of all main systems such as engine, transmission, suspension, body and chassis, control, and safety, latest

technologies in automotive engineering and the trend in the future, such as electric vehicles, hybrid system, and autonomous vehicle which relate to the movement in automotive industry and research.

01426026 INDUSTRIAL EXPERIENCE PREPARATION

2 (2-1-3)

(1 credits)

PREREQUISITE: NONE

This course is for preparing students before entering internship program and other senior year elective courses and programs such as independent study, oversea training and final year projects which are more involving with real industrial working environments. Project planning and methodology are learned. Case studies are investigated In order to guide student for their future carriers.

Elective subject

01426101 RESEARCH METHODOLOGY AND SCIENTIFIC WRITING

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

The course is focused on problem setting, assumption in finding the answer for the problem, data collection and data analysis in both quantitative and qualitative techniques. This involves critiquing current research in your discipline and developing competence in using instruments and software to collect data. Data analysis tools will be covered as well as understanding the validity and reliability of data. Furthermore, the course will develop skills in communicating scientific findings including writing academic publications and presentations. Additionally, This course offers practical guidelines for a successful approach of writing task. Special attention is paid to the problems of the beginning writer in scientific report.

01426110 CONDUCTION AND RADIATION HEAT TRANSFER

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

The main focus of the course is on method for solving heat transfer problems. The emphasis will be based on both analytical and numerical methods for the determination of the conduction of heat in solids and radiation between surfaces. The radiation transfer in absorbing, emitting and scattering media is also discussed in the course. Computer software such as MatLab, Mathematica or similar software will be introduced to solve problems in both heat transfer.

01426111 CONVECTION HEAT TRANSFER**3 (3-0-6)****(3 credits, 3-hour lecture)****PREREQUISITE: NONE**

This course focuses on transport of heat in fluids in motions, free and forced convection in laminar and turbulent flow over surfaces and within ducts, application of boundary layer heat transfer theory, similarity and dimensionless analysis, high speed flow heat transfer, natural convection heat transfer, boiling and condensation. The conservation equations are applied to solutions of heat transfer problems in various flow configurations of interest to industry. Current topical literature and computational software will be considered in both analytical and numerical aspect.

01426112 COMBUSTION**3 (3-0-6)****(3 credits, 3-hour lecture)****PREREQUISITE: NONE**

Brief review on thermodynamics relating to combustion science. Enthalpy of formation of chemical substance. Heat of reaction. Approximate and ultimate analysis of fuel. Stoichiometry. Chemical equilibrium. Utilization of energy from combustion. Chemical kinetics. Mode of combustion; premixed and diffusion flame. Flame speed. Ignition. Effect of turbulence. Combustion of solid fuel. Emissions and its mitigation techniques. Use of computer simulation for prediction of combustion in an industrial reactor.

01426113 THERMAL SYSTEM DESIGN**3 (3-0-6)****(3 credits, 3-hour lecture)****PREREQUISITE: NONE**

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, 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.

01426114 GAS TURBINE 3**(3-0-6)****(3 credits, 3-hour lecture)****PREREQUISITE: NONE**

The course includes gas dynamics, Brayton cycle, gas turbine cycle and its components. The use of gas turbines in power generation, petrochemical and pipeline and aviation industries will be discussed in this course. The course explains how a turbine works and the different types in common use and how to control and operate turbines efficiently. Effect of some parameters on the performance of the gas turbine cycle are also introduced such as ambient temperature and pressure, compressor cleaning, intake water misting, intake air filtration, etc. Furthermore, The performance benefits of using combined cycle gas turbine performance and cogeneration and the use of inter-cooling and reheat are also included. Basic computer software such as MatLab or similar will be used to demonstrate the effect of some parameter over the cycle performance.

01426115 AERODYNAMICS**3 (3-0-6)****(3 credits, 3-hour lecture)****PREREQUISITE: NONE**

This course focuses on forces and moment acting on solid bodies moving through fluids in subsonic flow, evaluation of power requirement, stability and control forces for various maneuvers, application of concepts and techniques of potential-flow theory and boundary-layer theory. The course will also introduce a fundamental understanding of concepts and models used to aerodynamically analyze and design subsonic, transonic, and supersonic craft. Problems in aerodynamics are investigated in both analytical and numerical approaches.

01426116 FLUID MACHINERY**3 (3-0-6)****(3 credits, 3-hour lecture)****PREREQUISITE: NONE**

Basic components of fluid machinery; blade theory; axial, radial and mixed flow; dimensional analysis; pump and turbine efficiency; cavitation in pumps; optimal design and selection of pumps using computer programs.

01426117 PINCH POINT TECHNOLOGY**3 (3-0-6)****(3 credits, 3-hour lecture)****PREREQUISITE: NONE**

The course introduces a systematic methodology for energy saving in processes and total sites. The methodology is based on thermodynamic principles. The three rules of the pinch principle,

composite curves drawing and capital-energy trade off for new and retrofit designs are also examined. The use of hot and cold energy at the site and the most suitable way to integrate heat engines and heat pumps are explained. Computer software is introduced in the most practical solution to increase total plant efficiency.

Elective Engineering and Design Group

01426120 PLUMBING SYSTEM DESIGN

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

Design and installation of cold water and hot water piping systems used in buildings; waste piping and soil piping; vent piping; extinguishing system; steam piping; optimal designs of plumbing system using computer programs.

01426121 PIPING DESIGN FOR INDUSTRIAL PLANTS

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

Pipe specifications and pertinent codes; valves; fitting; pumps and compressors; transportation function of piping as related to power plants, refineries, slurry systems and pumping systems; philosophy of system design regarding strength and vibration.

01426122 COMPUTER-AIDED MANUFACTURING (CAM)

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

The fundamental of digital modeling which influences the engineering design using computer system and the advancement of software generating models that represent actual parts and their mechanical properties, understanding the basic mathematic geometry, standard 3D modeling that can be implemented into the modern manufacturing plants where the CAD/CAM technology is commonly utilized such as cnc, programmable logic controller (plc) and robotic.

01426123 INTRODUCTION TO ROBOTICS

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

Introduction to robot mechanisms, dynamics, and intelligent controls, Planar and spatial kinematics, inverse kinematic and motion planning; manipulator mechanism and mobile robots, multi-rigid-body dynamics, 3D graphic simulation; control design, actuators, and sensors; human-machine interface, and embedded software.

01426124 MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

Fundamental of artificial intelligent methodology and applications, this includes problem solving and optimization by search, neural network modeling, representing and reasoning with uncertain knowledge and machine learning. Applications of machine learning in mechanical engineering are used as the case studies.

01426125 INTEGRATED PRODUCT DESIGN 3

(3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

Learning how to implement basic engineering knowledge into the product design and development, particularly aimed for different objectives such as higher efficiency, lower production cost, more attractive design and compact size etc. by integrating the essence of machine design, manufacturing processes, industrial design and the fundamental of economy in which the production cost and return of investment are also considered.

01426126 OPERATION RESEARCH

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This is an introduction to scientific method in decision making. Through mathematical modeling, it seeks to design, improve and operate complex systems in the best possible way. The course will explain methodology of operation research, linear programming, dynamic programming, game theory, queuing theory, simulation and industrial applications. Analytic techniques and computer packages will be used to solve problems.

Engineering and Environmental Elective Courses

01426130 RENEWABLE AND SUSTAINABLE ENERGY

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

The Renewable and Sustainable Energy course provides an understanding of the conversion principles and technology behind various renewable energy sources such as Solar, wind, hydroelectricity, hydrogen, biomass and geothermal energy. These major conversion methods will be quantitatively compared throughout the course with the main energy consumption pathways of human societies in different parts of the globe. Energy consumption of transportation, heating/cooling, food production and manufacturing of goods will be discussed. Energy savings potentials of the various consumption pathways will also be examined. Moreover, the study covers economics and environmental aspect of these alternative energies.

01426131 ENERGY CONSERVATION AND MANAGEMENT

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

Fundamentals of energy conservation and management; energy balance analysis for energy conservation and management; transformer; motor; lighting; boiler; air conditioner; air compressor; energy auditing; instruments and techniques for auditing; economic analysis and energy conservation plan; relevant laws; case studies.

01426132 WASTE WATER TREATMENT

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

This course describes water quality objectives and the chemical, physical, and biological processes necessary for designing and managing modern drinking water and wastewater treatment plants. The principles of coagulation, flocculation, sedimentation, filtration, biological treatment, solids handling, disinfection, and advanced treatment processes are included. The treatment plant design of physical, chemical and biological processes are provided and also focused on how to combine different treatment processes to meet present and future effluent requirements.

01426140 FRACTURE MECHANICS AND FAILURE ANALYSIS

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

Fracture mechanics, remnant life assessment, general practice in failure analysis, fractographic analysis, ductile and brittle fracture, fatigue, stress corrosion cracking, hydrogen embrittlement, fracture criteria in design, method of analysis; discussion of real cases of failure.

01426141 INTRODUCTION TO SMART MATERIALS

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

Introducing the technology of smart materials and their applications especially used in mechanical engineering, developing an essential understanding of structure-property relationship of smart materials, such as dielectric, piezoelectric, magnetoelectric and shape memory materials are learned. The mechanical properties and the working mechanism which relate to how to design and search for desired characteristics. Fabrication and implementation of smart materials in mechanical applications are also included as case studies.

01426150 INTERNAL COMBUSTION ENGINES

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: NONE

Fundamental of Internal combustion engine, types and their operations; combustion processes in CI and SI engines; fuel system; cooling system; ignition system; lubricating system; combustion and emission analysis of engine; heat balance; performance and testing; simulating and analysis of engine operations, basic maintenance of the engines.

01426151 ADVANCED AUTOMOTIVE ENGINEERING

3 (3-0-6)

(3 credits, 3-hour lecture)

PREREQUISITE: 01426025 AUTOMOTIVE ENGINEERING

This advanced course is focusing on details of all systems in vehicles such as power train system, clutch, manual and automatic transmissions, drive axle, differential gear, wheel and tire, four wheel drive system, steering system, suspension system, brake system and air conditioning system; assembly and disassembly training of all components of the vehicles. This includes how to design and select proper component and system for a vehicle and also how to diagnose the common problems in all systems of automobiles.

01426152 INTRODUCTION TO HYBRID AND ELECTRIC VEHICLES**3 (3-0-6)****(3 credits, 3-hour lecture)****PREREQUISITE: 01426025 AUTOMOTIVE ENGINEERING**

This course introduces the fundamental concepts, principles, analysis and design of hybrid and plug-in electric vehicles. History of hybrid and electric vehicles, the impact of modern drive-trains on energy supplies which distinguish from the conventional vehicles are discussed. Basics of vehicle performance, vehicle power source characterization, transmission characteristics relate to the modern electric vehicles are categorized. Basic concept of hybrid and electric traction, various hybrid drive-train topologies, power flow control in hybrid and electric drive-train topologies, fuel efficiency analysis for hybrid vehicles and power consumption in electric vehicles are studied in this course. The energy storage managements in hybrid and electric vehicles such as battery , fuel cell are also discussed.

01426153 AUTONOMOUS AND INTELLIGENT VEHICLE**3 (3-0-6)****(3 credits, 3-hour lecture)****PREREQUISITE: NONE**

The basics of automotive electronics, fundamentals of electronic control systems are studied. Review of fundamental automotive technology, chassis, and powertrain electronics which relate to driver assistance systems (ADAS). Principle of necessary components needed to implement these systems including vehicle location and surroundings object sensors, wireless technology and networking. Various automotive advanced driver assistance systems including recent Technologies such as lane keeping, collision avoidance, automatic emergency braking, and autonomous vehicles.

01426154 UNMANNED AIR VEHICLE SYSTEMS**3 (3-0-6)****(3 credits, 3-hour lecture)****PREREQUISITE: NONE**

This course focuses on understanding UAVs from a system perspective including variety of key UAV subsystems. The effectiveness of a particular UAV system for a given mission are studied. Based on this understanding it will also look at the evaluation and design of a complete UAV system for a given mission. The subsystem includes airframe and propulsion for different classes of UAVs, flight control and navigation sensors such as Autoland, Electro-Optical (EO); Infra-Red (IR); Electronic Warfare (EW); Electronic Surveillance (ES) Radar and others. The aspect of payload stabilization and flight performance which determine the capability of UAV and its applications are investigated along with limitations of the flight control system such as Air-ground communication link, civilian and military communication links i.e. range, security, bandwidth and cost issues.

Alternative study groups

1. Special project

01426201 MECHANICAL ENGINEERING PROJECT I

3 (0-9-0)

(3 credits, 9-hour lab)

PREREQUISITE : NONE

The research on selected topics in mechanical 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

01426202 MECHANICAL ENGINEERING PROJECT II

3 (0-9-0)

(3 credits, 9-hour lab)

PREREQUISITE : 01366402

This course following the 01366402 mechanical Engineering Project I, a progress report and oral presentation before the end of the semester

COOPERATIVE EDUCATION

01006301 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.

01006005 OVERSEA 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.

01006302 STUDY ABROAD

6 (6-0-12)

(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.