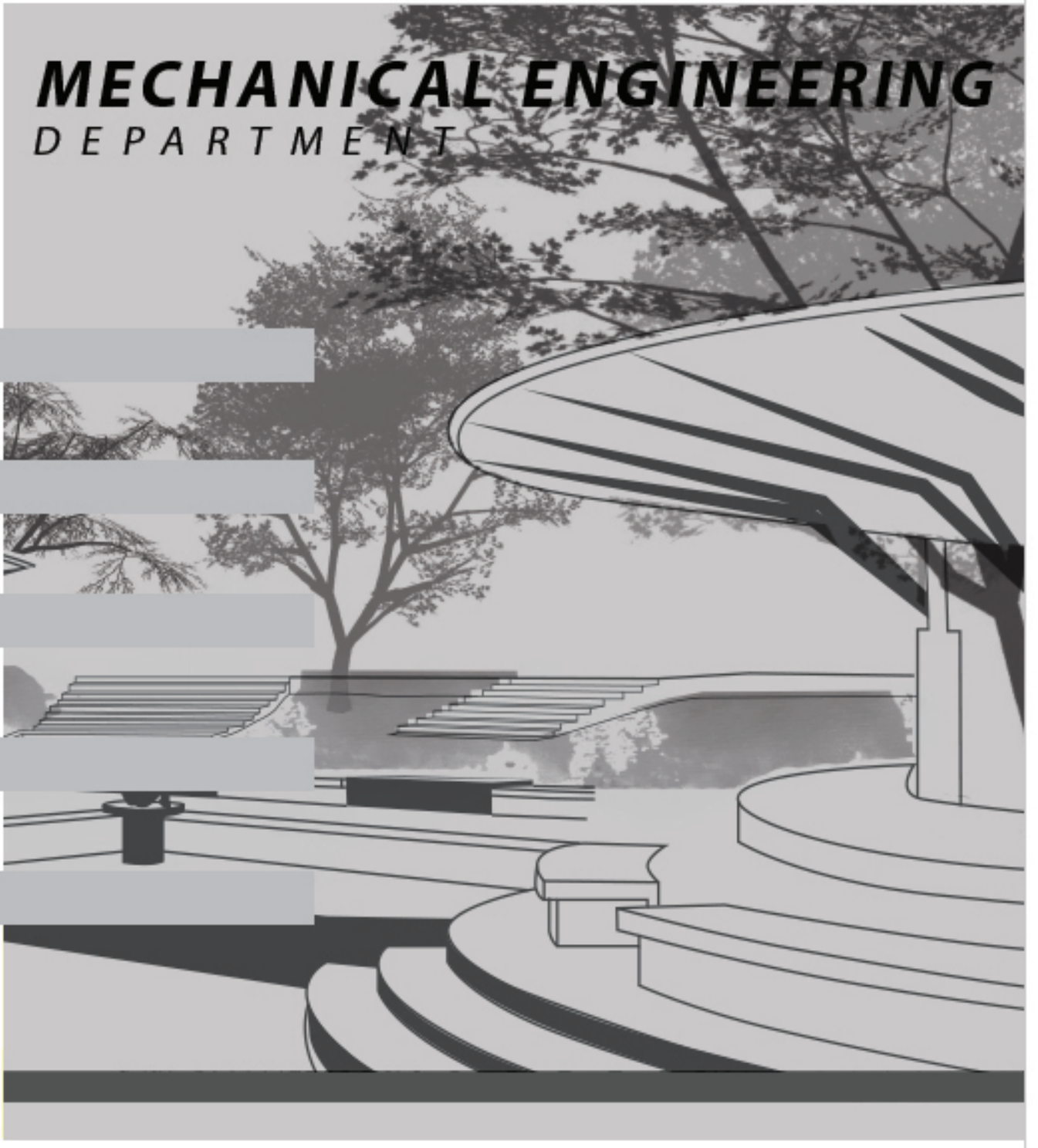
UNIVERSITAS INDONESIA

FACULTY OF ENGINEERING

ACADEMIC GUIDEBOOK

2017 edition

MECHANICAL ENGINEERING DEPARTMENT



PROFILE OF FTUI
AND DEPARTMENTS

1. PROFILE OF FTUI AND DEPARTMENTS

1.1. HISTORY OF FTUI

The history of the Faculty of Engineering, Universitas Indonesia (FTUI) began with an offer made from young engineers belonging to the Society of Engineers Indonesia (PII), to the first President of the Republic Indonesia, Bung Karno, for the renovations of the heavily damaged main streets of Jakarta. At that time Jakarta was preparing for the International Sports Event, the GANEFO. This bid was welcomed by President Soekarno. The young engineers were granted permission to start the renovations under the condition that all work must be completed within two weeks period. Headed by Ir. Bratanata, Ir. Roosseno, Ir. Sutami, and Ir. A.R. Soehoed, the project was completed on time.

After successful accomplishment of the street renovation project, these young engineers with their iron will felt that there was more that they could do to serve our country. But what? Then they thought of a brilliant idea: “Why not establish an engineering faculty in Jakarta as an alternative to the one in Bandung? This way those residing in the country’s capital would not need to travel far to Bandung for an engineering education”.

During the ceremonial event of Lenso dancing at the Pembangunan Building (formerly known as Pola Building) to welcome the GANEFO guests of honor, the young engineers brought their idea to President Soekarno to which he responded by inviting them to the Presidential Palace the next day. During the meeting in the Presidential Palace, the President wholeheartedly approved of the idea and even directly appointed Prof. Ir. Rooseno as the first Dean of the Faculty of Engineering. The President also instructed that the new Faculty of Engineering would be part of the University of Indonesia under the leadership of its Rector, dr. Syarief Thayeb.

The Establishment of Faculty of Engineering UI

Once dr. Syarief Thayeb served as the Minister of Higher Education and Science, he issued Decree No. 76 dated July 17, 1964 regarding the establishment of the Faculty of Engineering. Faculty of Engineering was officially established in Jakarta without any official ceremony or celebration, under the banner of the University of Indonesia as youngest faculty. And so the history of the Faculty of Engineering Universitas Indonesia began with the first three Study Programs with their respective Head of Study Programs: Ir. Sutami as Head of Civil Engineering Study Program, Ir. Ahmad Sayuti as Head of Mechanical Engineering Study Program and Ir. K. Hadinoto as Head of Electrical Engineering Study Program.

The Metallurgy and Architecture Study Programs were opened the following year with their respective Head of Study Programs: Dr.Ing. Purnomosidhi H. and Ir. Sunaryo S.. Ir. Roosseno as Dean was assisted by Ir. Sutami as Vice Dean for Academic Affairs, Ir. Slamet Bratanata as Vice Dean for Administration and Finance and Dr. Ing Purnomosidhi H. as Vice Dean for Student Affairs and Alumni. In its early acitivities in 1964, Faculty of Engineering UI was supported by 30 lecturers and 11 non-academic employees offering a 32 course subject curriculum. The first class of Faculty of Engineering UI consisted of 199 students. In five and a half years, 18 of them had successfully completed their study and graduated as certified Engineers.

In 1985, the study program Gas Engineering (originally under the Metallurgy Study Program) joined the study program Chemical Engineering (originally under the Mechanical Study Program) and formed the Gas and Petrochemical Engineering Study Program with its first Head of Study Program, Dr. Ir. H. Rachmantio. The Industrial Engineering Study Program, the youngest Study Program in Faculty of Engineering UI, was opened in 1999 with its first Head of Study Program, Ir. M. Dachyar, M.Sc. The term Study Program was later changed to Department and is still used today.

1.2. VISION AND MISSION OF FTUI

FTUI Vision

FTUI as a leading engineering education institution with the ability to compete in the international world.

FTUI Mission:

- Preparing its graduates to become lifelong learners, to be able to adapt to the working environment, and to acquire decent personalities and leadership qualities.
- To be center of excellence for education and research activities, to serve stakeholders' needs through facilitation of conducive academic environment.
- To be a leading institution with the initiatives that responds to local, national and global societal needs.

1.3. UI and FTUI Administration

UI

Rector:

Prof. Dr. Ir. Muhammad Anis. M. Met.

Deputy Rector for Academic and Student Affairs:

Prof. Dr. Bambang Wibawarta, S.S., M.A.

Deputy Rector for Finance, Logistic and Facilities:

Prof. Dr. Adi Zakaria Afiff

Deputy Rector for Research, and Innovation

Prof. Dr. rer. nat Rosari Saleh

Deputy Rector for for Human Resources, Development and Cooperation

Dr. Hamid Chalid, S.H., LL.M

FTUI

Dean of Engineering:

Prof. Dr. Ir. Dedi Priadi, DEA

Vice Dean I:

Dr. Ir. Muhamad Asvial, M.Eng

Vice Dean II:

Dr. Ir. Hendri DS Budiono, M.Eng

Associate Dean for Academic and Head of Faculty Administration Center:

Dr. Ir. Wiwik Rahayu, DEA

Associate Dean for Research & Community Service

Prof. Dr. Ir. Akhmad Herman Yuwono, M.Phil.Eng

Associate Dean for Cooperation, Students Affairs, Alumni & Venture :

Dr. Badrul Munir, ST., M.Eng.Sc

Associate Dean for General Affairs & Facilities

Jos Istiyanto, S.T., M.T., Ph.D

Head of Academic Quality Assurance Unit

Prof. Ir. Mahmud Sudibandriyo, M.Sc., Ph.D

Head of Management System Assurance Development Unit

Dr. Ir. Rahmat Nurcahyo, M.Eng. Sc.

Departments

The following are list of Head of Department, and Vice Head of Department:

Civil Engineering:

Prof. Ir. Widjojo A. Prakoso, M.Sc., Ph.D

Mulia Orientilize, S.T., M.Eng

Mechanical Engineering:

Dr.-Ing. Ir. Nasruddin, M.Eng

Dr. Ario Sunar Baskoro, ST., MT., M.Eng

Electrical Engineering:

Ir. Gunawan Wibisono, M.Sc., Ph.D

Dr. Arief Udhiarto, S.T., M.T

Metallurgy & Materials Engineering:

Dr. Ir. Sri Harjanto

Dr. Deni Ferdian, ST, M.Sc

Architecture:

Prof. Yandi Andri Yatmo, S.T., M.Arch., Ph.D

Rini Suryantini, S.T., M.Sc

Chemical Engineering:

Prof. Ir. Sutrasno Kartohardjono, M.Sc., Ph.D

Dr. Ir. Nelson Saksono, M.T.

Industrial Engineering:

Dr. Akhmad Hidayatno, S.T., MBT.

Dr.-Ing. Amalia Suzianti, ST., M.Sc.

BOARD OF PROFESSORS

Prof. Dr. Ir. Budi Susilo Soepandji
Prof. Dr. Ir. Sutanto Soehodo, M. Eng
Prof. Dr. Ir. Tommy Ilyas, M.Eng
Prof. Dr. Ir. Irwan Katili, DEA
Prof. Dr. Ir. I Made Kartika, Dipl. Ing.
Prof. Dr. Ir. Raldi Artono Koestoer
Prof. Dr. Ir. Bambang Sugiarto, M.Eng
Prof. Dr. Ir. Yanuar, M.Eng
Prof. Dr. Ir. Tresna P. Soemardi
Prof. Dr. Ir. Budiarso, M.Eng
Prof. Dr. Ir. Yulianto S. Nugroho, M.Sc
Prof. Dr.-Ing. Nandy Putra
Prof. Dr. Ir. Djoko Hartanto, M.Sc
Prof. Dr. Ir. Dadang Gunawan, M.Eng
Prof. Dr. Ir. Bagio Budiardjo, M.Sc
Prof. Dr. Ir. Eko Tjipto Rahardjo, M.Sc
Prof. Dr. Ir. Harry Sudibyo
Prof. Ir. Rinaldy Dalimi, M.Sc., Ph.D
Prof. Dr. Ir. Rudy Setiabudy, DEA
Prof. Dr. Ir. Iwa Garniwa, MK., MT
Prof. Dr. Ir. Muhammad Idrus Alhamid
Prof. Dr.-Ing. Ir. Bambang Suharno
Prof. Dr. Ir. Bondan T. Sofyan, M.Si
Prof. Ir. Triatno Yudo Harjoko, M.Sc., Ph.D
Prof. Dr. Ir. Abimanyu Takdir Alamsyah, MS
Prof. Dr. Ir. Widodo Wahyu P, DEA
Prof. Dr. Ir. M. Nasikin, M.Eng
Prof. Dr. Ir. Anondho W., M.Eng
Prof. Dr. Ir. Setijo Bismo, DEA
Prof. Dr. Ir. Slamet, M.T
Prof. Dr. Ir. T. Yuri M. Zagloel, M.Eng.Sc
Prof. Ir. Sutrasno Kartohardjono, M.Sc., Ph.D
Prof. Dr. Ir. Yusuf Latief, MT
Prof. Dr. Ir. Dedi Priadi, DEA
Prof. Dr. Ir. Harinaldi, M.Eng
Prof. Dr. Ir. Djoko M Hartono, SE., M.Eng
Prof. Dr. Ir. Muhammad Anis, M.Met
Prof. Ir. Isti Surjandari Prajitno, MT., MA., Ph.D
Prof. Dr. Ir. Danardono Agus S, DEA
Prof. Dr. Ir. Nji Raden Poespawati,MT
Prof. Dr. Ir. A. Herman Yuwono, M.Phil.Eng
Prof. Yandi A. Yatmo, S.T., M.Arch., Ph.D

Prof. Dr. Ir. Riri Fitri Sari, M.Sc.MM
Prof. Dr. Benyamin Kusumoputro, M.Eng
Prof. Dr. Ir. Kalamullah Ramli, M.Eng
Prof. Dr. Ir. Eddy S. Siradj, M.Sc
Prof. Dr. Ir. Johny Wahyuadi Mudaryoto
Prof. Dr. Ir. Anne Zulfia, M.Sc
Prof. Ir. Mahmud Sudibandriyo, M.Sc., Ph.D
Prof. Dr. Heri Hermansyah, S.T., M.Eng.
Prof. Dr. Ir. Sigit P. Hadiwardoyo, DEA
Prof. Dr. Kemas Ridwan Kurniawan, ST., M.Sc
Prof. Dr. Ir. Adi Surjosatyo, M.Eng
Prof. Ir. Widjojo Adi Prakoso, M.Sc., Ph.D
Prof. Dr. Ir. Winarto, M.Sc
Prof. Dr. Ing. Ir. Misri Gozan, M.Tech.
Prof. Dr. Ir. Nelson Saksono, MT
Prof. Paramita Atmodiwirjo, S.T., M.Arch., Ph.D.
Prof. Dr. Ir. Gandjar Kiswanto, M.Eng

INTERNATIONAL ADJUNCT PROFESSOR

Prof. Dr. Fumihiko Nishio, fnishio@faculty.chiba-u.jp (Fundamental Research Field of Remote Sensing: Snow and Ice), Center for Environmental Remote Sensing (CEReS), Chiba University, Japan.

Prof. Dr. Josaphat Tetuko Sri Sumantyo, jtetukoss@faculty.chiba-u.jp (Fundamental Research Field of Remote Sensing: Microwave Remote Sensing), Center for Environmental Remote Sensing (CEReS), Chiba University, Japan.

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Prof. Dr.-Ing. Axel Hunger, axel.hunger@uni-due.de (Adaptive e-Learning, adaptive instructional systems, e-course and its applications, pedagogical analyses of on-line course), University of Duisburg Essen, Germany.

Prof. Dr. Koichi Ito (Printed Antenna, Small Antenna, Medical Application of Antenna, Evaluation of Mutual Influence between Human Body and Electromagnetic Radiations), Chiba University, Japan.

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Prof. Hiroshi Inokawa, inokawa06@rie.shizuoka.ac.jp, (Nano Devices), Research Institute of Electronics, Shizuoka University

Prof. Hidenori Mimura, mimura.hidenori@shizuoka.ac.jp, (Vacuum Electron Devices) Research Institute of Electronics, Shizuoka University

Prof. Chit Chiow (Andy) Tan, School of Mechanical, Manufacturing and Medical Engineering, Queensland University of Technology, Australia, Mechanical Engineering

Prof. Kozo Obara, Dept. of Nanostructure and Advanced Materials, Kagoshima University, Japan, Nanomaterial dan Energi

Prof. Freddy Y.C. Boey, Nanyang Technological University, Singapore, Nanomaterial dan Biomedical Engineering

Prof. Kyoo-Ho Kim, Dr.Eng, School of Material Science and Engineering, Yeungnam University, Korea, Nanomaterial dan Energi

Prof. Bernard Cambou, Ecole Centrale de Lyon,France, INRETS (French National Institue for Transport and Safety Engineering), Transport and Safety

Prof. Chia-Fen Chi, Dept. of Industrial Engineering, National Taiwan University Science and Technology, Industrial Management

Prof. Dr. Katsuhiko Takahashi, Dept. of Artificial Complex Systems Engineering, Hiroshima University, Japan, Artificial Complex System Engineering

Prof. Martin Betts, Faculty of Built Environment and Engineering, Queensland University of Technology, Australia.

Prof. L. P. Lighart (Emeritus), Delft University of Technology, Dutch

Prof. Dr. Koichi Ito (Printed Antenna, Small Antenna, Medical Application of Antenna, Evaluation of Mutual Influence between Human Body and Electromagnetic Radiations), Chiba University, Japan.

Prof. Dr. Uwe Lahl

Prof. Dr. Tae Jo Ko
tjko@yu.ac.kr (BSc. Pusan National University; MSc. Pusan National University; Ph.D Pohang Institute of Technology) Micromachining, Nontraditional Manufacturing, Machine Tools

Prof. Dr. Keizo Watanabe
keizo@tmu.ac.jp (MSc. Tokyo Metropolitan University, 1970; Dr-Eng. Tokyo Metropolitan University, 1977) Drag Reduction, Fluid Mechanics

Prof. Philippe Lours, École nationale supérieure des mines d'Albi-Carmaux, (France) Superalloys, aerospace material

1.4. ACADEMIC PROGRAMS AT FTUI

FTUI consists of seven Departments and **twelve Undergraduate Study Programs**:

(1) Civil Engineering
(2) Environmental Engineering
(3) Mechanical Engineering
(4) Marine Engineering
(5) Electrical Engineering
(6) Computer Engineering
(7) Metallurgy & Materials Engineering
(8) Architecture
(9) Interior Architecture
(10) Chemical Engineering
(11) Bioprocess Engineering
(12) Industrial Engineering

seven Master Programs:

(1) Civil Engineering
(2) Mechanical Engineering
(3) Electrical Engineering
(4) Metallurgy and Material Engineering
(5) Architecture
(6) Chemical Engineering
(7) Industrial Engineering

and **seven Doctoral Programs**:

(1) Civil Engineering
(2) Mechanical Engineering
(3) Electrical Engineering
(4) Metallurgy and Material Engineering
(5) Architecture
(6) Chemical Engineering
(7) Industrial Engineering

and **one Professional Program for Architect**

Accreditation of FTUI Academic Programs

The National Board of Accreditation for Higher Education (BAN-PT) has awarded the following accreditation level for all study program in the Faculty of Engineering:
for Bachelor Programs:

Civil Engineering : A
Mechanical Engineering : A
Electrical Engineering : A
Metallurgy & Material Engineering : A
Architecture : A
Chemical Engineering : A
Industrial Engineering : A
Naval Architecture & Marine Engineering : A
Computer Engineering : A
Environmental Engineering : A
Architecure Interior : A
Bioprocess Engineering : A

Accreditation for Master Program is as follows:

Civil Engineering : A
Mechanical Engineering : A
Electrical Engineering : A
Metallurgy and Materials Engineering : A
Architecture : A
Chemical Engineering : A
Industrial Engineering : B

Accreditation for Doctoral Program is as follows:

Civil Engineering : A
Electrical Engineering : A
Metallurgy and Materials Engineering : A
Chemical Engineering : A
Mechanical Engineering : A
Architecture : B

In 2008 & 2010, the Departments of Mechanical Engineering, Civil Engineering, Electrical Engineering, Metallurgy and Materials Engineering, Architecture and Chemical Engineering have been accredited by the Asean University Network (AUN); and also In 2013 Departments of Industrial Engineering have been accredited by the ASEAN University Network (AUN).

International Undergraduate Program (Double-Degree & Single Degree)

Since 1999, Faculty of Engineering has established an international undergraduate program in engineering (double-degree program) with the following renowned Australian higher education institutions: Queensland University of Technology (QUT), Monash University, Curtin University of Technology, The University of Queensland and The University of Sydney. Graduates from this international undergraduate program will be awarded a Bachelor of Engineering degree from our Australian University partner and a Sarjana Teknik degree from Faculty of Engineering UI when they return to FTUI and fulfill certain requirements. The double degree cooperation with QUT involves the study programs Civil Engineering, Mechanical Engineering, Electrical Engineering and Architecture. The double degree cooperation with Monash University involves the study programs Metallurgy & Material Engineering and Chemical Engineering. The double degree cooperation with Curtin University involves the study programs Chemical Engineering, Architecture, Metallurgy & Material Engineering and Electrical Engineering, with other study programs to follow. The double degree cooperation with the University of Queensland involves the study programs Mechanical Engineering, Electrical Engineering, Chemical Engineering and Metallurgy & Material Engineering. This international undergraduate program provides high quality engineering education in the international level. Since 2011, students will also have a choice to continue their final two years at FTUI as part of the newly opened Single Degree International Program.

Since 2011, students will also have a choice to continue their final two years at FTUI as part of the newly opened Single Degree International Program. The undergraduate international single degree program was launched in 2011 as a result of an increasing demand to provide an international quality education locally. Students in this program are not obligated to continue their last four semester of study at one of our partner universities like their classmates who wishes to pursue a double degree. However, students of single degree program are required to do Study Abroad for a period between one to four semesters at an overseas university. The aims are to widen the international perspective of the students, to have experience to study in an overseas university, to enhance language capability, to enhance cross-cultural adaptability. Study Abroad can be conducted during regular semesters.

Undergraduate Parallel Class Program (Diploma Track) (Extension Program)

The Undergraduate Extension Program in FTUI was initiated in 1993. At the beginning the program was held for only four Study Programs (Civil, Mechanical, Electrical and Metallurgy Engineering). In 1995 the program was also opened for the Chemical Engineering Study Program (Gas and Petrochemical Engineering) followed by Industrial Engineering in 2002. Starting in 2011, the Undergraduate Extension Program of FTUI was cancelled. However, the faculty still give the opportunity for future FTUI students that are graduates from Diploma Program who wishes to continue their study into the FTUI Undergraduate Program. Students are now able to apply through the Undergraduate Parallel Program (Diploma Track) by using the Credit Transferred System. The number of credits acknowledge will be decided by their respective Departments.

The Undergraduate Parallel Program is a full time program where students are expected to be a full time students in campus. This is due to the schedule set for the program which started from the morning period and well into the afternoon. Currently there are six Study Programs available to choose from: Civil Engineering, Mechanical Engineering, Electrical Engineering, Metallurgy & Material Engineering, Chemical Engineering, Industrial Engineering.

1.5. DEPARTMENT OF MECHANICAL ENGINEERING

GENERAL

The Department of Mechanical Engineering, previously known as Mechanical Engineering Study Program. The department was established together with the launch of the faculty of engineering Universitas Indonesia in November 27, 1964 at Salemba, Jakarta. Nowadays there are 2 study programs within the department, which are: Mechanical Engineering Study Program and Marine Engineering Study Program. The mechanical engineering study program provides the knowledge which focused into Energy Conversion, Product Design, Manufacturing Process and also the basic of Industrial operational and managerial. The Marine Engineering study program provide the education which focused into Ship design, Ship manufacturing process, ship maintenance, ship machinery installation and also the rules and laws of marine. The graduates of the mechanical engineering have worked in several areas such as automotive industry, oil and gas industry, heavy duty engine, educational institution, research institution and other industries. The department of mechanical engineering organized several programs, which are: Bachelor Degree (Regular, Parallel, and International class) Master Degree and Doctoral Degree. Since August 2007, the department of mechanical engineering received the ISO 9001: 2000 for quality management system in Mechanical Engineering Study Program. In 2011, The Department of Mechanical Engineering once again received the ISO 9001: 1008 for quality management system. Certification by international agencies is one of management's commitments in quality management, to ensure and enhance academic quality and stakeholder satisfaction. The mechanical engineering study program also received the highest academic accreditation point according to the National Accreditation Board in 2005. In 2008, the Department of Mechanical Engineering has also gained international recognition in the form of accreditation of the ASEAN University Network (AUN). This again shows the commitment the Department of Mechanical Engineering to develop international education and excel in their fields, as stated by the firm through the vision, mission and goals.

Developing nations are very dependent of human resource development. Resource is people who set the direction, goals, implement and develop the nation's life. With good human resources are expected to achieve the life of prosperous and affluent nations. Therefore, the developments of human resources become the key of national development. Higher education in Indonesia is part of the National Education System which aims to develop the intellectual life of the nation through the development of human resources to carry out three main activities of the so-called "Tridharma Universities", namely :

- Hold a higher level education
- Conduct the scientific research
- Perform the Community service

In order to develop human resources for the life of the nation, the Department of Mechanical Engineering has set a goal of three main activities is to be a reference to any academic activity. In education, has a goal to produce graduates who are able to analyze and synthesize the characteristics of mechanical systems, designing and planning systems and mechanical equipment as well as managing the production installation, and be able to analyze and solve any scientific problem, work together in teams, and develop themselves and their knowledge, with a lofty intellectual attitude, pattern of systematic thinking, logical and integrated. In the field of research, Department of Mechanical Engineering has a goal to contribute and play a role in the development of mechanical science and technology and a continuous intake of the educational process. While the field of devotion and service to the community, aims to provide ideas and direct involvement in quality improvement and enhancement of community and industry.

To answer the demand of graduate academic programs that have the character of leadership and excellence in academic and professionalism in the field of Mechanical Engineering, both at the level of Bachelor, Master, or PhD, the Department of Mechanical Engineering, developed the design

of competency-based academic curriculum is implemented through the student centered teaching activity (student centered learning). According to the degree, in the curriculum design the research activity become the major aspect in the Doctoral Degree.

In the 2012 curriculum design, the integration of the design between bachelor degree, master degree and doctoral degree curriculum has been pursued, so it is possible for a student with an excellent academic record to take courses from a higher degree (Master and Doctoral) by using the credit transfer regulation through the Fast Track Program.

A more detailed explanation of each of the courses organized by The Mechanical Engineering and Marine Engineering Study Program, the description of the main academic competence, and other supporters of the graduates of each program of study, are given in the following section.

Contact

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VISION and MISSION

Vision

"Become the center of the excellent research and education service in Mechanical Engineering"

Mission

"To conduct research and research-based education for the development of science and technology in the field of mechanical engineering, and to conduct research and education and use it to improve the quality of life and humanity"

Head of Department :
Dr.-Ing. Ir. Nasruddin, M.Eng
Vice Head of Department:
Dr. Ario Sunar Baskoro, ST., MT., M.Eng
Head of Mechanical Engineering Study Program:
Dr-Ing.Ir. Nasruddin, MEng
Head of Naval Architecture and Marine Engineering Study Program:
Dr. Agus S. Pamitran, ST, MEng
Assistant to Vice Head for Academic Affairs:
Dr. Radon Dhelika, B.Eng, M.Eng
Assistant to Vice Head for Non-Academic Affairs:
Dr. Agung Shamsuddin Saragih, S.T, MS.Eng
Cooperation Relationship Coordinator:
Dr. Yudan Whulanza, ST., MSc.
Venture Coordinator / Director of P2M:
Ardiyansyah, S.T, M.Eng, Ph.D

Head of Laboratory

Head of Mechanical and Biomechanic Design Laboratory :
Dr. Ir. Wahyu Nirbito, MSME.

Head of Mechanical Technology Laboratory:
Prof. Dr. Ir. Danardono A.S., DEA, PE
Head of Thermodynamics Laboratory:
Prof. Dr. Ir. Yulianto S. Nugroho, MSc, PhD.
Head of Heat Transfer Laboratory:
Dr. Ir. Engkos A. Kosasih, MT
Head of Fluid Mechanics Laboratory:
Dr. Ir. Warjito, M.Eng.
Head of Manufacture and Otomatization Laboratory:
Dr. Ario Sunar Baskoro, ST., MT., M.Eng
Head of Air-conditioning Engineering Laboratory:
Prof. Dr. Ir. M. Idrus Alhamid
Head of Ship Design Laboratory:
Prof. Dr. Ir. Yanuar, M.Eng. MSc.

Head of Research Cluster- Kelompok Ilmu (KI)
Head of KI. Energy Conversion:
Prof. Dr. Ir. M. Idrus Alhamid
Head of KI. Design, Manufacture and Automation:
Dr. Ir. Gandjar Kiswanto, M.Eng.
Head of KI. Naval Architecture and Marine Engineering:
Dr. Agus S. Pamitran, ST, M.Eng

BOARD OF PROFESSOR

Prof. Dr. Ir. Adi Suryosatyo
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Prof. Dr. Ir. Budiarso, M.Eng
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Prof. Dr. Ir. Harinaldi, M.Eng
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Prof. Dr. Ir. M. Idrus Alhamid
mamak@eng.ui.ac.id (Ir. UI, 1978; Dr. K.U. Leuven Belgium, 1988) *Refrigeration and Air Conditioning, Solar Thermal Energy, Energy Conversion*
Prof. Dr.-Ing Nandy S. Putra
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Prof. Dr. Ir. R. Danardono Agus S., DEA
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Prof. Dr. Ir. Raldi Artono, DEA
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Prof. Dr. Ir. Tresna P. Soemardi
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and Propulsion

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FULL-TIME FACULTY

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Ario Sunar Baskoro

ario@eng.ui.ac.id (ST. UI, 1998; MT. UI 2004; MEng – Keio University 2006; Dr., Keio Univ, 2009) *Welding Engineering, Robotics, Mechatronics*

Engkos Achmad Kosasih

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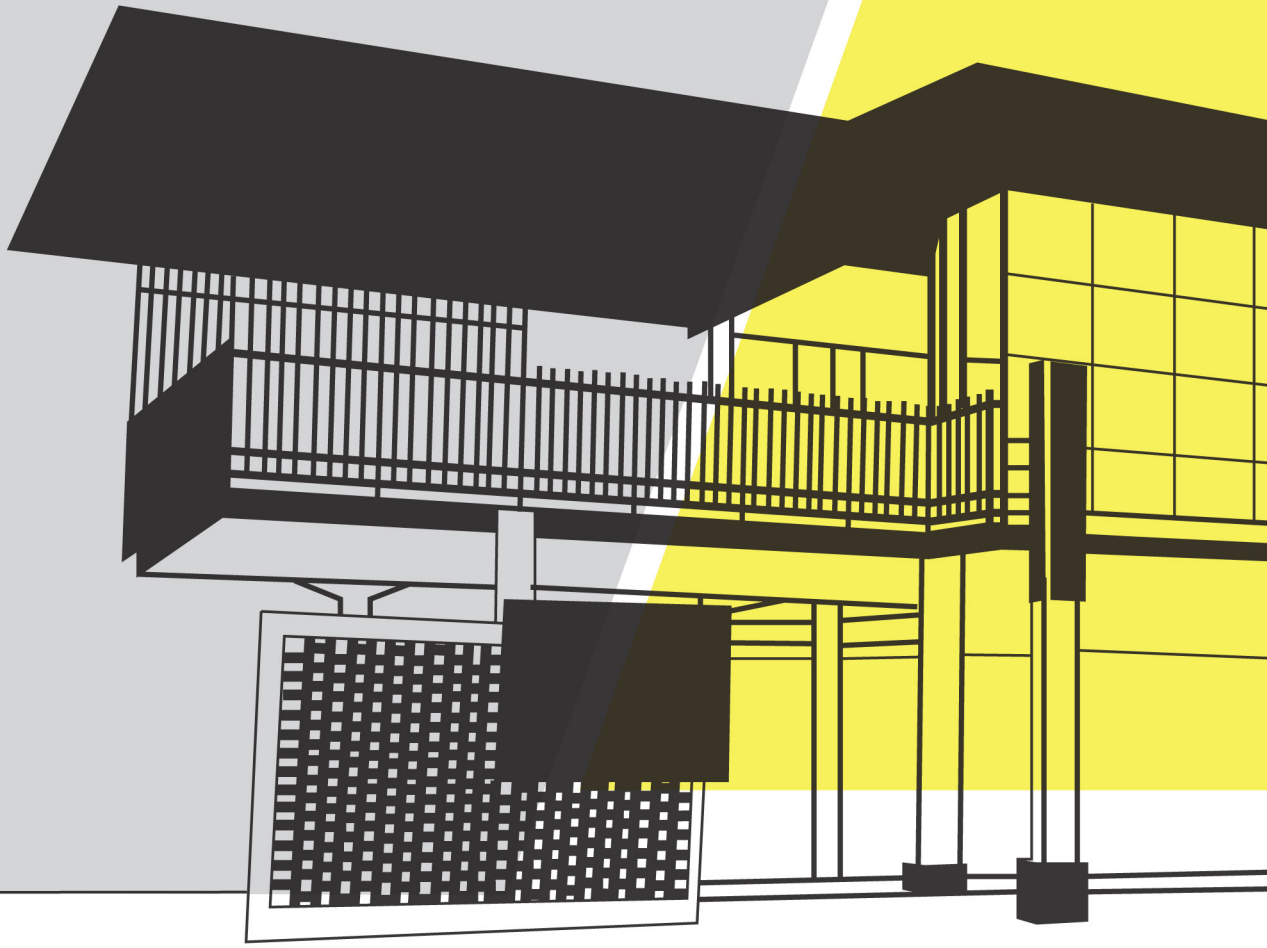
ACADEMIC SYSTEM
AND REGULATION



2. ACADEMIC SYSTEM AND REGULATION

The educational system in the Faculty of Engineering, Universitas Indonesia refers to the prevailing system of education at Universitas Indonesia.

2.1. GENERAL

Teaching and Learning Activities
One semester is the time of the activity consisting of 16-18 weeks of lectures or other scheduled activities, including various additional activities such 2-3 week assessment activities. These teaching and learning activities are in form of lecture, lab, studio, exams, quizzes, assignments, presentations, seminars, research, practical work, industrial visits, and a thesis.

Semester Credits Units (SKS)
Education in the Faculty of Engineering, Universitas Indonesia is held in a variety of ways such as lectures, assignments (ex: calculation tasks, planning, design), practical work, seminars, lab, studio, and research for thesis writing. All educational activities that must be undertaken by each student to earn a bachelor's degree are contained within the academic loads and measured in units of semester credit (SKS).
Semester Credit is a measurement on the learning experiences obtained by students on each semester.
One Semester Credit in lecture, responses and tutorials, includes: face to face study time for 50 (fifty) minutes per week per semester; structured learning activities with structured assignments for 60 (sixty) minutes per week per semester; and independent study session for 60 (sixty) minutes per week per semester.
One Semester Credit in seminar or other similar subjects, includes: face to face study time for 100 (one hundred) minutes per week per semester, independent study session of 70 (seventy) minutes per week per semester.
One Semester Credit in practical training, studio, workshop, on the field training, research and community services, and /or other similar subjects for 170 (one hundred and seventy) minutes per week per semester.
Activities for one semester consist of 16-18 weeks of lectures or other scheduled activities and its additional activities. Also included in the schedule are two weeks of midterm examination and another two weeks for final examination.
All educational activities must be performed by each student to earn a bachelor's degree is an academic load of 144-145 credits divided into 8 (eight) semesters. Undergraduate students with an average study load of about 18-20 credits per semester are expected to undergo a week of minimal 18 -20 hours of scheduled interaction with a lecturer, 18-20 hours of structured activities, and 18-20 hours of independent learning activities.

Subjects

Subjects in the FTUI's undergraduate curriculum are grouped into University General Subjects (12,5%), Basic Engineering Subjects (15-20%), Basic Skills Subjects (30-35%), Core Subjects (35-40%). Subjects can be categorized as compulsory subjects and electives. They can be taken across departments or across faculties.

Grade Point Average
Grade Point Average or GPA is used to evaluate students' performance either for a particular semester in term of Indeks Prestasi Semester (IPS) or Semester Performance Index, or, cumulatively for all of the semester up to the most recent one in term of IndeksPrestasiKumulatif (IPK) or GPA. The formula used to calculate either IPS or IPK is as follows:

$$GPA = \left(\frac{\sum_{courses} (\text{Grade Point Value} \times \text{Semester Credit Unit})}{\sum_{courses} \text{Semester Credit Unit}} \right)$$

The summation made by multiplying the weight of credits with a letter grade for each course, divided by the number of credits.

Semester Performance Index / Indeks Prestasi Semester (IPS)
The Semester Performance Index is calculated from all subjects taken in each semester, except for subjects with letter grade of BS, I, and TK. Achievement Index that takes into account all of the subjects for a certain semester is called the Semester Performance Index (IPS) and used to determine the maximum academic load that the student may take in the upcoming semesters.

Grade Point Average (GPA/IPK)
If the calculation involves the entire grade point value of subjects taken during the educational program period, the result of the summation is a Grade Point Average (GPA) that is used as a basis for study evaluation. Courses taken into account are the ones listed in the Study Plan Form (FRS). GPA is obtained from the summation of all subjects having a grade of C or higher from the first semester until the last semester, with the exception of subjects with letter grade of BS, I, and TK.

Academic Performance Evaluation
Assessment of academic ability is performed on an ongoing basis by assigning tasks, homework, quizzes, or exams which are given throughout the semester. For each subject, there are at least two components of assessment which may include a midterm exam (UTS) and a final exam (UAS). A student will be assessed on his academic ability if he meets the following requirements:

- The courses taken have been registered and verified by Academic Advisor during the academic registration period.
- The student has fulfilled all of the administrative and academic requirements for the ongoing semester.
- The student has completed all of the required academic assignments.

Grades

At the end of each semester, students may download Semester Grade Record as a report on their academic performance from SIAK NG. Assessment of study efficacy is carried out using letters and academic load in accordance with Table 2.1.

Table 2.1. Grade Value and Points

Grade Value	Marks	Grade Point
A	85 - 100	4,00
A-	80 - < 85	3,70
B+	75 - < 80	3,30
B	70 - < 75	3,00
B-	65 - < 70	2,70
C+	60 - < 65	2,30
C	55 - < 60	2,00
D	40 - < 55	1,00
E	0 - < 40	0,00

The highest grade is A with grade point of 4.00 and the minimum passing grade of a course is C with grade point of 2.00. The instructor may assign the 'Incomplete' (I) grade if the student has not made a reasonable attempt to complete major session assignments, laboratory projects and the lecturer has made a reasonable effort to inform the student as early as possible that an important part of session work is incomplete. The 'I" mark should be changed to other grade within 1 month, otherwise, it will be automatically changed to 'E' grade. The "T" mark is given for no attendance in exam. The "BS" mark is given for Special Lecture (such as Internship, Seminar & Final Project) that has not been completed. These BS courses are not taken into account in the calculation of Semester Study Unit, IPS and GPA.

Length of Study and Academic Load

Undergraduate Program
The academic load a student can take is determined by the Academic Counselor based on the previous Semester Performance Index (IPS) as stated in the Study Plan Form (FRS). Students must take the entire allocated credits of the entire courses in the first and second semester. Academic Load for Undergraduate Program is 144 (one hundred and forty four) credits including final assignment and maximum academic load is 160 (one hundred and sixty) credits including final assignment and can be completed in minimum 7 (seven) semesters and maximum of 12 (twelve) semesters.

As for the second semester, these following rules apply:

- For students obtaining an IPS of 2.00 or less, they must take all credits load allocated for the second semester according to the structure of the applicable curriculum.
- For students obtaining an IPS of 2.00 or more, the maximum credits that can be taken follow that of the provisions in the Maximum Credit Load Table.
- From the 3rd semester onwards, the maximum credit loads that may be taken is determined by IPS of the previous semester and follow provisions in Maximum Credit Load as shown in Table 2.2 with respect to course prerequisites (if any). If necessary, Academic Counselor (PA) can add a maximum of 2 credits more than the provision in the Table through the approval of the Vice Dean.

Table 2.2. Maximum study load in a semester for undergraduate program

IPS	Maximum SKS
< 2,00	12
2,00 – 2,49	15
2,50 – 2,99	18
3,00 – 3,49	21
3,50 - 4,00	24

Master Program
Academic load in the FTUI's Master Program curriculum is 40-44 credits after finishing the undergraduate program with the following study period:

a. For Regular Master Program, the length of study is scheduled for 4 (four) semesters and can be completed in at least 2 (two) semesters and a maximum of 6 (six) semesters.
b. For Non-Regular Master Program, the length of study is scheduled for 5 (five) semesters and can be completed in at least 3 (three) semesters and a maximum of 7 (seven) semesters.

Academic Load for each semester is set by the Academic counselor (PA) based on the IPS of the last semester as stated in the Semester Grade list (DNS). Provisions on the academic load are as follows:

- A semester's academic load is registered by a student as he carries out online registration according to the pre-determined schedule. Students are required to take all subjects as allocated in the first semester curriculum.
- For students with less than a 2,5 IPS, a provision stating that the number of credits taken for the following semester does not exceed 9 credits is applicable.
- The maximum number of credits that can be taken on Master Program is 16 (sixteen) credits (for Regular Master Program) and 12 (twelve credits (for Non Regular Master Program) per semester.

Exemption from the provisions of academic load should be with the permission of the Vice Dean.

Matriculation for Master

The Matriculation Program is aimed to synchronize the students' ability to achieve the minimum requirements to continue in the Master Program in the Faculty of Engineering Universitas Indonesia. Matriculation is done by taking classes of subjects required by each Faculty/ Study Program within the Curriculum of Undergraduate Program. The allowed credit load for this Matriculation program is 12 (twelve) credits that can be completed in 1 (one) or 2 (two) semesters. Students are allowed to continue their study in the Master Program only if they passed all Matriculation subjects within the maximum of 2 (two) semesters allowed with a Matriculation GPA of 3,00 (three point zero).

Doctoral Program

Academic load in the FTUI's Doctoral Program curriculum is 48-52 credits after finishing the Master Program, including 40 credits of research activities. A semester's academic load is registered by the student through online academic registration during a pre-determined schedule. New students are required to take all subjects as allocated in the curriculum for the first and second semesters. Students must re-take research courses with a BS grade from previous semesters. Student's Academic Load for each semester is established by the Academic Advisor (PA) or the doctorate Promoter based on a discussion with the student from the doctoral program.

The length of doctoral program for all scheduled courses is 6 (six) semesters and in its implementation can be completed in at least 4 (four) semesters and maximum of 10 (ten) semesters. Students in the Doctoral Program may be granted an extension of study period up to a maximum of 2 (two) semesters if their study time have never been extended before, have achieved a minimum grade of B for Research Result Examination, and obtained a recommendation from their promoter and a guarantee that they will complete their study within the granted extended study period. The proposal for such extension is regulated through a Rector's decree based on proposal from the Dean/ Director of School.

Undergraduate Thesis / Final Project

Undergraduate Thesis is mandatory course for undergraduate students of Faculty of Engineering UI. The course is the application of science that has been obtained in accordance with the basic scientific disciplines that the student has studied, in the form of scientific paper, engineering design, assembly or models and accessories. Undergraduate thesis is mandatory to complete the requirements in order to earn a degree in the field of engineering. Undergraduate Thesis status is equivalent to other skill courses is tailored in accordance with the scope of each study program. Undergraduate Thesis must meet certain requirements, both academic and administrative requirements. Students are allowed to start composing undergraduate thesis if:

- The Undergraduate Thesis has been registered in the Study Plan Form [FRS]
- Students have obtained a minimum of 114 credits with a minimum of grade of C and have passed all mandatory courses both in the faculty and university level.
- Students have fulfilled all prerequisites set by the Study Program.

Undergraduate Thesis can be taken in both odd and even semester in the running academic year. On SIAK NG system, student must fill out the name of his thesis supervisor and the title of thesis which will be verified by the Vice Head of the Department. At the end of the semester, the Undergraduate Thesis supervisor will submit the student's thesis's grade to SIAK NG and change the title of undergraduated thesis (if necessary). The completed undergraduated thesis must be submitted in the form of hard-covered book and CD within the pre-determined time limit. The undergraduate thesis must first be assessed in an undergraduated thesis examination by the supervisor and examiners assigned by the Head of the Department.

Thesis (Master Program)

Thesis is a report of the results of research activities in the form of scientific writing. The thesis topic should be a summary of the subject matter that can be scientifically studied on the basis of the theory and use of certain methods. Thesis should be written in Bahasa with an English abstract. For Master program students who are given the opportunity to conduct research and thesis preparation abroad, they are allowed to write thesis in English with abstracts in the Bahasa, while still following the appropriate format stated in the Final Project Writing Guideline of Universitas Indonesia. Exemption of this rule applies only to study programs that hold a joint collaboration with university's abroad as stated in the charter of cooperation.

Requirements to start making Thesis are:

- Thesis has been registered in Study Plan Form [FRS] in every semester
- Students have passed courses with a load of 20 credits with a GPA≥ 3.00
- Head of the study program has set lecturer's name as a thesis supervisor.

Students are responsible for all thesis research costs. Students can actively meet with any of their lecturers as a potential supervisor, to request a thesis topic. In addition, in middle of the second semester, Head of the Study Program can start announcing thesis topics from which the students of the Master program could chose from to prepare the thesis proposal in the form of seminars. The Head of the Study Program announces a list of thesis supervisor who are assigned to guide the students in writing and finishing the approved topic. Thesis examination committee consists of Head of the committee, a minimum 3 or a maximum 5 examiners including the thesis supervisor. Responsible for the implementation of the thesis is the thesis coordinator in each department. Thesis counseling should be carried out with maximum of two people, Supervisor I and Supervisor II. Supervisor I should have a PhD or Master degree with a minimum of 5 years teaching experience and have expertise relevant to the student's thesis. Supervisor II should at least have a minimal master degree & have expertise relevant to the student's thesis.

Thesis can be submitted for a thesis examination when the thesis has met the following academic requirements:

- Thesis has been registered in Study Plan Form [FRS] in said semester
- The thesis has been declared eligible for examination by the Thesis Advisor
- Students have passed seminar examination and have met the requirements for thesis examination set by the study program.
- The thesis has been declared eligible for examination must be submitted to the Department to be listed in the examination schedule determined by the Head of the Study Program.
- Uploading of Summary of Undergraduate Thesis/Thesis/Dissertation

Dissertation

Dissertation preparation are done under the guidance and evaluation of Promoter with the following qualification: Full Time University Lecture; a Professor or Doctor with an academic title of Associate Professor; Have a relevant expertise with the Dissertation Topic; within the last 5 (five) years have written at least 1 (one) scientific paper published in an accredited national journal or a reputable international journal or 1 (one) other similar scientific work acknowledge by a team of expert appointed by the Academic Senate of Universitas Indonesia. Promoter may be assisted by a maximum of 2 (tow) co-promoters from within the university, partner universities, or other institutions in cooperation with the promoter team. Co-promoter must have the following qualification: a full time or a part time lecture or an expert from other institution; hold a minimum title of Doctor/Ph.D with an academic title of a minimum Senior Lecture; Have a relevant expertise with the Dissertation Topic.

Internship

Internship is an out-of-campus activity to apply the scientific knowledge in a real work situation. Requirements for Internship is set up by each department and is part of the total 144 SKS. Students must find the place to carry out their internship themselves and departments will help by issuing a formal letter requesting the on-the-job training position.

For the undergraduate double degree program, students are required to complete internship when they are in the partner universities. For example in Australia internship is one of the requirements set by the Institute of Engineers Australia (IEAust) to obtain accredited B.E. (Bachelor of Engineering) degree. Internship is a good opportunity for students to apply their skills and build networks in the industry. It is strongly suggested that students should do their Internship in partner universities. However, if they cannot do so it in partner universities, they are allowed to do it in Indonesia with prior permission from partner university.

Supplementary Exam

Students are allowed to take a Supplementary Examination for Mid Term and Final Examination the following condition: Sick, Grievance; or representing Universitas Indonesia in a Competition. Students with Sickness excuse are obliged to submit the application for Supplementary Exam signed by their parents/guardian and a Medical Certificate from Doctor or Hospital where they was treated; Students with Grievance or death in the family (death to Father, Mother, Older or Younger Siblings) are obliged to submit the application for Supplementary Exam signed by their parents/guardian; Students representing

Universitas Indonesia in a Competition are obliged to submit a Letter of Assignments/ Letter of Reference stating the Competition which they represented UI in. The Supplementary Exam can only be done by a written consent from the Vice Dean for Academic, Research, and Student Affairs of Faculty of Engineering Universitas Indonesia.

Credit Transfer

Credit Transfer is a recognition process of a number of credits a student may obtained from a university after an evaluation process by a Credit Transfer Team on each Faculty /School in a University. Students who have registered and study at an undergraduate study program or other equivalent education programs, both within the Universitas Indonesia or in any other universities or through a Student Exchange or Study Abroad program, may apply for a Credit transfer, provided that: (i) the transferred credits contain the same material with the courses listed in the curriculum for undergraduate program in FTUI, (ii) the academic record must be dated not more than a maximum of 5 years from the credit transfer application date, (iii) if the academic record are obtained from other universities outside of the Universitas Indonesia, the university should have at least a "B" accreditation from the National Accreditation Board for Higher Education or other international accrediting agencies. The maximum academic load that can be transferred in an Undergraduate Program is a maximum of 50 (fifty) percents of the total academic load that a student is required to complete in accordance to the curriculum of the study program he/she is currently studying. The courses transferred will be indicated with "TK" mark in the academic transcript.

Credit Transfer procedure are as follows: (i) Student submit a letter requesting Credit Transfer to the Head of the designated department, (ii) The Head of the Department will form a team to recommend which courses the student has previously taken can be transferred, (iii) Recommendation will be sent to the Dean of FTUI, (iv) FTUI Dean issues the Credit Transfer Decree, (v) The Faculty's Center of Administration assigned "TK" marks for all relevant courses in the student's SIAK NG account.

Credit Transfer for Parallel Class Students of Diploma Graduates

Starting in 2011, all extension programs in FTUI were merged into Parallel Classes in the Undergraduate Program. Diploma graduates who are registered as a student in these parallel classes, credits obtained from the previous diploma program will be transferred in blocks of 36-41 credits. Students begin their study in the third semester by taking all academic load according to package provided for the third semester. Afterward, they can take credits in accordance with their IPS in the following semester.

Study Abroad

There are many opportunities available for undergraduate students, both from Regular and Parallel programs to participate in Student Exchange program abroad, such as in Japan, Korea, Taiwan, Singapore, and many other countries. Student exchange programs generally last for 1-2 semesters and is supported with a full scholarship. Information on Student Exchange program can be obtained from the Universitas Indonesia's International Office, PAU Building 1st floor. Courses taken during the study exchange program are transferrable when they return to Universitas Indonesia. Thus, students are still able to graduate on time.

In addition, Undergraduate students can participate in Double Degree 2 +2 International Undergraduate program with FTUI's partner universities. Students participating in this program will spend the last two years studying at the partner university abroad and he will earn two degrees once he graduates. However, this Double Degree program offers no scholarships. Thus, participating students should ensure their availability of funds. Student participating in classes outside of the university (in the form of Student Exchange, International Undergraduate Dual Degree Program, Sandwich Program, Joint Degree Program, or other university acknowledge program) for at least one semester will be given an "overseas" or study outside of the university status. Before leaving to continue their study overseas, students must ensure that their status in SIAK NG has been change to "overseas", and they are obliged to make payment to Universitas Indonesia in the amount stated in the applied Rector's Decree of "overseas" academic fee. Period of study abroad, either on the Student Exchange program and the Double Degree, is counted as part of the whole study period. The result or grades obtained from this program will not be calculated in determining their GPA and will be given a letter grade of TK in their transcript.

Fast Track

FT UI students, Regular, Parallel or International Undergraduate Program, with brilliant academic achievements can participate in the Fast Track program. In this program, FTUI's undergraduate students in semesters 7 & 8 are allowed to take several Master program courses. Courses that can be taken and

other requirements are specified by the Study Program in a way that the students can directly pursue Master program in FTUI and complete the program in 1 year. Thus, the total time needed to complete both undergraduate and master programs is 5 years or 10 (ten) semesters.

The Academic load for the Fast Track Program curriculum is as follow:

a. For the undergraduate program is 144 (one hundred and forty four) credits including 16-22 credits of elective subjects taken from the main competence subjects of the Master Program.
b. For the Master Program is 40-44 credits including the 16-22 credits from subjects mentioned in point a above and are acknowledge through credit transfer.

If student is unable to complete his/her Undergraduate Program in 8 (eight) semesters, then the student will be deemed as unable to complete the Fast Track program, making all the subjects of the Master Program he/she has taken will be considered as an elective subjects in their completion of the Undergraduate Program and cannot be acknowledge as part of their credit towards continuing to the Master Program.

Requirements and Procedure for Fast Track Registration

Undergraduate students who are interested in participating in the Fast Track Program must fulfill the following requirements:

Having a minimum GPA of 3.50

Having a minimum Institutional TOEFL/EPT score of 500 (students may use the score from the EPT test they took as new student in FTUI)

Having a high motivation for research

Procedure for Fast Track Program:

Fast Track Program is open for all FTUI undergraduate study programs which have the same specialization with the Master programs (for undergraduate study programs that have specialization).

Students who are interested in participating in the Fast Track Program are required to fill out the Registration Form downloadable through the http://www.eng.ui.ac.id/index.php/ft/downloadindeks (titled: (FormulirPendaftaran Fast Track Magister FTUI).

Students registering for the BeasiswaUnggulan from the Ministry of Education and Culture selection are required to fill out the BeasiswaUnggulan registration form downloadable from the same web page.

The Fast Track Registration Forms will be evaluated by a team headed by the Head of Department.

If the student's application to participate in the Fast Track scheme is approved, they are required to counsel with his/her academic advisor for the finalization of his/her Undergraduate (S1) and Master (S2) Study Plan. The student's study plan for semester 7 and 8, especially for the undergraduate Elective Course selection must be in accordance with the Compulsory and Elective Courses in their respective Master study program in line with their specialization.

Undergraduate thesis and thesis of the student are expected to be of continuous research to maximize knowledge, experience and quality research result.

The funds for the Fast Track Program will be borne entirely by the student.

Registration Form for the Fast Track Program for each running Academic Year may be submitted to each Department Secretariat on March each year at the latest.

2.2. ADMINISTRATIVE AND ACADEMIC REGISTRATION

Academic Calendar

Administrative and academic schedules in FTUI are set in accordance with the administrative and academic schedules in Universitas Indonesia as follows:

Term 1 2017/2018 *)

Administrative registration in Universitas Indonesia
July – August 2017

Academic registration in Universitas Indonesia
January - February 2017

Course period
August – December 2017

Mid-semester examination
October 2017

End of Semester Examination
December 2017

Deadline for grade assignment in SIAK-NG
January 2018

Departmental Judicium
1st, November 2017
2nd, January 2018

Faculty Yudicium
1st, November 2017
2nd, January 2018

Graduation
February 2018

Term 2 *)

Administrative registration in FTUI
January - February 2018

Academic registration in FTUI
January - February 2018

Course Period and examination
February - May 2018

Mid-semester examination
March - April 2018

End of Semester Examination
May 2018

Graduation
August 2018

Short Semester *)

Administrative Registration
June 2018

Academic Registration
May - June 2018

Course period
June - August 2018

Mid-semester Examination
July 2018

End of Semester Examination
August 2018

Note:
*) Schedules are subject to change
Note:

- Short Semester course period is held for 8 weeks, including mid-semester and final semester examinations.
- 2 credit courses consist of twice 2-hour contact per week, 3 credit courses consist of three times 2-hour contact per week, 4 credit subject consist of four times 2-hour contact per week.
- For regular undergraduate program: Faculty Basic Courses (Physics, Mathematics and Chemistry) are only available for students who wish to retake the course and have attended required lab activities.
- A student can take up to a maximum of 12 credits during the short semester.

- Courses offered are determined by the Department.
- If the number of students registered for a certain course in the Short Semester does not meet the minimum requirement, then the course will be canceled.
- Short Semester's tuition fee is not included in the normal tuition fee (BOP) and is calculated by the number of credits taken during the short term. Tuition fee for each credit is determined by FTUI.
- Payment for short semester courses must be made before the payment period is closed. Otherwise, the student's name will be automatically removed and the student is no longer considered as a participant in the short semester.

Registration and Course Guidelines

Before administrative registration takes place, FTUI publishes an academic calendar for one semester listing schedules for courses, mid-term, final-term examinations and other academic activities. The academic calendar and course schedule could be accessed at http://www.eng.ui.ac.id, and SIAK NG.

Administrative Registration

Administrative Registration includes payments of tuition fee and admission fee. Students are responsible for paying fees by the payment deadline. Students who do not complete the registration process by the payment deadline will not be registered at that particular semester will be included toward student's allowed length of study. Administrative registration are done by paying the tuition fee through the host-to-host system by the ATM (Automated Teller Machine) or bank teller of banks in cooperation with the Universitas Indonesia.

Academic Registration
Students should do online academic registration; consult with his/her Academic Advisor for approval and signing the Course Plan Form or FormulirRencanaStudi (FRS) during the academic registration period. The main duties of Academic Advisor are:

- Helping and directing students in their study plan particularly in selecting courses and in solving their academic problems
- Monitoring and evaluating student's academic performance during their period of study.

Students should logon to https://academic.ui.ac.id using username and password provided by the Office of PengembanganPelayananSistemInformasi (PPSI) UI. Students could get their username and password at PPMT (PusatPelayananMahasiswaTerpadu) building. Students could also download course schedules and academic calendar from the website.

After completing the online FRS, students should print the form (3 copies) and meet their PA to discuss, verify and validate the courses taken. Students have to check their FRS after registration period to ensure that the courses taken are correct. Fines will be levied to students for late administrative and academic registration, as per the university or the faculty regulation.

Sanctions

1. Students who do not carry out the administrative registration will receive inactive status as a student in the current semester, which is included as their length of study.
2. Students who do not carry out academic registration cannot follow the academic activities in the current semester, which is included as their length of study.
3. Students who are not active as referred to in points (1) are not charged with tuition payments.
4. Students who do not carry out the registration and administration of academic registration 2 (two) consecutive semesters, expressed as a university student resigned without notice from the university.
5. Active students who do not complete the payment in accordance with the agreement until the end of the semester goes imposed the fine of 50% of the unpaid amount.
6. Payment of fines referred to in points (5) shall be paid at the following semester Academic Registration

Exception Administrative Registration

When non-active students, with all reason intend to maintain their status as active students, they have to follow the procedure of administrative registration:

- Obtain the approval from FTUI by filling out a form available at PAF (Pusat Administrasi Fakultas/ Faculty Administrative Center).
- The students must come to the Directorate of Finance UI to obtain the approval for paying the tuition fee after paying the penalty 50% from the tuition fee on the current semester.
- The approval will be used by the students for paying the tuition fee manually.
- Students must give the copy of the payment record to the Directorate of Finance UI for verification.

Prerequisite Courses
These courses can only be taken if a student is currently taking or has previously taken and passed the prerequisite course with sufficient grade [not T].

Requirements for Transfer to Partner Universities in Australia for Double Degree Program

Minimum requirement of GPA and English before transferring to Partner University is listed in Table 2.3. Eligible students can continue their study to partner universities in Australia if they fulfill the following requirements:

1. Achieve minimum GPA as required at the end fourth semester for the 2+2 program;
2. Passed all required subjects as listed in the Study Program curriculum with minimum C with a total of passed credits consistent with the total number of credits listed in the Study Program curriculum for semester 1-4.
3. Achieve minimum IELTS or TOEFL scores as required.
4. If GPA less than required, the students must stay at UI and repeat some subjects to improve their GPA, while administratively and academically registered at FTUI.
5. If GPA meets minimum requirement, but IELTS or TOEFL scores less than minimum requirement, they are suggested to improve their IELTS or TOEFL score in Indonesia and maintain administrative registration at FTUI. Other choice is to take English for Academic Purposes (EAP) at the partner university. Information on duration and schedule of EAP can be found at the partner university's website.

Table 2.3. Minimum requirement of GPA and IELTS or TOEFL for transfer to the Partner Universities

Partner University	Minimum GPA	Minimum IELTS / TOEFL
QUT	3.0	IELTS min. 6.5 with no band lower than 6 IbT min 90 with no band lower than 22
Curtin		
UQ		
Uni Sydney		
Monash	3.2	

English Language Requirements for Undergraduate International Program Single Degree

Students of the Undergraduate International Program Single Degree (class of 2012 and after) are obligated to obtain an English certificate in IELTS (International English Language Testing System) or TOEFL iBT (Test of English as a Foreign Language –internet Based Test) with the following minimum score:

Type of Test	Overall Minimum Score	Additional Requirements
IELTS	6.5	No bands lower than 6.0
TOEFL iBT	80	No bands lower than 20

This English Language Certificate is one of the requirements before they may proceed to have their Undergraduate Thesis/ Final Project Exam. The date of said English Language Certificate is taken at least during their third semester of study.

Procedure for Study Abroad/ Student Exchange to Partner University for Undergraduate International Program Single Degree

1. Student choose a Partner University • Find out list of UI's Partner Universities • Information on Study Abroad/ Student Exchange Information from International Office UI through http://international.ui.ac.id
2. Student contacted the selected partner University for Information on: • List of subjects offered and course description • List of requirements/documents needed. • Application and Tuition Fees. • Other Documents needed.
3. Student consulted their Academic Guidance Counselor or the Vice Head of Department to determine the subjects they will take in Partner University that can be credit transferred upon their return.
4. The Head of Department issued a Letter addressed to the Vice Dean stating: • Name and Student ID of student participating in the Study Abroad/Student Exchange Program • Name of Partner University and length of study of said program • List of subjects that the students will take at Partner University.
5. The Vice Dean will assigned the Associate Dean for Academic and Head of PAF to process the student's status to "overseas" or "student exchange and issued a Reference Letter and Academic Transcript for the student.
6. Student prepare the documents needed for their Study Abroad/ Student Exchange: • Application Form • IELTS/TOEFL iBT • Other language requirement • Reference Letter and Academic Transcript from the Faculty.
7. Student sends their application documents to Partnery University.
8. Student receives Letter of Offer dan Letter of Acceptance from Partner University.
9. Student makes payment and signed the Letter of Offer
10. Student applies for Student Visa to the Country where the Partner University is located.
11. Departure to Partner University

2.3. GRADUATE PREDICATE

Students are considered to have passed the undergraduate program and earned a Bachelor Degree (S.T or S.Ars) if they are: registered as an active student in Universitas Indonesia during said semester both administratively and academically; have passed all the mandatory courses and acquired a minimum of 144 credits in accordance with the applicable curriculum with "C" as the lowest grade and completed all 8 semesters scheduled academic load within 8-12 semesters; completed all administrative obligation including the return of all borrowed library and laboratory collection; and complete all obligation of their study period and/or all assignments given in accordance to the curriculum of the Study Program (including revised Final Project) with a GPA ≥ 2,00 (two point zero). Honor predicate for graduates are determined by the student's final GPA as follow: Cum Laude (3.51 – 4.00), Very Satisfactory (3,01 – 3,51), and Satisfactory (2,76 – 3,00). For an undergraduate student to earn the Cum Laude degree, he must finished his study within 8 (eight) semesters time without retaking any courses.

Students are considered to have passed the Master program and earned a Master of Engineering or Master of Architecture Degree if they have passed all the required 40 – 42 credits, a ≥ 3.00 GPA

with "C" as the lowest grade and do not exceed study period and have met all administrative requirements. Honor predicate for graduates are determined by the student's final GPA as follow: Cum Laude (3.71 – 4.00), Very Satisfactory (3.41 – 3.70), and Satisfactory (3.00 – 3.40). For a Master program student to earn the Cum Laude degree, his length of study must not exceed 4 (four) semesters time without retaking any courses.

Students are considered to have passed the Doctoral program and earned a Doctor Degree if they have passed all the required 48 – 50 credits, a minimum GPA of 3.00 with a minimum "C" for in-class courses and a minimum "B" for research courses, do not exceed study period and have met all administrative requirements. Honor predicate for graduates are determined by the student's final GPA as follow: Cum Laude (3.71 – 4.00), Very Satisfactory (3.41 – 3.70), and Satisfactory (3.00 – 3.40). For a Doctoral program student to earn the Cum Laude degree, his length of study must not exceed 6 (six) semesters time without retaking any courses. The mark "BS" is not counted as course repetition. If a student's final GPA is within the 3.71 – 4.00 range but he fail to meet the other requirements, he will be awarded the "Very Satisfactory" predicate.

2.4. ACADEMIC PERFORMANCE EVALUATION AND DROPOUT CRITERIA

Undergraduate Program

The university also requires that students maintain satisfactory academic performance during their study at FTUI and meet the following evaluation criteria to be able to continue their studies:

- Attain at least 24 credits with a minimum of C at the end of their second semester;
- Attain at least 48 credits with a minimum of C at the end of their fourth semester;
- Attain at least 72 credits with a minimum of C at the end of their sixth semester;
- Attain at least 96 credits with a minimum of C at the end of their eight semester;
- Attain all required credit with a minimum of C at the end of their twelfth semester;

Or:

- Have the following problem: have an inactive status (empty) for two semesters in a row thus being declared as "resign" automatically from the status of Universitas Indonesia's student by the Rector's decree on Status Determination.
- Proven to be in violation of rules or regulations that caused the student to lose his right as FTUI students.
- Deemed unfit to continue their study based on consideration from a team of Doctors appointed by the Head of the University.

Student who still maintain satisfactory academic performance and meet the evaluation criteria to continue his study but would like to resign on his own free will may submit a written application to the Dean with a copy to the Head of the Department.

Master Program

The Maximum length of study to earn a Master Degree in FTUI is at the latest 6 (six) semesters, starting from registration time to graduation. This provision also applies to students who enroll in the FTUI Master program with a "probation" status. Students will lose their right to continue the study (dropping out) if:

- Students fail to achieve a 3.00 GPA of at least 14-18 passed credits (for regular Master Program student) or 12-14 passed credits (for non-regular Master Program student) at the end of the second semesters;
- In the end of the study period evaluation, students fail to achieve the following graduation requirements: registered as an active student in Universitas Indonesia during said semester both administratively and academically; not exceeding the maximum length of study; completed all administrative obligation including the return of all borrowed library and laboratory

collection; and complete all obligation of their study period and/or all assignments given in accordance to the curriculum of the Study Program (including revised Final Project) with a GPA ≥ 3,00 (three point zero)
- Students who do not register academically and administratively for two consecutive semesters.
- Proven to be in violation of rules or regulations that caused the student to lose his right as FTUI students.
- Deemed unfit to continue their study based on consideration from a team of Doctors appointed by the Head of the University.

Student who still maintain satisfactory academic performance and meet the evaluation criteria to continue his study but would like to resign on his own free will may submit a written application to the Dean with a copy to the Head of the Department.

Doctoral Program
The Maximum length of study earn a Doctoral degree in FTUI is 10 (ten) semesters, starting from registration time to graduation.

Students of the Doctoral Program (Class and Research) will lose their right to continue to study (dropping out) if:
- Students who do not register academically and administratively for two consecutive semesters will be automatically considered to have resigned from UI.
- Failed to obtain a minimum of B for their Research Proposal Examination or similar exam at the end of their fourth semester;
- Failed to obtain a minimum of 50 (fifty) percent for their Research based on the judgment of the promoter team at the end of their sixth semester;
- Failed to obtain a minimum of 75 (seventy five) percent for their Research based on the judgment of the promoter team at the end of their eight semester;
- Failed to obtain the following by the end of their study period of ten semesters: produce 1 (one) scientific paper based on research for their dissertation as main writer that can be accompanied by the promoter team and has been accepted to be published in an indexed international journal (8 credits); submit proof of compliance of requirements as stated before as part of the requirements for promotion exam; submit 1 (one) Dissertation and participate in a Promotion Exam as the final step of the Doctoral Program (6-8 credits).
- Exceeded the maximum length of study (10 semesters).
- Proven to be in violation of rules or regulations that caused the student to lose his right as FTUI students.

Student who still maintain satisfactory academic performance and meet the evaluation criteria to continue his study but would like to resign on his own may submit a written application to the Dean with a copy to the Head of the Department.

Students of the Doctoral Program (Research) will lose their right to continue to study (dropping out) if:
- Students who do not register academically and administratively for two consecutive semesters will be automatically considered to have resigned from UI;
- Failed to obtain a minimum of B for their Research Proposal Examination or similar exam at the end of their fourth semester;
- Failed to obtain a minimum of 50 (fifty) percent for their Research based on the judgment of the promoter team at the end of their sixth semester;
- Failed to obtain a minimum of 75 (seventy five) percent for their Research based on the judgment of the promoter team at the end of their eight semester;
- Failed to obtain the following by the end of their study period of ten semesters: produce 1 (one)

scientific paper based on research for their dissertation as main writer and be presented at an international scientific conference and published in the proceeding as a full paper (6 credits); produce 1 (one) scientific paper based on research for their dissertation as main writer that can be accompanied by the promoter team and has been accepted to be published in an indexed international journal (8 credits); submit 1 (one) scientific paper that has been accepted to be published in a nationally accredited journal; submit proof of compliance of requirements as stated before as part of the requirements for promotion exam; submit 1 (one) Dissertation and participate in a Promotion Exam as the final step of the Doctoral Program (6-8 credits).

- Exceeded the maximum length of study (10 semesters).
- Proven to be in violation of rules or regulations that caused the student to lose his right as FTUI students.

Student who still maintain satisfactory academic performance and meet the evaluation criteria to continue his study but would like to resign on his own may submit a written application to the Dean with a copy to the Head of the Department.

2.5. ACADEMIC LEAVE

Student who wishes to be away from his/her academic endeavors at FTUI for one to two semesters, but intend to return to FTUI are eligible for academic leave of absence. Leave of absence could be only given to student who has studied at least two semesters at FTUI, unless with specific circumstances. Academic leave for special circumstances are academic leave that is given to students for an unavoidable hindrance, such as: state task, university task, or undergoing medication which prohibited said student to participate in academic activity. Academic leave is not counted as part of the length of study.

Procedures of Academic Leave

1. To obtain academic leave, a student must write a letter requesting for academic leave to the Dean before the beginning of the administrative registration period of semester.
2. If the academic leave is approved, PAF will change the status of the student as academic leave before the beginning of the administrative registration period of semester and the amount of tuition fee will automatically be changed.
3. The student must pay 25 % of tuition fee during the period of administrative registration of the intended semester.
4. If a student has been granted an academic leave but fail to pay the obligated fee due to them during the registration period, the academic leave will be canceled and the student status will revert to inactive (empty).
5. In the situation as stated above, if the student still insist on making payment after the registration period has passed, the student will be charged with a late administration registration fee in the amount stated in the regulation issued in the Rector's Academic Fee.
6. If the students fail to pay during the prescribed period of administrative registration, Exceptional Administrative Registration will apply.
7. If the Academic Leave is proposed not accordance with point (1) above, or is proposed after the semester is on, the student should pay full amount (100 %) of tuition fee.

2.6. FACULTY and DEPARTMENT JUDISIUMS

Judisium is a meeting held at both the Faculty and the Department level to decide whether a student has fulfill all academic requirements and may graduate and earn a degree in engineering based on the Department / Faculty Evaluation.

2.7. SEMESTER GRADE TRANSCRIPT, DIPLOMA and ACADEMIC TRANSCRIPTS

FTUI Central Administration Office is responsible for issuing Semester Grade Transcript, Diploma

and Academic Transcript for all FTUI's graduates. Student Academic History is issued based on student's request while the diploma and academic transcripts are issued only once at the time of the student's graduation. Contained within the Student Academic History and Academic Transcript are name, course code and grades of all courses that the students took during their study period. Also included is the student's Grade Point Average (GPA) which is calculated based on all courses' grades. Diplomas and Academic Transcripts will be handed to all graduates no later than 2 (two) months from the date of graduation.

The Semester Academic Transcript (DNS) gives the information on the student's identity (name, student ID and latest education), Academic Advisor, Faculty, Study Program, Specialty, Education Level, Subject Code, Subject Title, Credit, Letter Grade, Semester GPA, and GPA. The Semester Academic Transcript can be issued as hard copy based on a student request as required. A valid DNS is signed by official handling the academic administration in the Faculty level.

Academic Record recorded chronologically all academic activity of a student since they first registered as a student until they are no longer registered, due to graduation, drop out, or resignation. The academic status of a student of each semester is recorded in the Academic Record. The Academic Record is also used as a source of information for student, Academic Advisor, and Study Program to the success of a student study and is issued as required based on the student's request and validated by the Vice Dean of the Faculty.

Academic Transcript is given to student that has been declared as a graduate from a Study Program which is decided in a graduation determination meeting and contained information on a student identity (name, student ID, place and date of birth), previous education, education level, study program, specialty, list and code number of subjects, letter grade, number of required credits, number of obtained credits, GPA, title of the student's Final Project, diploma number and year of graduation. All subjects taken by the student, including repeated subjects and transfer credit subjects, are included in the Academic Transcript which is issued in two language, Bahasa Indonesia and English. The Academic Transcript will be given to students with no arrears of tuition fees.

Diploma is given to student that has been declared as a graduate from a Study Program which is decided in a graduation determination meeting. Diploma contained information on the identity of the diploma holder (name, place and date of birth), academic title, name and signature of the Rector and Dean, date of diploma issued, date of graduation, student ID, diploma number and signature and photo of the diploma holder. In the event that the diploma is lost or damaged, the diploma holder is allowed to request a copy of the diploma. Dean/ Vice Dean/ Director of Academic on behalf of the Rector may signed to validate a copy of diploma. Diploma will be given to students with no arrears of tuition fees.

2.8 OFFENSES AND SANCTIONS

In any particular courses, no students shall engage in any form of unethical or improper conduct, such as but not limited to examination offenses:
Utilizing unauthorized materials/notes to enhance performance during on examination.
Attempting to observe the work of another student.
Taking an examination for another person, or permitting someone else to do so.
Collaborating improperly by joint effort on discussion in anyway expressly prohibited by lecturer.
When incidents, as enumerated above occurs, the following sanctions may be imposed (as per FTUI regulation):
The student may be assigned E for the subject in question
The student may be suspended for one semester
The student may be dismissed or expelled by FTUI
If necessary, a meeting of PanitiaPenyelesaianPelanggaran Tata Tertib (Offence Settlement Committee) (PT32) may be held.

Academic Sanction for Perpetrators of Academic Cheating In Exams

a. Academic sanction in the form of the cancellation of said exam (E grade) for student caught or proven committing academic fraud in examination process, such as working with other student, copying other student's work or giving answer to other student;
b. Academic sanction in the form of study period cancellation (for all subjects) for said semester

for student caught or proven committing academic fraud in examination process such as opening books, notes or other equipment planned before;

c. Academic sanction in the form of cancellation study period for said semester and one semester suspension for student caught or proven committing academic fraud in examination process due to working together with outside person(s) outside of the examination room;
d. Academic sanction in the form of expulsion from the Faculty of Engineering Universitas Indonesia (expelled) for student caught or proven committing academic fraud in the examination process by replacing other examinee or by having someone else take their place;
e. Academic sanction in the form of expulsion from the Faculty of Engineering Universitas Indonesia (expelled) for student caught or proven committing academic fraud in the examination process for planning and carrying out the plan to help other examinee;
f. Other academic fraud will be handled through a hearing by the Committee of Rules and Conduct Regulation Violation (Panitia Penyelesaian Pelanggaran Tata Tertib (P3T2)) Faculty of Engineering Universitas Indonesia;
g. Student is entitled to an appeal with the help of their Academic Advisor and the Vice Dean for Academic, Research, and Student Affairs Faculty of Engineering Universitas Indonesia, submitted to the Faculty Academic Senate in the quest of justice.

Academic Sanction on Plagiarism and Act of Fraud in the Completion of Final Project

Plagiarism is an act of stealing ideas or thought already available in written and/or someone else's writing and used them as if it is our own ideas, thoughts and/or writing thus causing harm/loss to the original owner both material or non material, this plagiarism can be in the form of using a word, phrase, sentence, paragraph, or even a chapter of someone else's writing or book, without stating the source. Included in this is the auto plagiarism.
Auto Plagiarisme is an act of using an idea or thought repeatedly in writing or using someone's own writing in parts or whole without stating the origin published source as if those ideas or thoughts are a new idea, thought and/or writing.

Plagiarism criteria used as a based to decide a sanction focuses on the amount of idea or phrase stolen and how similar the writing in phrase, sentence, paragraph, section, chapter, and the writing as a whole. A work can be considered plagiarism if based on the verification result on the writing contained a similarity level of 35% or more with the original work. To prevent plagiarism, student is obligated to check their final work using software of anti plagiarism provided by the Faculty or University before submitting their work to their advisor/promoter/co-promoter. If such software is unavailable, student is required to check existing list of research in connection to the topic of their research and state such research in their reference of research. Student caught and proven of committing plagiarism is entitled to an appeal tried in the Study Program level to the Faculty which the Faculty will later passed on to the university through the P3T2 to be verified and processed.

In case of an active student, early sanction can be in the form of delaying the final project examination or delaying the graduation status for student who has been declared passing the final project examination. Student that has been declared as a graduate but have not received their diploma, with the approval of the Rector, the Dean may hold said student diploma while await the Rector's final decision. Academic sanction on plagiarism for active student is established through the Dean's decree based on the proposal by the Head of the Study Program or recommendation from the Faculty in one month at the latest since the date of the proposal letter was accepted by the Dean. For graduate student is established through the Rector's Decree based on the P3T2 recommendation. The heaviest academic sanction given can be in the form of cancellation of the student final project (for active student) with the obligation to write a new final project with new topic, while for graduate student the sanction is in the form of revocation of academic titles.

The act of fraud in the writing of Final Project, Essay as Exam Substitute, or Assignment, includes the usage of other person's service/ replacement/ consultant/ or other service to complete assignments in the name of said student and other manipulative act of fraud. This act does not include the usage of service for data collecting, survey, and data processing for the completion of final project of student. Sanction given to the perpetrator of said act of fraud in the completion of final project is established throught the Dean's decree issued in one month at the latest since the proposal letter from the Head of Study Program is received by the Dean. The heaviest academic sanction given can be in the form of cancellation of the student final project (for active student) with the obligation to write a new final project with new topic, while for graduate student the sanction is in the form of revocation of academic titles. Active students who consciously act as a ghost writer in writing the final works for other students will be given the equivalent of student academic sanction given to the perpetrators of acts of fraud.

2.9. ACADEMIC REGULATION OF THE UNIVERSITAS INDONESIA

List of Academic Regulations at Universitas Indonesia can be accessed via http://resipotory.ui.ac.id.

Below is a list of Decrees that functioned as reference for education program at Universitas Indonesia

GENERAL:

Decree of the Board of Trustees Universitas Indonesia
Number: 008/SK/MWA-UI/2004 on the Amendment of Board of Trustees' Decree Number: 005/SK/MWA-UI/2004 on the Code of conduct on Campus Life in Universitas Indonesia

EDUCATION:

Decree of the Rector Universitas Indonesia
Number: 285/SK/R/UI/2003 on the Implementation Guidelines for Cross-Faculty Lectures in Universitas Indonesia

Decree of the Board of Trustees Universitas Indonesia
Number: 006 / MWA-UI/2004 on the Universitas Indonesia's Academic Curriculum

Decree of the Rector of Universitas Indonesia
Number: 491/SK/R/UI/2004 on Universitas Indonesia Education Activities Conclusion Regulations

Decree of the Board of Trustees Universitas Indonesia
Number: 001 / TAP/MWA-UI/2005 on the Establishment of Academic Degrees in the Universitas Indonesia.

Decree of the Board of Trustees Universitas Indonesia
Number 003 / TAP/MWA-UI/2005 on General Guidelines for Implementation on Universitas Indonesia's Professional Programs

Regulation of the Board of Trustees Universitas Indonesia
Number: 006 / Peraturan/MWA-UI/2005 on Student Learning Outcomes Evaluation at Universitas Indonesia

Regulation of the Board of Trustees Universitas Indonesia
Number: 007 / Peraturan/MWA-UI/2005 on Academic Education Implementation Norms in Universitas Indonesia

Regulation of the Board of Trustees Universitas Indonesia

Number: 008 / Peraturan/MWA-UI/2005 on Professional Education Curriculum Norms in Universitas Indonesia

Decree of the Rector of Universitas Indonesia
Number: 838/SK/R/UI/2006 on Administration of Universitas Indonesia Student's Learning Outcomes

Decree of the Rector of Universitas Indonesia
Number: 012/SK/R/UI/2007 on Implementation of the of Students Learning Activity in Universitas Indonesia

Decree of the Rector of Universitas Indonesia
Number: 450/SK/R/UI/2008 on the Implementation of E-Learning in the University Indonesia

Decree of the Dean of Faculty of Engineering Universitas Indonesia
Number: 290/D/SK/FTUI/VI/2013 on the English Requirements for Undergraduate International Program Single Degree Faculty of Engineering Universitas Indonesia.

Decree of the Rector of Universitas Indonesia
Number :014 year 2016 on the Implementation of Undergraduate Program in Universitas Indonesia

Decree of the Rector of Universitas Indonesia
Number :015 year 2016 on the Implementation of Master Program in Universitas Indonesia

Decree of the Rector of Universitas Indonesia
Number :016 year 2016 on the Implementation of Doctoral Program in Universitas Indonesia

Decree of the Dean of Faculty of Engineering Universitas Indonesia
Number: 622/D/SK/FTUI/IX/2016 on Academic Sanction for Academic Fraud Perpetrator in Faculty of Engineering Universitas Indonesia.

Decree of the Dean of Faculty of Engineering Universitas Indonesia
Number: 623/D/SK/FTUI/IX/2016 on General Regulation on Supplementary Exam for Mid Term and Final Examination in Faculty of Engineering Universitas Indonesia.

Decree of the Dean of Faculty of Engineering Universitas Indonesia
Number: 624/D/SK/FTUI/IX/2016 on Academic Sanction for Plagiarism and Act of Fraud in the Completion of Final Project in Faculty of Engineering Universitas Indonesia.

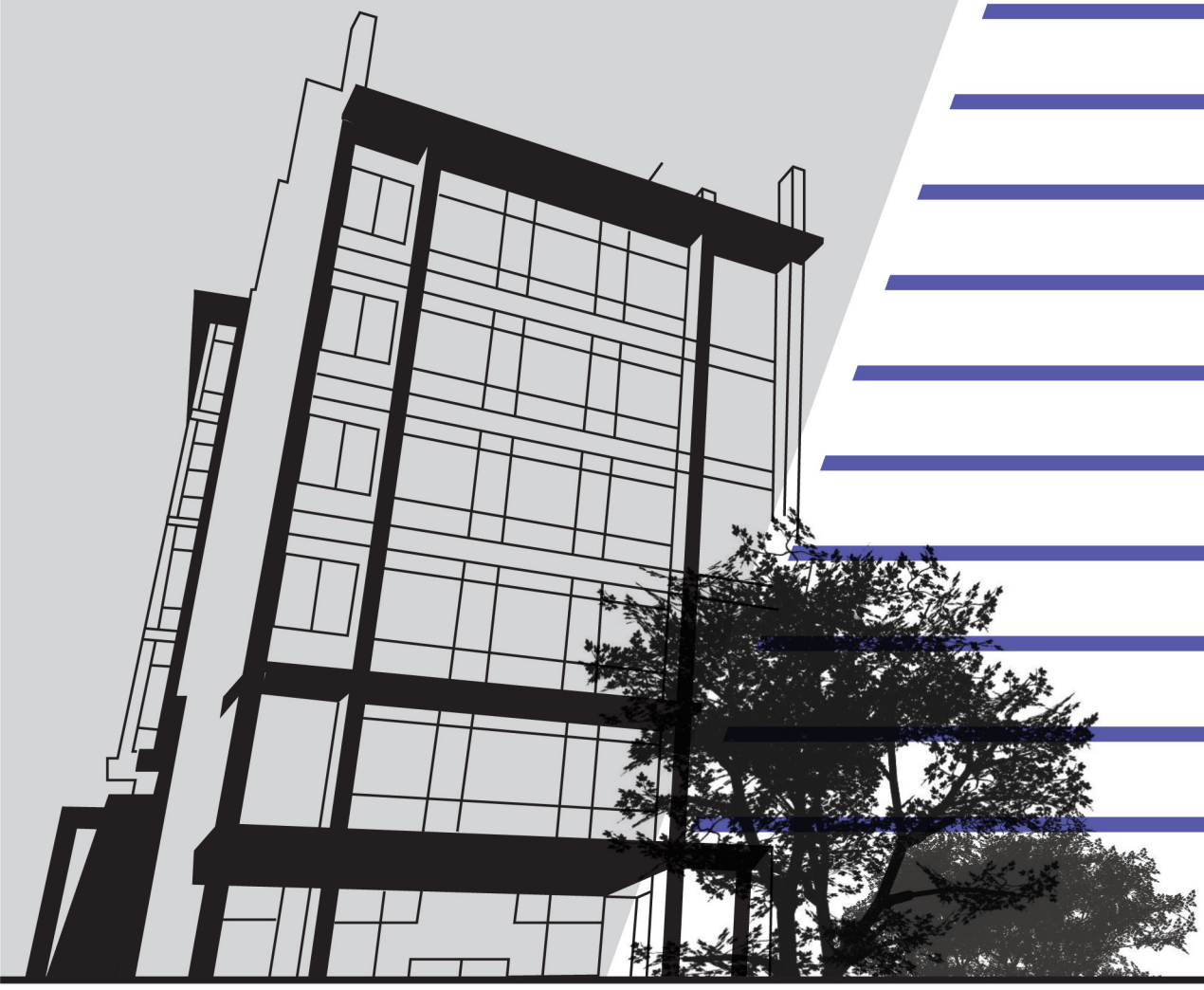
RESEARCH

Decree of the Board of Trustees Universitas Indonesia
Number 002/SK/MWA-UI/2008 on University's Research Norms

Decree of the Board of Trustees Universitas Indonesia
Number 003/SK/MWA-UI/2008 on Research Policy at Universitas Indonesia

Decree of the Board of Trustees Universitas Indonesia
Number 009/SK/MWA-UI/2008 on amendment of the Decree of the Board of Trustees of Universitas Indonesia Number 003/MWA-UI/2008 on Research Policy in Universitas Indonesia

FACILITIES
AND CAMPUS LIFE



3. FACILITIES AND CAMPUS LIFE

NEW FACILITIES AVAILABLE IN FTUI

1. All classrooms in S building are now having one special chair for each classroom dedicated to left handed students.
2. FTUI has renovated the S405 classroom into a specially design discussion room for students to learn and discuss in groups in the implementation of Student-Centered Learning (SCL). This renovation is partly funded by USAID through their PEER Science research program by providing chairs, computer screen for each discussion group, wireless LCD projector and documented camera. The renovation is completed by the start of the Odd Semester of 2015. The class room will be able to accommodate up to 80 students in groups discussion form as in problem-based learning (PBL) or Collaborative Learning (CL) and up to 100 students in class room form
3. Online Electricity Metering and Monitoring System now help FTUI in monitoring electricity usage of each building and their characteristic. www.ee.ui.ac.id/power; www.eng.ui.ac.id/power
4. Offline Water Metering and Monitoring System prepare FTUI in determining the water usage of each building and help plan the creation of rain water well within the faculty.
5. Smoking is prohibited throughout most of the faculty areas. However, the new and vastly improved Smoking Shelter is now available in the student's cafeteria area and in front of the S Building.
6. Starting from April 2012, we have started to tests all of our cafeteria vendors for E-Coli. Working together with the Faculty of Public Health, we conducted several Hygiene tests to our vendors. Between these tests we also conducted seminars, socialization, and counseling to all of our food vendors regarding the level of cleanliness and hygiene level expected from them. We also improved the sewer, sink and the vendor's facilities to achieve the desired effect. By February 2015, all food vendors in our Student's Cafeteria are 100% free of E-Coli, Salmonella and Borax. Thus, making us proud to say that FTUI's Students' Cafeteria is one of the healthiest in the university.

3.1. INTEGRATED STUDENTS SERVICE BUILDING (PPMT)

This building is located at the left of the Rector building with the one door policy in serving the registration process of all Universitas Indonesia students, whether they are vocational, undergraduate, undergraduate extension, master, doctoral, specialist, and professional students. This building consists of three divisions: PPSI division, Student Affairs division, and Academic division.

3.2. FACULTY ADMINISTRATION CENTER (PAF)

Academic administrative services for all academic programs in FTUI are managed by PAF. The services provided for students include academic records, change of grades from lecturers, testamur and academic transcripts, registration, absence of leave, enrollments and letter of reference letter. The working hour is at 08.00 to 16.00 from Monday to Friday, at PAF building.

3.3. UNIVERSITY CENTRAL LIBRARY

Location : Kampus UI Depok
Service hours of UI Central Library

Monday - Friday	08.30 - 19.00 WIB
Saturday & Sunday	08.30 - 15.00 WIB
Holly Month of Ramadhan	08.30 - 15.00 WIB

Membership:

Students, lecturers, researchers and employee of the Universitas Indonesia are entitled for membership of the central library with the following requirements:

1. Provide the latest semester payment proof or the latest study card (IRS) or certification letter from any faculty, unit or department within the Universitas Indonesia.
2. Provide a 2x3 photo (one)
3. Provide a cover letter from the faculty (for lecturers)

Lending Procedures:
- General text books can be borrowed for two weeks (max. 3 books) by showing your Student Card. Borrowed books need to be stamped.
- Reference books, magazines, newspaper and thesis can only be read on the spot or photo-copied.
- Dissertation and thesis can only be photocopied as many as 10 pages.

UI Central Library Services

Reference Service
This service is provided to help the UI civitas academica in searching information, especially for students who are working on their final assignment or research. Information search request may be submitted in person or via email (reflib@ui.ac.id).

Information Package
Information package is a form of service in the form of certain topics of information packages. Each package consists of several articles and their annotation in accordance to the selected topic. Each article can be obtained by contacting the reference division first (reflib@ui.ac.id) or by direct phone request (+6221-7270751).

Information Search Training
The information search training consists of several packages. They are: basic and advance package. This training is provided to help improve the information skill of library visitors and members. This service is available to all university members, especially new students and students who are in their final year. Request for training can be submitted directly or through the email perpusui@ui.ac.id

Circulation (Borrowing Books)
The circulation services are located in level 1
The library's collection of reference books, thesis, dissertation, research reports and UI-ana can only be read on the spot at the UI Central Library.

UI Central Library Facilities
OPAC (Online Public Access Catalog)
OPAC is a tool to search the information regarding the available collection of the library by using a terminal computer. OPAC computers are available on every floor of the library.

Internet Access
Internet access connection at the UI central library uses the integrated network (JUITA – Jaringan Terpadu) and can also be accessed by using the UI Hotspot. Internet service is also available at the first floor of the central library. Also available are computers with internet access for the usage of library visitors and members.

Computer, Scanner and Data Backup
Students are allowed to use the provided computers to work on their assignments, picture/photo scanning and to burn the result of their information search to a CD.

Photocopy
A photocopy machine is available at the UI Central Library

Discussion, Class and Seminar Rooms
Discussion, Class and Seminar rooms are available for students' needs and for classes.

Special Study Rooms
Special study rooms are available and can be used by all university members. These rooms are equipped with a desk, filing cabinet and internet access.

Locker
250 lockers are available for UI Central Library Members.

3.4. COMPUTER SCIENCES & NETWORK

Directorate of Information System Development and Service (PPSI) are responsible for the programmed computer network system designed to help fulfill the students and lecturers needs in computer usage (from academic activities such as programming to internet usage) through the Integrated UI network (JUITA).

Requirements for using the JUITA:
- Registered as a UI student
- Fill out registration form with a reference from the Associate Dean for Students Affairs/ Head of Study Program/Academic Counselor of the student.

Place of Registration:
- Depok (Integrated Student Service Center Building)
- Salemba (PUSILKOM Building)

Hotline Service
Users who are experiencing problems in the use of this facility can report or request the help of the Computer Technical Unit through the following PPSI hotline service:
Phone : +6221-7863419
Email : support@ui.ac.id
Web Site : http/cso.ui.ac.id
Office Hours : Monday – Friday
(09.00 - 16.00)

Puskom Services at FTUI

Puskom (Pusat Komputer) provides services related to education and information technology development for students and academic/non-academic staff. The office is located at 2nd floor of GK Building at FTUI, Depok Campus. Main duties of Puskom is to provide education facilities for students, learning and research facilities for lecturers, and services for education administration, students and personnel. Puskom also provides connection services to internet and local area network at the Faculty and the University. Internet can be accessed at all area of FTUI. This facility can be used by students as well as faculties. All computer networks have been connected by fiber optic cables for inter-building and copper cable in the buildings with capacity of 100 Mbps. Besides providing local networks, Puskom also controls 7 computer servers with redundancy backup to minimize troubles in academic and research services. Computers are also available for students at various locations at FTUI i.e. computer laboratory at 2nd floor of GK Building, as well as at FTUI building at Salemba Campus. The service hour is 09.00 to 16.00 from Monday to Friday. For further information please contact Puskom at GK Building, 2nd floor, tel. 021-7863508, 021-2720011 ext. 64, or send email to puskom@eng.ui.ac.id.

3.5. STUDENT WELFARE

3.5.1. UNIVERSITAS INDONESIA MOSQUES

- The Ukhuwah Islamiyah (UI) Mosque Depok located in the UI Depok Campus. Established on

28 January 1987 for the Friday prayer with Prof. H. Moh. Daud Ali, SH as khatib (preacher). This mosque was named Ukhuwah Islamiyah for within this mosque is fostered the Islamic brotherhood within the campus as well as the unity and brotherhood of Moslem from within and outside of campus area.

- The Arif Rahman Hakim (ARH) Mosque Salemba is located in the UI Salemba Campus. Established on 10 November 1967, 27 Rajab 1387 H. Based on the UI Rector Decree dated 16 August 1966, a development committee was established and consist of students. The vision of this mosque is to be the center of Islam education in the campus and produces modern Moslems (equipped with faith and knowledge) that can implement the teachings of Islam and help solve religious problems.

3.5.2. TEKSAS BRIDGE

The Teksas Bridge is a linkage bridge between two faculties in the UI Depok campus, the Faculty of Engineering and the Faculty of Humanities. These two faculties are separated by an 80 meters lake. The Teksas Bridge is hoped to serve as:

- As a connection bridge and "Landmark"
- As a research object for steel application product
- As a promotional tool on "Aesthetics Steel"

The concept of this bridge aims towards two approach:

- The side of the bridge on the Faculty of Engineering UI reflects a powerful and masculine character symbolized with a "Sail" shaped Pylon Bridge soaring to the sky as a symbol of "LINGGA".
- The side of the bridge on the Faculty of Humanities UI reflects a flexible and feminine character symbolized with a "Hole Gate" shaped Pylon Bridge as a symbol of "YONI".

3.5.3. CAMPUS BUS

To serve the transportation needs of students within the campus, Universitas Indonesia provides 20 campus busses. These busses will serve inside campus routes from these times: 07.00-21.00 (Monday-Friday) and 07.00-14.00 (Saturday). These yellow campus busses have two different routes:

- Blue: UI Dormitory, Gerbatama, UI Train Station, Faculty of Psychology, Faculty of Social and Political Science, Faculty of Humanities, Faculty of Economics, Faculty of Engineering, KuKel, Student Center Building, Faculty of Mathematic and Natural Sciences, Faculty of Public Health, Balairung, UI Mosque, and Faculty of Law.
- Red : UI Dormitory, Gerbatama, UI Trains Station, Faculty of Law, UI Mosque, Balairung, Faculty of Public Health, Faculty of Mathematic and Natural Sciences, Student Center Building, KuKel, Faculty of Engineering, Faculty of Economics, Faculty of Humanities, Faculty of Social and Political Science, and Faculty of Psychology.

Executive Bus

In order to provide transportation service, especially outside campus transportation, Universitas Indonesia provides Air Conditioned and Non-Air Conditioned busses for rent. These busses are available for various types of activity, such as: UI student organization activities, academic support activities, and many more.

Rental Procedures:

- Written rental request is submitted to:
  Directorate of Student Affairs
  Integrated Student Service Center
  Building, Kampus UI Depok
  Phone : +6221-7867222 (Operator)
  Fax : +6221-7863453
- Payment should be made, at the very latest, one week before the date of use via BNI Bank, Kampus UI Depok Branch, and Account Number: 1273000024 under the name of Universitas Indonesia.
- Proof of payment must be submitted to the Directorate of Student Affairs. Cancellation done 3 (three) days before the date of use will be charge a 10% cancellation fee from the paid rent.

Cancellation on the date of use will be charge a 30% cancellation fee from the paid rent.

3.5.4. STUDENT WELFARE AND FACILITY BUILDING (GKFM) / University Health Center
Address : Kampus UI Depok
Phone : +6221-78881019
This building is located in front of the Faculty of Engineering in UI Campus Depok. GKFM / University Health Center Building was built to better serve several important needs of the students, such as:

Polyclinic Unit
Provide a free health service to all students of the Universitas Indonesia. Students only need to provide their Student ID card to process their membership card for future medical record to receive this service. There are several services available:
a. Public Health Service
b. Dental Health Service

Service Hours:
Monday – Thursday : 08.00 - 12.30
and 14.00 - 19.00
Friday : 08.00 - 11.00
and 14.00 - 19.00
Saturday : 08.00 - 12.00

Note:
Aside from the above mentioned facilities for students which are funded by the Students Welfare and Facility Fund, GKFM in UI Depok Campus also provide facilities for blood chemistry examinations, x-ray, and cardiac examination for university members with affordable prices.

Pharmacy
The pharmacy provides free medicine for 3 (three) days for UI students who seek treatments in the Polyclinic unit. The pharmacy also provides various other medicines for first aid needs for general public purchase.

UI Student Counseling and Guidance (BKM)
In providing service in the mental welfare of the UI students, the Student Counseling and Guidance is a place where UI students can receive psychological help in dealing with academic, personal or family problems. These psychological help are given in the form of counseling and guidance. Guidance service is the provision of information (to an individual or group) with the purpose of making sure that students are able to learn and build an optimal social relationship. Counseling service is the process of giving help to students and support student in finding a way to solve his problem. Here, a counselor functions as a facilitator.

Services in the UI Student Counseling and Guidance
The routine services provided by the BKM UI are counseling and guidance services daily which are done at:
Service Time : Monday – Friday
Service Hours : 09.00 – 15.00
Place : Student Welfare Center
2nd floor, Student Welfare & Facility Center Building
UI Campus Depok
Phone : +6221-96384797

BKM UI staff of counselors consists of psychologies, psychiatrists, and academic counselors.

Problems handled by BKM UI
Generally, the problems handled by the BKM UI consist of academic, personal, family, and social

problems.

BKM UI's other services:
- Online counseling
- Peer counseling training
- Counseling training for counselor lecturers and BKM management in the faculty level.
- Coordinate meeting between BKM in the university and faculty level.
- Personality development training
- Group therapy

UI Salemba Polyclinic
For students in the UI Salemba Campus, the university also provides similar health service in the polyclinic for public health service.

Service time : Monday – Friday: 08.00 – 12.00
and 14.00 – 18.00

3.5.5. UI STUDENT DORMITORY
Location : UI Campus, Depok
Phone/Fax : +6221- 7874414 /
+6221-7874271
Capacity : 594 rooms for male students housing, 656 rooms for female students housing (including the VIP – AC rooms)
Facility : TV, cafetaria, public pay phone, public internet shops, computer rental

UI Wismarini Student Dormitory
Location : Jl. Otto Iskandar Dinata No. 38, East Jakarta, Indonesia
Phone/Fax : +6221-8195058
Capacity : 72 rooms for male students housing, 111 rooms for female students housing
Facility : Badminton court, TV, cafeteria, Table Tennis

The UI Wismarini student dormitory is provided to students from the Salemba Campus (Faculty of Medicine & Faculty of Dentistry).

Facility
- Standard housing facility: Bed, table, chair, wardrobe, shoe rack, lamp, bathroom, wash basin.
- Technology facility: Public pay phone shops, public internet shop, photocopy
- Public facility: Cafeteria, praying room, laundry service, sport facility, car/motorcycle parking areas, minimart, dormitory market

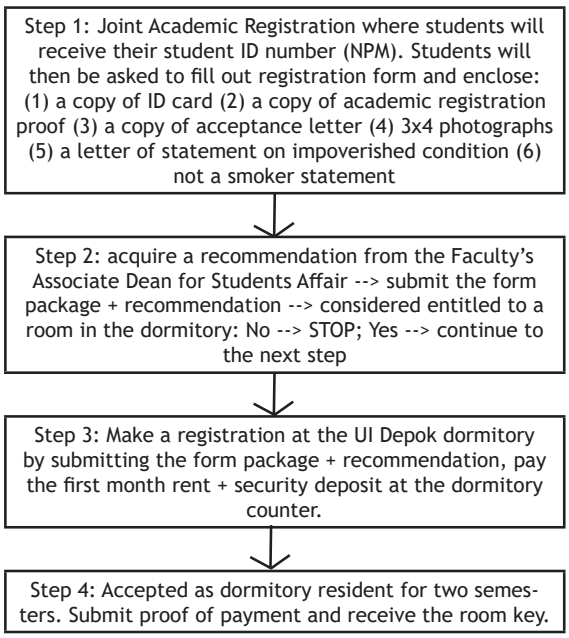
Room Specification
- Standard room: Standard bed, table, chair, bookcase, wardrobe, shoe rack, lamp, outdoor bathroom, non AC.
- Standard plus room: Standard bed, table, chair, book case, wardrobe, shoe rack, lamp, outdoor bathroom, air conditioned.
- Bungur and Melati room: Spring bed mattress, table, chair, indoor bathroom, wash basin, small kitchen, living room, air conditioned.
- VIP room: Spring bed mattress, table, chair, indoor bathroom, wash basin, small kitchen, living room, air conditioned.

Other information
- UI Depok dormitory has their own set of rules and regulations which must be obeyed by all dormitory residents as an attempt to create conducive environment for dormitory residents and as an attempt to maintain harmony among the various elements of the UI Depok dormi-

tory residents.

- Each undergraduate student residents of the UI Depok dormitory are entitled to live in the dormitory for one year (semesters 1 and 2).
- Residents will be charged for every electronic device which they brought to their dormitory rooms.
- For further information, please contact UI Dormitory secretariat at +6221-78744144 or by clicking http://asrama.ui.edu.

Registration Process Flow Chart for UI Dormitory



3.5.6. WISMA MAKARA

Phone : +6221-78883670, 78883671
Reservation : +6221-78883672
E-mail : info@makara.cso.ui.ac.id
Website : http://www.wismamakara.com

Wisma Makara, located within the UI Depok campus, is a choice of accommodation for the Southern Jakarta and Depok area. This hotel is very suitable for seminar, training, workshop activities. Surrounded by rubber trees and a lake; the hotel's cool, calm, and beautiful atmosphere provides the perfect background for your various activities. The hotel's tranquility also makes it very suitable for those of you who need tranquility to work and rest.

Available facilities:

- 70 fully furnished rooms (AC, TV, refrigerator)
- Restaurant
- Swimming Pool
- Coffee Shop
- Meeting room (up to 100 person capacity)
- Pay phone shop and internet shop
- Photocopy
- Ballroom (with 800 person capacity)
- Parking area

3.5.7. UI STUDENT ACTIVITY CENTER (PUSGIWA)

Location : UI Campus Depok
Phone : +6221-7270201
Pusgiwa UI is a place for various student activities in Universitas Indonesia. Here we can find secretariat offices of various UI student organizations. Pusgiwa also provides many facilities for students' acitivites such as an 300-400 person auditorium.

3.5.8. UI STUDENTS HALL

Location : UI Salemba Campus
Capacity : 300 People
Phone : +6221-31901355/56
The UI Salemba Student Hall is one of the facilities in UI under the management of Directorate of Student Affairs and Alumni Relation. This hall is often used for various activities such as meetings, seminars, workshops, and many more. The hall is available for use by the university members and public.

3.5.9. SPORT FACILITIES

A. Stadium
- Football field
- Triple Jump Field
- Athletic Field

B. In Door (Gymnasium)
- Badminton court
- Volleyball court
- Basketball court

C. Out Door
- Hockey field
- Basketball court (3 lines)
- Badminton court (1 line)

Permit form or letter for the use of UI Student Activity Center (Pusgiwa), UI Student Hall, and Sport Facilities must be submitted to the Directorate of Student Affairs and Alumni Relation UI located at the Student Activity Center Building, UI Campus Depok.
Phone : +6221-7866403, 7863453
Fax : +6221-7863453
at FTUI, several sport facilities are available: basket ball court, futsal court and climbing wall.

3.5.10. BIKE TO CAMPUS

As a proof to Universitas Indonesia's commitment in implementing the "Go Green" program, UI has provided free bicycles as a mean of transportation within the campus area. Started in 2008, this program establishes collaboration with the Bike to Work and Polygon, making UI the first campus in Indonesia with their own Bike to Campus program.

These bicycles, which colors and and form are specially design for UI, are single seat bicycles. By July 2009, there are around 300 units of bicycle available for use and will continue to be added in accordance with the campus development or demand.

How to Borrow:
1. Students simply showed their student ID card (KTM) to officer in charge of each bike shelter.
2. Campus bicycle can only be use on the available bicycle track. It is forbidden to ride them outside of the available track or to take them outside of campus area.
3. Each bicycle is equipped with a trunk with a maximum capacity of 10 kg and is not to be use as a passenger space.
4. Borrowed bicycle is the responsibility of each student until it is returned to the officer in

charge of each bike shelter.
5. Students may return the borrowed bicycle at the nearest bike shelter by showing their student ID card (KTM) to the officer of said shelter.

Service time for Bike to Campus is Monday to Friday, 08.00 – 17.00. For usage outside of service day and time, interested party must coordinate in accordance to the existing regulation.

A few points worth noting in cycling:
Once you've received your borrowed bicycle from the shelter officer, please do the following:
1. Make sure that your bicycle are in good order and function well.
2. Make sure that you have both hand on the bicycle handle, put your books/bags on the provided space.
3. Arrange your seat in accordance to your height, the height of your seat determines your comfort in cycling.
4. Each bicycle has three shifter levels, use them in accordance.
5. Ride the bicycle on the provided track, stay at the left side of the track when passing other bicycle.
6. Pay special care to motorcycles at each crossing.
7. Pay special attention to cycling safety.

3.6. STUDENT ORGANIZATION

Students are a nation's agent of change in making changes towards a fair and prosper independent society. Their power in fighting and struggling toward that goal must always be balanced with moral power as future asset in their fight in realizing the country's objectives. Thus, students need a vessel where all of their independent, family oriented, scientific, society oriented, and open activities can be accommodated. In Universitas Indonesia, this vessel is called Universitas Indonesia Student Society Association (Ikatan Keluarga Mahasiswa Universitas Indonesia – IKM UI).

IKM UI is a formal and legal organization which is the parent organization for all student activities in Universitas Indonesia. IKM UI adopts constitutional values adapted with the need of student lives. Sovereignty of IKM UI lies in the hand of the students and is fully implemented according to Laws and Constitution of IKM UI. The members of IKM UI are registered students in the Universitas Indonesia, consisting of active and regular members. Active members are IKM UI members that have followed active member admission procedures and received recommendation from the faculty. Regular members are IKM UI members that are not registered within the active membership of IKM UI. The symbol of the Universitas Indonesia Student Society Association (IKM UI) is the Makara of Universitas Indonesia with the wording IKATAN KELUARGA MAHASISWA UNIVERSITAS INDONESIA in black.

Student organizations that are incorporated within the IKM UI are:
1. Students Forum
2. Students Representative Council
3. Student Executive Body
4. Financial Audit Agency
5. Student Court
6. Student Element of the Board of Trustees
7. Autonomous Body of the Student Activity Unit
8. Semi Autonomous Body of the Student Activity Unit

Students Representative Council (Dewan Perwakilan Mahasiswa - DPM)
Students Representative Council is the high level body within the Universitas Indonesia Student Society Association (IKM UI) which possesses a legislative power. Members of the DPM UI consist of independent members from each faculties and representatives of legislative bodies of each faculty. Independent members are voted through a general election, while there can only be one

representative from each faculty's legislative body. Membership of DPM UI is inaugurated by a student forum decree. Term of office for members of the DPM UI is one year and ended simultaneously with the inauguration of the new members of the DPM. The requirements for becoming a member of the DPM UI are regulated within the IKM UI laws. DPM UI has the authority in term of legislative, supervision, and assessment of Students Representative Council's (BEM UI) Work Accountability Report, jurisdiction, facility, and designing the admission mechanism and follow up on financial budget plan of each student organizations within the Universitas Indonesia for each period of management. Members of the DPM UI are entitled to interpellation right, voting right, and the right to convey suggestion and express their opinions.

Secretariat : Student Activity Center
Building (Pusgiwa), 2nd floor
Phone :+6221-94629107,
+6285717884964

Students Representative Council (Badan Eksekutif Mahasiswa - BEM)
Universitas Indonesia Students Representative Council is a student organization within the university level with the executive power. Term of office for UI Students Representative Council is one year, from January to December each year. Chairman and Vice Chairman of BEM UI are elected as a couple directly by members of the IKM UI in a Universitas Indonesia General Election. The elected Chairman and Vice Chairman of BEM UI are later officially inaugurated with a Student Forum Decree. Function and authority of BEM UI are, among other: advocate students in issues relating to funds and facilities at the university level; addressing the external politic policy of IKM UI; serve and coordinate with the Universitas Indonesia Autonomy Body of UKM UI, faculty's executive body, and student element of the Board of Trustees. BEM UI Board of Administrators is elected based on open and close recruitment mechanism.

Student Activity Unit (Unit Kegiatan Mahasiswa - UKM)
Student Activity Unit of Universitas Indonesia (UKM-UI) is a place of student activities and creations in the Universitas Indonesia in one area of specialization, talent and religious services at the university level. The Student Activity Unit consists of the Autonomy and Semi Autonomy Bodies. Universitas Indonesia UKM Autonomy Body is a UKM in the university level which is deemed qualified and valid by the decree of the Student Forum into an autonomic UKM UI Autonomy Body. While the Universitas Indonesia UKM Semi Autonomy Body is a place of student activities and creations in the Universitas Indonesia in one area of specialization, talent and religious services at the university level under the coordination of the Students Representative Council.

a. Art
1. Krida Budaya Dance League
2. Madah Bahana Marching Band
3. Mahawarditra Philharmonic
4. Paragita Choir
5. Student Theater

b. Sport
1. Badminton
2. Hockey
3. Tennis
4. Soccer
5. Basket Ball
6. Swimming
7. Volley Ball
8. Soft Ball
9. Bridge
10. Futsal
11. Dance Sport
12. Cricket
13. Table Tennis

c. Martial Art
1. Taekwondo
2. Merpati Putih
3. Aikido

4. Wushu

d. Religious Groups
1. Moslem Student Society (Nuansa Islam Mahasiswa - SALAM)
2. Catholic Student Society (Keluarga Mahasiswa Katolik - KMK)
3. Oikumene Civitas Academica Society (Persekutuan Oikumene Sivitas Akademika - POSA)
4. Buddhist Student Society (Keluarga Mahasiswa Budhis)
5. Hindu Student Society (Keluarga Mahasiswa Hindu)

e. Academic Group
1. Eka Prasetya Student Study Group (KSM EP)
2. English Debating Society (EDS)

f. Entrepreneurship
1. Student Voice
2. CEDS
3. Student Radio (RTC UI FM) 107,9

g. Others
1. Wira Makara (Student Regiment)
2. Students' Mountaineering Club (Mapala)

3.7. CAREER DEVELOPMENT CENTER (CDC)

Career Development Center is a center with the aim of preparing UI graduates to have more skill and higher level of competitiveness and at the same time channeled UI graduates to the working world. CDC is located in the Student Center Building.

Phone/Fax : +6221-70880577/78881021
Email : cdc-ui@ui.ac.id
FTUI also has a CDC, located at 3rd floor of Engineering Center (EC) Building.
Phone : +6221-78880766

3.8. NATIONAL STUDENT SCIENCE WEEK

The National Student Science Week (Pekan Ilmiah Mahasiswa Nasional - PIMNAS) is a prestigious event for all Universities in Indonesia organized by the Directorate General of Higher Education (DIKTI). The Adikarta Kertawidaya trophy is the award contested at the PIMNAS. PIMNAS is an opportunity to channel the creativity, education and community service of the society in a Student Activities Program. Below is some of the Student Activities Program being contested within the National Student Science Week.

Student Creativity Program – Research (PKM-P)
This program is a research program that aimed to identify the determinants of the quality of the product, find a causal relationship between two or more factors, experimented with a form or equipment, to establish the method of learning, conduct an inventory of resources,
modifying existing products, identify the chemical compounds in the plants, testing the efficacy of plant extracts, formulate marketing techniques, a health survey of street children, teaching methods Balinese script in elementary school students, the rate of economic growth in the craft center of Kasongan, superstition factor that characterizes the behavior of the Javanese community and other activities that have such a purpose.

Student Creativity Program - Technology Application (PKM-T)
This program is a technology assistance program (quality of raw materials, prototypes, models, equipment or production processes, waste management, and quality assurance systems and many other) or other micro-or small-scale industries (home industries, small traders or cooperation) as needed by the potential partners in the program. PKMT require students to exchange ideas with

their partner in the program first, because the product is a solution of a problem which the PKMT partner prioritizes. Thus, in the proposed program, the student must attach a Statement of Willingness to Work Together with Partner on a paper with Rp. 6000, - seal.

Student Creativity Program – Entrepreneurship (PKM-K)
This program is the where students develop their skills in entrepreneurship and is a profit oriented program. Business commodities produced can be in the form of goods or services which in turn are one of the basic capital students will need in entrepreneurship and to enter the market.

Student Creativity Program – Community Service (PKM-M)
This program is an assistance program in science, technology, and arts in an effort to increase performance, build business skills, structuring and improving the environment, strengthening community institutions, the socialization of rational drug use, exposure to and understanding aspects of customary law, relief efforts on illiterates in the society and other community programs both for formal and non-formal societies.

Student Creativity Program - Writing Scientific Articles (PKM - AI)
This program is a program of writing a scientific article which originated from student activities in education, research, or community service which the student has done himself (case studies, field practice, community development work, student creativity program, internships, and many other).

Student Creativity Program – Written Concept (PKM - GT)
This program is a program of writing a scientific article that originated from ideas or concepts from a group of students. This written idea refers to an actual problem that can be found in the community and require a smart and realistic solution. In each area these programs are subdivided into seven groups of fields of science, namely:

1. Health field, including: Pharmacy, Nutrition, Obstetrics, Medicine, Dentistry, Nursing, Public Health, and Psychology.
2. Agricultural field, include: Veterinary Medicine, Forestry, Maritime, Fisheries, Agriculture, Animal Husbandry, and Agricultural Technology.
3. Mathematic and Natural Sciences field, including: Astronomy, Biology, Geography, Physics, Chemistry, and Mathematics.
4. Technology and Engineering field, including: Information Technology, Engineering, and Agricultural Technology.
5. Social Economy field, including: Agribusiness (Agriculture), Economic, Social and Political Sciences.
6. Humanities field, including: Religion, Language, Philosophy, Literature, and Art.
7. Education field, including: Education Sciences study program under the Faculty of Education.

Submission deadline for PKM-K, PKM-M, and PKM-P proposals are in October of each year, while deadline proposals for PKM-GT and PKM-AI are in March of each year. Almost all of these areas can be followed by students in 12 faculties at UI. PIMNAS is a means to prove the existence of UI as a research university in Indonesia. Win the Adikarta Kertawidya trophy and show the existence of UI as the Research Campus.
For further information :
http://bem.ui.ac.id/
http://mahasiswa.ui.ac.id/info-pkm-2010.html

3.9. SCHOLARSHIP

Universitas Indonesia currently manages approximately 71 scholarships both from the government and the private sector. Information about scholarships can be obtained at the Student Affairs Division of each faculty or through the website of the Directorate of Student Affairs at www.mahasiswa.ui.ac.id.

There are two types of scholarship in UI:
- UI Scholarship
- Donor/Sponsor Scholarship

General requirement procedure for scholarship application from Donor/Sponsor:
- Submit application through the Faculty Head with a recommendation from the Associate Dean of Student Affairs.
- Submit a photocopy of academic transcript stating a GPA corresponding with the requirement given by the donor/sponsor.
- Not a smoker.
- Is not a receiver of similar other scholarship.
- Other requirements as stated by the Donor/Sponsor.

LIST OF NAME OF SCHOLARSHIP DONOR/ SPONSOR FOR UNIVERSITAS INDONESIA STUDENTS

1. Bank BNI 46
2. Bank Central Asia
3. Bank Indonesia
4. Bank KEB Indonesia
5. Bank Lippo
6. Bank Mandiri

   - Bank Mandiri

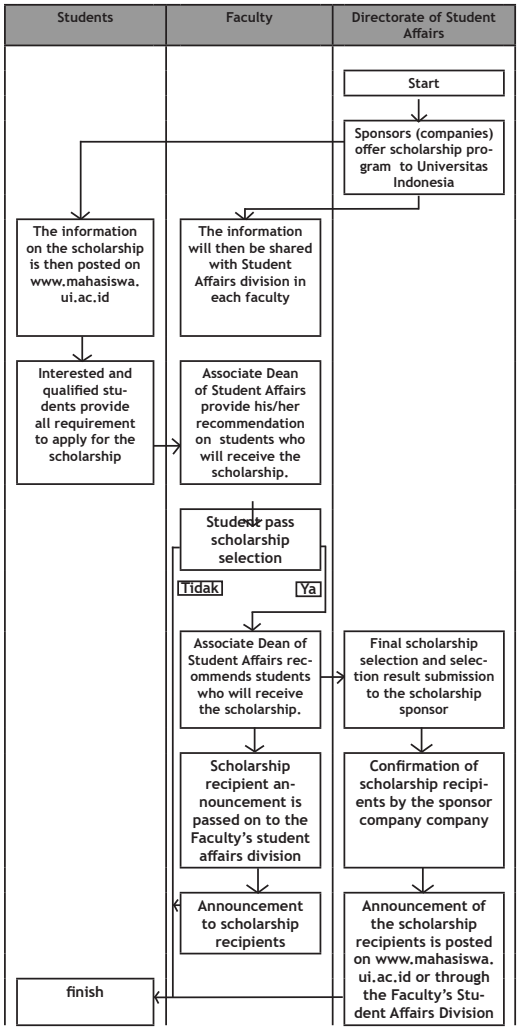
   - Bank Mandiri Prestasi
7. Bank Mayapada
8. Bank Niaga
9. Bank Permata
10. Bank Tabungan Negara
11. Student Special Aid

    - Special Aid for Undergraduate Program Student

    - Special Aid for Vocational Program Student
12. BAZNAS
13. West Java Scholarship
14. BMU Scholarship
15. CIMB Niaga Excellent Scholarship
16. DKI Jakarta Scholarship
    - Jakarta Achievement Scholarship
    - Jakarta Thesis Scholarship
17. BPMIGAS
18. BRI
19. BUMN
20. DIKNAS
    - Diknas (Excellent Activist Scholarship)
    - Diknas (Excellent Master Scholarship)
    - Diknas (Super Excellent Scholarship)
21. Diknas 1 (BBM)
22. Diknas 2 (PPA)
23. Eka 2007 - 2008
24. Eka 2008 - 2009
25. Eka CIpta (Uang Buku)
26. Exxon MOBIL (For Students from Aceh)
27. Exxon MOBIL (For Students from Aceh)

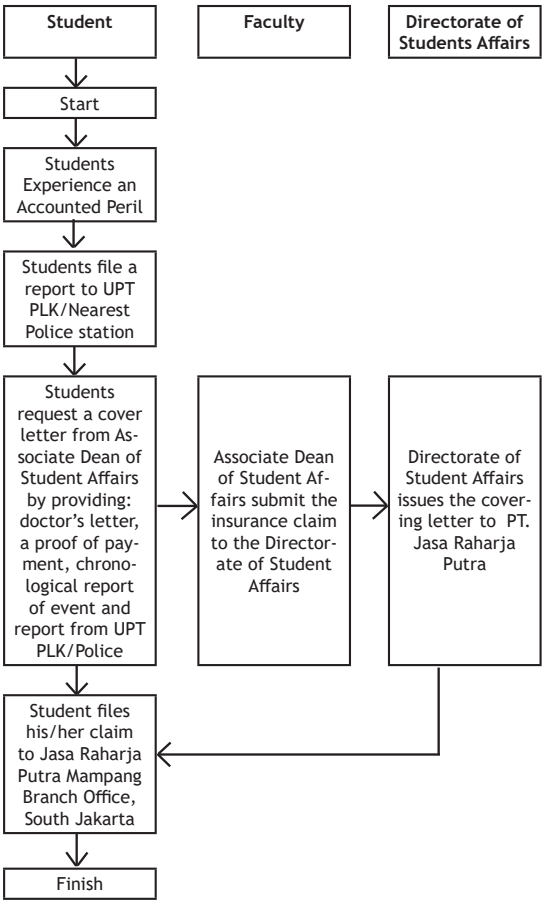
    Thesis
28. Indosat
29. Karya Salemba 4 (KS 4)
30. KORINDO
31. LPE

Flowchart of Scholarship Application



32. MARUBENI
33. MC.DERMONT
34. Part TIme Job
35. Posco (Thesis Aid)
36. PPA/BBM Angkatan 2009
    - PPA/BBM S1
    - PPA/BBM DIII
37. PPE
38. PT. BUMA Apparel Industry
39. PT. Coca Cola
40. PT. Indocement
41. PT. Accenture
42. PT. Sun Life Indonesia
43. PT. Thiess
44. Qatar Charity
45. Recapital
46. Rotary Club Jakarta Sudirman
47. Salim
48. Sariboga
49. Shell (Extention Scheme)
50. Shell (New Scheme)
51. Sime Darby
52. Sumitomo Bank (Supportive Scholarship)
53. Sumitomo Bank (Full Scholarship)
54. Sumitomo Corporation Scholarship
55. Supersemar
56. Tanoto
57. Tanoto S2
58. Total E & P
59. TPSDP (DIKTI)
60. UFJ Foundation / Mitsubishi
61. Unilever
62. Y. Asahi Glass (YAGI)
63. Y. Toyota (REGULER)
64. Yayasan IJARI
65. Yayasan Goodwill Internasional
66. YAYASAN TIFICO
67. YKPP - Pertamina
    - YKPP - Pertamina (Tuition Fee)
    - YKPP - Pertamina (Living Allowance)

Insurance Claims Process



Cause	Condition	Required Document
Train Accident	Injured	1. A notification letter from the Faculty's Associate Dean of Student Affairs to the Directorate of Students Affairs.
		2. Accident Report issued by the police
		3. Treatment report from the attending doctor
		4. Original receipt from the hospital or the attending physician
	Death	1. A notification letter from the Faculty's Associate Dean of Student Affairs to the Directorate of Students Affairs.
		2. Accident Report issued by the police
		3. Accident Report from Polsuska (PT. KAI)
		4. Autopsy report from the hospital
		5. Death Certificate
		6. A copy of the victim's birth certificate
		7. A copy of Family Card
		8. Heir certificate letter from the local district office.
Road Accident	Injured	1. A notification letter from the Faculty's Associate Dean of Student Affairs to the Directorate of Students Affairs.
		2. Accident Report issued by the police
		3. Treatment report from the attending doctor
		4. Original receipt from the hospital or the attending physician and the pharmacy
	Death	1. A notification letter from the Faculty's Associate Dean of Student Affairs to the Directorate of Students Affairs.
		2. Accident Report issued by the police
		3. Accident Report from Transportation Agency
		4. Autopsy report from the hospital
		5. Death Certificate
		6. A copy of the victim's birth certificate
		7. A copy of Family Card
		8. Heir certificate letter from the local district office.

3.10. INSURANCE

Each student enrolled in Universitas Indonesia for each running semester (participate in academic activities) will also be registered as an insurance member of PT. Asuransi Jasa Raharja.

For these insured students, they are allowed to submit an insurance claim in accordance with the following provisions:

- Accidents included within the insurance claim are accidents which occurred during the student's journey from home to UI campus to participate in academic and extracurricular activities whether it is within or outside of Campus area and with the UI/Faculty's Management's knowledge and permission.
- Compensation on claim regarding students' accident is only applicable to those who have paid the DKFM fee for the semester.
- In the event of an accident, student must report the accident no later than 3x24 hours to the office of the Universitas Indonesia Directorate of Student Affairs Sub Directorate of Student Welfare Services or the nearest PT Jasa Raharja Office Branch.
- If after 180 (one hundred and eighty) days, the accident is not reported, insurance compensation shall be canceled.
- Compensation claim (for victims suffering from injuries) must be submitted by attaching the original and valid receipt from doctor/hospital/clinic that treated the student's injuries.
- Non-medical care or treatment is not compensable.
- Students may send their inquiries regarding any matter that are not listed here directly to the Universitas Indonesia Head of Student Welfare Sub Directorate at the Central Administration Building, Universitas Indonesia Campus, Depok.

Compensation Receivable from the Insurance Claim *)
Death due to an accident :
Rp. 5.000.000, -
Permanent disability due to accident :
Rp. 10.000.000, -
Care / medical Treatment due to accident (maximum payment) :
Rp. 3.500.000, -

*) Subject about to change without notice

3.11. GENERAL INFORMATION

Post Office, Depok Campus

The Depok Campus Post Office offers postage stamp sales, special delivery mail delivery, registered mail, parcel post, money orders, checks and postal giro and savings services such as Batara. Address: Ground Floor Integrated Student Services Center (PPMT) Building, UI ,Depok Campus, 16424

Important Phone Numbers

UI Campus Salemba
Phone : +6221-330343, 3303455
Fax : +6221-330343

UI Campus Depok

Phone : +6221-7270020, 7270021, 7270022, 7270023, 7863460

Firefighters : 116
SAR : 55 021

Ambulance

RSCM : 118
Accidents : 119, 334 130
Police (on duty) : 525011

Police station

Central Jakarta : 3909922
North Jakarta : 491 017

South Jakarta : 7206011
West Jakarta : 5482371
East Jakarta : 8191478
Depok : 7520014

3.12. INTERNATIONAL JOURNAL OF TECHNOLOGY

International Journal of Technology (IJTech) is bi-annual international referred journal with the objectives to explore, develop, and elucidate the knowledge of engineering design and technology, to keep practitioners and researchers informed on current issues and best practices, as well as serving as a platform for the exchange of ideas, knowledge, and expertise among technology researchers and practitioners.

International Journal of Technology provides an opportunity to share detailed insights from different understandings and practices associated with technology. It provides an international forum for cross-disciplinary exchange of insights and ideas regarding value and practices for dissemination. International Journal of Technology will publish your work to international society of practitioners and researchers with interest in technology design and development from a wide variety of sectors.

Website: www.ijtech.eng.ui.ac.id

3.13. QUALITY IN RESEARCH (QiR) CONFERENCE

QiR Conference is a bi-annual international conference organized by FTUI since 1998. The 13th QiR was held in Yogyakarta from 25 – 28 June 2013. It was attended by over 400 participants from 16 different countries in the world. This conference provide a chance for students, be it undergraduate, master or doctoral program students, to present their research findings in front of an international audience. The 14th QiR will be held in August 2015. For more detail information on Qir, please visit: http://qir.eng.ui.ac.id.

3.14. INTERNATIONAL OFFICE

International Office is the university division dedicated to support the internationalization goals of the university and to handle international mobility involving the university and the international civitas academica. Their goal is to assist the international students and scholars handle their academic-related matters at Universitas Indonesia and to bridge Universitas Indonesia's civitas academica with overseas universities. Universitas Indonesia has a worldwide cooperation with various universities all over the world. These cooperations include not only academic but also research collaborations, giving the international access and exposure to its entire proud member.

The International Office of Universitas Indonesia provides various services such as: Bilateral Cooperation (University to University Cooperation), Regional Cooperation (International Associations & International Forums), Government to Government Cooperation (G to G), International Learning and Teaching, Student Exchange, Double Degree, Sandwich Program, Visiting Scholars, Study abroad, Scholarship Opportunities, International Research and Research Training, International Knowledge Transfer; are some of the services provided by the International Office. These opportunities are open for all university members from lecturers to students, be it in their Bachelor, Master or Ph.D program. Students can benefit from these programs in experiencing a once in a life time chance to study and understand different academic cultures in the world.

For further information, please contact:
Central Administration Building
1st Floor, Universitas Indonesia
Kampus Depok, Jawa Barat 16424
Phone/fax : +62 21 – 7888 0139
Email : intofui@yahoo.com, io-ui@ui.ac.id
Milist : internationaloffice@yahoogroups.com
Twitter : @intofui

UNDERGRADUATE PROGRAM

4.3. UNDERGRADUATE PROGRAM IN MECHANICAL ENGINEERING

Program Specification

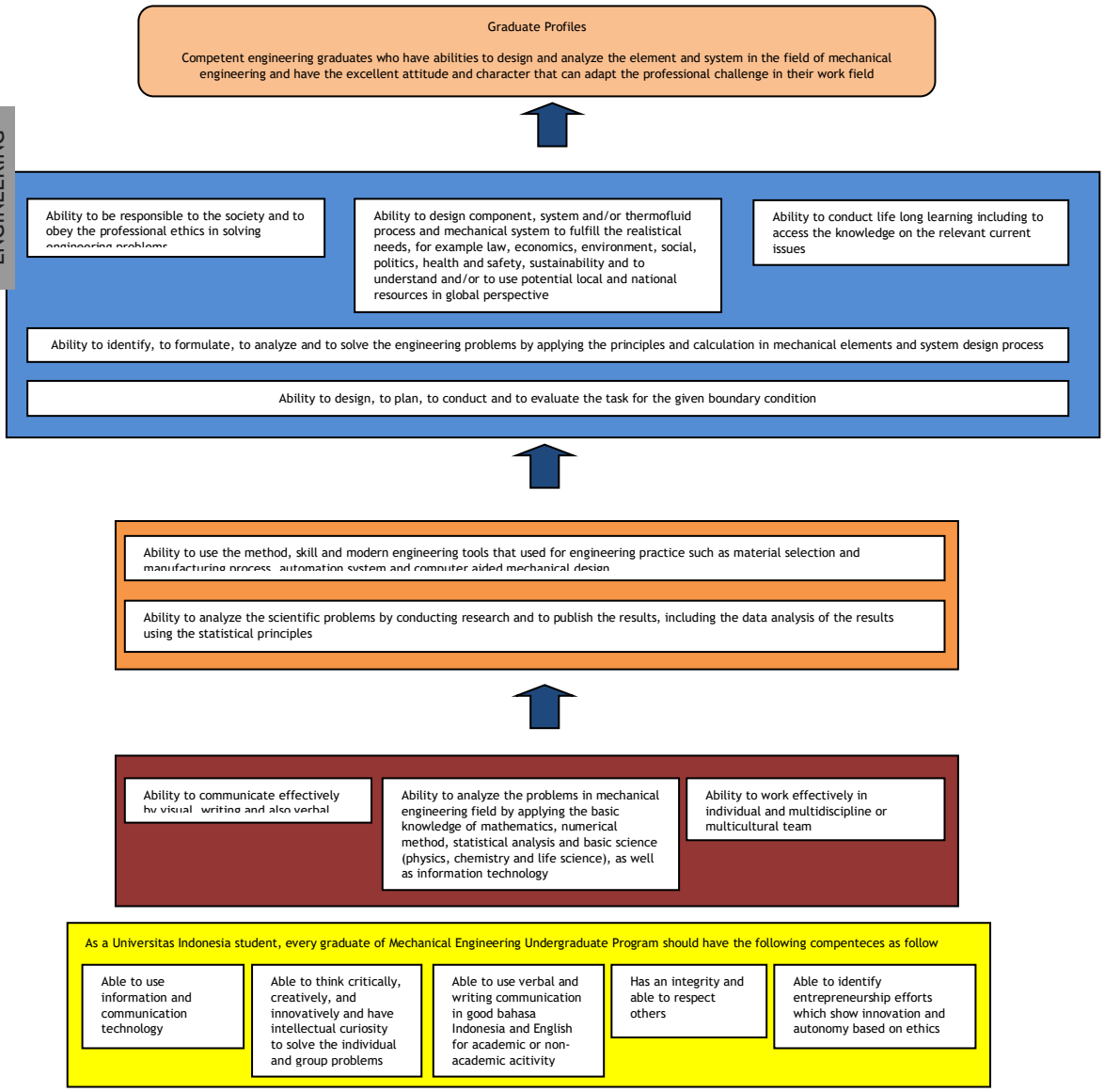
1.	**Awarding Institution**	Universitas Indonesia Double Degree: Universitas Indonesia and Partner University	
2.	**Teaching Institution**	Universitas Indonesia Double Degree: Universitas Indonesia and Partner University	
3.	**Programme Tittle**	Undergraduate Program in Mechanical Engineering	
4.	**Class**	Regular, Parallel and International	
5.	**Final Award**	Sarjana Teknik (S.T) Double Degree: Sarjana Teknik (S.T) and Bachelor of Engineering (B.Eng)	
6.	**Accreditation / Recognition**	BAN-PT: A Accredited - AUN-QA	
7.	**Language(s) of Instruction**	Bahasa Indonesia and English	
8.	**Study Scheme (Full Time / Part Time)**	Full Time	
9.	**Entry Requirements**	High school /equivalent, or D3 / Polytechnique / equivalent, AND pass the entrance exam.	
10.	**Study Duration**	Designed for 4 years	
	Type of Semester	Number of Semester	Number of weeks / semester
	Regular	8	17
	Short (optional)	3	8
11.	**Graduate Profiles:** Competent engineering graduates who have abilities to design and analyze the element and system in the field of mechanical engineering and have the excellent attitude and character that can adapt the professional challenge in their work field		
12.	List of Graduates Competency: 1. Ability to analyze the problems in mechanical engineering field by applying the basic knowledge of mathematics, numerical method, statistical analysis and basic science (physics, chemistry and life science), as well as information technology 2. Ability to design component, system and/or thermofluid process and mechanical system to fulfill the realistical needs, for example law, economics, environment, social, politics, health and safety, sustainability and to understand and/or to use potential local and national resources in global perspective 3. Ability to analyze the scientific problems by conducting research and to publish the results, including the data analysis of the results using the statistical principles 4. Ability to identify, to formulate, to analyze and to solve the engineering problems by applying the principles and calculation in mechanical elements and system design process 5. Ability to use the method, skill and modern engineering tools that used for engineering practice such as material selection and manufacturing process, automation system and computer aided mechanical design 6. Ability to communicate effectively by visual, writing and also verbal 7. Ability to design, to plan, to conduct and to evaluate the task for the given boundary condition 8. Ability to work effectively in individual and multidiscipline or multicultural team 9. Ability to be responsible to the society and to obey the professional ethics in solving engineering problems 10. Ability to conduct life long learning including to access the knowledge on the relevant current issues		

12	**As a Universitas Indonesia student, every graduate of Mechanical Engineering Undergraduate Program should have the following compenteces as follow:** 1. Able to use information and communication technology; 2. Able to think critically, creatively, and innovatively and have intellectual curiosity to solve the individual and group problems; 3. Able to use verbal and writing communication in good bahasa Indonesia and English for academic or non-academic acitivity; 4. Has an integrity and able to respect others; 5. Able to identify entrepreneurship efforts which show innovation and autonomy based on ethics		
13	**Classification of Subjects**		
No.	**Classification**	**Credit Hours (SKS)**	**Percentage**
i	University General Subjects	18	12,5 %
ii	Basic Engineering Subjects	30	20,8 %
iii	Core Subjects	68	47,2 %
iv	Elective Subjects	16	11,1 %
v	Internship, Seminar, Undergraduate Thesis, Project	12	8,4 %
	Total	144	100 %
14.	Total Credit Hours to Graduate		144 SKS

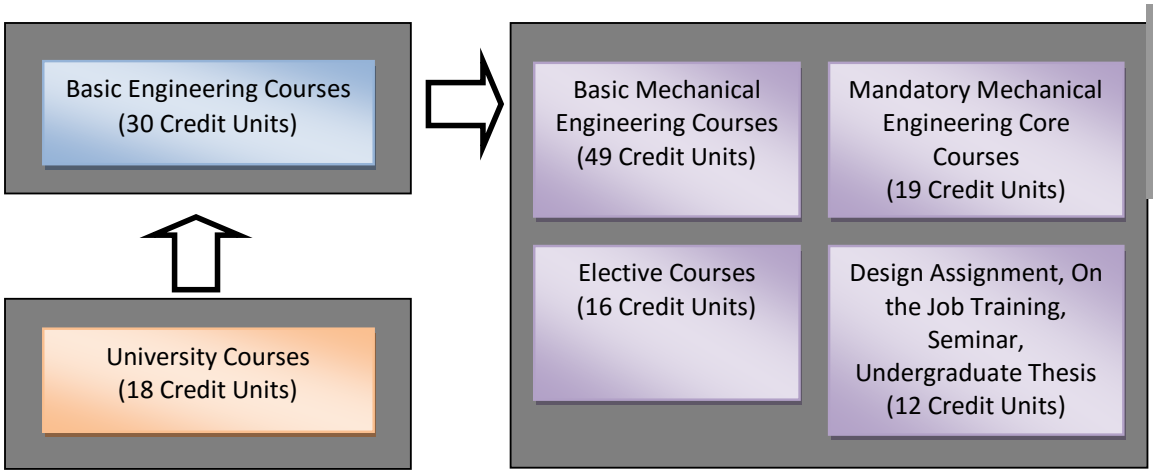
Career Prospects

Graduates of Mechanical Engineering has devoted itself in various fields, including mechanical element and system engineer (mechanical system, thermal and fluid, material and production process), government, process plan supervisor, construction, operation and maintenance, leader and instructor of community development, technical project inspector, Sales & Service Engineer, Entrepreneur and Adjuster

Learning Outcomes Flow Diagram



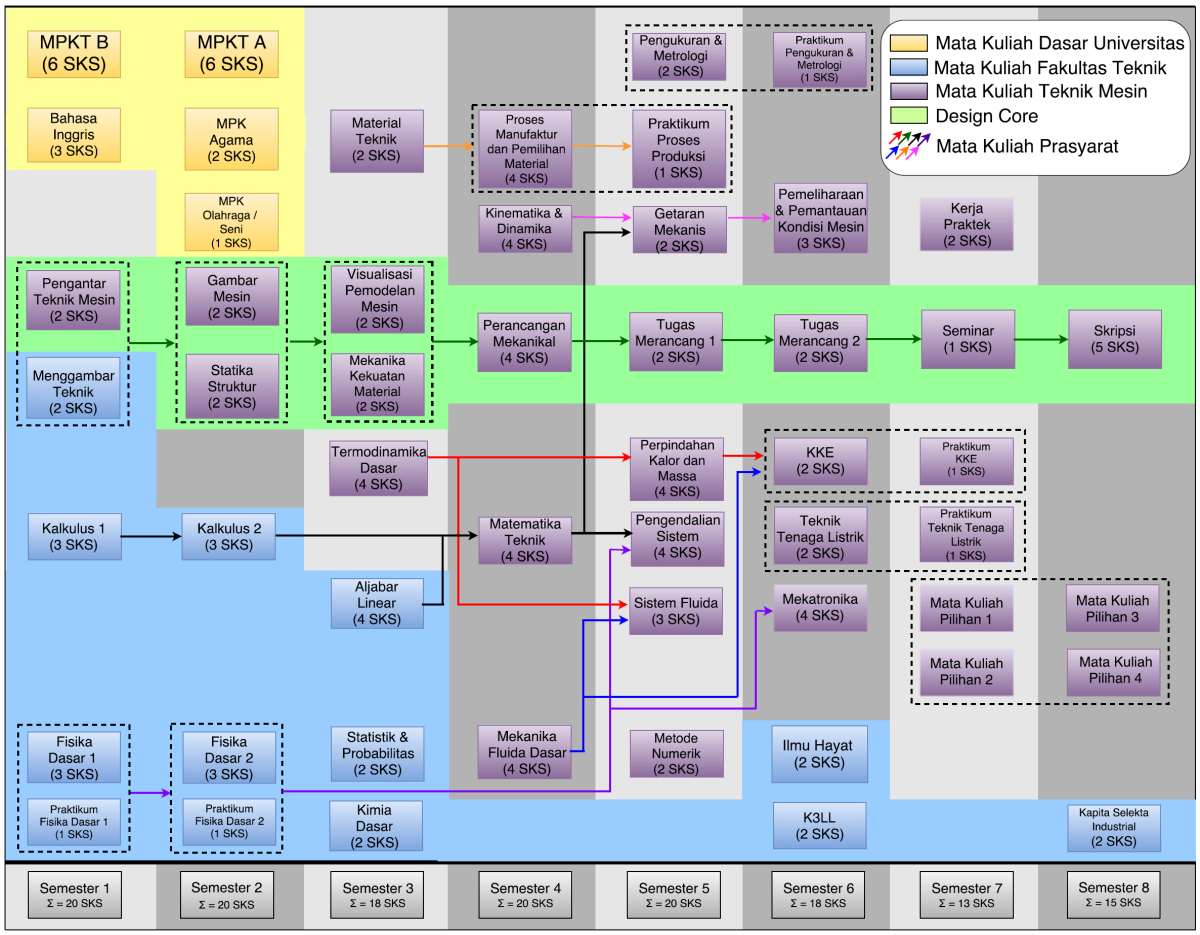
Curriculum Structure



Composition :

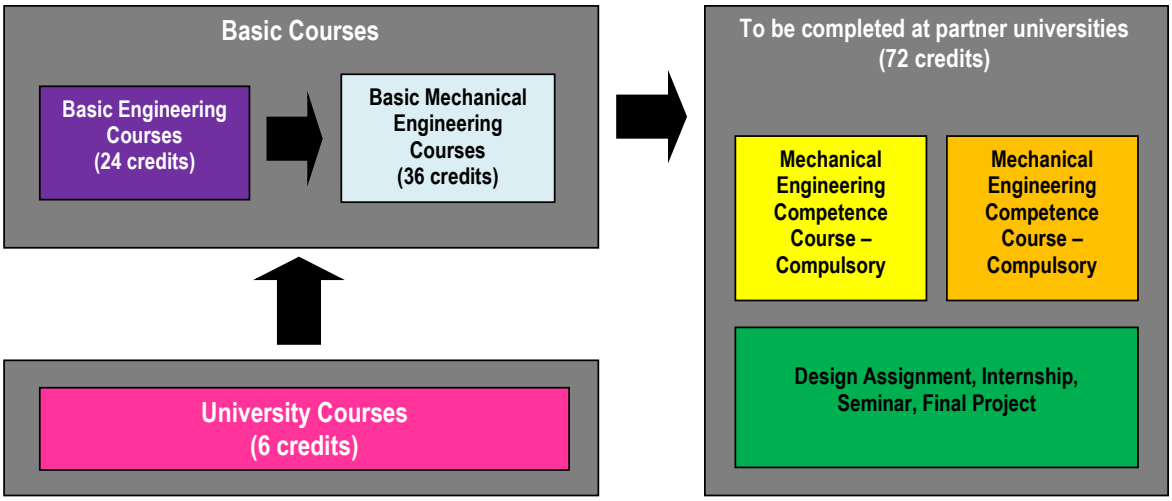
University Courses (18 Credit Units)	
MPKT A	6
MPKT B	6
English	3
MPK Religion	2
MPK Sport/Art	1
Basic Engineering (30 Credit Units)	
Calculus 1	3
Calculus 2	3
Linear Algebra	4
Basic Physics 1 (Mechanics and Heat)	4
Basic Physics 2 (Electrical, Magnet, Wave, and Optic)	4
Engineering Drawing #	2
Chemistry	2
Health, Safety and Enviroment	2
Statistics and Probability	2
Life Science for Engineer	2
Industrial Seminar	2
Basic Mechanical Engineering Courses (49 Credit Units)	
Introduction to Mechanical Engineering	2
Mechanical Drawing	2
Mechanical Modelling and Visualization	2
Engineering Statics	2
Strength of Materials	2
Enginnering Material	2
Mechanical Design	4
Basic Thermodynamics	4
Engineering Mathematics	4
Kinematics and Dynamics	4
Basic Fluid Mechanics	4
Material Selection and Manufacturing Process	4
Laboratory Experiment for Manufacturing Process	1
Heat and Mass Transfer	4
Electrical Power Engineering	2
Laboratory Experiment for Electrical Power Engineering	1
Measurement and Metrology	2
Laboratory Experiment for Measurement and Metrology	1
Numerical Method	2
Mandatory Mechanical Engineering Core Courses (19 Credit Units)	
Fluid System	3
Mechatronics	4
Maintenance and Condition Monitoring	3
Energy Conversion and Conservation	2
Laboratory Experiment for Energy Conversion and Conservation	1
Mechanical Vibration	2
Control System	4
Elective Courses (16 Credit Units)	
Elective Courses Semester 7:	
Elective Course #1	4
Elective Course #2	4
Elective Courses Semester 8:	
Elective Course #3	4
Elective Course #4	4
Design Assignment, Internship, Seminar and Undergraduate Thesis (12 Credit Units)	
Design Assignment 1	2
Design Assignment 2	2
Internship	2
Seminar	1
Final Project	5

The groups of the courses can be seen according to the characteristic and the education purposes that are expected as shown in figure below



Mechanical Engineering Undergraduate International Program Curriculum

The international program of mechanical engineering study is divided into two phase which are the first will be done at University of Indonesia and the other phase will be completed at partner universities in Australia. There will be option to continue the second phase at UI. A student at the Department of Mechanical Engineering - Univesity of Indonesia must complete and pass 72 - 76 credits over 4 semester before continuing to partner universities. The courses are classified into University courses (6 credits); Basic courses (70 credits) that consist of Basic Engineering courses (24 credits) and Basic Mechanical Engineering courses (36 credits).



COURSE STRUCTURE UNDERGRADUATE PROGRAM MECHANICAL ENGINEERING

KODE	SUBJECT	Credit
	1st Semester	
UIGE600002	Integrated Character Building B	6
ENME601001	Introduction to Mechanical Engineering	2
UIGE600003	English	3
ENGE 6 0 0001	Calculus 1	3
ENGE 6 0 0005	Physics (Mechanics and Thermal)	3
ENGE 6 0 0006	Physics (Mechanics and Thermal) Lab	1
ENME601002	Engineering Drawing	2
	Sub Total	**20**
	2nd Semester	
UIGE600001	Integrated Character Building A	6
UIGE600010-15	Relligion	2
ENGE 6 0 0002	Calculus 2	3
ENGE 6 0 0007	Physics (Electricity, MWO)	3
ENGE 6 0 0008	Physics (Electricity, MWO) Lab	1
UIGE600020 - 48	Sport / Art	1
ENME602003	Machine Drawing	2
ENME602004	Statics	2
	Sub Total	**20**
	3rd Semester	
ENME603005	Engineering Material	2
ENME603006	Mechanical Modelling and Visualization	2
ENME603007	Strength of Materials	2
ENGE 6 0 0009	Basic Chemistry	2
ENME603008	Basic Thermodynamics	4
ENGE 6 0 0010	Statistic and Probability	2
ENGE 6 0 0004	Linear Algebra	4
ENMT 6 0 3 008	Thermodynamics of Materials	3
	Sub Total	**18**
	4th Semester	
ENME600009	Kinematics and Dynamics	4
ENME604010	Material Selection & Manuf. Process	4
ENME604011	Basic Fluid Mechanics	4
ENME604012	Mechanical Design	4
ENME600013	Engineering Mathematics	4
	Sub Total	**20**
	5th Semester	
ENME605014	Mechanical Vibration	2
ENME605015	Measurement and Metrology	2
ENME600016	Numerical Method	2
ENME605017	Heat and Mass Transfer	4

ENME605018	Fluid Systema	3
ENME605019	Control System	4
ENME600001	Design Assignment 1	2
ENME600007	Lab of Production Process	1
	Subtotal	**20**
	6th Semester	
ENGE 6 0 0012	HSE Protection	2
ENME606020	Maintenance & Machine Monitoring	3
ENME606021	Energy Conversion & Conservation	2
ENME606024	Life Science for Engineer	2
ENME606022	Mechatronics	4
ENME600002	Design Assignment 2	2
ENME606023	Electrical Power Engineering	2
ENME600008	Lab for Measurement and Metrology	1
	Subtotal	**18**
	7th Semester	
ENME600019	Laboratory Experiment for ECC	1
ENME600010	Lab for Electrical Power Engineering	1
ENME600003	On the Job Training	2
ENME600004	Seminar	1
	Electives	4
	Electives	4
	Subtotal	**13**
	8th Semester	
ENME600005	Final Project	5
ENME600006	Industrial Seminar	2
	Electives	4
	Electives	4
	Subtotal	**15**
	TOTAL	**144**

Resume

Wajib Universitas	18
Wajib Fakultas	30
Wajib Program Studi	80
Jumlah	128
Pilihan	16
Total Beban Studi	144

ELECTIVES

CODE	MATA AJARAN PILIHAN / ELECTIVES SEMESTER 7	Credit
	SUBJECT	
ENME801113	Ventilation & AC System	4
ENME803105	Internal Combustion Engine	4
ENME803106	Flow Measurement & Visualization	4
ENME803107	CFD Application	4
ENME803108	Refrigeration Engineering	4
ENME803104	Thermal Power Generation	4
ENME803115	Clean Room	4
ENME803124	Energy Audit	4
ENME803134	Enclosure Fire Dynamics & Modelling	4
ENME803143	Mechanical Failure	4
ENME803145	Composite Product Development	4
ENME803147	Toy Production Design and Development	4
ENME803153	Machine Vision System	4
ENME803154	Quality & Production Manag. System	4
ENME803161	Micro-machining	4
ENME803167	Modern Vehicle Technology	4
ENME803195	Oil and Gas Drilling Equipment	4
ENME803196	Jet and Rocket Propulsion	4
ENME803174	Risk Management	4

KODE	MATA AJARAN PILIHAN / ELECTIVES SEMESTER 8	Credit
	SUBJECT	
ENME804110	Combustion Engineering	4
ENME804109	Heat and Mass Transfer Engineering	4
ENME804111	Aerodynamics Engineering	4
ENME804118	Mechanical system for Building	4
ENME802103	Energy System Optimization	4
ENME804138	Evaluation of Fire Protection System	4
ENME804148	Design For Manufacture and Assembly	4
ENME804149	Noise and Vibration	4
ENME804155	CAD/CAM	4
ENME804156	Manufacturing Performance Assesment	4
ENME802152	Automation and Robotics	4
ENME804168	Railway Vehicle Engineering	4
ENME804197	Handling and Construction Equipment	4
ENME804198	Aircraft Stability and Control	4
ENME804190	Advanced Welding Engineering	4

COURSE STRUCTURE INTERNATIONAL UNDERGRADUATE MECHANICAL ENGINEERING

KODE	SUBJECT	SKS
	1st Semester	
ENME611001	Introduction to Mechanical Engineering	2
UIGE610002	Academic Writing	3
ENGE 6 1 0001	Calculus 1	3
ENGE610005	Physics - Mechanics and Heat	3
ENGE610006	Physics - Mechanics and Heat Laboratory	1
ENME611002	Engineering Drawing	2
ENGE 6 1 0010	Statistic and Probability	2
ENGE 6 1 0004	Linear Algebra	4
	Subtotal	**20**
	2nd Semester	
UIGE610005-9	Religion	2
ENGE 6 1 0002	Calculus 2	3
ENGE610007	Physics - Electricity, MWO	3
ENGE610008	Physics - Electricity, MWO Laboratory	1
UIGE600020-48	Sport/ Art	1
ENME612003	Machine Drawing	2
ENME612004	Engineering Statics	2
ENME612005	Engineering Material	2
ENGE 6 1 0009	Basic Chemistry	2
	Subtotal	**18**
	3rd Semester	
ENME610013	Engineering Mathematics	4
ENME613006	Machanical Modelling and Visualization	2
ENME613007	Strength of Materials	2
ENME610016	Numerical Method	2
ENME613008	Basic Thermodynamics	4
ENME613010	Material Selection and Manuf. Process	4
ENME613015	Measurement and Metrology	2
	Subtotal	**20**
	4th Semester	
ENME610009	Kinematics and Dynamics	4
ENME610007	Laboratory Experiment of Production Process	1
ENME614011	Basic Fluid Mechanics	4
ENME614012	Mechanical Design	4
ENGE 6 1 0012	Health, Safety and Environmental Protection	2
ENME616024	Life Science for Engineer	2
ENME610008	Laboratory Experiment for Measurement and Metrology	1
	Subtotal	**18**

	5th Semester	
UIGE610004	Integrated Character Building Course B	6
ENME615014	Mechanical Vibration	2
ENME615017	Heat and Mass Transfer	4
ENME615018	Fluid System	3
ENME615019	Control System	4
ENME610001	Design Assignment 1	2
	Subtotal	**21**
	6th Semester	
UIGE610001	Integrated Character Building Course A	6
ENME616020	Maintenance and Machine Monitoring	3
ENME616021	Energy Conversion and Conservation	2
ENME616022	Mechatronics	4
ENME610002	Design Assignment 2	2
ENME616023	Electrical Power Engineering	2
	Subtotal	**19**
	7th Semester	
ENME610019	Laboratory Experiment for ECC	1
ENME610010	Laboratory Experiment for Electrical Power Engineering	1
ENME610003	On the Job Training	2
ENME610004	Seminar	1
	Elective # 1	4
	Elective # 2	4
	Subtotal	**13**
	8th Semester	
ENME610005	Final Project	5
ENME610006	Industrial Seminar	2
	Elective # 3	4
	Elective # 4	4
	Subtotal	**15**

Resume

Wajib Universitas	**18**
Wajib Fakultas	**30**
Wajib Program Studi	**80**
Jumlah	**128**
Pilihan	**16**
Total Beban Studi	**144**

ELECTIVE COURSES

KODE	ELECTIVES FOR 7th SEMESTER SUBJECT	SKS
ENME803105	Internal Combustion Engine	4
ENME803106	Applied Flow Measurement and Visualization	4
ENME803107	CFD Application	4
ENME803108	Refrigeration Engineering	4
ENME803104	Thermal Power Generation	4
ENME803115	Clean Room	4
ENME803124	Energy Audit	4
ENME803134	Enclosure Fire Dynamics and Modelling	4
ENME803143	Mechanical Failure	4
ENME803145	Composite Product Development	4
ENME803147	Toy Production Design	4
ENME803153	Machine Vision System	4
ENME803154	Quality and Production Management System	4
ENME803161	Micro-machining	4
ENME803167	Modern Vehicle Technology	4
ENME803195	Oil and Gas Drilling Equipment	4
ENME803196	Jet and Rocket Propulsion	4
ENME803174	Risk Management	4

KODE	ELECTIVES FOR 8th SEMESTER SUBJECT	SKS
ENME804110	Combustion Engineering	4
ENME804109	Heat and Mass Transfer Engineering	4
ENME804111	Aerodynamics Engineering	4
ENME801113	Ventilation and Air Conditioning System	4
ENME804118	Mechanical system for Building	4
ENME802103	Energy System Optimization	4
ENME804138	Evaluation and Maintenance of Fire Protection System	4
ENME804148	Design For Manufacture and Assembly	4
ENME804149	Noise and Vibration	4
ENME804155	CAD/CAM	4
ENME804156	Manufacturing Performance Assesment	4
ENME802152	Automation and Robotics	4
ENME804168	Railway Vehicle Engineering	4
ENME804197	Handling and Construction Equipment	4
ENME804198	Aircraft Stability and Control	4
ENME804190	Advanced Welding Engineering	4

Curriculum Design for Queensland University of Technology (QUT) 2+2

For Mechanical Engineering, the advanced standing is as follows (based on 2009 mechanical course structure at UI):

UI Units	QUT Units
MCS110802l + ENG100808l + ENG100807l + MCS210803l	ENB100, ENB200, ENB150
ENG100801l + ENG100804l + ENG200801l + MCS210810l	MAB126, MAB127, MAB233
ENG100805l+ MCS120801l	ENB130, ENB110
ENG200802l + EES21089l + EES210914l	ENB120
MCS220801l	ENB211
MCS120801l + MCS220802l + MCS320801l	ENB231, ENB331
MCS220804l	ENB221
MCS210802l	ENB222
MCS210803l + MCS220803l	ENB212, ENB215

Provisional Program at QUT

February Entry

Semester 1, Year 1		Semester 2, Year 1	
Code	Course Title	Code	Course Title
ENB311	Stress Analysis	ENB205	Electrical and Computer Engineering
ENB312	Dynamics of Machinery	ENB321	Fluids Dynamics
ENB316	Design of Machine Elements		Minor/Second Major 4
	Minor/Second Major 1		Minor/Second Major 2

Semester 1, Year 2		Semester 2, Year 2	
Code	Course Title	Code	Course Title
ENB421	Thermodynamics 2	ENB317	Design and Maintenance of Machinery
BEB801	Project 1	ENB313	Automatic Control
SEB400	Foundations of Research	BEB802	Project 2
	Minor/Second Major 3		Advance Selective

July Entry (preferred)

		Semester 2, Year 1	
		Code	Course Title
		ENB205	Electrical and Computer Engineering
		ENB321	Fluids Dynamics
			Minor/Second Major 4
			Minor/Second Major 2

Semester 1, Year 2		Semester 2, Year 2	
Code	Course Title	Code	Course Title
ENB311	Stress Analysis	ENB317	Design and Maintenance of Machinery
ENB312	Dynamics of Machinery	ENB313	Automatic Control
ENB316	Design of Machine Elements	BEB801	Project 1

	Minor/Second Major 1		Advance Selective

Semester 1, Year 3			
Code	Course Title		
ENB421	Thermodynamics 2		
BEB802	Project 2		
SEB400	Foundations of Research		
	Minor/Second Major 3		

New QUT Units Name:
BEB801 Project 1
Synopsis: This unit is usually taken in the final year of study. Students complete an individual project involving the application of skills and knowledge attained during the earlier years of their degree program. For some students, this unit will be taken one of two 'project' units related to the same student project; in such cases this unit may be a pre-requisite or co-requisite to the second unit (or a follow-on from the first unit). The final 'deliverable' for this unit may vary for each discipline and details will be provided in lectures/tutorials and on the Blackboard website.

BEB802 Project 2
Synopsis: This unit is usually taken in the final year of study, and is only taken by students completing a two unit project. Students complete an individual project involving the application of skills and knowledge attained during the earlier years of their degree program. This unit will be taken as the second of two 'project' units related to the same student project.

SEB400 Foundations of Research
Synopsis: This unit facilitates the acquisition of knowledge and skills essential to engaging with, and conducting research. This unit introduces you to the research process, project planning and management, and methodologies used in science, information technology, engineering, mathematics, urban development and property economics. The learning acquired in this unit will be applied to your project which is further developed in the Research units.

Curriculum Design for University of Queensland (UQ) 2+2

Course list for the Mechanical Engineering Single Major

Show information for:

Information valid for students commencing 2016

Mechanical Engineering
Students must complete for the BE(Hons) (Mechanical Engineering) a Single Major (Plan code: MECHAX2342) or Extended Major (Plan code: MECHAY2342), #64 comprising one of the following:
1. a. a major - #50, comprising all compulsory courses listed in Part A of the Mechanical Engineering lists; and
b. balance from electives, being courses from the BE(Hons) list or other

courses approved by the executive dean, with

(i) a minimum of #6 from courses on the BE(Hons) list, other than courses on the Mechanical Engi neering Part B0 list, and

(ii) a maximum of #4 from courses from part B0 of the Mechanical Engineering list, and

(iii) a maximum of #4 from level one courses not on the BE(Hons) list;

OR

2. a. an extended major - #60, comprising

(i) #50 being all courses in part A compulsory;plus

(ii) #10 from part B Electives under Extended Major; and

b. balance from electives, being courses from the BE(Hons) list or other courses approved by the Executive Dean.

Part A – Compulsory

Year 1, Semester 1		
Course Code	**Units**	**Course Title**
ENGG1100	2	Engineering Design
Year 1, Semester 1 or 2		
Course Code	**Units**	**Course Title**
ENGG1300	2	Introduction to Electrical Systems
ENGG1400	2	Engineering Mechanics: Statics & Dynamics
ENGG1500	2	Engineering Thermodynamics
MATH1051	2	Calculus & Linear Algebra I [1]
Year 1, Semester 2		
Course Code	**Units**	**Course Title**
ENGG1200	2	Engineering Modelling & Problem Solving
MATH1052	2	Multivariate Calculus & Ordinary Differential Equations
Year 2 Semester 1		
Course Code	**Units**	**Course Title**
MATH2000 MATH2001	2 or 2	Calculus & Linear Algebra II Advanced Calculus and Linear Algebra
MECH2300	2	Structures & Materials
MECH2305	2	Introduction to Engineering Design and Manufacturing
MECH2410	2	Fundamentals of Fluid Mechanics

Year 2 Semester 2		
Course Code	**Units**	**Course Title**
MECH2100	2	Machine Element Design
MECH2210	2	Intermediate Mechanical & Space Dynamics
MECH2700	2	Engineering Analysis I
Year 3 Semester 1		
Course Code	**Units**	**Course Title**
MATH2010	1	Analysis of Ordinary Differential Equations

MECH3300	2	Finite Element Method & Fracture Mechanics
MECH3400	2	Thermodynamics & Heat Transfer
MECH3600	2	Engineering Management & Communication
STAT2201	1	Analysis of Engineering & Scientific Data
Year 3 Semester 2		
Course Code	**Units**	**Course Title**
MECH3100	2	Mechanical Systems Design
MECH3200	2	Advanced Dynamics & Vibrations
MECH3410	2	Fluid Mechanics
Year 3 or 4 #2 from -		
Course Code	Units	Course Title
MECH3250	2	Engineering Acoustics
MECH3750	2	Engineering Analysis II
ENGY4000	2	Energy Systems
METR3100	2	Sensors & Actuators
Year 4		
Course Code	**Units**	**Course Title**
METR4201	2	Introduction to Control Systems
and at least #4 from -		
Course Code	Units	Course Title
ENGG4011	6	Professional Engineering Project
MECH4500	4	Engineering Thesis [2]
MECH4501	4	Engineering Thesis [2]
MECH4552	4	Major Design Project [2]
Part B Electives Part B0 - Preparatory Mathematics & Science Electives		
CHEM1090	2	Introductory Chemistry [3]
MATH1050	2	Mathematical Foundations [1] [4]
PHYS1171	2	Physical Basis of Biological Systems [5]

Extended Major

Students enrolled in the extended major are required to obtain the major plus an additional #10 from introductory or advanced electives from Part B1 or B2, including a minimum of #8 from Part B2. Students participating in the CEED program and undertaking #6 ENGG4011 are only required to obtain an additional #8 towards the extended major, including a minimum of #6 from Part B2.

B1 - Introductory Electives		
Course Code	Units	Course Title
CHEM1100	2	Chemistry 1
CSSE1001	2	Introduction to Software Engineering
ENGG1600	2	Introduction to Research Practices - The Big Issues
PHYS1002	2	Electromagnetism and Modern Physics
B2 - Advanced Electives		
Course Code	Units	Course Title
AERO4300	2	Aerospace Composites

CHEE4302	2	Electrochemistry & Corrosion
ELEC2003	2	Electromechanics & Electronics
ENGG4103	2	Engineering Asset Management
ENGG4900	2	Professional Practice and the Business Environment
ENGY4000	2	Energy Systems
FIRE3700	2	Introduction to Fire Safety Engineering
MECH3250	2	Engineering Acoustics
MECH3305	2	Science & Engineering of Metals
MECH3750	2	Engineering Analysis II
MECH4301	2	Materials Selection
MECH4304	2	Net Shape Manufacturing
MECH4450	2	Aerospace Propulsion
MECH4470	2	Hypersonics & Rarefied Gas Dynamics
MECH4480	2	Computational Fluid Dynamics
MECH4552	4	Major Design Project [2]
MECH4800	2	Space Engineering
MECH4950	2	Special Topics C
MECH4951	1	Special Topics D
METR3100	2	Sensors & Actuators
METR4202	2	Advanced Control & Robotics
TIMS3309	2	Fundamentals of Technology and Innovation Management

End notes

- [1] Students without at least a Sound Achievement in Senior Maths C are required to take MATH1050 as an elective before MATH1051
- [2] This course is offered over more than one semester. Enrol in the same course code in each semester.
- [3] CHEM1090 is not available for students with a Sound Achievement or higher in Senior Chemistry or equivalent.
- [4] MATH1050 is not available for students with a High Achievement or higher in Senior Maths C. MATH1050 is not available to students who have passed MATH1051 and/or MATH1052.
- [5] PHYS1171 is not available for students with a Sound Achievement or higher in Senior Physics or equivalent.

COURSE DESCRIPTION

ENME601001 – INTRODUCTION TO MECHANICAL ENGINEERING (2 SKS)
Learning Objective(s):
To give a description of mechanical engineering knowledge by describing scoupe, field and relation to other knowledges. By this course, student can understand the application and the knowldege of mechanical engineering in every sector. Memberikan gambaran tentang keilmuan teknik mesin dengan menjabarkan ruang lingkup, bidang, serta hubungan dengan keilmuan lain. Melalui mata ajaran ini, diharapkan mahasiswa memahami aplikasi dan keilmuan teknik mesin di berbagai sektor
Syllabus:
Mechanical engineering field, Mechanical engineering sub-field, mechanical engineering professional ethics; mechanical design, manufacturing process; force, structure and machine; material; fluid mechanics, energy and heat
Pre-requisite(s): -
Text Book(s):

1. Wickert Jonathan, and Kemper Lewis. An introduction to mechanical engineering. Cengage learning, 2012.
2. Avallone, Eugene A., Theodore Baumeister, and Ali Sadegh. Marks' Standard Handbook For Mechanical Engineers (Standard Handbook for Mechanical Engineers). Mcgraw-Hill Professional, 2006.
3. Grote, Karl-Heinrich, and Erik K. Antonsson. Springer handbook of mechanical engineering. Vol. 10. Springer Science & Business Media, 2009.

ENME601002 – ENGINEERING DRAWING (2 SKS)
Learning Objective(s):
Course participants are able to transfer geometric component by drawing according to standard draw which is recognized by International Standard Organization (ISO). Students understand the theory and procedure of engineering drawing based on ISO standard. Students are able to read, interpret, and transfer 2D/3D geometric draw from component or construction. Students are able to draw the orthogonal projection based on ISO standard.
Syllabus:
Illustration: Function and benefit of Engineering Drawing; SAP; Measurement and Evaluation; Introduction to drawing equipment; Basic definition of geometric, paper format, draw regulation, line, field, line configuration, basic geometric form; Visualization geometric: Skew projection and isometric, function and line types, configuration geometric form; Orthogonal Projection: Projection standard, viewing concept, width display principle; Advanced orthogonal projection: Circle region concept, special region concept, trimming concept, display width, refraction.
Pre-requisite(s): -
Text Book(s):

1. ISO 1101, Technical Drawings, International Organization for Standardization.
2. A.W. Boundy, Engineering Drawing , McGraw-Hill Book Company
3. Colin Simmons & Dennis Maguire, Manual of Engineering Drawing, Edward Arnold
4. Takeshi S. G., Sugiarto Hartanto, Menggambar Mesin, Pradnya Paramita, 1983
5. Warren J. Luzadder, Fundamentals of Engineering Drawing, Prentice-Hall, Inc.
6. Giesecke-Mitchell-Spencer-Hill-Dygdon-Novak, Technical Drawing, Prentice Hall Inc.

ENME602003 – MECHANICAL DRAWING (2 SKS)
Learning Objective(s):
Students have the basic ability to visualize the information content of one component effectively, capable to create a model for 2D and 3D visualization with utilize the software and interprete the subject into a drawing that can be used as working guidance and can be understand clearly by the user.

Syllabus:
The purpose and the advantage of the drawing in the design and manufacturing process, surface working quality and tolerance, standard and marking classification of working quality, standard and marking classification of working tolerance, Welding construction, standard and marking of weld groove, line diagram, 2D and 3D representation method, introduction to modeling software interface, modeling, manipulation and 2D & 3D visualization.
Pre-requisite(s): Engineering Drawing, Introduction to Mechanical Engineering
Text Book(s):

1. A.W. Boundy, Engineering Drawing, McGraw-Hill Book Company
2. Colin Simmons & Dennis Maguire, Manual of Engineering Drawing – 4th Ed, Elsevier. 2012.
3. ISO 1101, Mechanical Engineering Drawings, International Organization for Standardization.
4. Takeshi S. G., Sugiarto Hartanto, Menggambar Mesin, Pradnya Paramita, 1983
5. Japanese Industrial Standard, Technical Drawing for Mechanical Engineering, Japanese Standards Association.
6. Warren J. Luzadder, Fundamentals of Engineering Drawing, Prentice-Hall, Inc..

ENME602004 – ENGINEERING STATICS (2 SKS)
Learning Objective(s):
To understand the concept of force and force equilibrium in some construction so the student can calculate and analyze the equilibrium of construction by using static equilibrium law.
Syllabus:
Basic principle of engineering statics/Newton Law. Arrangement and decomposition of force in plane and space. Static equilibrium law. Support and support reaction. Frame construction.
Pre-requisite(s): Introduction to Mechanical Engineering, Engineering Drawing
Text Book(s):

1. Beer, Ferdinand P, Mechanics for Engineers: STATICS, Mc GrawHill.
2. Hibbeler RC, Mechanics of Materials, 10th ed., Prentice Hall, 2016.
3. Riley, F William, Engineering mechanics: STATICS, John wiley & sons
4. Hamrock, Fundamental of Machine Element, Mc Graw-Hill.
5. Shigley, Joseph Edward, Mechanical Engineering Design, McGrawHill.
6. Kurowski, P.M., Finite Element Analysis for Design Engineers, SAE International, 2004

ENME603005 – ENGINEERING MATERIAL (2 SKS)
Learning Objective(s):
Engineering materials are one of the basic knowledge in field of design, especially in mechanical engineering. From the discussion of the behavior of several materials, the students are expected to have the overview about several thing that has to be the concern related to the working process or the specific need. The students are expected to have the basic ability to identify and explain the nature and behavior of materials related to the treatment in working process and specific need. **Syllabus:**
Introduction to the importance of the engineering material science in mechanical engineering, atomic structure, crystalic material, metal and non metal material, process, phase diagram and solidificatiom, heat treatment process, mechanical behavior of crystalic material, elastic material, plastic deformation, crystal plasticity, method of material mechanical testing, dislocation, strengthening, failure and remaining lifetime of material, introduction to mechanical crack and steel mechanical structure behavior, material structure degradation, corrosion process, corrosion prevention, Oxidation, wear and erotion, concrete material behavior, wood, cement and its structure behavior.
Pre-requisite(s): -

Text Book(s):

1. Kalpakjian, Manufacturing Engineering and Technology – 6th Ed., Digital Designs- 2006
2. Thomas H. Courtney, Mechanical Behavior of Materials – 2nd Ed, Waveland Press. - 2005
3. R.A. Higgins, Property of Engineering Materials, Edward Arnold - 1994
4. Flinn & Trojan, Engineering Materials and Their Applications, John Wiley & Sons, Inc.- 1995
5. James A. Jacobs & Thomas F. Kilduff, Engineering Material Technology, Prentice- Hall, Inc. - 2004

ENME603006 – MECHANICAL VISUALIZATION AND MODELING (2 SKS)

Learning Objective(s):

This course will give the understanding of any respond of solid material when it is given the specific thermal and mechanical load.

Syllabus:

Introduction of physical mechanism related to the design of material properties, such as,rigidity, strength, toughness and endurance; understanding of basic mechanical properties of material, testing procedure for determining the properties, every properties that influence the material responses; material capability in engineering design; and fundamental principle to choose the material in mechanical design.

Pre-requisite(s): Mechanical Drawing, Engineering Statics

Text Book(s):

1. Lardner, T. J., R. R. Archer, S. H. Crandall, and N. C. Dahl. An Introduction to the Mechanics of Solids. 2nd ed. New York: McGraw-Hill Primis Custom Publishing, 1999. ISBN: 9780072380415.
2. Dowling, N. E. Mechanical Behavior of Materials. 2nd ed. Upper Saddle River, NJ: Prentice-Hall, 1998. ISBN: 9780139057205.
3. Ashby, M. F., and D. R. H. Jones. Engineering Materials 1: An Introduction to their Properties and Applications. 2nd ed. Oxford, UK: Butterworth-Heinemann, 1996. ISBN: 9780750627665.
4. Bowman, Keith. Mechanical Behavior of Materials. Hoboken, NJ: John Wiley & Sons, 2003. ISBN: 9780471241980.

ENME603007 – STRENGTH OF MATERIALS (2 SKS)

Learning Objective(s):

The aim of this subject is student can calculate and analyze the stress in construction. Student able to solve the defelection and indeterminate statics.

Syllabus:

Moment and internal force diagram. Characteristics of energy. Deformation, stress & strain. Stress due to normal force, shear, bending moment and torsion. Stress distribution, combination of stress. Deflection/beam deformation. Indeterminate static construction. Column. Energy method. Construction of thin and thick wall, rotating disc.

Pre-requisite(s): Mechanical Drawing, Engineering Statics

Text Book(s):

1. Timoshenko, Strength of Material, 1965
2. Belyaev, Strength of Material, MIR Publisher, 1979
3. Propov, Mechanic of Material, Prentice Hall, 1976
4. Hibbeler RC, Mechanics of Materials, 10th ed., Prentice Hall, 2016.
5. Riley, F William, Engineering mechanics: STATICS, John wiley & sons
6. Hamrock, Fundamental of Machine Element, Mc Graw-Hill.

ENME603008 – BASIC THERMODYNAMICS (4 SKS)

Learning Objective(s):
This course introduces the basic concept of thermodynamics and its application in real life and gives the understanding about the design of thermodynamics system.
Syllabus :
Scope and basic understanding of thermodynamics system, temperature concept, pressure, thermodynamics equilibrium, reversible/irreversible process, zero law of thermodynamics and absolute temperature, first law of thermodynamics, second law of thermodynamics, thermodynamics equation, gas power cycle, gas compressor, combustion engine cycle, internal combustion engine , simple gas turbine cycle, brayton's cycle, stirling's cycle, steam power cycle, refrigeration, carnot's cycle, simple rankine's cycle, rankine's cycle with modification, biner cycle, phsycometrich chart, cooling tower, real gas, real gas equation, enthalpy and entrophy.
Pre-requisite(s): -
Text Book(s):

1. Michael J. Moran, Howard N. Shapiro, Fundamentals of Engineering Thermodynamics, 8th Edition, Wiley, 2014.
2. Reynolds W.C., Perkins H.C., Engineering Thermodynamics, Mc. G. Hill .
3. Zemansky , Aboot , van Ness, Basic Engineering Thermodynamics, McGraw Hill
4. Kenneth Wark Jr. Thermodynamics , Mc.Graw Hill
5. H.D. Baehr, Termodynamik , Springer Verlag

ENME600009 – KINEMATICS AND DYNAMICS (4 SKS)
Learning Objective(s):
The students have the ability to understand the key concept of kinematics and dynamics of mechanical system and capable to analyse the movement, velocity, acceleration force and equilibrium.
Syllabus:
Vector velocity analysis, free body diagram, linier motion, velocity polygon, 2D motion, rectangular coordinates, N-T and pole, relative motioan and velocity of 2 coincide/relate point, Coriolis acceleration and stiff body kinematics, Inertia Force, Statics, particle system, works, energy, impuls, linear-angular momentum, stiff body motion, works and energy, relative motion, rotating mass balancing and back & forth motion, cam dynamics and Giroscope.
Pre-requisite(s): Engineering Statics
Text Book(s):

1. Meriam & Kraige, Engineering Mechanics. 7th ed, Wiley New York. 2012.
2. Holowenko, Dynamics of Machinery, John Wiley, 1995.
3. Beer & Johnston, Mechanics for Engineer, Dynamics, 11th ed. Dynamics, Mc Graw-Hill, 2015.

ENME604010 – MATERIAL SELECTION AND MANUFACTURING PROCESS (4 SKS)
Learning Objective(s):
To give the knowledge, understanding and competence about the theory, application method and product manufacturing process technology that consist of: characteristic and how the process work, process constraint, force and energy that needed in process, the effect of the process parameter to the product quality and the relation between process and material to the material characterisc that needed in every process.
Syllabus:
Manufacturing process and production system, materials in manufactur, theory and method in metal casting, theory and method of bulk formation, theory and method of sheet metal forming, theory and method of powder metallurgy, theory and method of machining/metal cutting

process, theory and precess of product surface quality improvement, theory and method of joining, theory and method of prototyping process, characteristic of engineering materials, correlation of material
and process characteristic, process parameter control of material, Design of material selection and manufacturing process that related to the market needs (assignment).
Pre-requisite(s): Material Teknik
Text Book(s):

1. Ashby, Material selection in Mechanical Design, 4th ed., Butterworrth Heinneman, 2010
2. Ashby, Material selection in Mechanical Engineering, 3rd ed., Butterworth Heinneman, 2005
3. John A. Schey, Introduction to Manufacturing Processes, McGraw Hill, 1999
4. Degarmo, E. Paul, Materials and Processes in Manufacturing, Prentice Hall Int. Inc, 10th edition, 2010
5. Kalpakjian, S, Manufacturing Engineering and Technology, McGraw Hill 7th edition, 2013.
6. Buku Panduan Praktikum Proses Produksi, Departemen Teknik Mesin FTUI

ENME600007 – LABORATORY EXPERIMENT FOR MANUFACTURING PROCESS (1 SKS)
Learning Objective(s):
This course is laboratory practice for Material Selection and Manufacturing Process course. After this course, student can have practical ability of manufacturing process of product by considering the technology and material.
Syllabus:
Laboratory practice usingn manual machine tool for workbench such as turning machine, drilling, milling, sawing, etc., welding process; rapid prototyping
Pre-requisite(s): Material Selection and Manufacturing Process
Text Book(s):

1. Buku Panduan Praktikum Proses Produksi, Departemen Teknik Mesin FTUI.

ENME604011 – BASIC FLUID MECHANICS (4 SKS)
Learning Objective(s):
Fluid meachanic are one of the applied mechanical science branch that will be used to investigate, analyse, and learn the nature and the behavior of fluids. Fluid that will be explored could be a moving or stationary fluid. Fluid Mechanics course intends to complement the ability of a student to be able to apply the basic laws of fluid mechanics in practical engineering calculations of fluid mechanics and be able to analyze the behavior of the fluid and developing knowledge in the field of
fluid mechanics.
Syllabus:
Fluid and its nature, fluid statics, the relative balance, concept and basic equations of fluid flow, dynamic of flow, the equation of fluid motion (Newton, Euler, Navierstokes), Basic Equation of Fluid Dynamics (Continiuty, Energy and momentum), dimentional analysist and hydraulic similarity, ideal fluid flow, viscous flow, viscous flow: transition from laminar into turbulent flow, fully developed turbulent flow, flow around submerged objects, general characteristic of outside flow, concept and characteristic of layer in closed flow, measurement and visualization of flow, pressure
measurement concept, flow and capacity, flow measurement devices (Pitot tube, Venturi, orifice, Nozzel, HWA, LDV), Flow visualization method.
Pre-requisite(s): -
Text Book(s):

1. Munson, B.R., Fundamentals of Fluid Mecha-nics 7th Ed, John Wiley & Sons, Inc. 2012
2. Smits, A.J., A, Physical Introduction to Fluid Mechanics, John Wiley & Sons, Inc. 2000
3. Kumar, K.L., Engineering Fluid Mechanics, Eurasia Publishing House Ltd., 2010

ENME604012 – MECHANICAL DESIGN (4 SKS)
Learning Objective(s):
Give the understanding about the application of engineering mechanic science and material strength in machine element. The students have the basic competence to design the machine element.
Syllabus:
Basic mechanical design review, design of joint : welding, solder, adhesive bonding, rivet, pin, bolt, nut, thread, axel, shaft, hub, roller & lauch bearing, lubrication, wear and friction, spring, break, fixed and unfixed clutch, chain, belt, basic of gear, straight & tilt bearing, Final Assignment : Design process consist of the understanding of purpose, load and calculation of machine element.
Pre-requisite(s): Mechanical Visuzalization and Modelling,Strength of Material
Text Book(s):
1. Hamrock, Fundamental of Machine Element, 3rd ed, CRC Press, 2013
2. Shigley, Joseph Edward, Mechanical Engineering Design, 10th ed, McGraw-Hill., 2014
3. Sularso, Dasar Perencanaan & Pemilihan Elemen Mesin, Pradnya Paramita, 1994
4. Hibbeler RC, Mechanics of Materials, 10th ed., Prentice Hall, 2016.
5. Riley, F William, Engineering Mechanics: STATICS, John wiley & sons

ENME600013 - ENGINEERING MATHEMATICS (4 SKS)
Learning Objective(s):
Complete student's anylitical ability. Students understand and able to use the advances mathematical concepts in order to solve the engineering problems.
Syllabus:
Introduction to differential equation, 1st order differential equation, 2nd order differential equation, higher order differential equation, vector analysis, vector differential, grad operation, divergence and culr, vector integration, laplace transform, laplace transform to solve the differential equation, fourrier transform, convulsion, numerical method, root of equation, numerical differentiation, numerical integral.
Pre-requisite(s): Calculus, Linear Algebra
Text Book(s):
1. Croft, A, et.al, Mathematics for Engineers, 3rd Edition, 2008, Prentice Hall
2. Chapra S.C., Canale, Numerical Methods for Engineer, 6th Edition, 2010, Mc Graw Hill
3. Kreyszig, E, Advanced Engineering Mathematics 10th Edition, John Wiley and Sons

ENME605014 – MECHANICAL VIBRATION (2 SKS)
Learning Objective(s):
The students have an understanding of the key points and concepts of the mechanical vibrations of mechanical systems and have the basic competence to analyze the vibration behavior and what parameters can be controlled in order to vibration damping.
Syllabus:
Fundamental of mechanical vibration in mechanical system, oscillatory motion, free vibration, harmonic vibration, transient vibration, system with 2 degree of freedom and system witih multi degree freedom, lumped parameters system and continue system, Lagrange equation, random and non-linier vibration.

Pre-requisite(s): Engineering Mathematics, Kinematics and Dynamics
Text Book(s):

1. Meriam & Kraige. Engineering Mechanics, Dynamics. Wiley New York. 8th ed.2015.
2. Holowenko. Dynamics of Machinery.John Wiley.1995.
3. William T.Thomson. Theory of Vibration with application, 5th Ed. Prentice Hall India.1997.
4. Beer & Johnston. Mechanics for Engineer- Dynamics, 11th ed. Mc-Graw-Hill. 2015.

ENME605015 – MEASUREMENT AND METROLOGY (2 SKS)
Learning Objective(s):
Measurment and Metrology course is knowledge to study the concept of metrology and measurement in industry and the applicaton of metrology and its tools. This course is study the relevance of the theory to the engineering application and manufacturing industry. This course will give the ability to the student to understand the theory and application of engineering measurement and metrology in mechanical engineering application
Syllabus:
The basic concept of measurement and metrology, measurement terminology and systems, industrial measurement and system terminology, temperature measurement, pressure and flow measurement, force, stress, data acquisition, motion measurement : position, velocity, vibration and acceleration, types of sensors/transducer, transfer function, FFT and filtering, uncertainty analysis, geometric and dimension calibration, room dimention, metrology (length measurement), surface texture, roughnes and roundness, flatness and straightness, angle measurement, introduction to CMM
Pre-requisite(s): -
Text Book(s):

1. Busch, Ted, Fundamentals of Dimensional Metrology, 4th Ed, Delmar Publishers
2. Fargo F.T., Curtis, M.A., Handbook of Dimensional Measurement, 5th Ed, Industrial Press. 2013.
3. Slocum, A., Precision Machine Design, SME Press, 1992.
4. Raldi Artono Koestoer, Pengukuran Teknik, Departemen Teknik Mesin FTUI.

ENME600008 – LABORATORY EXPERIMENT FOR MEASUREMENT AND METROLOGY (1 SKS)
Learning Objective(s):
This course is laboratory practice for Measurement and Metrology course. By this course, student can study the technical application of metrology, sensors and tranducer and how to use it in measurement system.
Syllabus:
Laboratory practice to use metrology tool; practice to use some sensors such as temperature and pressure.
Pre-requisite(s): Measurement and Metrology
Text Book(s):

1. Busch, Ted, Fundamentals of Dimensional Metrology, 4th Ed, Delmar Publishers
2. Fargo F.T., Curtis, M.A., Handbook of Dimensional Measurement, 3rd Ed, Industrial Press.
3. Slocum, A., Precision Machine Design, SME Press, 1992.
4. Raldi Artono Koestoer, Pengukuran Teknik, Departemen Teknik Mesin FTUI.

ENME600016 – NUMERICAL METHODS (2 SKS)
Learning Objective(s):
The objectives of this course is that the student can understand and able to apply the process and method (algorithm) of engineering numerical method in computer-based computation and to understand the parameters that influence the speed and accuracy of calculation.
Syllabus:
Introduction to numerical method and programming: simple mathematical modeling, programming and software, structural programming, modular programming, iterative method; Function: function and function value, Taylor and Maclaurin series, approximation and error; Root of equation: graphical method, Bisection method, False-Position method, Newton – Raphson method, Secant method, Bairstow method; Linear algebra equation system: Gauss elimination, Gauss-Jordan elimination, Decomposition and transformed matrices; Curve – Fitting: Least – Square regression, Interpolation; Numerical Integral: Trapezoid method, Simpson method, Double Integral; Differential equation: Finite Divided Difference, Euler method, Runge - Kutta method; Ordinary Diffrential Equation System
Pre-requisite(s): -
Text Book(s):
1. Chapra, Steven C. and Canale, Raymond P. Numerical Methods for Engineers 6th edition. New York: McGraw-Hill, 2010.
2. Kreyszig, Erwin. Advanced Engineering Mathematics 10th edition. Danvers: John Wiley & Sons, 2011.
3. Sedgewick R., Phillippe F, An Introduction to the Analysis of Algorithms, Addison Wesley.
4. Cheney W., Kincaid D., Numerical Mathematics and Computing, Cole Publishing

ENME605017 – HEAT AND MASS TRANSFER (4 SKS)
Learning Objective(s):
This course studies about the heat and mass transfer mechanism within a volume control system due to the temperature gradient, this course strictly related to the basic thermodynamics course. The purpose of this course is to develop the understading from the students about several heat and mass transfer mechanism between two systems if the temperature gradient ocure and the students able to calculate the heat transfer rate. The students capable to solve numbers of heat transfer problems using non-dimensional parameter.
Syllabus:
Fundamental of heat transfer, conduction heat transfer (1 dimentional and 2 dimentional), numerical analysis in conduction heat transfer/unsteady state, forced convection heat transver, free convection heat transfer, boiling and condensation, heat exchanger, radiation, fundamental of mass transfer, steady state molecul diffusion, unsteady state molecul diffusion, convection mass transfer, convection mass transfer correlation, mass transfer apparatus.
Pre-requisite(s): Basic Thermodynamics
Text Book(s):
1. Frank P Incropere, David P De Witt, Fundamental heat and mass transfer, 7th Ed., Wiley, 2011, New York
2. Holman JP, Heat Transfer, 10th ed, Mc Graw-Hill, 2009.
3. Koestoer, RA, Perpindahan Kalor untuk Mahasiswa Teknik, Salemba Teknika, 2003.
4. Welty R James, Wicks Charless, Wilson Robert, Fundamentals of Momentum, Heat, and Mass Transfer, 6th Ed. Wiley, 2014.
5. Cengel, Yunus, Heat Transfer a Practical Approach, 2nd Ed. Mc Graw Hill, 2003, Singapore.
6. Kreith Frank, Bohn Mark, Principles of Heat Transfer, 7th Ed. CL Engineering, 2010.

ENME605018 – FLUID SYSTEM (3 SKS)
Learning Objective(s):
Fluid system is applied science and engineering of basic fluid science which studies the utilization of characteristic, behavior and properties of fluid and its flow behavior in various fluid machines i.e. rotodynamics, reciprocating, hydraulic and pneumatic system. The course is intended to equip student to understand characteristic of turbo fluid machines, hydraulic and pneumatic system and to be able to calculate and design a fluid system.
Syllabus:
Basic Thermo fluid in a Fluid System; Energy Transfer from Fluid to Rotor; Lagrangian and Eularian Approach; Energy Transfer Components; Impulse and Reaction; Turbo machinery Analysis with Flow; Operational Aspects of Rotodynamic Machinery; Hydraulic Similarities on Fluid Machinery; Reciprocating Machinery: Classification, Main Component and Operating; Discharge and Coefficient Discharge; Work and Power; Basic Hydraulic Machines; Hydraulic Machines; Hydraulic Accumulator; Hydraulic Intensifier, Hydraulic Press; Hydraulic Crane; Hydraulic lift; Pneumatic System: Basic Laws, Pressure Drop Losses, Basic Control Valve of Pneumatic Circuit.
Pre-requisite(s): Basic Thermodynamics, Basic Fluid Mechanics
Text Book(s):

1. Harinaldi, Sistem Fluida
2. Dixon, S.L, Fluid Mechanics and Thermodynamics of Turbomachinery, 7th Edition, Butterworth-Heinemann, 2013
3. Esposito, A., Fluid Power with Application, 7th Edition, Prentice Hall, 2008
4. Mobley, R.K, Fluid Power Dynamics, Newnes Butterworth-Heinemann, 2000
5. Giles, R.V, Fluid Mechanics and Hydraulics, 4th Edition Schaum's Outline Series, McGraw-Hill, 2013

ENME605019 – CONTROL SYSTEM (4 SKS)
Learning Objective(s):
System control is one of the sciences discussed about the method to control the value of parameters within a system. Parameters within the system in this course are base on physic that could be position, velocity, rotation, pressure, acceleration flow rate, temperature and other variables. This course aims for students to understand the basics, analysis, and engineering design and control system compensation techniques, and be able to choose a control system (controller) is right for a mechanical system.
Syllabus:
Introduction to system control, laplace transform, reverse laplace transform, solution for linier ordinary differential equation, mathematical modeling I-IV, control action, PID controller, electronic controller, pneumatic and hydraulic control, transient response analysis I and II, root place analysis, design of system control with root place analysis method, frequency response analysis, stability analysis, MATLAB laboratory activity, design of control system with response frequency method, discrete time system and Z-Transform, PID control and introduction to robust control, space condition analysis I-II, design of control system within space condition, liapunove stability analysis and optimum square control.
Pre-requisite(s): Engineering Mathematics, Basic Physics 1, Basic Physics 2
Text Book(s):

1. Ogata, Katsuhiko., Modern Control Engineering, 5th ed, Prentice-Hall. 2009.
2. Golnaraghi, F and Kuo, B. C., Automatic Control System, 9th Ed, Wiley, 2010.
3. Francis H, Raven., Automatic Control Engineering, 5th ed. McGraw-Hill,1995.
4. Cheng, David K., Analysis of Linear System, Addison–Wesley P. C., Inc.

ENME600001 – DESIGN ASSIGNMENT 1 (2 SKS)
Learning Objective(s):
Student has the ability to design the system and mechanical product using previous knowledge and skill. From this course, student can work in team, communicate, report, present and defend the final project.
Syllabus:
Fundamental of mechanical design process; team work in design; process planning, understanding the problem and development of engineering specification; Concept Generation, Evaluation and Selection; Product Design Phase; Engineering Economics
Pre-requisite(s): Mechanical Design, Material Selection and Manufacturing Process
Text Book(s):
1. David G.Ullman. The mechanical design process, 4th ed. McGraw-Hill. 2009.
2. George Dieter. Engineering Design: A Material and Processing Approach, 3rd ed. McGraw-Hill. 2000.
3. G.Pahl and W.Beitz. Engineering Design: A Systematic Approach, 3rd ed. Springer. 2007.

ENME606020 – MAINTENANCE AND CONDITION MONITORING (3 SKS)
Learning Objective(s):
This course gives the understanding and the ability to analyze a system and design a system for maintenance and its procedure to improve the efficiency and reliability within a system. To give the understanding and competence to develop and implementation of vibration monitoring and engine condition so that the mechanical system reach the optimum performance.
Syllabus:
Quality, Reliability and Maintainability, maintenance system strategy, failure analysis, design of maintenance system and scheduling, maintenance system organization, condition monitoring and condition based maintenance, computer based maintenance system, total productive maintenance (TPM) and its implementation, the effectiveness measurement of total productive maintenance, reliability based maintenance system, planning;measurement and standardization of maintenance work, quality of maintenance system, basic theory of vibration and engine condition, basic of engine condition monitoring, vibration monitoring device in several mechanical systems and engine
condition analysis.
Pre-requisite(s): Mechanical Vibration
Text Book(s):
1. Niebel, B.W., Engineering Maintenance Management, Marcel Dekker, Inc. 1994
2. Higgin, L.R., Maintenance Planning and control, Mc Graw Hill Book Company, 1998
3. Mishra, R.C., and K. Pathak, Maintenance Engineering and Management, PHI, 2004
4. Bruel & Kjaer. Handbook of Vibration & Condition Monitoring

ENME606021 - ENERGY CONVERSION AND CONSERVASION (3 SKS)
Learning Objective(s):
This course discusses about the energy resources, type and classification of energy, energy conversion, energy consumption, basic concept of energy conversion, power resources and classification of energy conversion enginess. The students understand the energy source, type of energy conversion engine, conversion and conservasion of energy system, and also capable to perform a basic calculation of energy conversion engine performance and critical consideration of energy conversion.
Syllabus:
Definition of energy and energy resources, type and energy classification, law and equation in

energy conversion, energy profile (resources, reserves and the world's and Indonesia's energy needs), basic concept of energy conversion system, power resources and classification of energy conversion engine, fuel in energy conversion, renewable energy, non-renewable energy, classification of combustion engine, calculation for internal combustion engine performance, steam power plant, fluid machinery, cooling engine classification, thermodynamic cycle of cooling engine, energy conversion method in vehicle, industry and building.
Pre-requisite(s): Basic Thermodynamics, Basic Fluid Mechanics, Heat and Mass Transfer
Text Book(s):

1. Kreith, F, Goswami, DY, Energy Conversion (Mechanical Engineering), CNC Press, 2007
2. Kreith, F, Goswami, DY, Energy management and Conservation Handbook, CNC Press, 2007
3. Patrick, D.R., et.al, Energy Conservation Guidebook, 3rd ed. Fairmont Press 2014
4. Dincer, I., Rosen, Thermal Energy Storage: Systems and Applications 2nd ed, Wiley, 2010
5. Panduan Praktikum Prestasi Mesin Konversi energi, Departemen Teknik Mesin versi 2003. Depok 2003.

ENME600009 – LABORATORY EXPERIMENT FOR ENERGY CONVERSION AND CONSERVASION (1 SKS)
Learning Objective(s):
This course is laboratory practice for Energy Conversion and Conservation course. By this course, student can understand practical applicaton of energy conversion and conservation
Syllabus:
Laboratory practice of compressor, Pelton turbine, axial turbine, heat pump, Refrigeration Training Unit, Diesel engine, Otto engine, sentrifugal pump
Pre-requisite(s): Konversi dan Konservasi Energi
Text Book(s):

1. Panduan Praktikum Prestasi Mesin Konversi energi, Departemen Teknik Mesin versi 2003. Depok 2003.

ENME606022 – MECHATRONICS (4 SKS)
Learning Objective(s):
This course provides the ability to design electrical-mechanical that properly meet the needs of a process specification and a design that given in a laboratory scale with the mechanical, electrical theory and automation control.
Syllabus:
Mechatronics concept and theory, electronics analog system, electronis analog components, electronics digital system, analog and digital interface, sensors and actuators (electric motor, pneumatic, hydraulic), principles of microprocessor and microcontroller, microcontroller based control system theory, C/C++ programming for electrical-mechanical for control, programmable logic controller (PLC), Laboratory activity.
Pre-requisite(s): Basic Physics 1, Basic Physics 2
Text Book(s):

1. Smaili A. dan Mrad F., Applied Mechatronics, Oxford University Press, 2007
2. Sabri Cetinkunt, Mechatronics, Wiley, 2006
3. Histand, M.B., & Alciatore, D.G., Introduction to Mechatronics and Measurement System 4th ed, McGraw-Hill, 2011.
4. Fraser, C. dan Milne, J, Electromechanical Engineering, An Introduction, IEEE Press,

McGraw-Hill, New York, 1994.

5. Gandjar K, Hand-out Mekatronika, DTMUI, 2007

ENME606023 – ELECTRICAL POWER ENGINEERING (2 SKS)
Learning Objective(s):
The objective of this course is to give the understanding of basic concept and practical application on electrical power engineering. Student also studies the general understanding of electrical power engineering terms and can work in team effectively.
Syllabus:
Linear approach and signal analysis; History of development and basic physics of electrical power generationt Electromechanical energy conversion; Single phase and Triple phase Transformator; Three phase generation.
Pre-requisite(s): -
Text Book(s):

1. J. David Irwin and David V. Kerns, Jr., Introduction to Electrical Engineering, Prentice Hall, 1995.
2. R.D. Shultz and R.A. Smith, Introduction to Electric Power Engineering, John Wiley &Sons, New York, 1988.
3. Zuhal, Dasar Tenaga Listrik dan Elektronika Daya

ENME600010 – LABORATORY EXPERIMENT FOR ELECTRICAL POWER ENGINEERING (1 SKS)
Learning Objective(s):
The laboratory is intended to introduce electric power basic concept to electrical engineering students : motor and generator includes DC or AC transformator
Syllabus:
Watt meter, volt meter, amp meter and transformer. Motor & generators DC. Reading of 3 phase circuit power either with balanced or unbalanced load. One and three phase circuit testing for Y & Δ. Power Transformer, solving by using open loop and closed loop circuit test. Autotransformer.
Pre-requisite(s): Electrical Power Engineering
Text Book(s):

1. J. David Irwin and David V. Kerns, Jr., Introduction to Electrical Engineering, Prentice Hall, 1995.
2. R.D. Shultz and R.A. Smith, Introduction to Electric Power Engineering, John Wiley &Sons, New York, 1988.
3. Zuhal, Dasar Tenaga Listrik dan Elektronika Daya

ENME606024 – LIFE SCIENCE FOR ENGINEERS (2 SKS)
Learning Objective(s):
This course will study the basic knowledge and introduction to the aspect of life organism that have close relation to mechanical engineering field. The student will get the broad perspective of life science application in mechanical engineering.
Syllabus:
Introduction to cell, chemical aspect in biology: acid, carbohidrat, lipid, protein, nucleat acid; bioenergy and metabolism: aerobic and anaerobic respiration, photosynthesis; animal control system, termoregulation and homestasis; biomechanics, animal locomotion, scale effect; food and farm; environmental conservation, air, water, life science consideration in mechanical design
Pre-requisite(s): -
Text Book(s):

1. Alexander, R. McNeill. Principles of animal locomotion. Princeton University Press, 2003.
2. Karp, G. Cell and Molecular Biology, 5th ed., John Wiley and Sons, Inc.
3. Berger, S. et al. Introduction to Bioengineering, Oxford University Press
4. Cunningham, William P., and Mary Ann Cunningham. Principles of environmental science: inquiry & applications. McGraw-Hill, 2011.
5. Cosentino, Carlo, and Declan Bates. Feedback control in systems biology. CRC Press, 2011.
6. Basic Biomechanics, Susan J. Hall, McGraw Hill, USA
7. Biomechanics, Kreighbaum, Barthels, Burgees Publishing, USA
8. Biomechanics in Ergonomics, Shrawan Kumar, Taylor & Francis INC, USA
9. Biomechanics Circulation, Y.C. Fung, Springer, USA
10. Biomechanics Mechanical Properties, Y.C. Fung, Springer, USA
11. Biomechanics of the Upper Limbs, Andris Freivalds, CRC Press, USA
12. Skeletal Tissue Mechanics, Martin,Burr,Sharkey, Springer, USA
13. Biomedical Engineering Principles, David Cooney, Marcel Dekker INC, USA

ENME600002 – DESIGN ASSIGNMENT 2 (2 SKS)
Learning Objective(s):
Student have ability to produce the prototype from the previous design in Design Assignment 1. Student can work in team, manage the project and present the final project.
Syllabus:
Product Generation, Evaluation and Performance; Project Management; Product Evaluation or Mechanical System for Cost, Manufacutring, Assembling etc; Technopreneurship consideration.
Pre-requisite(s): Design Assingment 1
Text Book(s):

1. David G.Ullman. The mechanical design process, 4th ed. McGraw-Hill. 2009.
2. George Dieter. Engineering Design: A Material and Processing Approach.2000.
3. G.Pahl and W.Beitz. Engineering Design: A Systematic Approach. Springer, 3rd ed. Springer. 2007.

ENME600006 – INDUSTRIAL SEMINAR (2 SKS)
Learning Objective(s):
Able to understand industrial development and its problems.
Syllabus:
Special topics in industries which are not covered in other courses.
Pre-requisite(s): Passed 76 SKS and GPA > 2.00
Text Book(s): -

ENME600003 – INTERNSHIP (2 SKS)
Learning Objective(s):
The course is intended to provide opportunity for gaining experience in industries and applying mechanical engineering knowledge. Able to perform management tasks and engineering technique according to field of interest.
Syllabus:
Management and Engineering according to the field of interest. Presentation of internship results and report.
Pre-requisite(s): Passed 95 SKS and GPA > 2.00

ENME600004 - SEMINAR (1 SKS)
Learning Objective(s):
Student can communicate in verbal or written with final project pjroposal; able to formulate the problems and objectives of the research, conduct theoretical review to formulate the hypothesis, design the research method for empirical proof and present the preliminary result to the supervisor
Syllabus:

Problem description, basic concept of research with assumption and constraint; making preliminary report, conducting the preparation, literature review and research methodology; present final report with structured report, language, graphical presentation, table etc, reference and clarity.
Pre-requisite(s): Passed 110 SKS and GPA > 2.00 without Grade E
Text Book(s): -

ENME600005 – FINAL PROJECT (5 SKS)
Learning Objective(s):
Students are able to conduct design and analysis the object of system that related to the mechanical engineering field
Syllabus:
Synthesizing various lectures taken by students to design or to solve engineering problems. Preparing a written report of the synthesis.
Pre-requisite(s): Passed 128 SKS and GPA > 2.00 without Grade E

ELECTIVES

ENME803105 – INTERNAL COMBUSTION ENGINE (4 SKS)
Learning Objective(s):
Student is expected to have competency and expertise in the field of his interest of internal combustion engine working principle and theory and is able to design and do construction calculation.
Syllabus:
Actual Cycle of Internal Combustion Engine; Fuel System; Ignition and Combustion in Spark Ignition Engine and Compressed Ignition Engine; Some Basic Characteristics and Calculations; Basic Engine Design; Determination of Engine's Main Components; Kinematics and Dynamics Analysis of the Motion; Calculation and Planning of Lubrication and Cooling System.
Pre-requisite(s): -
Text Book(s):
1. Guzela L, Onder, C., Introduction to Modelling and Control of Internal Combustion Engines, 2nd Edition, Springer, 2014
2. Heywood, J., Internal Combustion Engines Fundamental, McGraw Hill, 2011
3. Taylor, C.F., Internal Combustion Engines, in Theory and Practice, M.I.T Press, England, 1985.
4. Khovakh, M., Motor Vehicle Engines, MIR Publisher, Moscow, 1971.

ENME803106 - APPLIED FLOW MEASUREMENT AND VISUALIZATION (4 SKS)
Learning Objective(s):
Applied flow diagnostic study measurement and visualization techniques which have wide application both in industry and laboratory. The course give basic competency for the student to be bale to understand various measurement and visualization methods and to design appropriate flow diagnostic system in process installation in industry or experimental set up in a scientific research activities which related to fluid flow.
Syllabus :
Statistics Diagnostic Flow, Calibration in Flow Measurement; Momentum Sensing Meter (orifice plate, venturi, nozzle meters); Positive Displacement Flow Meter (Nutating Disc, Sliding Vane, Gear meters, etc.); Electromagnetic and Ultrasonic Flow Meters; Compressible Flow Meter (Wet Gas and Wind Anemometer); Principles Local Velocity Measurement in Liquid and Gases; Hot Wire Anemometry; Based Laser Velocimetry (LDV, PIV); Principles of Flow Visualization, Flow Visualization conventional; Shadowgraphs and Schliern Technique; Interferometry Technique; Light Sheet Based Technique ; Image Processing and Computer Assitested Method.
Pre-requisite(s): Fluid Mechanics, Fluid System
Text Book(s):
1. Yang ,W.J, Handbook of Flow Visualization, Taylor and Francis. 2001

2. Baker, R.C., Flow Measurement Handbook: Industrial Designs, Operating Principles, Performance and Applications, Cambridge University Press, 2005

ENME803107 - CFD APPLICATIONS (4 SKS)
Learning Objective(s):
Understanding the basic principles of CFD and having the basic knowledge in applying CFD (Computational Fluid Dynamic)
Syllabus:
Prediction-rule Principles, Numerical Solutions: Advantages and Disadvantages; Mathematical Description of Physical Phenomena; Basic Nature of Coordinates; Discretization Method; Volume-set Application on Heat Conduction Problem; Convection and Diffusion; Two-Dimension Discretization Equations; Three-Dimension Discretization Method; Special Procedure Needs; Some of Constraints Associated with the Representation of Pressure-gradient Factors, Continuity Equations Representation; Stayered Grid; SIMPLE Algorithm; Revision of SIMPLER algorithm; Final Solutions: Basic Properties of Iterative Numerical Procedures; Sourceterm Linearization, Irregular Geometries, Preparation and Testing a Computer Programs.
Pre-requisite(s): -
Text Book(s):
1. Suhas V. Patankar, 1980, Numerical Heat Transfer and Fluid Flow, McGraw Hill.
2. C.A.J. Fletcher, 1996, Computational Techniques for Fluid Dynamics, 2nd edition, Springer Verlag
3. A.D. Gosman et al., 1985, COMPUTER AIDED ENGINEERING Heat Transfer dan Fluid Flow, John Wiley & Sons.

ENME803108 - REFRIGERATION ENGINEERING (4 SKS)
Learning Objective(s):
Refrigeration engineering course provides basic competency for the student to be able to do the simulation software to design a cooling system and equipments involved with a very close relationship with the Industrial and engineering users. Hence student will have understanding in design and development of cooling system and ability to evaluate and analyze its performance, especially on clod storage.
Syllabus:
Principles of Refrigeration and Heat Pump, Terminology and Units; Mechanical Vapor Compression Refrigeration Engine; Heat Trasnfer in Refrigeration System; ph Diagram Calculation in Refrigeration Cycle; Refrigeran, Lubricant, Salt and the Environment; Compressors; Condenser and Evaporator; Refrigeration Piping System and Equipments; Automatic Control System and Safety Equipments; Air Properties; Psychrometric and its process; Absorption Refrigeration; Alternative refrigeration Cycles (adsorption, gas compression, and ejector); Display Case, Prefabricated Cold Storage and Cold Storage, Cold Room Calculations.
Pre-requisite(s): Basic Thermodynamics
Text Book(s):
1. ASHRAE Handbook of Fundamental, ASHRAE Atlanta, 1995.
2. Kuehn, Ramsey and Therkeld, Thermal Environmental Engineering, 3rd Edition, Prentice Hall, 1998.
3. Threkeld,JL., Thermal Environmental Engineering, Prentice Hall.
4. ASHRAE Handbook of Fundamental, ASHRAE Atlanta, 2001
5. ASHRAE Handbook of Refrigeration, ASHRAE, Atlanta, 2002.

ENME803104 – THERMAL POWER GENERATION (4 SKS)
Learning Objective(s):
The course objective is to provide an understanding of the basic principles of power generation,

and basic competency in the design and development of power generation systems.
Syllabus:
Industrial Power Plant and Steam System: Boiler, Steam Turbine, Gas Turbine; Cogeneration Engineering, Instrumentation and Main Tools; Performance and Reliability Factors; Economical Aspects, Environmental Aspects: Settings and Prevention.
Pre-requisite(s): -
Text Book(s):

1. Tyler G. Hicks, Power Plant Evaluation and Design Reference Guide, McGraw Hill, 1986.
2. Sill and Zoner, Steam Turbine Generator Process Control and Diagnostics, Wiley Higher Ed., 1996.
3. Saranavamuttoo et.al, Gas Turbine Theory, 6th Edition, Prentice Hall, 2008.
4. Black and Veath-Power plant engineering , Philips Keameh–Power generation handbook
5. Steam Generators by Babcock Willcock
6. Borman, G.L., and Ragland, K.W., Combustion Engineering, 2nd Edition, McGraw-Hill, Inc. 2011.

ENME801113 - VENTILATION AND AIR CONDITIONING SYSTEM (4 SKS)
Learning Objective(s) :
This course provide the understanding and basic competence in design the air conditioning system regarding a better air condition. The student will provided with knowledge about the environmentally friendly regrigerant.
Syllabus :
Basic of Air Conditioning: Air Cooled dan Water Cooled Chiller, Packaged Unit, Direct Expansion and Split Unit; Basic VAC Calculation : Design Condition, Load Estimating, Cooling Load; Sistem Ventilasi : Air Changes, Outdoor Air Requirement, Indoor Air Quality. Clean Space and Air Filter System in industry and hospotal; distribution system: Equal Friction Method and Static Regain, Duct and Piping Sizing; Air Conditioning System Components : Chiller, Cooling Tower, Fan, S and AHU; Control System in Building.
Pre-requisite(s): Refrigeration System
Text Book(s) :

1. Ronald Howell, Harry J.Sauer, Jr and William J.Coad : Principles of HVAC, ASHRAE 1998.
2. Carrier : Handbook of HVAC
3. ASHRAE Standard
4. Overseas Vocational Training Association Employment Promotion Corporation : Fundamentals of refrigeration and Air Conditioning.

ENME803115 – CLEAN ROOM (4 SKS)
Learning Objective(s):
Provide an understanding of the basic knowledge of clean room systems and its application in buildings, hospital and pharmaceutical industries. Understanding of the concept of air cleanliness, ventilation and fresh air exchange, application of laminar flow, the air pressure in the chamber and measuring systems, validation and its control.
Syllabus:
Indoor environment: human psychological and physiological aspects, BEAM IAQ assessment; Air quality: air cleanliness, ambient air quality, rationale for standards; Indoor air pollutants: gaseous pollutants, airborne particulate, VOCs, radon, biological contaminants; Indoor air movement: air flow in confined and unconfined spaces, filtration systems; Instrumentation and measurement techniques; Control measures: improved IAQ by HVAC system design, removal of contaminants.
Pre-requisite(s): -
Text Book(s):

1. ASHRAE : HVAC Design Manual for Hospitals and Clinics Second Edition, 2013
2. W. Whyte, Clean Room Technology Fundamentals of Design, Testing and Operation,

John Wiley & Sons Ltd., 2001
3. John D. Spengler, J.M.Samet, J.F McCarthy, Indoor Air Quality Handbook, McGrawHIll, 2001.

ENME803124 – ENERGY AUDIT (4 SKS)
Learning Objective(s):
This course focuses on the theory, techniques and practices of analyzing energy aspects of building operations and correlating a building envelope's interaction with the mechanical systems. Students will perform a detailed energy audit of a state-of-the-art commercial building design using energy modeling simulation software and develop energy conservation strategies, such as thermal stor- age, that can be applied to heating, cooling, and ventilating equipment to reduce utility bills. Students will apply supporting analytical data to develop operations and maintenance changes designed to improve energy efficiency and reduce operating cost.
Syllabus:
Energy Auditing Basics, Energy Accounting and Analysis, Understanding the Utility Bill, Energy Economics, Survey Instrumentation, The Building Envelope Audit, The Electrical System Audit, The Heating, Ventilating and Air-Conditioning Audit, Upgrading HVAC Systems for Energy Efficiency Verification of System Performance, Maintenance and Energy Audits, Self-Evaluation Checklists, World-class Energy Assessmeents, and Water Conservation.
Pre-requisite(s): -
Text Book(s):
1. Albert Thumann, William J. Younger, Terry Niehus, Handbook of Energy Audits, Eighth Edition, The Fairmont Press, 2010.
2. Moncef Krarti, Energy Audit of Building Systems: An Engineering Approach, Second Edition, CRC Press, Taylor & Francis Group, 2010.

ENME803134 – ENCLOSURE FIRE DYNAMICS AND MODELLING (4 SKS)
Learning Objective(s):
Sudents understand the various stages of fires and provide basic knowledge methods and techniques applied in the analysis of fire development, and develop students' ability to critically analyze the methods of practical application. This course also aims to improve the ability to understand and analyze the fires model.
Syllabus:
Introduction to the process of combustion, premixed flame and diffusion flame, ignition and spread of fire, classification of fires and the influence of the geometry of the room. Calorimetry fire: heat release rate, mass loss rate and the relationship between time and heat release rate, the growth of fire in the room, as well as testing methods. The dynamics of the flame: fire plume and flame (flame), a high flame, the flame height correlation.
Pre-requisite(s): -
Text Book(s):
1. Dougal Dysdale, An Introduction to Fire Dynamics, 3rd Edition, John Wiley and Sons, 2011.
2. James G. Quintiere, Fundamentals of Fire Phenomena, John Wiley & Sons, Ltd ISBN: 0-470-09113-4, 2006
3. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
4. Thierry POINSOT, Denis VEYNANTE, Theoretical and Numerical Combustion.
5. Jurnal dan standar terkait.

ENME803143 - MECHANICAL FAILURE (4 SKS)
Learning Objective(s):
This course provides an understanding and competence about principles and modes of mechanical failure may occur and should be avoided so that should be considered in the design of mechanical, including buckling, Corrosion, fatigue, creep, melting, fracture, thermal, and wear.
Syllabus:
Theory and Buckling Mode (Torsional-lateral, Plastic, Dynamic), Theory and Corrosion mode (Metal, Non-Metal, Glass); Corrosion Prevention; Theory and Fatigue Failure Mode; Theory and

creep mode; Theory and Melting Mode; Theory and Type of Fracture mode, Theory and the thermal failure mode; Theory and Wear mode; Failure Analysis and Prevention to: Buckling, Corrosion, Fatigue, creep, Melting, Fracture, Thermal, and Wear
Pre-requisite(s): Engineering Material, Basic Mechanical Design, Mechanical Design
Text Book(s):

1. Jack A Collins, Materials Failure in Mechanical Design, Wiley - Interscience, 1993
2. S. Suresh, Fatigue of Materials, Cambridge University Press, 1998
3. M Jansenn, J. Zuidema, Fracture Mechanics, VSSD, 2006
4. Arthur J. McEvily, Metal Failures : Mechanisms, Analysis and Prevention, 2013

ENME803145 - COMPOSITE PRODUCT DEVELOPMENT (4 SKS)
Learning Objective(s):
Provide expertise and competence to students in the field of designing and manufacturing of parts / mechanical construction using composite materials. This course provides an understanding of composite materials, including the characteristics, testing, manufacturing process, and special applications in the engineering field.
Syllabus:
Composite Type, Material, Properties, Mechanics; Knowledge and Characteristics of Fiber Composite, Strength, Hardness, and the composite thermal expansion; Theory of Combination Fiber and Matrix; Matrix Composite Characterization; Laminar Theory On Axis and Off Axis; Composite Product Design, Composite Fabrication Technique ; Testing Method; Future Applications.
Pre-requisite(s): Engineering Materials, Mechanical Design, Design Assignment.
Text Book(s):

1. Brent Strong, Fundamentals Of Composites Manufacturing: Materials, Methods and Applications - Technology & Engineering – 2007
2. By Daniel Gay, Suong V . Hoa, Stephen W. TsaiTranslated by Stephen W Tsai Contributor Suong V. Hoa, Stephen W. Tsai, Composite materials: Design and application, 2nd : CRC Press 2007
3. Soemardi,T.P. Diktat Mekanika komposit, Fabrikasi dan Testing. FTUI.2003.
4. Composites ASM handbook No 21

ENME803147 - TOY PRODUCTION DESIGN (4 SKS)
Learning Objective(s):
Understanding the basics and design development of educational products in the industry props, product education, and game props.
Syllabus:
Brainstorming and express the ideas and opinions, Innovation and Development Themes, Basics of Toy Product Design, Basic Design Engineering and Mechanical, Basic Theory Make Sketch, Process Modeling Sketch Image, Design Aesthetics, Theory of Manufacturing and Selection of Materials for Viewer tool Games, Basic Theory Creation prototype, Portfolio Design, Presentation and Pitching Idea.
Pre-requisite(s): -
Text Book(s):

1. Karl Urlich, Steven Eppinger, 2015, Product Design Development Flow, 6th Edition, McGraw Hill.
2. Donald A. Norman, 2005, Emotional Design, 1st Edition, Basic Books.
3. Michael Michalko, 2006, Thinkertoys : A Hanbook of Creative Thinking Techniques, 2nd Edition, Ten Speed Press.

ENME803153 - SISTEM MACHINE VISION (4 SKS)
Learning Objective(s):
Machine Vision Industry Subjects provides the understanding and competency of the principles, methods and applications monitoring the production process by using visual-based camera technology, image processing, for the purpose of introducing the feature: product identification, selection and product screening, and quality control. With the completion of this course, students have the ability to apply and develop the visual method of monitoring the production process in the industry for the purpose.
Syllabus:
Basic Machine Vision Method: Binary Image, Binary Morphology and Gray-Scale, Texture analysis; Identification Method feature; image Processing Method Smart / Intelligent, Image Processing System (Prolog); Control Equipment / Instruments Interface (Instruments, Signal, Protocol, PLC) ; Method Introduction Color image; Machine Vision Applications.
Pre-requisite(s): -
Text Book(s):

1. J.R. Parker, Algorithms for Image Processing and Computer Vision 2nd ed, Wiley, 2010
2. Butchelor B. G., Whelan P. F.,Intelligent Vision System for Industry, Springer, 2012
3. E.R. Davies, Machine Vision : Theory, Algorithm, Practicalities, Morgan Kauffman, 2004
4. Micheul S, Lawrence O'Gorman, Michael J S Practical Algorithms for Image Analysis : Description, Examples and Code, , Cambride Univ. Press, 2000
5. Rafael Gonzales, et.al, Digital Image Processing using Matlab, McGraw Hill, 2010.
6. A.S. Baskoro, Handout Sistem Machine Vision, Diktat kuliah, 2011.

ENME803154 - QUALITY AND PRODUCTION MANAGEMENT SYSTEM (4 SKS)
Learning Objective(s):
Provide knowledge, understanding and ability to perform management, analysis and improvement of production systems in the manufacturing industry with the principles of efficiency and effectiveness, and able to understand and implement and develop policies and procedures are needed to improve and control the various processes.
Syllabus :
Introduction to Manufacturing Systems, Manufacturing Principles, Resources, Production Process and Production Organization, Production Lay-Out, Design, Scheduling and Production Process Control; Productive Maintenance, Logistics and Inventory; Engineering Quality, Quality Control, Quality Function Deployment (QFD) , Total Quality Management; Quality Management System (8 Quality Management Principles, International Standard Quality Management System: ISO 9001, ISO 9004, ISO TS 16949, the International Management System Standard: ISO 14001, OHSAS 18001); System And Process Improvement: Cause - Effect Analysis, FMEA (Failure Mode and Effect Analysis), Lean Six Sigma.
Pre-requisite(s): -
Text Book(s):

1. Hitomi, Katsundo. Manufacturing System Engineering. Taylor & Francis. 2001
2. TQM : A Cross Functional Prespective, Rao, CARR, Dambolena, Kopp, Martin, Rafii, Schlesinger, John Willey, 1996
3. TQM, Text, Cases and Readings, Joel E. Ross, St. Lucie Press 100 E. Linton Blvd Suite 403 B Delray Beach, FL 33483

ENME803161 – MICROFABRICATION AND PRECISION MANUFACTURING (4 SKS)
Learning Objective(s):
In this course provides expertise of micro manufacturing process widely used in the making of MEMS (micro Electro mechanical system) at this time that has wide application of the biomedic system, sensors and micro-electronic devices (electronic devices). This course giving

understanding of manufacturing techniques and basic structure mechanics in a product and also the micro-characterization of the process fabrication conducted in the laboratory. This course provides a basic competency of the principles in the design techniques which control the movement of the size or dimensions in a very small if compared with the size of the object that is designed and produced the correct design and the development machine and a precision mechanism

Syllabus:

Introduction to Engineering Micro Fabrication; Lithography: The design aspect, masks making, etching technique (And Wet Etching Dry Etching); Deposisi Engineering: Chemistry and Chemicals; Electroplating, Micromolding, Beam Processing; Microscaling consideration); Transport Processes and Metrology in the micro-scope; Lab Practice and Applications, Philosophy Precision Manufacturing; kinematic concept; Pro and contra Flexures Design; Materials for Precision Components; Self Calibration Concept; Manufacturing Process which is Important in Precision Manufacturing, Precision Instruments; Basic Concept of Tolerance on Dimensions and geometric.

Pre-requisite(s): Basic mechanical design, Mechatronics, Design assignment, Metrology and Measurement, Engineering Materials, Manufacturing Process and Materials Selection

Text Book(s):

1. Madou, M.J. Fundamentals of microfabrication: the science of miniaturization, CRC Press, 2002.

2. McGeough, J (Ed.), Micromachining of Engineering Materials, Marcel Dekker, 2002, ISBN 0-8247-0644-7

3. Mainsah, E., Greenwood J.A. and Chetwynd D.G. Metrology and properties of engineering surfaces, Kluwer Academic Publ., 2010

4. Gardner J.W. and Hingle H.T. (Ed.) From Instrumentation to Nanotechnology, Gordon and Breach Science Publishers, 1991, ISBN 2-88124-794-.

5. Korvink J.G. and Greiner A. Semiconductors for Micro- and Nanotechnology – An Introduction for Engineers, WILEY-VCH Verlag GmbH, 2002, ISBN 3-527-30257-3.

6. Mark J. Jackson, Microfabrication and nanomanufacturing. Taylor and Francis, 2006

ENME803167 – MODERN VEHICLE TECHNOLOGY (4 SKS)

Learning Objective(s):

Students understand the concept of manufacturing technology and control systems on the vehicle so as to: • Analyze the condition of current technological advances to make fundamental changes in vehicle design a sustainable future.

• Design process to create an automatic control system that helps in controlling the vehicle.

• Designing vehicles with electronic control systems that can improve vehicle performance.

• Describes the integration of vehicle control systems and mechanicalelectrical interaction possibilities for the design of future vehicles.

Syllabus:

Knock control, Linear solenoid idle speed control, Sequential fuel injection, Distributorless ignition, Self-diagnosis for fail-safe operation, Crankshaft angular position measurement for ignition timing, Direct mass air flow sensor, Variable valve phasing,teknologi kendaraan Hybrid Electric Vehicles and Electric Vehicle.

Pre-requisite(s): -

Text Book(s):

1. Julian Happian-Smith, " An Introduction to Modern Vehicle Design", Butterworth-Heinemann Linacre House, Jordan Hill, Oxford OX2 8DP, ISBN 07506 5044 3.
2. Heinz Hei s ler, "Advance Vehicle Technology", Society of Automotive Engineers, Inc. ISBN 07680 1071 3.
3. Fuhs, Allen E., "Hybrid vehicles and the future of personal transportation", CRC Press, Taylor & Francis Group, ISBN-13: 978-1-4200-7534-2, ISBN-10: 1-4200- 7534-9.

4. Lino Guzzella and Christopher H. Onder, "Introduction to Modeling and Control of Internal Combustion Engine Systems", Springer-Verlag Berlin Heidelberg, ISBN 978-3-642-10774-0 e-ISBN 978-3-642- 10775-7, DOI 10.1007/978-3-642-10775-7, Library of Congress Control Number: 2009940323.
5. Iqbal Husain, "ELECTRIC and HYBRID VEHICLES Design Fundamentals", CRC PRESS Boca Raton London New York Washington, D.C., ISBN 0-203-00939-8 Master e-book ISBN, International Standard Book Number 0-8493-1466-6 (Print Edition), Library of Congress Card Number 2002041120.
6. Ali Emadi, "Handbook of Automotive Power Electronics and Motor Drives", Taylor & Francis Group, CRC Press is an imprint of Taylor & Francis Group, ISBN 0-8247-2361-9.
7. Nicolas Navet and Françoise Simonot- Lion, "Automotive Embedded Systems Handbook", CRC Press Taylor & Francis Group, 6000 Broken Sound Parkway NW, Suite 300, ISBN-13: 978-0-8493-8026-6, ISBN-10: 0-8493-8026-X
8. Paul Nieuwenhuis and Peter Wells, "The automotive industry and the environment A technical, business and social future", Woodhead Publishing ISBN 1 85573 713 2, CRC Press ISBN 0-8493-2072-0, CRC Press order number: WP2072.
9. Simon Tung, Bernard Kinker, and Mathias Woydt," Automotive Lubricant Testing and Advanced Additive Development", ASTM 100 Barr Harbor Drive PO Box C700, West Conshohocken, PA 19428-2959,ISBN: 978- 0-8031-4505-4.
10. James Larminie, John Lowry, "Electric Vehicle Technology Explained", Oxford Brookes University, Oxford, UK, Acenti Designs Ltd.,UK. ISBN 0-470-85163-5.

ENME803195 – OIL AND GAS DRILLING EQUIPMENT (4 SKS)

Learning Objective(s):

Provide additional insights regarding the implementation of basic knowledge of engineering competence that is at the core of oil and gas drilling techniques. Competencies expected of graduates capable of developing the engine with value added technical knowledge of oil and gas drilling equipment that is ready to be trained and shaped to be easily and immediately adapt to work without the awkwardness of the world's E / P oil and gas fields in general and in particular oil and gas drilling. Thus it has the advantages of graduates and a wider choice in the real world of work later. Objectives and learning outcomes to be achieved:

1. Enabled students to know the basic tools and their functions and how each is needed in an oil and gas drilling operations.
2. Students capable of explaining the technique of oil and gas drilling operations and its other related aspects such as equipment used, safety issues, safety equipment, emergency and environmental issues.
3. Student s have a pret ty good understanding of the knowledge of drilling equipment and its operation so as to participate in an oil and gas drilling operations with confidence and readiness to increase knowledge and skills later on after graduation.

Syllabus:

Intro to oil / gas well, oil / gas Exploration, exploitation and production, drilling rig, the terminology, the problem of drilling, drilling fluid, drilling oil and gas in the system, hoisting system equipments, equipments rotating system, circulating system equipments, power system equipments, blowout prevention system equipments, well design, equipments and operations for safety and efficiency, process and equipments for cementing, drilling preparation, drilling operations, drilling and process problems (drill string vibration and whirling, collar failure, etc.) artificial lift methods and equipments, visit to the field of oil and gas drilling.

Pre-requisite(s): -

Text Book(s):

1. Don A. Gorman, Jerry W. Meyer, "Drilling Equipment and Operations", Action Systems Inc., Dallas, Texas – USA.
2. Adam T. Bourgoyne, Martin E. Chenevert, et. al., "Applied Drilling Engineering", Society of Petroleum Engineers, Richarson, Texas – USA.
3. Nguyen J.P., "Drilling-Oil and Gas Field Development Techniques", Institut Français du Pétrole Publication, 1996
4. Kermit E. Brown, "The Technology of Artificial Lift Methods", Volume 2a, Petroleum

publishing Co., 1980
5. Amanat U.C., "Oil Well Testing handbook", Elsevier, 2004
6. Amanat U.C., "Gas Well Testing handbook", Elsevier, 2004

ENME803174 – RISK MANAGEMENT (4 SKS)
Learning Objective(s):
Students can explain and apply risk management in a risk assessment.
Syllabus:
Introduction to risk management, Value at Risk --VaR Risk measures for various asset classes, Monte Carlo Simulation, VaR Validation and Extremes, Regulatory Environment 25 years of risk related regulations, Multifactor models Discussion of multifactor analysis, Review of industry leading risk management system, Operational Risk and its Basel II requirements.
Pre-requisite(s): -
Text Book(s):
1. Jorion, Philippe, Value at Risk: The New Benchmark for Managing Financial Risk, 3rd edition, McGraw-Hill, 2007
2. Roger Lowenstein, When Genius Failed, Random House, 2000

ENME804110 - COMBUSTION ENGINEERING (4 SKS)
Learning Objective(s):
Combustion Engineering provide basic competency to investigate, analyze and learn about the process of combustion of fuel, and the nature and behavior of flame. The course provides basic understanding to apply the laws of basic aerothermochemistry in the engineering calculation of practical combustion engineering. The student is expected to be able to analyze the combustion behavior of a flame and to develop knowledge in the field of combustion engineering.
Syllabus:
Syllabus: Important Meaning of Combustion Study; Basic Reaction and Stoikhiometry of Combustion; Gas Fuel (BBG); Liquid Fuel, Solid Fuel; Basic Thermochemistry and Fluid Dynamics of Combustion; Principles of Conservation of Mass and Continuity; Turbulence Premixed Flame Structure; Detonation; Combustion Technology; Fixed-Bed Combustion, Suspension, Fluidized-Bed; Study on Flame and Combustion Technology; Minimum Temperature Self-ignition (Auto/Self-Ignition); Flammability Limit; Fire spread, Fire Suppression Material, Combustion and the environment.
Pre-requisite(s): Basic Chemistry, Basic Thermodynamics, Basic Fluid Mechanic, Heat and Mass Trasnfer.
Text Book(s):
1. Turn, S.R., An Introduction to Combustion, 3rd Edition, McGraw-Hill, Inc. 2011
2. Borman, G.L., and Ragland, K.W., Combustion Engineering, 2nd Edition, McGraw-Hill, Inc. 2011.
3. Griffi ths, J.F., and Barnard, J.A., Flame and Combustion, 3rd Edition, Blackie Academic and Professional, 1995.
4. Glassman, I., Combustion, 5th Edition, Academic Press, 2014.
5. Warnatz, J., Maas, U., and Dibble R.W., Combustion, 2nd Edition, Springer-Verlag, 1998.

ENME804109 – HEAT AND MASS TRANSFER ENGINEERING (4 SKS)
Learning Objective(s):
The course objective is to provide understanding of the heat exchangers used in many industrial processes and power plants as the application of heat transfer. This course provides a basic competency to know main heat exchanger types and to understand and able to select suitable heat exchanger type for current applications. Student is also expected to understand basic factors in designing heat exchangers, to estimate size and price and know and choose the type of heat exchanger. Provide basic understanding and various parameters on the drying process so that students can perform calculations and analysis of various drying techniques and their applications. This course also provides the expertise so that students are able to do drying modeling, to design and analyze the system for various materials (solid and solvent) so that the drying process can be suitably selected for particular product.

Syllabus:
Heat Transfer Review; Type and Application of Heat Exchangers; Practgical Design of Shell and Tube Heat Exchanger (Thermal and Mechanical); Manufacturing Cost Estimation; Heat Exchangers; Operation and Monitoring of Heat Exchangers (Fouling And Vibration); Maintenance of Heat Exchangers; Corrossion on Heat Eschangers; Heat Exchanger Design Software; Presentation and Laboratory Practice of Heat Exchangers. Review Transfer Phenomena (Momentum, Heat and Mass); Drying Principles and Basics; Mathematical Modeling of Drying System; Classification and Selection of Dryer, Post-Harvest Drying and Storage of Grain; Rotary Drying; Vacuum Drying; Fluidized Bed and Spouted Bed Drying; Drum Dryer; Spray Drying, Freeze Drying; Conveyor Drying; Solar Drying; Enrgy Optimization in Drying System; Drying System Design.
Pre-requisite(s): Heat and Mass Transfer, Fluid Mechanics
Text Book(s):

1. Frank P Incropere, David P De Witt, Fundamental heat and mass transfer, 7th Ed.,John Wiley & Sons, 2011, New York
2. Holman JP, Heat Transfer, 10th, Mc Graw Hill,2009.
3. Smith Eric, Thermal Design of Heat Exchanger, John Wiley & Sons, 1996, New York
4. Welty R James, Wicks Charless, Wilson Robert, Fundamentals of Momentum, Heat, and Mass Transfer, 6th Ed. John Wiley & Sons, 2014, New York.
5. Cengel, Yunus, Heat Transfer a Practical Approach, 2nd Ed. Mc Graw Hill, 2003,Singapore.
6. Kreith Frank, Bohn Mark, Principles of Heat Transfer, 7th Ed. Brooks/cole, 2010, USA
7. Rohsenow Warren, Hartnett James, Cho Young, Handbooks of Heat Transfer, 3rd Ed., Mc Graw Hill, 1998, New York.

ENME804111 - AERODYNAMICS ENGINEERING (4 SKS)
Learning Objective(s):
Aerodynamic Engineering is an advanced course of Fluid Mechanics which focusing on aeronautics applications. Through the course students is expected to be able to understand the fundamental principles and basic equations of aerodynamics and to apply them in the process of airfoil design and to understand performance characteristics of the airfoil. Student is able to understand the phenomenon of incompressible flow through the airfoil and finite wings. Student is expected to be able to have an understanding of subsonic and supersonic compressible flow phenomena through aerofoil and other compressible flow phenomena.
Syllabus:
Introduction on Aerodynamics; Basic and Principle Equations; Incompressible flow; Airfoil Aerodynamics Characteristics; Finite Wings; Incompressible Flow through Airfoil; Incompressible Flow through Finite Wings; Airfoil in Compressible Flow; Wings and Wings-Body Combination in Compressible Flow; Airfoil Design; Double Surface; Vortex Lift; Secondary Flow and Viscous Effect; Other Phenomena in Compressible Flow; Normal Shock Wave; Oblique Shock Wave; Expansion Wave; Supersonic Wave.
Pre-requisite(s): Fluid Mechanics, Basic Thermodynamics
Text Book(s):

1. A.M. Kuethe and C.Y. Chow, Foundations of Aerodynamics, 5th Edition, John Wiley & Sons, Inc., 2009.
2. B.W. McCormick, Aerodynamics, Aeronautics, and Flight Mechanics, 6th Edition, John Wiley & Sons,Inc., 2010.
3. J Anderson, Fundamentals of Aerodynamics, 5th Edition, McGraw Hill, 2011.

ENME804118 – BUILDING MECHANICAL AND ELECTRICAL SYSTEM (4 SKS)
Learning Objective(s):
The course's objective is to deliver knowledge, skills and understanding of the mechanical and electrical systems in a modern building that has been increasing in its requirements in terms of sophistication, efficiency, and low energy use.
Syllabus:
General Building Mechanical System, Plumbing System: SNI, Calculation, Waste Water Management, Building Energy System; Building Automation System; Lift and Escalator: Types, Round Trip Time, Handling Capacity, Waiting Time, Installation and Control System; Escalator Types,

Application and Installation, Building Automation System,
Pre-requisite(s): -
Text Book(s):

1. Stein, Benjamin, Reynolds, John S., Grondzik, Walter T., Kwok, Alison G., "Mechanical and Electrical Equipment for Building", John Wiley and Sons, 2006.
2. Gina Barney, "Elevator Traffic Handbook, Theory and Practice", Spon Press, 2003.
3. The American Society of Mechanical Engineers, (ANSI A.17.1-2000), "American National Standard Safety Code for Elevator, Dumbwaiters, Escalators and Moving Walks", ANSI A.17.1-1971

ENME802103 - ENERGY SYSTEM OPTIMIZATION (4 SKS)
Learning Objective(s):
This course provides an understanding of mathematical modeling, simulation and optimization of energy systems through technical and economical approach. The course is intended to equip student with the ability to understand mathematical model, simulation and optimization of thermal systems.
Syllabus:
Workable System Design; Economical Evaluation; Determination of Mathematical Equations; Thermal Equipment Modeling; System Simulation; System Optimization: Objective Function, Constraints; Lagrange Multipliers: Lagrange multiplier to complete the optimiza- tion process; Dynamics, Geometric and Linear Programming; Mathematical Model of Thermodynamics Properties; Big System Simulation under Steady Condition; Big Thermal System Simulation; Calculation of Variables in Optimum Conditions.
Pre-requisite(s): Matematika Teknik, Termodinamika Dasar, Mekanika Fluida.
Text Book(s):

1. Stoecker, W.F. Design of Thermal System, 3rd Edition, Mc.Graw Hill Book Co, 2011.
2. Boehm,R.F., Design of Analysis of Thermal System, John Wiley&Sons,1987.
3. Yogesh Jaluria, Design and Optimization of Thermal Systems, 2nd Edition, Mc.Graw Hill Book Co, 2007.

ENME804138 – EVALUATION AND MAINTENANCE OF FIRE PROTECTION SYSTEM (4 SKS)
Learning Objective(s):
Students understand the basic and important parameters in the process of fire and fire hazards. Students have the competency on the regulations and standards on the testing of material of the fire and the design of fire protection systems. Students have the expertise in specialized skills in fire modeling, designing and analyzing the protection system against fire. Students know the role of safety management on the fire hazard in ensuring the industry and high rise building operations.
Syllabus:
Introduction of Fire Process; Fire Dynamics; dangerous Elements Release in Fire; Fire Modeling Theory; Fire Modeling with Computer Program; Material Testing Method for Fire Hazard; Fire Detection Systems; Standard Rules on Fire Hazard; Fire Protection System Design Fire, Fire Fighting Systems: Hydrant and Sprinkler System; Analysis of Fire Risk in Buildings.
Pre-requisite(s): -
Text Book(s):

1. Dougal Dysdale, An Introduction to Fire Dynamics 3rd Edition, John Wiley and Sons, 2011.
2. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
3. Rasbach, D.J., et al., Evaluation of Fire Safety, John Wiley and Sons, 2004.
4. A.H. Buchanan, Fire Engineering Design Guide, New Zealand, 2001.
5. SNI, ASTM, NFPA, rules and standards

ENME804148 - DESIGN FOR MANUFACTURE AND ASSEMBLY (4 SKS)
Learning Objective(s):
Provide knowledge, understanding and competence in the product design process which is considering, including factor and oriented on: material, manufacturing capability and assembling process. Therefore the product is expected to have made ease of manufacture and assembly.

Syllabus:
Review of the materials selection and processes, product design for manual assembly, design for automated assembly, PCB design for manufacture and assembly, machining process design, injection molding, sheet metal forming processes, die-casting.
Pre-requisite(s): -
Text Book(s):
Boothroyd, Product Design for Manufacture and Assembly 3rd Ed, CRC Press, 2010

ENME804149 – NOISE AND VIBRATION (4 SKS)
Learning Objective(s) :
This course provides competency to students to complete the issue of application of vibration on the mechanical structure of the construction, and plate or vessel (vessel), perform the calculation of vibration reducer system design, system and engine holder enhancing of production equipment. Finally students have to make basic vibration measurements; forecasts predicted the damage engine, the vibration analysis of the data signal and the vibration spectrum and carry out machine performance diagnosis based on data analysis of vibration data and other data related
Syllabus :
Mechanical vibration with Many Degrees Freedom; Vibration on the Structure Construction; Vibration on plate and body shell (Vibration Plate and Shell); Vibration Isolation; Designing Vibration Absorber; Engineering Vibration Measurement; Vibration spectrum analysis; Performance Diagnostic Machine.
Pre-requisite(s) : Numerical Computation, Mechanical Vibration, Maintenance and Machine Cond. Minitoring
Text Book(s) :

1. Jerry H.G., "Mechanical and Structural Vibrations", John Wiley, 2004
2. Demeter G.F., "Mechanical and Structural Vibrations", John Wiley, 1995
3. Kenneth G.M., "Vibration Testing: Theory and practice 2nd ed", Wiley, 2008
4. Werner Soedel, "Vibrations of Shells and Plates", 3rd edition – revised and expanded, Marcel Dekker, INC., 2004
5. Randall R.B., "Frequency Analysis", Brüel & Kjær, 1987
6. Jens T.B., "Mechanical Vibration and Shock Measurement", Brüel & Kjær, 1980

ENME804155 - CAD/CAM (4 SKS)
Learning Objective(s):
This lecture will discussed about technology of CAD, CAM, Integration of CAD / CAM application in the industry and the emphasis on: the principles modeling and surface curve geometry (Geometric modeling), design of 2D and 3D models with computer assisted. The principle of data exchange between CAD/CAM systems also tool path design using computer for prismatic and sculptured model. Lectures CAD / CAM are provided with the aim that students have the understanding and applying technology of CAD / CAM: starting the process from design to production process with the computers assistance.
Syllabus:
Overview of CAD / CAM System; Hardware & Software System of CAD / CAM; Interactive Tools and Computer Graphics Concepts, Geometric Modeling: Type & Representation of mathematical model Curve, Surface & Solid ; Data Exchange in CAD / CAM system; Manufacturing Processes: Manufacturing Process Review Type and Parameter Calculation machining, Lab. practice of CAD; CNC Technology; Tool Path Generation Method in the CAM system; Control 'quality of machinery' in the CAM system; Computer Aided Process Planning-CAPP; Postprocessing; Lab. practice of CAM.
Pre-requisite(s): -

Text Book(s):

1. Kiswanto G., Handout CAD/CAM, Diktat kuliah, 2004.
2. Choi B. K., Jerard R. B., Sculptured Surface Machining,
3. Zeid, I., CAD/CAM Theory and Practice, McGraw-Hill, 2009.
4. Chang, T. -C., Computer Aided Manufacturing, 3rd ed, Prentice-Hall, 2005.
5. Korem, Y., Computer Control of Manufacturing Systems, McGraw-Hill

ENME804156 - MANUFACTURING PERFORMANCE ASSESMENT (4 SKS)
Learning Objective(s):
Provide knowledge about the basic concepts of performance assessment of manufacturing industry relating to product performance, process, manufacturing system and its relation to manufacturing excellence. At the end of this course, students are expected to understand the methodologies and assessment tools manufacturing performance and are able to identify, assess and analyze the performance of the manufacturing industry increase.
Syllabus:
Introduction, Traditional Performance Methodology & Tool: Dupont Financial Performance, Basic Performance Measurement process & tools: Data collection techniques, chart, graph & diagram, Process Improvement methodologies & tools: Process Capability, Measurement System Analysis (MSA), QFD, FMEA, six sigma & lean six sigma, Industry specific/ generic standards & best practices, Manufacturing Maturity model concept & measurements, Case study of Industrial performance Measurement (assignment & evaluation)
Pre-requisite(s): -
Text Book(s):

1. US Departement of Energy, United Sates of America, Performance Based Management, 2005 Oak Ridge Associated Universities,. "How to Measure Performance, A Hand Book of Techniques and Tools"
2. "World Class Manufacturing Performace Measures"
3. Harold T.Amrine, John A.Ritchey, Prentice Hall International Edition, "Manufacturing Organization and Management"
4. Will Kaydos, Productivity Press Portland Oregon, " Measuring, Managing and Maximizing Performance"

ENME802152 - AUTOMATION AND ROBOTICS (4 SKS)
Learning Objective(s):
Automation and Robotics course discusses technology and application in the automation industry and the design and control the robot emphasizes: understanding the types of automation systems, particularly in the manufacturing industry and the mechanism, the design and development of automation system that emphasizes the 3 things: reliability, quality and cost and the understanding robot control system. Automation and Robotics Lectures given with the aim that students have an understanding in the implementation of technology Automation and Robotics, especially in the manufacturing industry.
Syllabus:
Automation System; Classification Type Manufacturing Automation machinery; Actuator; Sensor System; PLC Control System in the Manufacturing Automation machinery; Robot- cs: Definitions and Principles of Robot; Spatial Descriptions: Definitions and Principles, Methods and Applications Spatial descriptions; Forward Kinematics: Definition, Principles and The Forward Kinematics; Jacobians: Speed, explicit shape, definition and principle of inverse Kinematics; Dynamic: The form of explicit, Acceleration and inertia; Control system ronbotic: PID control, the Joint Space Control, Operational Control and Space Force Control; Robot Design Assignment.
Pre-requisite(s): -
Text Book(s):

1. Craig J., Introduction to Robotics 3rd ed, Prentice Hall, 2004.

2. Heath L., Fundamentals of Robotics, Theory and Applications, Prentice Hall, 1985.

3. Koren Y., Robotics for Engineer, McGraw Hill, Intl Edition, 1985.

4. Lentz K. W. Jr., Design of Automatic Machinery, Van Nostrand Reinhold, 1985.

5. Schilling R. J., Mikell P., Fundamentals of Robotics, Analysis and Control, Prentice Hall, 2000.

6. Kiswanto G., Otomasi dan Robotika, Diktat Kuliah Departemen Teknik Mesin, 2004.

ENME804168 – RAILWAY VEHICLE ENGINEERING (4 SKS)
Learning Objective(s):
Provide the knowledge and design of rail vehicle.
Syllabus:
Engineering and economic analysis of rail vehicles; body structures and rail vehicles; structural analysis of flat car; coupler analysis; electrical and pressurized water; analysis and modeling of the bogie; axle; wheel; brake and pivot; suspension system and driving quality; dynamic load analysis; fatigue and cracks in rail vehicles; models of rail vehicles and track geometry; modeling components of rolling stock; response rail vehicle on the track tangent; lateral stability of the rail vehicle on the track tangent; response rail vehicle on a curved trajectory; wheel wear; rail vehicle dynamics.
Pre-requisite(s): -
Text Book(s):
1. Simon Iwnicki, handbook of railway vehicle dynamics, CRC Press, Taylor & Francis Group, 2006.

ENME804197 – MATERIAL HANDLING EQUIPMENT (4 SKS)
Learning Objective(s):
Provide expertise and competence to students in the field of design and development of lifting equipment and construction equipment
Syllabus:
Introduction and Scope of Construction Equipment; Tractor, Bulldozer, Dump Truck and shovel; Construction Equipment Mechanical Concept; Heavy equipment system: Pneumatic and Hydraulic; Basic Machine-lifting machinery and materials transporter; Cranes, hoist and conveyor; forklift: Moving Walks, Escalators, and Elevators
Pre-requisite(s): Mechanical Design, Design Assigment
Text Book(s):
1. ASME. Handbook of Materials Handling.

2. Mc.Guiness. Mechanical and Electrical Equiment for Building.

ENME804198 – AIRCRAFT STABILITY AND CONTROL (4 SKS)
Learning Objective(s):
Provide the students with the knowledge and ability in analyzing the aircraft (A/C) stability and control.
Syllabus:
Systems of Aircraft Axes and Notation, Aircraft Static Equilibrium and Trim, The Equations of Aircraft Motion, Aircraft Longitudinal Dynamics, Aircraft Lateral–Directional Dynamics, Aircraft Maneuverability, Aircraft Stability, Aircraft Flying and Handling Qualities, Aircraft Stability Augmentation, Aircraft Aerodynamic Modelling, Aircraft Aerodynamic Stability and Control Derivatives
Pre-requisite(s): -
Text Book(s) :
1. Cook, Michael V., Flight Dynamics Principles, Elsevier Aerospace Engineering Series, 2007.

2. Russell, J.B., Performance and Stability of Aircraft, Butterworth Heinemann, 2003.
3. Von Mises, Richard, Theory of Flight, Dover Books on Aeronautical Engineering, 1959

ENME804190 - ADVANCED WELDING ENGINEERING (4 SKS)
Learning Objective(s):
Provide knowledge, understanding of the theories, principles and design as well as the assessment of the quality of welding and welding applications.
Syllabus:
Introduction, review of welding term and definition, welding process type, standard power source, Oxy-gas welding, Shield Metal Arc Welding (SMAW), Gas Tungsten Arc Welding (GTAW), Gas Metal Arc Welding (GMAW), Submerged Arc Welding (SAW), Flux Cored Arc Welding (FCAW), Resistance welding, Friction Stir Welding, Other welding process: laser, electron beam, plasma, Cutting and other edge preparation processes, surfacing and spraying, Brazing and soldering, Joining processes for plastics, ceramics and composites, Welding metal: Ferrous-based metal, non-ferrous-based metal, Material behavior during welding process, Testing materials and the weld joint, Non Destructive Examination (NDE), DT (Destructive Test), Heat treatment of base materials and welded joints, Basic of welding design, Residual stresses and distortion, Welding Symbol, Behavior of welded structures under different types of loading, Design of welded structures under static and dynamic loading, welding defects, Design of welded pressure equipment, Welding Performance Qualification Record (WPQR), Welding Procedure Specification (WPS), Welding automation.
Pre-requisite(s): -
Text Book(s):

1. Sindo Kou, Welding Metallurgy, 2nd Edition, Wiley, 2002.
2. ASME Section IX, Welding and Brazing Qualifications
3. AWS D1.1., Structural Welding (Steel)
4. William A. Bowditch, Welding Fundamentals 5th Edition, Goodheart-Willcox, 2011.
5. Technical Manual TM 5-805-7. Welding Design, Procedures and Inspection Headquarters, Department of the Army.1985
6. Lloyds Register. Welding Procedures, Inspections and Qualifications.

4.4. UNDERGRADUATE PROGRAM IN NAVAL ARCHITECTURE AND MARINE ENGINEERING

Program Specification

1.	**Awarding Institution**	Universitas Indonesia	
2.	**Teaching Institution**	Universitas Indonesia	
3.	**Programme Tittle**	Undergraduate Program in Naval Architecture and Marine Engineering	
4.	**Class**	Regular	
5.	**Final Award**	Sarjana Teknik (S.T)	
6.	**Accreditation / Recognition**	BAN-PT: A - Accredited AUN-QA	
7.	**Language(s) of Instruction**	Bahasa Indonesia	
8.	**Study Scheme (Full Time / Part Time)**	Full Time	
9.	**Entry Requirements**	High school /equivalent, or D3 / Polytechnique / equivalent, AND pass the entrance exam.	
10.	**Study Duration**	Designed for 4 years	
	Type of Semester	Number of Semester	Number of weeks / semester
	Regular	8	17
	Short (optional)	3	8
11.	**Graduate Profiles:** A Bachelor in Engineering with abilities to design ship structure and system, and excellence in leadership and professional characters.		
12.	**List of Graduates Competency:** 1. Ability to aply basic knowledge of mathematics, numerical methods, statistical analysis, basic sciences (physics and chemistry), as well as information technology required to achieve competence in the discipline of Maritime Engineering (Main competency) 2. Ability to design by applying methods, skills and modern engineering software required for practical engineering problems such as materials selection and process, as well as ship designing using a computer (Main competency) 3. Ability to carry out analysis for problem solving in the field of Maritime Engineering by applying calculation and principles in ship designing process and ship system (Main competency) 4. Ability to evaluate scientific problem by carrying out research and report the results, including statistical data analysis obtained for decision making in the field of Marine Engineering (Main competency) 5. Ability to identify impacts as a result of solution in the field of Marine Engineering with respect to sustainable development (Supporting competency) 6. Ability to think critically, creatively, and innovatively as well as to maintain intellectual curiosity for problem solving in individual and group level (UI) 7. Ability to communicate effectively in visual, written, and verbal (Supporting competency) 8. Ability to apply professional ethics related to law, economy, environment, social, politic, health, and safety with responsibility and integrity (Supporting competency) 9. Ability to carry out life-long learning including access to knowledge of relevant recent issues (Supporting competency) 10. Ability to apply financial principles and management as well as entrepreneurship in the field of Marine Engineering		
	As a Universitas Indonesia student, every graduate of Mechanical Engineering Undergraduate Program should have the following compenteces as follow: 1. Able to use information and communication technology; 2. Able to think critically, creatively, and innovatively and have intellectual curiosity to solve the individual and group problems; 3. Able to use verbal and writing communication in good bahasa Indonesia and English for academic or non-academic acitivity; 4. Has an integrity and able to respect others; 5. Able to identify entrepreneurship efforts which show innovation and autonomy based on ethics		

13	Classification of Subjects		
No.	Classification	Credit Hours (SKS)	Percentage
i	University General Subjects	18	12.5 %
ii	Basic Engineering Subjects	26	18.05 %
iii	Core Subjects	70	48.6 %
iv	Elective Subjects	12	8.33 %
v	Ship Design Assignment 1, Ship Design Assignment 2, Ship Design Assignment 3, On The Job Training, Seminar, Undergraduate Thesis	18	12.5 %
	Total	144	100 %
14.	Total Credit Hours to Graduate		144 SKS

Career Prospects

Naval architecture and marine engineering graduates have devoted themselves to various fields such as: maritime industry, government classification, research institutes, industrial engineering, automotive industry, shipbuilding industry, oil and gas industry, heavy machinery industry, educational institutions and other industries both domestically and internationally.

DESCRIPTION

Naval architecture and Marine Engineering study program was developed with a purpose, namely: producing graduates who have the attitude of leadership and excellence in scholarship and professionalism that have ability to analyze and synthesize characteristics of shipbuilding technology that includes design and planning process and ship machinery systems, as well as managing the installation and production systems ship, and were able to analyze and solve any scientific problem, work together in teams, and able to develop themselves and their knowledge.

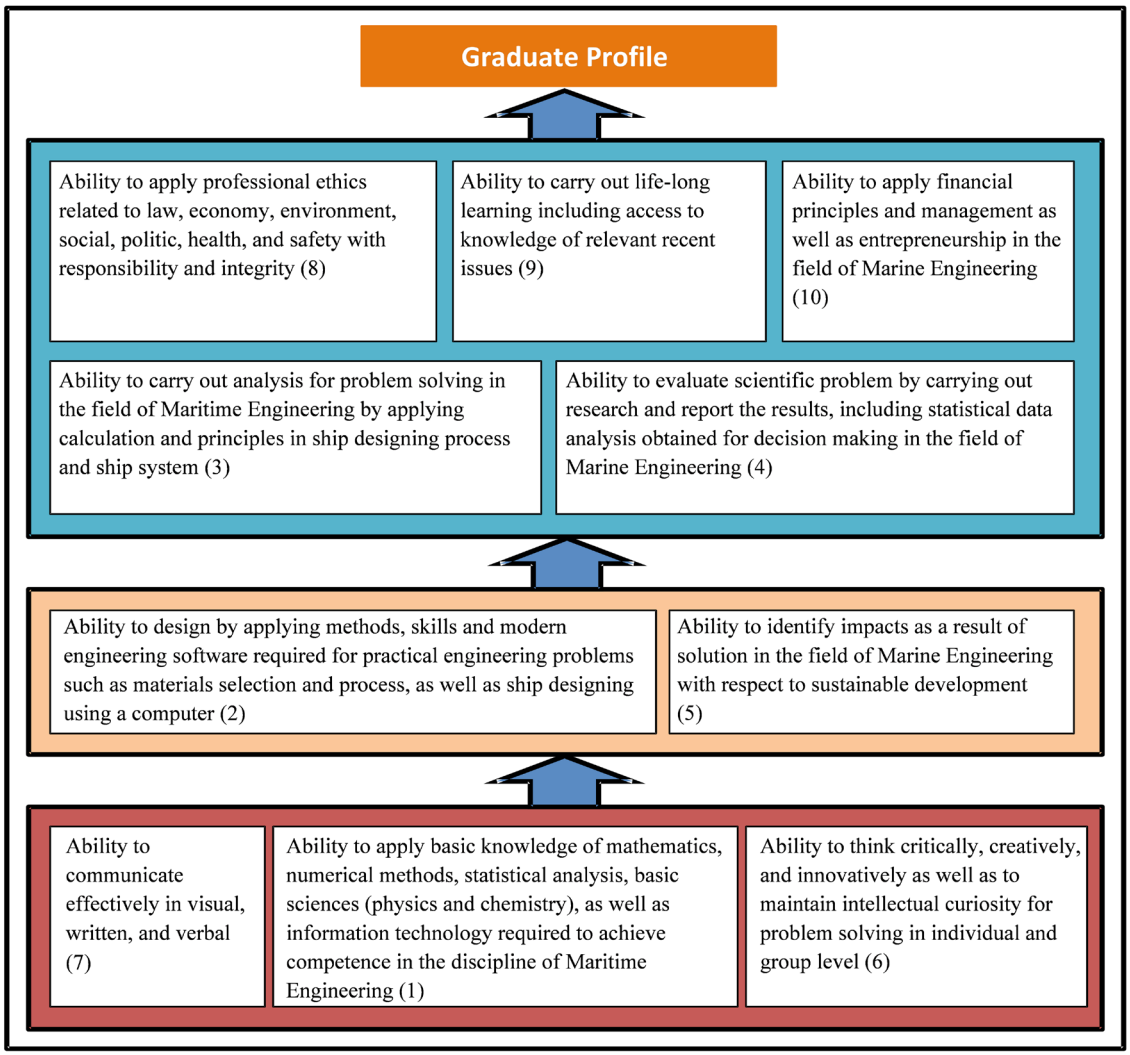
The basic curriculum 2012 in Bachelor of Naval architecture and Marine Engineering which can be seen in the figure shows the grouping and the relationship between subject groups.

Before reaching a Bachelor's degree from a total of 144 SKS, a student in Marine Engineering must complete the university courses (18 SKS), basic courses (75 SKS) which consists of basic engineering (26 SKS) and basic of marine engineering (49 SKS), and marine technical skills courses (33 SKS) consisting of core courses (21 SKS), elective courses (12 SKS), and the remaining 18 SKS in the form of assigment, intership and final project.

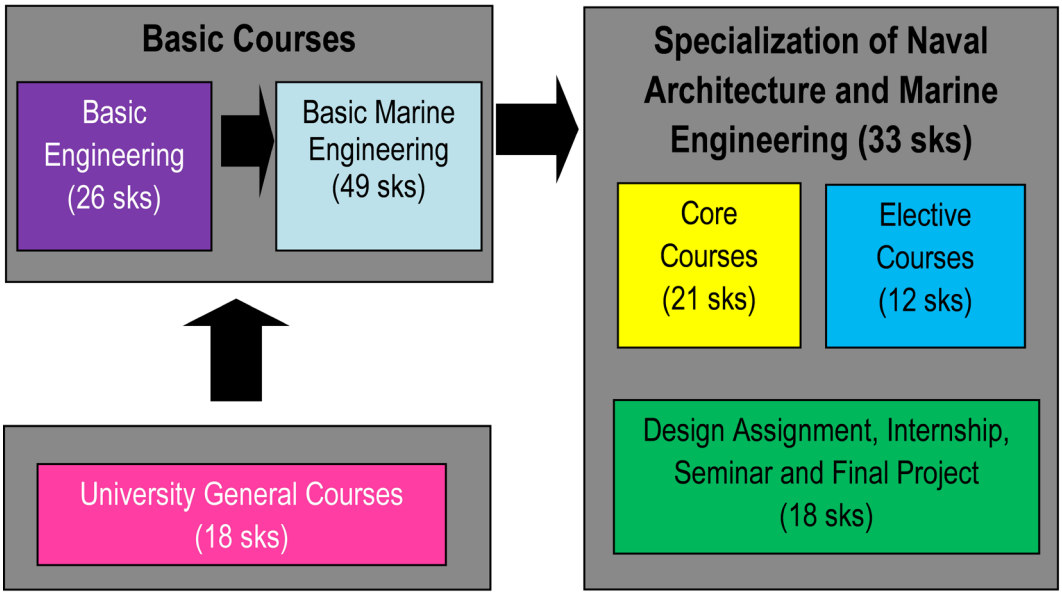
The curriculum was designed and developed to make the learning process is able to produce graduates who are competent in the field of Naval architecture and marine engineering with characteristics in accordance with the purpose of education, that is :

1. Having a strong base of engineering knowledge through the sciences of mathematics, physics, and chemistry
2. The ability to design and conduct research to analyze and interpret the data.
3. The ability to identify, formulate and solve problems in the field of shipbuilding techniques based on a review of the latest issue
4. The ability to design a system, component or process to meet desired needs by considering and implementing aspects of the economy,
5. Knowledge of leadership, ability to communicate well, work together in teams, and develop themselves and their knowledge

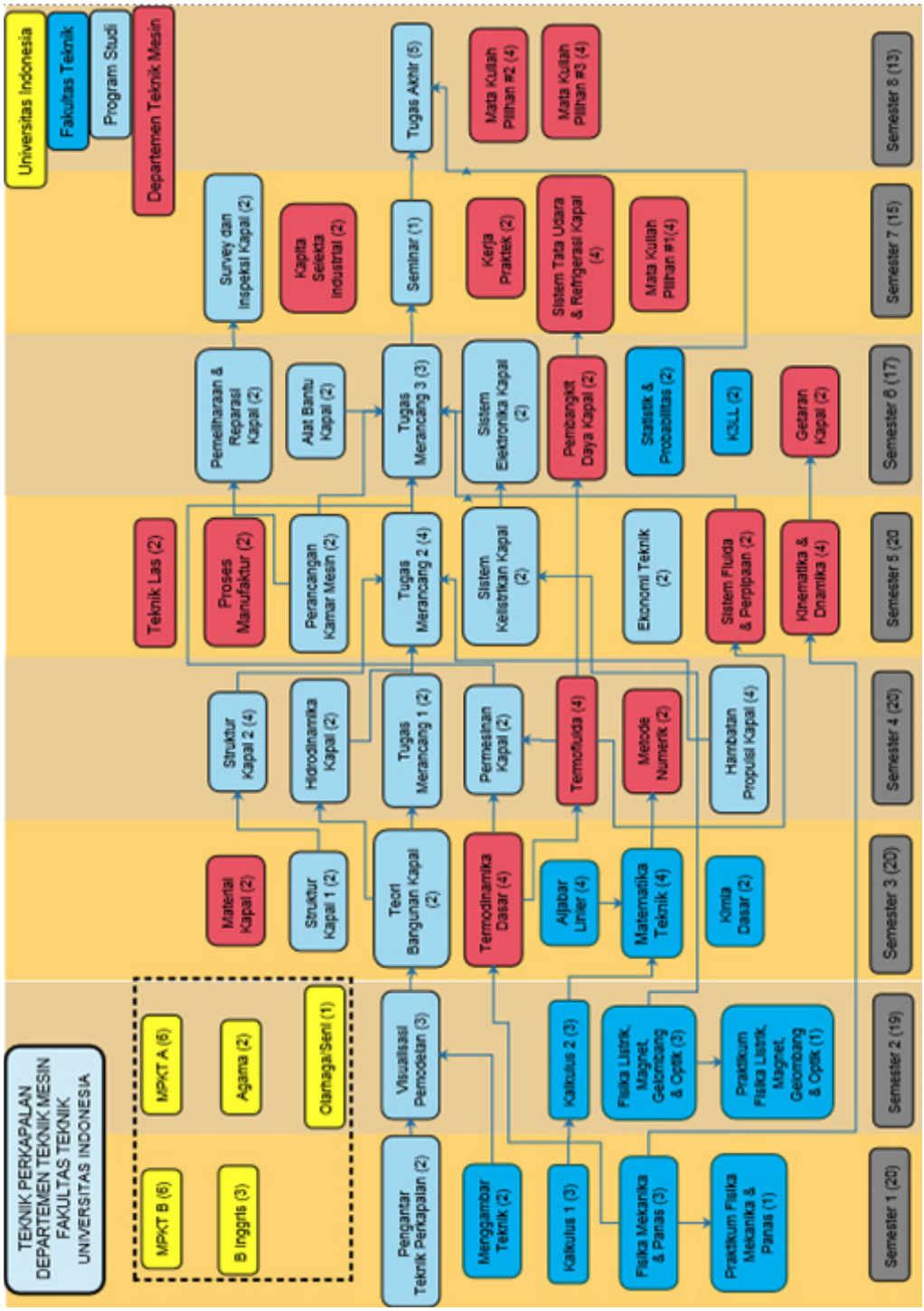
Learning Outcomes Flow Diagram



Curriculum Structure



Flow Diagram of Subjects



COURSE STRUCTURE UNDERGRADUATE PROGRAM IN NAVAL ARCHITECTURE AND MARINE ENGINEERING REGULLAR

KODE	SUBJECT	Credit
	1st Semester	
UIGE600002	Integrated Character Building B	6
UIGE600003	English	3
ENGE 6 0 0001	Calculus 1	3
ENGE 6 0 0005	Physics (Mechanics and Thermal)	3
ENGE 6 0 0006	Physics (Mechanics and Thermal) Lab	1
ENMR601001	Intro to Marine Engineering	2
ENME601002	Engineering Drawing	2
	Subtotal	**20**
	2nd Semester	
UIGE600001	Integrated Character Building A	6
UIGE600010-15	Relligion	2
UIGE600020 - 48	Sport / Art	1
ENGE 6 0 0002	Calculus 2	3
ENGE 6 0 0007	Physics (Electricity, MWO)	3
ENGE 6 0 0008	Physics (Electricity, MWO) Lab	1
ENMR602002	Ships Visualization & Modelling	3
	Subtotal	19
	3rd Semester	
ENME600013	Engineering Mathematics	4
ENGE 6 0 0009	Basic Chemistry	2
ENME603008	Basic Thermodynamics	4
ENGE 6 0 0004	Linear Algebra	4
ENMR603003	Ship Materials	2
ENMR603004	Ship Building Theory	2
ENMR603005	Ship Structure 1	2
	Subtotal	**20**
	4th Semester	
ENMR604006	Thermofluids	4
ENMR604007	Ship Machinery	2
ENMR604008	Ship Structure 2	4
ENME600016	Numerical Method	2
ENMR604009	Ship Resistance and Propulsion	4
ENMR604010	Ship Hydrodynamics	2
ENMR600001	Ship Design Assignment 1	2
	Subtotal	**20**

	5th Semester	
ENMR605011	Fluid & Piping System of Ship	2
ENME600009	Kinematics and Dynamics	4
ENMR605012	Engineering Economics	2
ENMR605013	Ship Manufacturing Process	2
ENMR605014	Welding Engineering	2
ENMR605015	Ship Electrical System	2
ENMR605016	Engine Room Layout Design	2
ENMR600002	Ship Design Assignment 2	4
	Subtotal	**20**
	6th Semester	
ENGE 6 0 0010	Statistic and Probability	2
ENGE 6 0 0012	HSE Protection	2
ENMR606017	Ship Vibration	2
ENMR606018	Ship Machinery & Equipment	2
ENMR606019	Ship Electronic System	2
ENMR606020	Ship Power System	2
ENMR606021	Ship Maintenance & Repair	2
ENMR600003	Ship Design Assignment 3	3
	Subtotal	**17**
	7th Semester	
ENME600006	Capita Selecta Industrial	2
ENMR600004	On the Job Training	2
ENMR607022	AC & Refrigeration System of Ship	4
ENMR607023	Survey and Inspection of Ship	2
ENMR600005	Seminar	1
	Electives	4
	Subtotal	**15**
	8th Semester	
ENMR600006	Final Project	5
	Electives	4
	Electives	4
	Subtotal	**13**
	Total	**144**

Resume

Wajib Universitas	**18**
Wajib Fakultas	**28**
Wajib Program Studi	**86**
Jumlah	**132**
Pilihan	**12**
Total Beban Studi	**144**

ELECTIVES

KODE	MATA AJARAN PILIHAN SEMESTER 7	SKS
	SUBJECT	
ENME803183	Marine and Offshore Structure	4
ENME803184	Sea Transportation Port Manag.	4
ENME803185	Maritime Law and regulation	4

KODE	MATA AJARAN PILIHAN SEMESTER 8	SKS
	SUBJECT	
ENME804186	Special Ship Project	4
ENME804187	Ship Production Management	4
ENME802103	Energy Optimization System	4
ENME804188	Maritime Energy Management	4
ENME804189	Maritime Safety	4
ENME804190	Advanced Welding Engineering	4

COURSE DESCRIPTION

ENMR601001 - INTRODUCTION TO MARINE ENGINEERING (2 sks)
Course Objective :
Provides basic competence of ship building and structure and the approach to ship designing.
Syllabus :
History of Ship Building; Types of water bulding: the Classification of Society and the International Agency; Ship Building and Construction; main dimension: Ship Motion; Ship Design Process; Stability: resistance and Propulsion; Tonnage; Ship building method. Historical of ship machinery, main engines, auxiliary engines, the engine room layout.
Pre-requisite: -
References :
1. GM Kok, A.C. Nierich., *Bangunan Kapal* , MARTECH
2. D A Taylor, *Introduction to Marine Engineering*.1996

ENME601002 - ENGINEERING DRAWING (2 SKS)
Course Objective:
Course participants are able to transfer geometric component by drawing according to standard draw which is recognized by International Standard Organization (ISO). Students understand the theory and procedure of engineering drawing based on ISO standard. Students are able to read, interpret, and transfer 2D/3D geometric draw from component or construction. Students are able to draw the orthogonal projection based on ISO standard.
Syllabus:
Function and benefit of Engineering Drawing; SAP; Measurement and Evaluation; Introduction to drawing equipment; Basic definition of geometric, paper format, draw regulation, line, field, line configuration, basic geometric form; Visualization geometric: Skew projection and isometric, function and line types, configuration geometric form; Orthogonal Projection: Projection standard, viewing concept, width display principle; Advanced orthogonal projection: Circle region concept, special region concept, trimming concept, display width, refraction.
Pre-requisite: -
References:
1. ISO 1101, Technical Drawings, International Organization for Standardization.
2. A.W. Boundy, Engineering Drawing , McGraw-Hill Book Company
3. Colin Simmons & Dennis Maguire, Manual of Engineering Drawing, Edward Arnold
4. Takeshi S. G., Sugiarto Hartanto, Menggambar Mesin, Pradnya Paramita, 1983
5. Warren J. Luzadder, Fundamentals of Engineering Drawing, Prentice-Hall, Inc.
6. Giesecke-Mitchell-Spencer-Hill-Dygdon-Novak, Technical Drawing, Prentice Hall Inc.

ENMR602002 - SHIPS VISUALIZATION AND MODELING (3 sks)
Course Objective :
Students have the basic ability to visualize the information content of one component effectively. Additionally, they are capable of creating a model for 2D and 3D visualization with the aid of softwares and interpreting the subject into a drawing that can be used as a working guidance and can be understood clearly by the user.
Syllabus :
The purpose and the advantage of the drawing in the design and manufacturing process, surface working quality and tolerance, standard and marking classification of working quality, standard and marking classification of working tolerance, Welding construction, standard and marking of kampuh (seam?) and welding, line diagram, 2D and 3D representation method, introduction to modeling software interface, modeling, manipulation and 2D & 3D visualization.
Pre-requisite : -
References :
1. Tupper E.C., *Basic Ship Theory*, Butterworth Heinemann, 2001
2. David Watson, *Practical Ship Design*.Elsevier Science.1998
3. V. Bertram, H.Schneekluth, *Ship design for Efficiency and Economy*, Butterworth Heinemann,

1998
4. Tupper E.C. dan W. Muckle, *Introduction to Naval Architecture*, Butterworth Heinemann, 1996
5. T.C. Gillmer, Modern Ship Design, US Naval Institute, 1975.
6. Manual *Autocad* dan *Maxsurf 12.02*

ENMR603003 – SHIP MATERIALS (3 sks)
Course Objective:
Students are expected to understand available material options depending on the operation requirement of the ships, encompassing both qualitative and quantitative understanding. Qualitative understanding includes properties of materials which are used for ship structure. Quantitative understanding includes calculation of properties of materials which may change due to external influences such as elongation that results from a loading.
Syllabus:
Types of materials and their applications in industry, properties of materials in various industries such as naval industry, heat treatment, diffusion of materials, phase diagram, dislocation and strengthening mechanism, materials failure, corrosion and degradation of materials, stress-strain diagram, elastic-plastic deformation, compressive deformation, shear stress and torsional stress, material hardness, destructive and non-destructive testing.
Pre-requisite: -
References:
1. Callister W. D., Introduction to Material Science and Engineering, John Wiley and sons, 2007
2. Hibbeler R. C., Statics and Machanics of Materials, Prentice Hall, 2004
3. Muckle W., Strength of Ship'ss Structure, Edward Arnold Ltd, 1975.
4. Wessel J. K., Handbook of Advanced Material, John Wiley and sons, 2004

ENMR603004 – SHIP BUILDING THEORY (2 sks)
Course Objective :
Provides an understanding about hydrostatic and dynamic stability calculation
Syllabus :
Lines Plan calculation and methodology; Bouyancy system; Metasentra, Static Stability: Calculation of hydrostatic curves and cross curves; docking, Ship crashes out, inclining test, ship launching, Wave Theory; Ship Hydrodynamics; Foil shape; Theory of Ship Motion; Plan Steering: Dynamic Stability: Theory of Stationary and Non-Stationary on a Ship Motion; Calculation of Critical Conditions Due to shaky ship; Impact loading.
Pre-requisite : -
References :
1. Bryan Barrass & Dr Derrett, *ship stability for master and mates*.2006
2. A.B Brain, *Ship hydrostatics and stability*, Butterworth, Heinemann, 2003.
3. Volker Bertram, *Practical ship hydrodynamics*, Butterworth, Heinemann, 2000.
4. Dr C B Barrass, *Ship stability notes & example,3rd edition* Butterworth, Heinemann, 2001
5. E.C. Tupper & K.J. Rawson, *Basic ship Theory*, Butterworth, Heinemann, 2001.
6. M.A. Talahatu, Hidrodinamika kapal I & II, FTUI. 1998.

ENME600013 – ENGINEERING MATHEMATICS (4 SKS)
Course Objective:
This course aims to complete student's anylitical ability. Students understand and are able to use the advanced mathematical concepts in order to solve engineering problems.
Syllabus:
Introduction to differential equation, 1st order differential equation, 2nd order differential equation, higher order differential equation, vector analysis, vector differential, grad operation, divergence and curl, vector integration, laplace transform, laplace transform to solve the differential equation, fourrier transform, convulsion, numerical method, root of equation, numerical differentiation, numerical integral
Pre-requisite: Calculus 2
References:
1. Croft, A, et.al, Mathematics for Engineers, 3rd Edition, 2008, Prentice Hall

2. Chapra S.C., Canale, Numerical Methods for Engineer, 6th Edition, 2010, Mc Graw Hill
3. Kreyszig, E, Advanced Engineering Mathematics 10th Edition, John Wiley and Sons

ENME603008 – BASIC THERMODYNAMICS (4 SKS)

Course Objective:

This course introduces the basic concept of thermodynamics and its application in real life and gives the understanding about the design of thermodynamics system.

Syllabus :

Scope and basic understanding of thermodynamics system, temperature concept, pressure, thermodynamics equilibrium, reversible/irreversible process, zero law of thermodynamics and absolute temperature, first law of thermodynamics, second law of thermodynamics, thermodynamics equation, gas power cycle, gas compressor, combustion engine cycle, internal combustion engine, simple gas turbine cycle, brayton's cycle, stirling's cycle, steam power cycle, refrigeration, carnot's cycle, simple rankine's cycle, rankine's cycle with modification, biner cycle, phsycometric chart, cooling tower, real gas, real gas equation, enthalpy and entrophy.

Pre-requisite: -

References:

1. Michael J. Moran, Howard N. Shapiro, Fundamentals of Engineering Thermodynamics, 8th Edition, Wiley, 2014.
2. Reynolds W.C., Perkins H.C., Engineering Thermodynamics, Mc. G. Hill .
3. Zemansky , Aboot , van Ness, Basic Engineering Thermodynamics, McGraw Hill
4. Kenneth Wark Jr. Thermodynamics , Mc.Graw Hill
5. H.D. Baehr, Termodynamik , Springer Verlag

ENMR603005 – SHIP STRUCTURE 1 (2 sks)

Course Objective :

Provides an understanding for calculating transversal and longitudinal constructions, profile and plate selection

Syllabus :

Stress and strain torsion (torque) and calculation of moment inertia; axial force, shear force and bending moment; Calculation of reaction cross-beam and diagrams, axial and moment diagrams; Analysis of stress and strain fields;

Beams Deflection I; Beams Deflection II: Static; column; energy method; cylinder walls thick and thin; theory of plate; analysis of ship structures; longitudinal and transversal strength of ships; calculation of midship strength; Bending and torsion on the Hull Girder; Calculation of Cross Section, Bending and Buckling on the panels; concept of fatigue.

Pre-requisite : -

References :

1. Dr. Yong Bai, *Marine Structural Design*. Elsevier Science.2003
2. Tupper E.C., Basic Ship Theory, Butterworth Heinemann, 2001
3. B. Baxter, Naval Architecture Examples and theory, Charles Griffin & Co.
4. Biro Klasifikasi Indonesia
5. Lloyd's Register Rules and Regulations

ENME600016 – NUMERICAL METHOD (2 SKS)

Course Objective:

The objective of this course is so that students can understand and apply the process and method (algorithm) for engineering numerical computation based on computer and parameters that affect speed and accuracy of the results.

Syllabus:

Introduction to numerical method and programming, simple mathematical modeling, programming and software, structured programming, modular programming, iterative method, function, Taylor and Maclaurin series, approximation and error, solutions to system of linear equations, Graphical method, bisection method, false-position method, Newton – Raphson method, Secant method, Bairstow method, linear algebra system of equations: Gaussian elimination, Gauss-Jordan elimination, decomposition, matrix transformation, Curve – Fitting: Least – Square regression,

Interpolation; Numerical integral: Trapezoidal method, Simpson method, multiple integral; Differential equation: Finite Divided Difference, Euler method, Runge – Kutta method; Ordinary differential equation

Pre-requisite: -

References:

1. Chapra, Steven C. and Canale, Raymond P. Numerical Methods for Engineers 6th edition. New York: McGraw-Hill, 2010.
2. Kreyszig, Erwin. Advanced Engineering Mathematics 10th edition. Danvers: John Wiley & Sons, 2011.
3. Sedgewick R., Phillippe F, An Introduction to the Analysis of Algorithms, Addison Wesley.
4. Cheney W., Kincaid D., Numerical Mathematics and Computing, Cole Publishing

ENMR605013 – SHIP MANUFACTURING PROCESS (2 sks)

Course Objective:

This course aims to study the ship manufacturing process in general, the process of forming and shaping, the manufacturing of ship's plate, and the machining process.

Syllabus:

Ship manufacturing process (ship planning & Mouldloft, Sand Blasting & Primer Coating, Keel Laying, Fabrication, Assembly, Erection, Outfitting, Painting, Leakage Test, Launching, Sea Trial, Delivery), Forming and shaping process (Rolling, Forging, Extrusion, Sheet Metal Forming), Manufacturing of ship's plate (surface roughness, surface treatment, surface coating, surface cleaning), Machining process (machining fundamentals, turning, milling, broaching, sawing, & filing)

Pre-requisite: -

References:

1. Kalpakjian S., Manufacture Engineering and Technology, Pearson Springer, 2009

ENMR605014 – WELDING ENGINEERING (2 sks)

Course Objective:

This course aims to study basic knowledges in welding, joining, cutting. Students are expected to achieve the basic competences of welding engineering.

Syllabus:

Basic knowledge of welding, joining and cutting (Oxy –gas welding dan SMAW, GTAW dan GMAW, SAW, FCAW and friction welding, types of cutting, Brazing, soldering and joining), terminologies and definitions, welding design and its calculations (Weld joint, non destructive test, and destructive test, Heat treatment of base materials and welded joints)

Pre-requisite: -

References:

1. Harsono W., T. Okumura, Teknologi Pengelasan Logam, PT Pradnya Paramita Jakarta Cetakan ke-10, 2008.
2. American Welding Society, AWS D1.1/D1.1M:2004, Structural Welding Code – Steel, 19thedition, 2004.

ENMR605012 – ENGINEERING ECONOMICS (2 sks)

Course Objective :

Provides an understanding of utilizing concepts in advanced mathematics to solve problems in naval engineering

Syllabus :

Graphs, Trigonometry and Geometry, Solution of Triangles, Mensuration of Areas, Volume-Mass, Centre of Gravity, Moment, Economic Mathematics

Pre-requisite : -

References :

1. Kevin Corner, *Mathematic for Marine Engineers*. Thomas Reed Publications.2013

ENMR606020 – SHIP POWER SYSTEM (2 sks)

Course Objective:

Students can understand the principles of power system of the ship, including the current and the

future trends.

Syllabus:

The need for ship power system, current and future trends (fossil fuel, carbon emission, international regulations, system and consumption of ship energy, efficiency management of ship energy), conventional power system (diesel and biofuel, LNG and CNG, dual-fuel, gas turbine), non- conventional power system (nuclear energy, wind energy, solar energy, Organic Rankine Cycle (ORC)), system of electric ship (principles of electric ship, types of electric ship application, hybrid ship)

Pre-requisite: Thermofluids

References:

1. K.C. Weston, Energy Conversion, PWS Publisher
2. D.Y. Goswani, F. Kreith, Energy Conversion, CRC Press
3. A.W. Culp, Principle of Energy Conversion, McGraw-Hill

ENMR604010 – SHIP HYDRODYNAMICS (2 sks)

Course Objective :

Students are expected to understand basic knowledge on ship hydrodynamics, waves, and viscous flow

Syllabus :

Basic of fluid, hydrostatic pressure, basic of hydrodynamics, theory of linear wave, Bernoulli equation and dynamic pressure, effect of wave force on the body of ship, mass addition, equation for seakeeping, viscous lift and drag, friction and streamline endurance, buff bodies, and Navier Stoke equation.

Pre-requisite : Ship Building Theory

References :

1. White, F. Fluid Mechanics. 5th ed. New York, NY: McGraw-Hill, 2002. ISBN: 9780072831801.
2. Smits, A. J. A Physical Introduction to Fluid Mechanics. New York, NY: John Wiley & Sons, 1999. ISBN: 9780471253495.
3. Bhattacharyya, F. Dynamics of Marine Vehicles. New York, NY: John Wiley & Sons, 1978. ISBN: 9780471072065

ENMR604008 – SHIP STRUCTURE 2 (4 sks)

Course Objective :

Provides knowledge and understanding of the types of construction on the ship structure and competence to design ship structures

Syllabus :

Bottom Structure: Ship hull and section system; Bulk head and girder; deck, Coaming and super structure: fore peak and after peak construction: Construction of Tankers; Gas Carrier Ship Construction: Doors and Windows; Fire Protection; Cabin Construction: Construction of loading and unloading Equipments; Painting and Corrosion Prevention.

Pre-requisite : Ship Structure 1

References :

1. D. J. Eyres, Ship Construction, 5th edition. Butterworth-Heinemann. 2011
2. D. Taylor, Merchant Ship Construction, Prentice Hall
3. Biro Klasifikasi Indonesia
4. Lloyd's Register Rules and Regulations

ENMR604006 - TERMOFLUIDS (4 sks)

Course Objective :

Students can understand various heat transfer mechanism between two systems if there exists a temperature difference, can calculate its heat transfer coefficient, and can solve various heat transfer problems with dimensionless parameters.

Syllabus :

Principles of Fluid Dynamics: Pressure distribution of fluid flow, integral flow analysis, differensial flow analysis. Viscous flow, drag and lift force for floating and moving objects. Laminar and turbulent flow; Boundary Layer; Losses in Fluid Flow. Heat Transfer; one-dimensional steady state; Steady dimensional conduction state; Convection principles; empirical formulas and practices for

forced convection and heat transfer.; natural convection System, heat exchangers.
Pre-requisite : Basic Thermodynamics
References :
1. Munson, B.R., Fundamentals of Fluid Mecha-nics 4th Ed, John Wiley & Sons, Inc. 2000
2. Smits, A.J., A, Physical Introduction to Fluid Mechanics, John Wiley & Sons, Inc. 2000
3. Kumar, K.L., Engineering Fluid Mechanics, Eurasia Publishing House Ltd., 2000
4. Frank P Incropere, David P De Witt, Fundamental heat and mass transfer, 5th Ed., John Wiley & Sons, 1996, New York
5. Holman JP, Heat Transfer, 9th, Mc Graw Hill, 2003.

ENMR604007 – SHIP MACHINERY (2 sks)
Course Objective :
Understanding of types and concept of the main system, supporting system, lubrication system, and refrigeration system of a ship machinery
Syllabus :
Basic concept of diesel engine, combustion process, four and two stroke engine theory, types of engine, performance of diesel engine, turbo charger, engine ratings, machinery components, supporting system of machines, starting systems, fuel system, lubrication system, refrigeration system, engine propeller matching, experiment for diesel engine performance testing.
Pre-requisite : Basic Thermodynamics
References :
1. D A Taylor, *Introduction to Marine Engineering*.1996

ENMR600001 - SHIP DESIGN ASSIGNMENT 1 (2 sks)
Course Objective :
Understanding of ship design procedures and monitoring.
Syllabus :
Design Analysis (owner requirement based); study literature; initial finding: Displacement, main dimension, and shape of ship, finding power driven; linesplan skecth and monitong of calculation CSA (Curve of Sectional Area); general plan sketch (GA); initial assessment payload and unloading space, stability, hull arise, trim; free and unloading space estimates; watertight bulkhead positioning for passenger ships.
Pre-requisite : Ship Building Theory
References :
1. B. Baxter, Teach Yourself Naval Architecture, The English Universities Press. Signifi cant Ships, RINA
2. M.A Talahatu, Teori Merancang Kapal. FTUI 1998.

ENMR605011 – FLUID AND PIPING SYSTEM OF SHIP (2 sks)
Course Objective :
Understanding types of fluid system, piping system, and practical aspects on the Ship Construction
Syllabus :
Positive displacement of fluid engines, hydrolic system,pneumatic power systems. Experimental of water piping system, air piping system, pump impeller, Pelton turbine. Piping systems on ships and marine construction, type of pipe material, pipe fittings, valves, tanks, sea-chest, standards and methods of drawing systems, bilga systems, ballast systems, fire extinguish system,supporting system (auxiliary motor), fuel system, lubrication system, cooling system, compressed air systems, domestic systems, tanker loading and unloading systems.
Pre-requisite : Thermofluids
References :
1. A.Keith Escoe. Piping and Pipeline Assesment Guide. Elsevier Inc. 2006
2. Dixon, S.L, Fluid Mechanics and Thermodynamics of Turbomachinery, 4th Edition, Pergamon Press, 2005
3. Esposito, A., Fluid Power with Application, 5th Edition, Prentice Hall, 2003
4. Mobley, R.K, Fluid Power Dynamics, Newnes Butterworth-Heinemann, 1999
5. Giles, R.V, Fluid Mechanics and Hydraulics, 2nd Edition Schaum's Outline Series, Mc- Graw-

Hill, 1994

ENMR604009 – SHIP RESISTANCE AND PROPULSION (4 sks)
Course Objective :
Provides an understanding for the calculation of ships resistance and propulsion, both theoretically and by using a model
Syllabus :
Ship force; Ship Resistance Comparative Law; Frictional resistance: wave resistance; pressure resistance: Air resistance; Effect of Ship Shape; Resistance predictions with Model Test; Wake Friction: Thrust reduction; Ship resistance in Bad Weather: The principle of Hydrofoil Ship; coefficient of propulsion; Calculation of Propeller Design with Form Data and Wageningen Graphs..
Pre-requisite : -
References :
1. J. P. Ghose, R. P. Gokarn, Basic Ship Propulsion, 2004
2. Dave Gerr, The Propeller Handbook, McGraw-Hill Professional, 2001
3. Sv. Aa. *Harvald,* Resistance and *Propulsion* of *Ships, 1983*
4. C. Gallin, Ships and Their Propulsion System, Lohmann & Stolterfoht

ENMR605016 – ENGINE ROOM LAYOUT DESIGN (2 sks)
Course Objective :
Students can design the layout and ergonomic aspect of engine room
Syllabus :
Engine Room Lay Out: ergonomic consideration in the placement of equipments, placement of the main engine, placement of auxilliary engine system, placement of ship supporting system
Pre-requisite :
References :
1. Anthony F. Molland, *The Maritime Engineering Reference Book*, Elsevier.2008
2. Nigel Calder, *Marine Diesel Engines*, McGraw-Hill, 2006

ENMR600002 - SHIP DESIGN ASSIGNMENT 2 (4 sks)
Course Objective :
Understanding the calculation and monitoring of supporting system for ships designing
Syllabus :
Ship displacement methode; determine main dimension and coefficient; determine lines plan, hydrostatic calculation, main section plan, profile and bulkhead plan, design of air condirtioning system, ship maintenance design, communication devices election, navigate devices election, safety plan
Pre-requisite : Ship Design Assignment 1
References :
1. B. Baxter, *Teach Yourself Naval Architecture*, The English Universities Press. Signifi cant Ships, RINA
2. M.A Talahatu, Teori Merancang Kapal. FTUI 1998.

ENMR606019 - ELECTRONIC SYSTEM OF SHIPS (2 sks)
Course Objective :
Understanding of the principles, operations, and applications of electronic systems of ships
Syllabus :
Basic of electronics: Passive Components: Semiconductors: Electronic Components; Digital Systems; Digital Combinational circuit; Digital Sequential circuit; PLC; Electronics Simple Plan; basic theory of DC circuit: basic theory of AC electrical circuits, working principle of DC motors, Types of MDC; operation of the MDC, the working principle of AC Motor, Various kinds of MAC, MAC operation: principle of generator, voltage drop generator; generator no-load and under load; Parallel generator; Introduction of the application on ship; Electric propulsion and PTO.
Pre-requisite : -
References :

1. John Bird, Electrical & Electronic Principle and Technology. Jhon Bird.2003
2. John C Payne, The Marine Electronical & Electronics Bible, John Pyne.1993

ENMR605015 – ELECTRICAL SYSTEM OF SHIPS (2 sks)
Course Objective :
Understanding the principles of engineering and automation and control applications of the ship
Syllabus :
Introduction to automation systems engineering; proportional plus integral plus derivative control; Application of mathematical modeling to determine the performance of control system. Response system signals I and Order II: Analysis of transient response of the system order I and order II: Introduction to process control in shipbuilding applications; computer simulations and laboratory-scale models; Introduction of hydraulic and pneumatic control systems. Instruments for UMS classification
Pre-requisite : -
References :
1. E. Hughes, Electrical Technology, IBS
2. John Bird, Electrical & Electronic Principle and Technology. Jhon Bird.2003
3. John C Payne, The Marine Electronical & Electronics Bible, John Pyne.1993

ENME600009 – KINEMATICS AND DYNAMICS (4 SKS)
Course Objective:
Students have the ability to understand the key concept of kinematics and dynamics of mechanical system and capable to analyze the movement, velocity, acceleration force and equilibrium.
Syllabus:
Vector velocity analysis, free body diagram, linier motion, velocity polygon, 2D motion, rectangular coordinates, N-T and pole, relative motioan and velocity of 2 coincide/relate point, Coriolis acceleration and stiff body kinematics, Inertia Force, Statics, particle system, works, energy, impuls, linear-angular momentum, stiff body motion, works and energy, relative motion, rotating mass balancing and back & forth motion, cam dynamics and Gyroscope.
Pre-requisite: Physics of Mechanics & Heat
References:
1. Meriam & Kraige, Engineering Mechanics. 7th ed, Wiley New York. 2012.
2. Holowenko, Dynamics of Machinery, John Wiley, 1995.
3. Beer & Johnston, Mechanics for Engineer, Dynamics, 11th ed. Dynamics, Mc Graw-Hill, 2015.

ENMR606017 – SHIP VIBRATION (2 sks)
Course Objective :
Understanding of engine vibration system and vibration source detection
Syllabus :
Engine vibration system: free vibration, damping, transient vibrations, forced vibrations, vibrations with two degrees of freedom, torsional vibration, lateral and longitudinal in ship propulsion system; Experimental measurement of vibration
Pre-requisite : Kinematics and Dynamics
References :
1. L.C. Burrill, *Ship vibration: simple methods of estimating critical frequencies*, North East Coast Institution of Engineers and Shipbuilders. 1935
2. Meriam & Kraige. Engineering Mechanics. Vol-2, Dynamics. Wiley New York.4th eds.1998.
3. Holowenko. Dynamics of Machinery.John Wiley.1995.
4. William T.Thomson. Theory of Vibration with application. Prentice Hall India.1972.
5. Beer & Johnston.Mechanics for Engineer-Dynamics.Mc-Graw-Hill.1976.

ENMR606021 – SHIP MAINTENANCE AND REPAIR (2 sks)
Course Objective :
Students are able to understand the maintenance and control of ship's engine system.
Syllabus :
Introduction to reliability system, reliability Fundamental Review of the concept, simple system

Network Modelling, Network Modelling System, Introduction to Markov and Monte Carlo Simulation, Discrete Markov Chains and Markov Continuous Process. Public Review: Economic and Reliability, Maintenance Strategy. Functions of Manual Maintenance; Parts List and Stock; Preparation of Schedule Maintenance: Maintenance Document Preparation; Engine Room Maintenance, Maintenance of Inventory: The Role of Engine Builders Tips andTools: Spare-Parts.
Pre-requisite : Engine Room Layout Design
References :
1. D. Benkovsky, Technology of ship repairing, MIR Publisher.
2. Piero Caridis, Inspection, Repair, and Maintenance of Ship Structures, Witherby & Co.Ltd, 2001
3. Shields S., et.al, Ship Maintenance : A Quantitative Approach, IMARES, 1996

ENMR606018 – SHIP MACHINERY AND EQUIPMENT (2 sks)
Course Objective :
Understanding of theory, system, and working principle of ship equipment
Syllabus :
Anchoring and mooring equipment supplies; loading and unloading equipment; Water-tight windows and doors; Ventilation Equipment: Safety Equipment: Equipment Navigation and Communications; Firefighting Equipment: Equipment Ship Steering; Oil Separator Equipment: Pumps and System Installation.
Pre-requisite : -
References :
1. H. McGeorge, Marine Auxiliary Machinery, Butterworth Heinemann, 2001.
2. D.A. Taylor, Introduction to Marine Engineering, Butterworth Heinemann, 1996

ENMR600003 – SHIP DESIGN ASSIGNMENT 3 (3 sks)
Course Objective :
Understanding of calculation and monitoring of ship engine design
Syllabus :
Engine and tools selection (auxilary engine); electrical load balance; Detailed drawings; Design of Ship Engine Room Layout; transmission system, reduction gear and shafting; Construction of a propeller and propeller maching; ship piping systems for engine and hull; fire extinguishing system; steering system; ventilation system; calculation, selection and layout of the marine cable; load analysis and design one-line diagram of electrical & Wiring Diagram instalasi including lighting vessels and equipment. Bilga system design and Engine Room Bilga System (Oily-Water Bilge System); Design System Reply: Fire System Design: Design of Fuel System: Engine Lubrication System Design: Design of Engine Cooling System: Air Pressure System Design; Domestic Fresh Water System Design Air & Sea; Sanitary Disposal System Design: the design of loading and unloading systems; Ship Electrical Load Analysis: Calculation and selection of the number and capacity of Genset & Shore Connection: the calculation and selection of battery capacity; List Equipment Code
Pre-requisite : Ship Design Assignment 2
References :
1. B. Baxter, *Teach Yourself Naval Architecture*, The English Universities Press. Signifi cant Ships, RINA
2. M.A Talahatu, Teori Merancang Kapal. FTUI 1998.

ENME600006 – INDUSTRIAL SEMINAR (2 SKS)
Course Objective:
Able to understand industrial development and its problems.
Syllabus: Special topics in industries which are not covered in other courses
Pre-requisite: Passed 76 SKS and GPA > 2.00
References: -

ENMR607022 – AIR CONDITIONING AND REFRIGERATION SYSTEM (4 sks)
Course Objective :
Students are able to analyze the design of air conditioning and refrigeration system on the ship
Syllabus :

Basic principles of refrigeration and air conditioning processes. Diagrams Psikrometri, ducting system design, heating system design, ventilation system design, system design of air conditioning and refrigeration, technical specifications and troubleshooting, ISO standards and the Class
Pre-requisite : Ship Power System
References :
1. James Harbach, Marine Refrigeration and Air Conditioning, Cornell Maritime Press, 2005
2. N. Larsen, Marine Air Conditioning Plant, Butterworth-Heinemann, 2001
3. Jones W.P., Air Conditioning Engineering, Butterworth-Heinemann, 2001

ENMR607023 - SURVEY AND INSPECTION OF SHIP AND MARINE STRUCTURE (2 sks)
Course Objective :
Understanding of types of class survey, statutory approval and ship operation
Syllabus :
Statutory survey; Class survey; Hull survey; Loadline survey, Inclining experiment; Damage survey; Machinery Installations survey; Electrical & Genset survey; Seatrial procedure.
Pre-requisite :
References :
1. D. Benkovsky, Technology of ship repairing, MIR Publisher.
2. Piero Caridis, Inspection, Repair, and Maintenance of Ship Structures, Witherby & Co.Ltd, 2001
3. Shields S., et.al, Ship Maintenance : A Quantitative Approach, IMARES, 1996
4. Biro Klasifikasi Indonesia
5. Lloyd's Register Rules and Regulations

ENME600003 – INTERNSHIP (2 SKS)
Learning Objective(s):
The course is intended to provide opportunity for gaining experience in industries and applying mechanical engineering knowledge. Able to perform management tasks and engineering technique according to field of interest.
Syllabus:
1. Management and Engineering according to the field of interest. Presentation of internship results and report.
2. **Pre-requisite(s):** Passed 95 SKS and GPA > 2.00

ENME600004 - SEMINAR (1 SKS)
Learning Objective(s):
Student can communicate in verbal or written with final project pjroposal; able to formulate the problems and objectives of the research, conduct theoretical review to formulate the hypothesis, design the research method for empirical proof and present the preliminary result to the supervisor
Syllabus:
Problem description, basic concept of research with assumption and constraint; making preliminary report, conducting the preparation, literature review and research methodology; present final report with structured report, language, graphical presentation, table etc, reference and clarity.
Pre-requisite(s): Passed 110 SKS and GPA > 2.00 without Grade E
Text Book(s): -

ENME600005 – FINAL PROJECT (5 SKS)
Learning Objective(s):
Students are able to conduct design and analysis the object of system that related to the mechanical engineering field
Syllabus:
Synthesizing various lectures taken by students to design or to solve engineering problems. Preparing a written report of the synthesis.
Pre-requisite(s): Passed 128 SKS and GPA > 2.00 without Grade E

ELECTIVES

ENME803183 - MARINE AND OFFSHORE STRUCTURE (4 sks)
Course Objective :
Provide the knowledge, understanding of the theory and principles of building offshore include the type, function, and offshore construction technology and techniques in performing design structure.
Syllabus :
Types of Offshore; Construction and Offshore Structures; Calculation of Style and Power Offshore: Safety Requirements; Construction Semi-submersible; Single Buoy Mooring; FPSO; Offshore Maintenance and Repair.
Pre-requisite : -
References :
1. Cliff Gerwick, Construction of Marine and Off-shore Structures, CRC Press 1999
2. Subrata Chakrabarti, Handbook of Offshore Engineering, Elsevier Science, 2005
3. Yong Bai, Marine Structural Design, Elsevier Science, 2003

ENME803184 - SEA TRANSPORT AND PORT MANAGEMENT (4 sks)
Course Objective :
Provides the knowledge and understanding of various management approaches, maritime transport and port activities which also include risk factors, safety, and economy.
Syllabus :
Sea Transport Demand Trend: Marine Transportation Market Research; Inter Mode Transport System; System loading and unloading, Types of Sea Transport, Warehousing and Storage Cargo Systems, SystemsAgency, Survey Charge, Corporate Sailing economic calculation, Customs.
Pre-requisite : -
References :
1. P. Lorange, Shipping Management, Institution for shipping Research.
2. Patrick Alderton, Reeds Sea Transport : Operation and Management, Adlard Coles, 2008
3. Patrick Alderton, Port Management and Operations,Informa Business Publishing, 2005
4. Svein Kristiansen, Maritime Transportation : Safety management and Risk analysis, Butterworth-Heinemann, 2004
5. M. Stopford, Maritime Economics, Routledge, 1997
6. House, D.J, Cargo Work for Maritime Operation, Butterworth Heinemann, 2005

ENME803185 - MARITIME LAW AND REGULATION (4 sks)
Course Objective :
Provide knowledge and understanding of the laws and regulations on maritime activities both nationally and internationally.
Syllabus :
Introduction of maritime law; Regulation of Marine Pollution Prevention and Control; SOLAS; Prevention of Collisions Regulations; ISM Code; Statutory Rules; Passenger Ship Regulations; Tanker Regulations; Offshore Regulations: Accident Rescue Regulations; Other IMO rules. Accident prevention regulations; Risk assessment and analysis.
Pre-requisite : -
References :
1. International Convention for the Prevention of Pollution From Ships (MARPOL), International Maritime Organisation Publications
2. International Regulations for Preventing Collisions at Sea (COLREG), International Maritime Organisation Publications
3. International Convention for the *Safety of Life at Sea* (SOLAS), International Maritime Organisation Publications
4. International Safety Management Code (ISM Code) Guide Book, International Maritime Organisation Publications
5. Churchil R.R. dan Lowe A.V, The Law of the Sea, MUP 1999

ENME804186 - SPECIAL SHIP PROJECT (4 sks)
Course Objective :
Provide the knowledge, understanding of ship design for special purposes.
Syllabus :
Typology and special ship purposes; Material to special Ship, Design Considerations; Calculation of loading; Calculation of Ship Quantities; Computation Structures: Propulsion Systems; Motion System; Safety and Navigation System; Stability Calculation.
Pre-requisite : -
References :
1. Lars Larsson dan Rolf Eliasson, Principles of Yacht Design, International Marine/Ragged Mountain Press, 2007
2. Dave Gerr, The Elements of Boats Strength, International Marine/Ragged Mountain Press, 1999
3. Norman L. Skene, dan Marnard Bray, Elements of Yacht Design, Sheridan house, 2001
4. Steve Killing dan Doug Hunter, Yacht Design Explained : A Sailors Guide to the Principles and Practices of Design, W.W Norton and Company, 1998
5. S. Sleight, Modern Boat Building, Conway Maritime Press.

ENME804187 - SHIP PRODUCTION MANAGEMENT (4 sks)
Course Objective :
Provides knowledge and understanding of the various shipyard management and technique.
Syllabus :
Shipyard Layout; Ship Process Production; Steel Stock Yard Planning; Crane Calculation: Jamorang Calculation At Each Stage Production: Make Work Schedule: Work Break Down Structure; Integrated Hull Outfitting and Painting; Advanced Outfiting; Group Technology Methods for Ship Production; Ship launching; Ship trials.
Pre-requisite : -
References :
1. D.J. Eyres, Ship Construction, Butterworth- Heinemann, 2007
2. R.Shenoi, Ship Production Technology, Univ. Of Southampton.
3. National Research Council, Shipbuilding Technology and Education, National Academy Press, 1996

ENME802103 - ENERGY OPTIMIZATION SYSTEM (4 sks)
Course Objective :
This course provides an understanding of mathematical modeling, simulation and optimization of energy systems through technical and economical approach. The course is intended to equip student with the ability to understand mathematical model, simulation and optimization of thermal systems.
Syllabus :
Workable System Design; Economical Evaluation; Determination of Mathematical Equations; Thermal Equipment Modeling; System Simulation; System Optimization: Objective Function, Constraints; Lagrange Multipliers: Lagrange multiplier to complete the optimization process; Dynamics, Geometric and Linear Programming; Mathematical Model of Thermodynamics Properties; Big System Simulation under Steady Condition; Big Thermal System Simulation; Calculation of Variables in Optimum Conditions.
Pre-requisite : -
References :
1. Stoecker, W.F. " Design of Thermal System", Mc.Graw Hill Book Co, 1989.
2. Boehm,R.F."Design of Analysis of Thermal System"John Wiley&Sons,1987.
3. Yogesh Jaluria, "Design and Optimization of Thermal Systems " Mc.Graw Hill Book Co, 1998.

ENME804188 - MARITIME ENERGY MANAGEMENT (4 sks)
Course Objective :
This course aims to provide an understanding of analysis for energy optimization resulted from minimum fuel consumption as well as analysis for performance optimization from minimum initial energy

Syllabus :
Principle and regulation of maritime energy, design and operation of efficient ship, energy management for off shore structure, port energy management, renewable energy, and human resources factors in energy management.
Pre-requisite : -
References :
1. Hongyi Lai, "Asian Energy Security: The Maritime Dimension", Palgrave MacMillan, 2009
2. Steve Doty, Wayne C. Turner, "Energy Management Handbook 8th Ed.", Fairmont Press, 2012
3. Petrecca, Giovann, "Energy Conversion and Management: Principles and Applications," Springer, 2014

ENME804189 – MARITIME SAFETY (4 sks)
Course Objective:
Provides knowledge and understanding of maritime safety through regulations, management and development of maritime transportation technology.
Syllabus :
SOLAS: general provision, construction, safety equipment, communication radio, safety navigation, freight, management for ship safety, MARPOL Annex I-V, maritime safety, threats from maritime trading, threats from shipping, evolution of maritime safety, implementation of ISPS code, safety planning.
Pre-requisite: -
References:
1. Jones. S. Maritime Security: A practical Guide, the nautical institute 2012
2. Consolidate Edition, MARPOL, International Maritime Organization, 2006
3. Consolidate Edition, SOLAS, International Maritime Organization, 2004

ENME804190 - ADVANCED WELDING ENGINEERING (4 SKS)
Learning Objective(s):
Provide knowledge, understanding of the theories, principles and design as well as the assessment of the quality of welding and welding applications.
Syllabus:
Introduction, review of welding term and definition, welding process type, standard power source, Oxy-gas welding, Shield Metal Arc Welding (SMAW), Gas Tungsten Arc Welding (GTAW), Gas Metal Arc Welding (GMAW), Submerged Arc Welding (SAW), Flux Cored Arc Welding (FCAW), Resistance welding, Friction Stir Welding, Other welding process: laser, electron beam, plasma, Cutting and other edge preparation processes, surfacing and spraying, Brazing and soldering, Joining processes for plastics, ceramics and composites, Welding metal: Ferrous-based metal, non-ferrous-based metal, Material behavior during welding process, Testing materials and the weld joint, Non Destructive Examination (NDE), DT (Destructive Test), Heat treatment of base materials and welded joints, Basic of welding design, Residual stresses and distortion, Welding Symbol, Behavior of welded structures under different types of loading, Design of welded structures under static and dynamic loading, welding defects, Design of welded pressure equipment, Welding Performance Qualification Record (WPQR), Welding Procedure Specification (WPS), Welding automation.
Pre-requisite(s): -
Text Book(s):
1. Sindo Kou, Welding Metallurgy, 2nd Edition, Wiley, 2002.
2. ASME Section IX, Welding and Brazing Qualifications
3. AWS D1.1., Structural Welding (Steel)
4. William A. Bowditch, Welding Fundamentals 5th Edition, Goodheart-Willcox, 2011.
5. Technical Manual TM 5-805-7. Welding Design, Procedures and Inspection Headquarters, Department of the Army.1985
6. Lloyds Register. Welding Procedures, Inspections and Qualifications.

MASTER PROGRAM

MASTER PROGRAM IN MECHANICAL ENGINEERING

Program Specification

1	**Awarding Institution**		Universitas Indonesia
2	**Teaching Institution**		Universitas Indonesia
3	**Programme Title**		Master Program in Mechanical Engineering
4	**Class**		Regular
5	**Final Award**		Magister Teknik (M.T.)
6	**Accreditation / Recognition**		BAN-PT: A – accredited
7	**Language(s) of Instruction**		Bahasa Indonesia and English
8	**Study Scheme (Full Time / Part Time)**		Full Time
9	**Entry Requirements**		Bachelor Degree in Mechanical Engineering, Math and Physics; pass the entrance exam.
10	**Study Duration**		Designed for 2 years
	Type of Semester	Number of semester	Number of weeks /semester
	Regular	4	17
	Short (optional)	1	8
11	**Graduate Profiles:** Graduates who have the character of leadership and excellence in scholarship, research, expertise and professionalism in the field of Mechanical Engineering		
12	**List of Graduates Competences:** 1. Ability to develop a logical, critical, systematic, and creative thinking through scientific researches, design creation or art product in the field of science and technology, by also putting attention to humanities value related to his/her field of expertise; to formulate scientific concept and research result based on principles and scientific ethics in a form of thesis or other equivalent forms and is uploaded on the unversity's web page, as well as scientific article published by accredited international journal. 2. Ability to carry out an academic validation or in-depth study in the field of his/her expertise to solve problems in society or industry which is relevant for his/her knowledge and skill development 3. Ability to formulate ideas and scientific argument with responsibility and based on academic ethics, and to publish it through a media to the society 4. Ability to identify academic field which is his/her research object, and to position it in a research map via an interdisciplinary approach 5. Ability to take a decision in the context of problem solving of science and technology which puts attention to humanities values based on analytical study or experiment to a given information or data 6. Ability to manage, develop, and maintain working network with colleagues in wide research institutions and communities 7. Ability to self-improve his/her learning capacity 8. Ability to save/manage and subsequently find his/her research data for the purpose of guaranteeing originality and avoiding plagiarism 9. Ability to take responsibility toward society and to comply to professional ethics in solving engineering problems 10. Ability to carry out a life-long learning, including to get an access to knowledge of current issues		

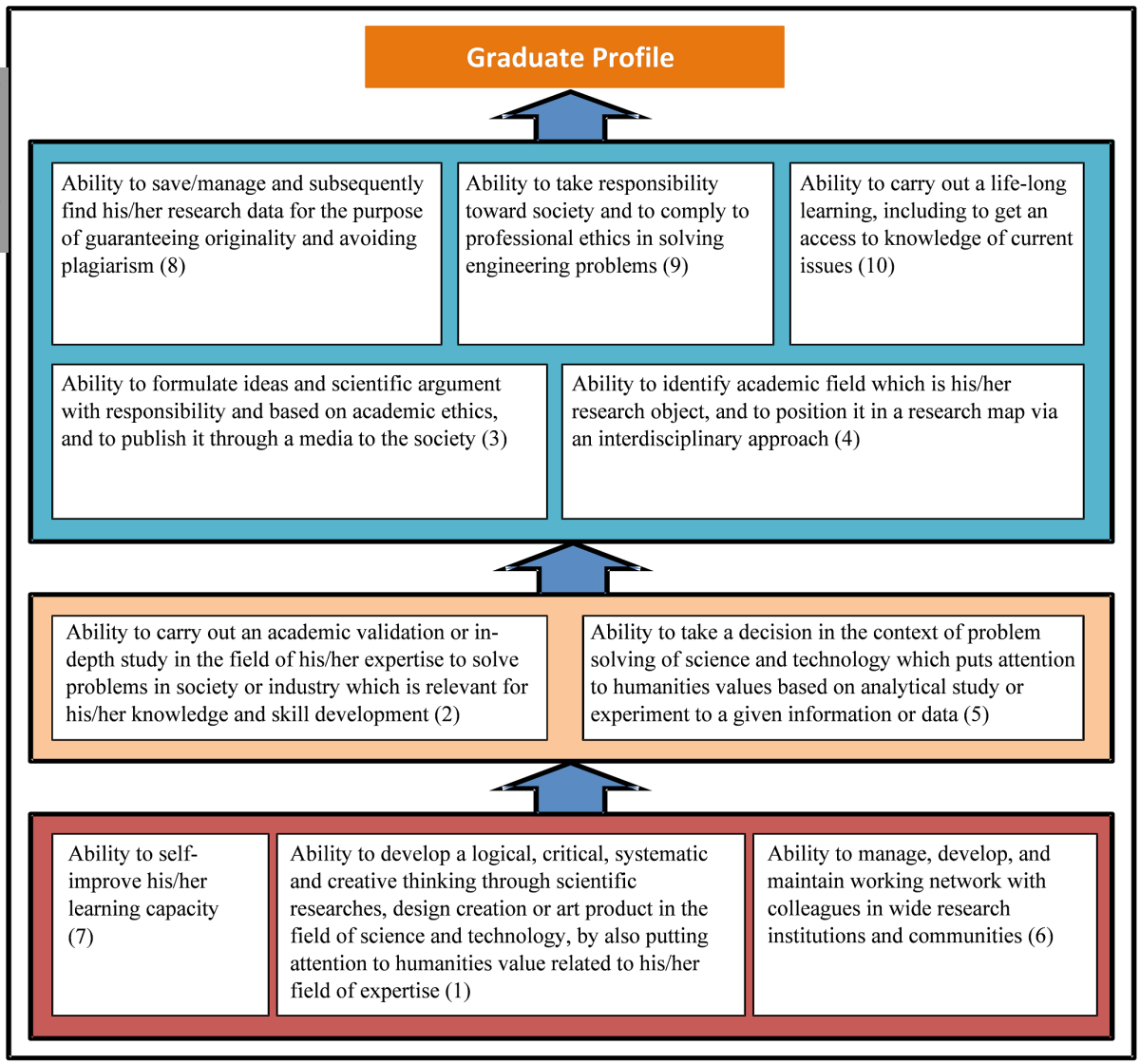
12	As a Universitas Indonesia student, every graduate of Mechanical Engineering Undergraduate Program should have the following compenteces as follow: 1. Able to use information and communication technology; 2. Able to think critically, creatively, and innovatively and have intellectual curiosity to solve the individual and group problems; 3. Able to use verbal and writing communication in good bahasa Indonesia and English for academic or non-academic acitivity; 4. Has an integrity and able to respect others; 5. Able to identify entrepreneurship efforts which show innovation and autonomy based on ethics In the 2016 Mechanical Engineering Graduate Program curriculum, there are 6 Specialization Programs that can be chosen by the students according to their academic ability dan interest, which are: 1. Energy Conversion 2. Bulding Utilities and Fire Safety 3. Design and Manufacture 4. Automation and Manufacture System 5. Vehicle Engineering and Heavy Equipment 6. Marine Resources and Technology Specifically, besides the 10 points of Graduates Competences, the students of The Graduates Program will have the competences in accordance to their specialization. 1. Competence in the field of Energy Conversion: Ability to analyse, apply and design a mechanical system by utilizing the law and phenomenon from the cutting-edge technology related to the field of energy conversion and conservation. 2. Competence in the field of Building Utility System and Fire Safety: Ability to analyse, apply and design the building utility efficiently and the fire safety system based on performance for the office and industrial buildings. 3. Competence in the field of Design and Manufacturing: Ability to analyse, apply and desing a product, manfacture and assembly process by integrating the latest technology in the field of desing and manufacturing. 4. Competence in the field of Automation and Manufacturing System: Ability to analyse, apply and desingn a manufacturing system and automation that will be used for a development and product manufacturing process by utilizing the cutting-edge technology in the field of manufacturing and automation. 5. Competence in the field of Vehicle Engineering and Heavy Equipment: Ability to analyse and design a vehicle system and heavy equipment for several fields, such as: industrial, construction, minerals and energy. 6. Competence in the field of Maritime Resources and Technology: Ability to analyse and design a system and apply the maritime technology related to the utilization of sustainable maritime resources

13	**Classification of Subjects**		
No	Classification	Credit Hours (SKS)	Percentage
i	Core courses of study program	10	22,73 %
ii	Core courses of specialization	16	36,36 %
iii	Elective courses of specialization	8	18,18 %
iv	Scientific Publication, Thesis	10	22,73 %
	Total	44	100 %
14	**Total Credit Hours to Graduate**		44 SKS

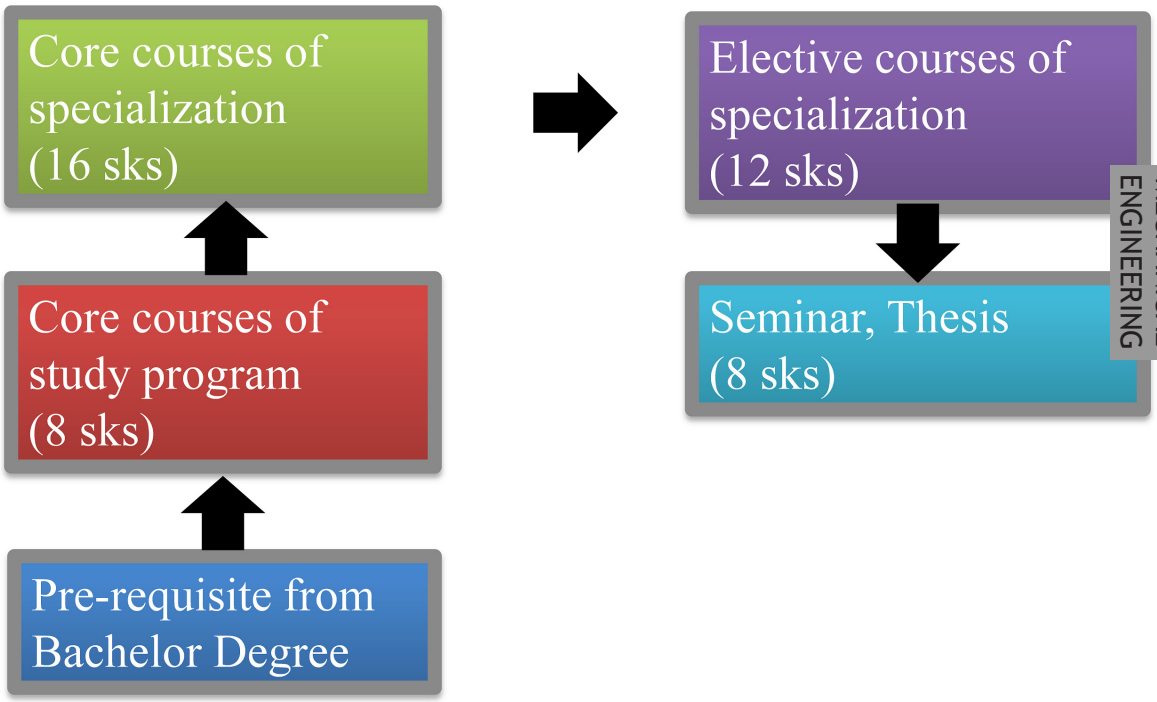
Career Prospects

Graduates of Mechanical Engineering has devoted itself in various fields, including automotive industry, oil and gas, heavy machinery, educational institutions, research institutions and other industries

Learning Outcomes Flow Diagram

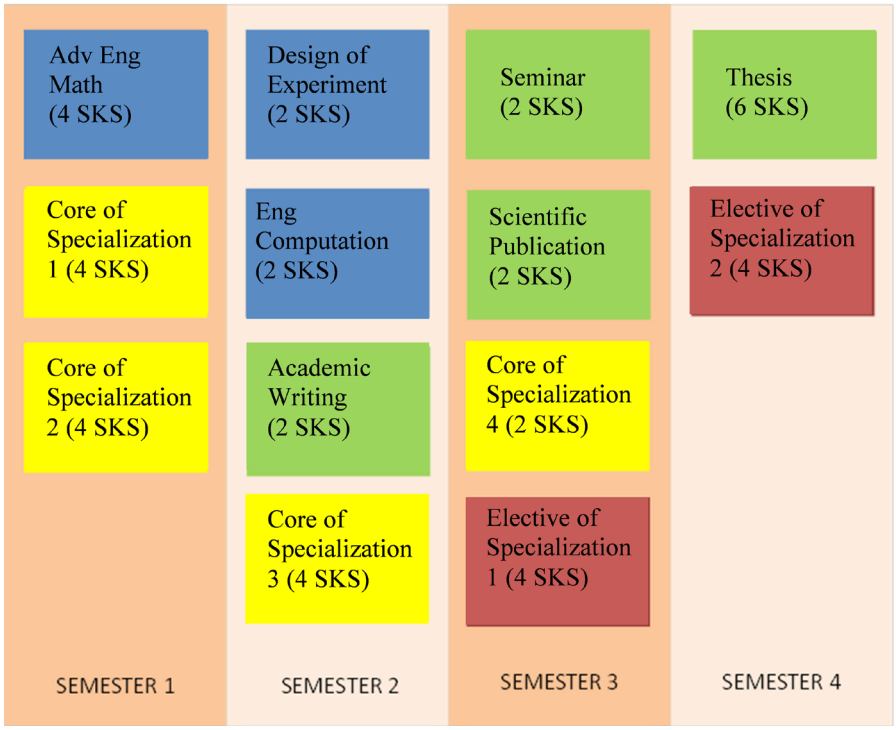


Curriculum Structure

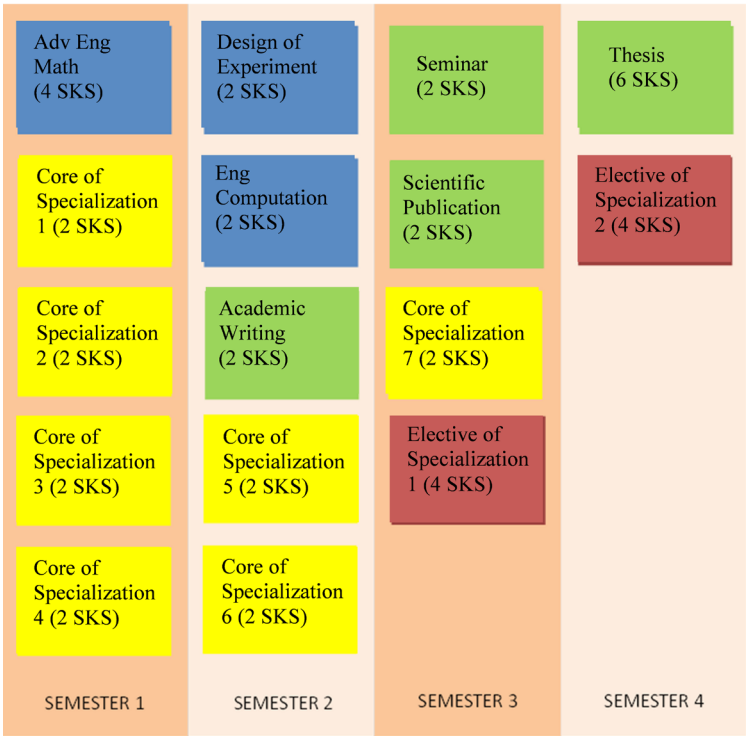


Flow Diagram of Subjects

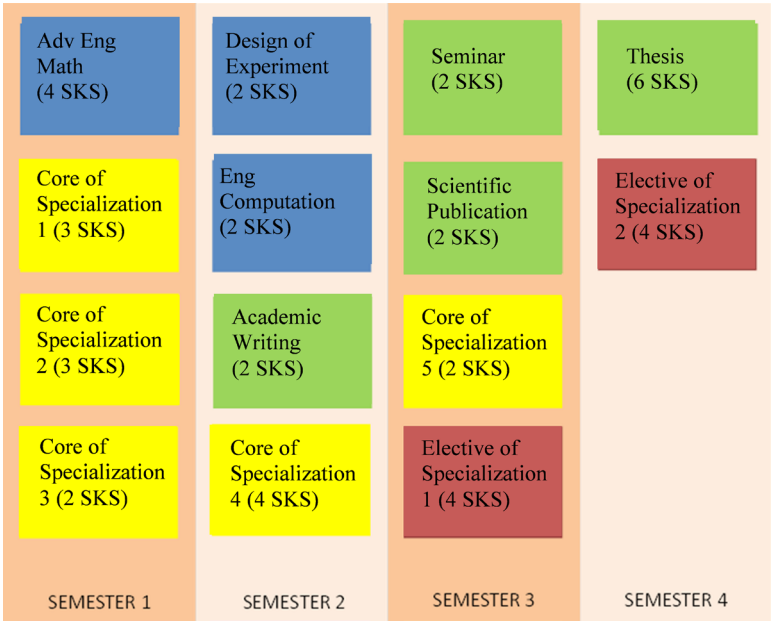
Throughout the course of study, students of Magister Degree in Mechanical Engineering can opt and manage his/her subjects very flexibly, based on the credit of each subject. Given below are three different scenarios of flow diagram of subjects.



Scenario 1



Scenario 2



Scenario 3

CURRICULUM STRUCTURE OF MAGISTER PROGRAM OF MECHANICAL ENGINEERING

Code	SUBJECT	Credit
	1st SEMESTER	
ENME801001	Advanced Engineering Mathematics	4
	Specialization Compulsory	8
	Subtotal	**12**
	2nd SEMESTER	
ENME802002	Design of Experiment	2
ENME802004	Engineering Computation	2
ENME802003	Academic Writing	2
	Specialization Compulsory	4
	Subtotal	**10**
	3rd SEMESTER	
ENME800005	Scientific Publication	2
	Specialization Compulsory	4
	Specialization Electives	4
	Elective Course #1	4
	Subtotal	**10**
	4th SEMESTER	
ENME800008	Thesis	8
	Specialization Electives	4
	Subtotal	**12**
	Total	**44**

1. Major in Energy Conversion

Code	SUBJECT	Credit
	1st SEMESTER	
ENME801001	Advanced Engineering Mathematics	4
ENME801101	Advanced Thermodynamics	4
ENME801102	Advanced Fluid Dynamics & Heat Transfer	4
	Subtotal	**12**
	2nd SEMESTER	
ENME802002	Design of Experiment	2
ENME802003	Academic Writing	2
ENME802004	Engineering Computation	2
ENME802103	Optimization of Energy System	4
	Subtotal	**10**

	3rd SEMESTER	
ENME803104	Thermal Power Generation	4
ENME800005	Scientific Publication	2
	Specialization Electives #1	4
	Subtotal	**12**
	4th SEMESTER	
	Specialization Electives #2	4
ENME800008	Thesis	8
	Subtotal	**12**
	Total	**44**

List of Elective Courses in Energy Conversion Stream

Code	SUBJECT	Credit
	3rd SEMESTER	
ENME803105	Internal Combustion Engine	4
ENME803106	Flow Measurement and Visualization	4
ENME803107	CFD Application	4
ENME803196	Rocket and Jet Propulsion	4
ENME803125	Energy and Environment	4
ENME803108	Refrigeration Engineering	4
ENME803124	Energy Audit	4
	4th SEMESTER	
ENME804109	Heat and Mass Transfer Engineering	4
ENME804110	Combustion Engineering	4
ENME804111	Aerodynamics Engineering	4
ENME804112	Turbo Machinery	4

2. Major in Building Utilities and Fire Safety

Code	SUBJECT	Credit
	1st SEMESTER	
ENME801001	Advanced Engineering Mathematics	4
ENME801129	Thermofluid and Radiation	2
ENME801113	Ventilation & AC System	4
ENME801130	Indtroduction to Fire Dynamics	2
	Subtotal	**12**
	2nd SEMESTER	
ENME802002	Design of Experiment	2
ENME802003	Academic Writing	2
ENME802004	Engineering Computation	2
ENME802131	Fire Protection System	2
ENME802132	Building Mechanical Electrical System	2
	Subtotal	**10**

	3rd SEMESTER	
ENME803133	Design Assignm of Utility Sys for Building	2
ENME801121	Energy Management System	2
ENME800005	Scientific Publication	2
	Specialization Electives #1	4
	Subtotal	**10**
	4th SEMESTER	
	Specialization Electives #2	4
ENME800008	Thesis	8
	Subtotal	**12**
	Total	**44**

List of Elective Courses in Building Utilities and Fire Safety Stream

Code	SUBJECT	Credit
	3rd SEMESTER	
ENME803134	Enclosure Fire Dynamics Modelling	4
ENME803115	Clean Room	4
ENME803116	Plumbing and STP Systems	4
ENME803117	Building Environmental Assessment	4
ENME803135	Fire Fighting Strategy Engineering	4
ENME803136	Fire Safety Management in Building	4
KODE	**4th SEMESTER**	
ENME802103	Optimization of Energy System	4
ENME804118	Mechanical system for Building	4
ENME804119	Acoustics in Buildings	4
ENME804120	Building Utilities Management	4
ENME804137	Fire Investigation Engineering	4
ENME804138	Evaluation of Fire Protection System	4
ENME804139	Fire Protection in Process Industry	4

3. Major in Design and Manufacturing

Code	SUBJECT	Credit
	1st SEMESTER	
ENME801001	Advanced Engineering Mathematics	4
ENME801140	Materials and Manufacturing Processes	4
ENME801141	Product Design Methodology	4
	Subtotal	**12**
	2nd SEMESTER	
ENME802002	Design of Experiment	2
ENME802003	Academic Writing	2
ENME802004	Engineering Computation	2
ENME802142	Designing Manufacturing Technology	4
	Subtotal	**14**

	3rd SEMESTER	
ENME803143	Mechanical Failure	4
ENME800005	Scientific Publication	2
	Specialization Electives #1	4
	Subtotal	**10**
	4th SEMESTER	
	Specialization Electives #2	4
ENME800008	Thesis	8
	Subtotal	**12**
	Total	**44**

List of Elective Courses in Design and Manufacturing Stream

Code	SUBJECT	Credit
	3rd SEMESTER	
ENME803145	Composite Product Development	4
ENME803146	Finite Element and Multiphysics	4
ENME803147	Toy Production Design	4
ENME803161	Micro-machining	4
ENME803144	Dynamics of Mechanical System	4
ENME803147	Toy Production Design	4
	4th SEMESTER	
ENME804148	DESIGN FOR MANUFACTURE ASSEMBLY	4
ENME804149	Noise and Vibration	4
ENME804162	Laser Assisted Process	4

4. Major in Manufacturing System and Automation

Code	SUBJECT	Credit
	1st SEMESTER	
ENME801001	Advanced Engineering Mathematics	4
ENME801150	Management of Manufacturing IS	4
ENME801151	Manufacturing System and Processes	4
	Subtotal	**12**
	2nd SEMESTER	
ENME802002	Design of Experiment	2
ENME802003	Academic Writing	2
ENME802004	Engineering Computation	2
ENME802152	Automation and Robotics	4
	Subtotal	**10**
	3rd SEMESTER	
ENME803153	Machine Vision System	4
ENME800005	Scientific Publication	2
	Specialization Electives #1	4
	Subtotal	**10**

	4th SEMESTER	
	Specialization Electives #2	4
ENME800008	Thesis	8
	Subtotal	**12**
	Total	**44**

List of Elective Courses in Manucfacuturing Technology and Automation Stream

Code	SUBJECT	Credit
	3rd SEMESTER	
ENME803154	Quality & Production Manag. System	4
ENME803174	Risk Management	4
	4th SEMESTER	
ENME804155	CAD/CAM	4
ENME804156	Manufacturing Performance Assesment	4

5. Major in Vehicle Engineering and Heavy Equipment

Code	SUBJECT	Credit
	1st SEMESTER	
ENME801001	Advanced Engineering Mathematics	4
ENME801163	Vehicle Engineering	4
ENME801164	Prime Mover & Drivetrain System	4
	Subtotal	**12**
	2nd SEMESTER	
ENME802002	Design of Experiment	2
ENME802003	Academic Writing	2
ENME802004	Engineering Computation	2
ENME802165	Vehicle Frame and Body Engineering	4
	Subtotal	**10**
	3rd SEMESTER	
ENME803166	Vehicle Control System	4
ENME800005	Scientific Publication	2
	Specialization Electives #1	4
	Subtotal	**10**
	4th SEMESTER	
	Specialization Electives #2	4
ENME800008	Thesis	8
	Subtotal	**12**
	Total	**44**

List of Elective Courses in Vehicle Engineering and Heavy Equipment Stream

Code	SUBJECT	Credit
	3rd SEMESTER	
ENME803167	Modern Vehicle Technology	4
ENME803195	Peralatan Pengeboran Minyak dan Gas	4
	4th SEMESTER	
ENME804168	Railway Vehicle Engineering	4
ENME804197	Crane Equipment and Machinery	4
ENME804198	Plane Stability and Control System	4

6. Major in Marine Resources and Technology

Code	SUBJECT	Credit
	1st SEMESTER	
ENME801001	Advanced Engineering Mathematics	4
ENME801179	Advanced Thermofluid	4
ENME801180	SMaritime Resources	4
	Subtotal	12
	2nd SEMESTER	
ENME802002	Design of Experiment	2
ENME802003	Academic Writing	2
ENME802004	Engineering Computation	2
ENME802181	Maritime Technology and Management	4
	Subtotal	10
KODE	3rd SEMESTER	
ENME803182	Ocean Energy	4
ENME800005	Scientific Publication	2
	Specialization Electives #1	4
	Subtotal	10
KODE	4th SEMESTER	
	Specialization Electives #2	4
ENME800008	Thesis	8
	Subtotal	12
	Total	44

List of elective courses in Marine Resources and Technology Study Program

Code	SUBJECT	Credit
	3rd SEMESTER	
ENME803183	Marine and Offshore Structure	4
ENME803184	Sea Transport and Port Management	4
ENME803185	Maritime Law and Regulation	4
	4th SEMESTER	
ENME804186	Special Ship	4
ENME804187	Ship Production Management	4
ENME802103	Optimization of Energy System	4
ENME804188	Management of Maritime Energy	4
ENME804189	Maritime Safety	4
ENME804190	Advanced Welding Engineering	4

COURSE DESCRIPTION

ENME800001
ADVANCED ENGINEERING MATHEMATICS (4 SKS)
Learning Objective(s):
Complete student's anylitical ability. Students understand and able to use the advances mathematical concepts in order to solve the engineering problems
Syllabus :
Introduction to differential equation, 1st order differential equation, 2nd order differential equation, higher order differential equation, vector analysis, vector differential, grad operation, divergence and culr, vector integration, laplace transform, laplace transform to solve the differential equation, fourrier transform, convulsion, numerical method, root of equation, numerical differentiation, numerical integral
Pre-requisite(s): -
Text Book(s):
1. Chapra, Steven C. and Canale, Raymond P. Numerical Methods for Engineers 6th edition. New York: McGraw-Hill, 2010.
2. Kreyszig, Erwin. Advanced Engineering Mathematics 10th edition. Danvers: John Wiley & Sons, 2011.
3. Sedgewick R., Phillippe F, An Introduction to the Analysis of Algorithms, Addison Wesley.
4. Cheney W., Kincaid D., Numerical Mathematics and Computing, Cole Publishing

ENME800003
DESIGN OF EXPERIMENT (2 SKS)
Learning Objective(s):
This course provides knowledge on methods of planning, execution and reporting of the research in the field of engineering so that students are able to apply scientific principles in the preparation of the thesis in particular, as well as in a scientific publication from the research. Students should be able to manage an investigation that began from the planning stages, applying the correct procedure and constructs apparatus design, and apply instrumentation and measurement systems, to execute and perform the analysis and interpretation of data by the rules of statistics properly.
Syllabus:
Introduction: Introduction to Research Design, Problem Solving Approaches, Research Project Planning, Design and Application Measurement Systems: Elements of Functional Measurement Systems, Performance Measurement System Characteristics, Analysis of Accuracy (Uncertainty) Systems, Design and Construction of Apparatus Research, Planning Experiments, execution experiments: Construction of the apparatus, the apparatus Debugging, Datasheet and logbooks; Analysis and Interpretation of data; Communication Engineering: Principles of Communication Engineering, Report, Paper, and Research Articles.
Pre-requisite(s) : -
Text Book(s):
1. Montgomery, D.C., Design and Analysis of Experiments, (5th ed.), John Wiley and Sons, Inc., New York, 2001
2. Coleman, H.W., Steele, G.W.Jr., Experimentation and Uncertainty Analysis for Engineers, (2nd ed.), John Wiley and Sons, Inc., New York, 1999
3. Doebelin, E.O., Engineering Experimentation: Planning, Execution, Reporting, McGraw-Hill, Inc., New York, 1995
4. Kirkup, Les., Experimental Method: An Introduction to the Analysis and Presentation of Data, John Wiley and Sons Australia, Ltd., Queensland, 1994
5. Lipson, C, Sheth, N.J., Statistical Design and Analysis of Engineering Experiments, Mc-Graw Hill Kogakusha, Ltd., Tokyo, 1973

ENME802003
ACADEMIC WRITING (2 SKS)
Learning Objective(s):

Student able to understand the basic academic writing to improve the capability of reading the scientific paper, reference and to write argumentation accurately with the proper and proficient language effectively. This course also study the critical thinking, propose the argumentation, formulate basic reasoning and how to deliver the idea with correct language. Student will study how to write the scientific paper with good technique, able to find and to make proper list of reference.

Syllabus:

Introductoin to academic writing, rhetoric analysis in scientific paper, act critically and argumentation in academic writing, academic writing techniques, draft scientific paper, peer review and scientific paper revision, find scientific resources, synthesis scientific paper, present the paper as a result from this course

Pre-requisite(s) : -

Text Book(s):

1. Ross, V. *A Brief Guide to Critical Writing*. Philadelphia, PA : Critical Writing Program. 2015.
2. Graff, G., Birkenstein, C. As He Himself Puts It : *The Art of Quoting "They Say / I Say" : The Moves That Matter in Academic Writing*. New York. 2006
3. Rheingold, H. *Net Smart : How To Thrive Online*. Cambridge, Mass : MIT Press. 2012.

ENME800002

ENGINEERING COMPUTATION (2 SKS)

Learning Objective(s):

The purpose of this course is that students know well and are able to apply the processes and methods (algorithms) calculations (numerical and analytic) of engineering in the real world of computing and computer-based parameters that affect the speed and accuracy of the calculation.

Syllabus :

The purpose of this course is that students know well and are able to apply the processes and methods (algorithms) calculations (numerical and analytic) of engineering in the real world of computing and computer-based parameters that affect the speed and accuracy of the calculation.

Pre-requisite(s): -

Text Book(s):

1. Chapra, Steven C. and Canale, Raymond P. Numerical Methods for Engineers 6th edition. New York: McGraw-Hill, 2010.
2. Kreyszig, Erwin. Advanced Engineering Mathematics 10th edition. Danvers: John Wiley & Sons, 2011.
3. Sedgewick R., Phillippe F, An Introduction to the Analysis of Algorithms, Addison Wesley.
4. Cheney W., Kincaid D., Numerical Mathematics and Computing, Cole Publishing

ENME800005

SCIENTIFIC PUBLICATION (2 SKS)

Learning Objective(s):

Student can develop logicial, critical, systematical and creative thinking using scientific research and/or creation of design in science and technology by consider and apply social values. And by using scientific concept and discussion, scientific way and ethics, the paper will be written and published in accredited scientific journal and accepted in international journal under supervision one or more supervisor.

Syllabus:

Pre-requisite(s): Academic Writing, Design of Experiment

Text Book(s):

1. Related papers to the current experiment

ENME800007

THESIS (8 SKS)

Learning Objective(s):

Student will study to apply the science and previous knowledge to conduct independent research under one or more supervisor(s). After completing this course, student should able to

make research concept by applying related theories. Under supervision of supervisor, student can design, integrate, implement and analyze concept and writing the research finding systematically and scientifically in thesis book. Student also should come to defend the design of experiment in front of board of examiner in thesis examination forum

Syllabus:

Pre-requisite(s): Passed 32 credit units

Text Book(s):

1. Panduan Teknik Penulisan Tugas Akhir Universitas Indonesia

ENME801101– ADVANCED THERMODYNAMICS (4 SKS)

Learning Objective(s):

Provide further understanding of the science of thermodynamics and its applications so that students are able to design and conduct a basic research mapun able to complete the analysis involves the calculation of the thermodynamic system correctly and systematically in order to find the best solution gentang effectiveness of the use of substances and energy, especially in the 'engineering design' by motto: 'Low entropy production', 'high thermal efficiency' and 'low pollution effect'.

Syllabus :

Basic Thermodynamics and Gas Dynamics, Equilibrium of Thermodynamics System, Thermodynamics properties of System, Thermodyamics of ideal gas mixture, review of chemical thermodynamics, review of chemical kinetics, conservation equation for multicomponent reaction system, pre-mixed laminar flames, method of measuring flame velocity (bunsen burner), flame quenching, flamability limit of premixed laminar flame, gaseous diffusion flame and combustion of single liquid droplet, combustion in compression ignition engine, combustion in spark ignition engine, combustion research in hydrocarbon oxygen mixture, engine research, combustion-generated emission, experimental method : preseure measurement and recording; temperature measurement and recording; combustion photography and flame speed detection; spectrographic method; chemical analysis technique (NDIR, FID, Gaschromatography).

Pre-requisite(s): -

Text Book(s):

1. Holmann, J.P., Thermodynamics, Intl. Student Edition, McGraw Hill, 2005.
2. Kenneth Wark Jr. Thermodynamics, McGraw Hill, 2003.
3. Francis F. Huang, Engineering Thermodynamics, MaxWell Macmillan Intl. Edition, 2000.
4. H.D. Baehr, Termodynamik , Springer Verlag
5. K. Stephan, Termodynamik, Grundlagen und technishe Anwendung-en, Band 1, Band Springer Verlag.
6. Bejan, Adrian, Advanced Engineering Thermodynamics, Wiley – interscience, 2nd Edition, 1997

ENME801102 – ADVANCED FLUID DYNAMICS AND HEAT TRANSFER (4 SKS)

Learning Objective(s):

Enhance the ability of students in the study of fluid mechanics in more detail so as to conduct research or the application of science in industrial applications. Studying the mechanism of heat transfer in a control volume due to the existence of the temperature difference and concentration as well as the involvement of one, two or three phases at the time simultaneously.

Syllabus :

Viscous flow of Newtonian fluid, membrane boundary flow, Non-Newtonian Fluid Flow, Two-Multi Phase Flow, Particle Displacement Flow, Porous Media and Fluidized Beds, Turbulent Flow and Mixing, Jet, Chimney, Energy and Momentum Equatio, one-two-three dimension conduction heat transfer, heat transfer on extended surface.

Pre-requisite(s): -

Text Book(s):

1. Frank P Incropere, David P De Witt, Fundamental heat and mass transfer, 5th Ed., John Wiley & Sons, 1996, New York
2. Holman JP, Heat Transfer, 9th, Mc Graw Hill, 2003.
3. Koestoer, RA, Perpindahan Kalor untuk Mahasiswa Teknik, Salemba Teknika, 2003.
4. Welty R James, Wicks Charless, Wilson Robert, Fundamentals of Momentum, Heat,

and Mass Transfer, 3rd Ed. John Wiley & Sons, 1996, New York
5. Cengel, Yunus, Heat Transfer a Practical Approach, 2nd Ed. Mc Graw Hill, 2003, Singapore.
6. Kreith Frank, Bohn Mark, Principles of Heat Transfer, 6th Ed. Brooks/cole, 2001, USA
7. Abbott I R, Theory of Wing Section, Dover Publications.
8. Bird R B, Transport Phenomena, John Wiley & Sons.

ENME802103 - ENERGY SYSTEM OPTIMIZATION (4 SKS)
Learning Objective(s):
This course provides an understanding of mathematical modeling, simulation and optimization of energy systems through technical and economical approach. The course is intended to equip student with the ability to understand mathematical model, simulation and optimization of thermal systems.
Syllabus:
Workable System Design; Economical Evaluation; Determination of Mathematical Equations; Thermal Equipment Modeling; System Simulation; System Optimization: Objective Function, Constraints; Lagrange Multipliers: Lagrange multiplier to complete the optimiza- tion process; Dynamics, Geometric and Linear Programming; Mathematical Model of Thermodynamics Properties; Big System Simulation under Steady Condition; Big Thermal System Simulation; Calculation of Variables in Optimum Conditions.
Pre-requisite(s): -
Text Book(s):
1. Stoecker, W.F. Design of Thermal System, 3rd Edition, Mc.Graw Hill Book Co, 2011.
2. Boehm,R.F., Design of Analysis of Thermal System, John Wiley&Sons,1987.
3. Yogesh Jaluria, Design and Optimization of Thermal Systems, 2nd Edition, Mc.Graw Hill Book Co, 2007.

ENME803104 – THERMAL POWER GENERATION (4 SKS)
Learning Objective(s):
The course objective is to provide an understanding of the basic principles of power generation, and basic competency in the design and development of power generation systems.
Syllabus:
Industrial Power Plant and Steam System: Boiler, Steam Turbine, Gas Turbine; Cogeneration Engineering, Instrumentation and Main Tools; Performance and Reliability Factors; Economical Aspects, Environmental Aspects: Settings and Prevention.
Pre-requisite(s): -
Text Book(s):
1. Tyler G. Hicks, Power Plant Evaluation and Design Reference Guide, McGraw Hill, 1986.
2. Sill and Zoner, Steam Turbine Generator Process Control and Diagnostics, Wiley Higher Ed., 1996.
3. Saranavamuttoo et.al, Gas Turbine Theory, 6th Edition, Prentice Hall, 2008.
4. Black and Veath-Power plant engineering , Philips Keameh-Power generation handbook
5. Steam Generators by Babcock Willcock
6. Borman, G.L., and Ragland, K.W., Combustion Engineering, 2nd Edition, McGraw-Hill, Inc. 2011.

ENME803105 – INTERNAL COMBUSTION ENGINE (4 SKS)
Learning Objective(s):
Student is expected to have competency and expertise in the field of his interest of internal combustion engine working principle and theory and is able to design and do construction calculation.
Syllabus:
Actual Cycle of Internal Combustion Engine; Fuel System; Ignition and Combustion in Spark Ignition Engine and Compressed Ignition Engine; Some Basic Characteristics and Calculations; Basic Engine Design; Determination of Engine's Main Components; Kinematics and Dynamics Analysis of the Motion; Calculation and Planning of Lubrication and Cooling System.
Pre-requisite(s): -

Text Book(s):

1. Guzela L, Onder, C., Introduction to Modelling and Control of Internal Combustion Engines, 2nd Edition, Springer, 2014
2. Heywood, J., Internal Combustion Engines Fundamental, McGraw Hill, 2011
3. Taylor, C.F., Internal Combustion Engines, in Theory and Practice, M.I.T Press, England, 1985.
4. Khovakh, M., Motor Vehicle Engines, MIR Publisher, Moscow, 1971.

ENME803106 - APPLIED FLOW MEASUREMENT AND VISUALIZATION (4 SKS)

Learning Objective(s):

Applied flow diagnostic study measurement and visualization techniques which have wide application both in industry and laboratory. The course give basic competency for the student to be bale to understand various measurement and visualization methods and to design appropriate flow diagnostic system in process installation in industry or experimental set up in a scientific research activities which related to fluid flow.

Syllabus :

Statistics Diagnostic Flow, Calibration in Flow Measurement; Momentum Sensing Meter (orifice plate, venturi, nozzle meters); Positive Displacement Flow Meter (Nutating Disc, Sliding Vane, Gear meters, etc.); Electromagnetic and Ultrasonic Flow Meters; Compressible Flow Meter (Wet Gas and Wind Anemometer); Principles Local Velocity Measurement in Liquid and Gases; Hot Wire Anemometry; Based Laser Velocimetry (LDV, PIV); Principles of Flow Visualization, Flow Visualization conventional; Shadowgraphs and Schliern Technique; Interferometry Technique; Light Sheet Based Technique ; Image Processing and Computer Assitested Method.

Pre-requisite(s): -

Text Book(s):

1. Yang ,W.J, Handbook of Flow Visualization, Taylor and Francis. 2001
2. Baker, R.C., Flow Measurement Handbook: Industrial Designs, Operating Principles, Performance and Applications, Cambridge University Press, 2005

ENME803107 - CFD APPLICATIONS (4 SKS)

Learning Objective(s):

Understanding the basic principles of CFD and having the basic knowledge in applying CFD (Computational Fluid Dynamic)

Syllabus:

Prediction-rule Principles, Numerical Solutions: Advantages and Disadvantages; Mathematical Description of Physical Phenomena; Basic Nature of Coordinates; Discretization Method; Volume-set Application on Heat Conduction Problem; Convection and Diffusion; Two-Dimension Discretization Equations; Three-Dimension Discretization Method; Special Procedure Needs; Some of Constraints Associated with the Representation of Pressure-gradient Factors, Continuity Equations Representation; Stayered Grid; SIMPLE Algorithm; Revision of SIMPLER algorithm; Final Solutions: Basic Properties of Iterative Numerical Procedures; Sourceterm Linearization, Irregular Geometries, Preparation and Testing a Computer Programs.

Pre-requisite(s): -

Text Book(s):

1. Suhas V. Patankar, 1980, Numerical Heat Transfer and Fluid Flow, McGraw Hill.
2. C.A.J. Fletcher, 1996, Computational Techniques for Fluid Dynamics, 2nd edition, Springer Verlag
3. A.D. Gosman et al., 1985, COMPUTER AIDED ENGINEERING Heat Transfer dan Fluid Flow, John Wiley & Sons.

ENME803108 - REFRIGERATION ENGINEERING (4 SKS)

Learning Objective(s):

Refrigeration engineering course provides basic competency for the student to be able to do the simulation software to design a cooling system and equipments involved with a very close relationship with the Industrial and engineering users. Hence student will have understanding

in design and development of cooling system and ability to evaluate and analyze its performance, especially on clod storage.

Syllabus:

Principles of Refrigeration and Heat Pump, Terminology and Units; Mechanical Vapor Compression Refrigeration Engine; Heat Trasnfer in Refrigeration System; ph Diagram Calculation in Refrigeration Cycle; Refrigeran, Lubricant, Salt and the Environment; Compressors; Condenser and Evaporator; Refrigeration Piping System and Equipments; Automatic Control System and Safety Equipments; Air Properties; Psychrometric and its process; Absorption Refrigeration; Alternative refrigeration Cycles (adsorption, gas compression, and ejector); Display Case, Prefabricated Cold Storage and Cold Storage, Cold Room Calculations.

Pre-requisite(s): -

Text Book(s):

1. ASHRAE Handbook of Fundamental, ASHRAE Atlanta, 1995.
2. Kuehn, Ramsey and Therkeld, Thermal Environmental Engineering, 3rd Edition, Prentice Hall, 1998.
3. Threkeld,JL., Thermal Environmental Engineering, Prentice Hall.
4. ASHRAE Handbook of Fundamental, ASHRAE Atlanta, 2001
5. ASHRAE Handbook of Refrigeration, ASHRAE, Atlanta, 2002.

ENME803124 – ENERGY AUDIT (4 SKS)

Learning Objective(s):

This course focuses on the theory, techniques and practices of analyzing energy aspects of building operations and correlating a building envelope's interaction with the mechanical systems. Students will perform a detailed energy audit of a state-of-the-art commercial building design using energy modeling simulation software and develop energy conservation strategies, such as thermal stor- age, that can be applied to heating, cooling, and ventilating equipment to reduce utility bills. Students will apply supporting analytical data to develop operations and maintenance changes designed to improve energy efficiency and reduce operating cost.

Syllabus:

Energy Auditing Basics, Energy Accounting and Analysis, Understanding the Utility Bill, Energy Economics, Survey Instrumentation, The Building Envelope Audit, The Electrical System Audit, The Heating, Ventilating and Air-Conditioning Audit, Upgrading HVAC Systems for Energy Efficiency Verification of System Performance, Maintenance and Energy Audits, Self-Evaluation Checklists, World-class Energy Assessmeents, and Water Conservation.

Pre-requisite(s): -

Text Book(s):

1. Albert Thumann, William J. Younger, Terry Niehus, Handbook of Energy Audits, Eighth Edition, The Fairmont Press, 2010.
2. Moncef Krarti, Energy Audit of Building Systems: An Engineering Approach, Second Edition, CRC Press, Taylor & Francis Group, 2010.

ENME803125 – ENERGY AND ENVIROMENT (4 SKS)

Learning Objective(s)::

This course will provides an understanding of the impact of environmental damage caused by the processing and use of energy and the implementation of measures - preventive and remedial measures that are use in modern industrial processes.

Syllabus :

Ecological principles & energy flow, environment concerns of energy extraction, energy use & climate change, environmental and ethic concerns, International treaties & convention on environmental mitigation. Environmental technology and pollution prevention, planning and management of industrial processes in order to prevent potential damage to the environment, Process Safety, energy recovery from waste, sustainable development, combustion and gas

explosions, alternative energy.
Pre-requisite(s): -
Text Book(s):

1. F.M. Vanek, L.D. Albright and L.T. Angenent. Energy Systems Engineering:Evaluation and Implementation, 2nd Edition. Mc. Graw Hill Companies, 2012.
2. Ristinen RA. Kaushaar JJ. Energy and the environment, 2nd edition, john willey& sons, 2006
3. Banerjee BP. Handbook of energy and environment in India, Oxford University Press, 2005, India
4. MC.Dass, fundamentals of ecology, Tata McGraw Hill, 1994
5. Kaushik ND. Kaushik K. Energy, Ecology & Environment, Capital Publishing, 2004
6. De AK. Environmental Chemistry, New Age International Publishers, 2005

ENME803196 – JET PROPULSION AND ROCKET (4 SKS)
Learning Objective(s):
Syllabus :
Text Book(s):

ENME804109 – HEAT AND MASS TRANSFER ENGINEERING (4 SKS)
Learning Objective(s):
The course objective is to provide understanding of the heat exchangers used in many industrial processes and power plants as the application of heat transfer. This course provides a basic competency to know main heat exchanger types and to understand and able to select suitable heat exchanger type for current applications. Student is also expected to understand basic factors in designing heat exchangers, to estimate size and price and know and choose the type of heat exchanger. Provide basic understanding and various parameters on the drying process so that students can perform calculations and analysis of various drying techniques and their applications. This course also provides the expertise so that students are able to do drying modeling, to design and analyze the system for various materials (solid and solvent) so that the drying process can be suitably selected for particular product.
Syllabus:
Heat Transfer Review; Type and Application of Heat Exchangers; Practgical Design of Shell and Tube Heat Exchanger (Thermal and Mechanical); Manufacturing Cost Estimation; Heat Exchangers; Operation and Monitoring of Heat Exchangers (Fouling And Vibration); Maintenance of Heat Exchangers; Corrossion on Heat Eschangers; Heat Exchanger Design Software; Presentation and Laboratory Practice of Heat Exchangers. Review Transfer Phenomena (Momentum, Heat and Mass); Drying Principles and Basics; Mathematical Modeling of Drying System; Classification and Selection of Dryer, Post-Harvest Drying and Storage of Grain; Rotary Drying; Vacuum Drying; Fluidized Bed and Spouted Bed Drying; Drum Dryer; Spray Drying, Freeze Drying; Conveyor Drying; Solar Drying; Enrgy Optimization in Drying System; Drying System Design.
Pre-requisite(s): -
Text Book(s):

1. Frank P Incropere, David P De Witt, Fundamental heat and mass transfer, 7th Ed.,John Wiley & Sons, 2011, New York
2. Holman JP, Heat Transfer, 10th, Mc Graw Hill,2009.
3. Smith Eric, Thermal Design of Heat Exchanger, John Wiley & Sons, 1996, New York
4. Welty R James, Wicks Charless, Wilson Robert, Fundamentals of Momentum, Heat, and Mass Transfer, 6th Ed. John Wiley & Sons, 2014, New York.
5. Cengel, Yunus, Heat Transfer a Practical Approach, 2nd Ed. Mc Graw Hill, 2003,Singapore.
6. Kreith Frank, Bohn Mark, Principles of Heat Transfer, 7th Ed. Brooks/cole, 2010, USA
7. Rohsenow Warren, Hartnett James, Cho Young, Handbooks of Heat Transfer, 3rd Ed., Mc Graw Hill, 1998, New York.

ENME804110 - COMBUSTION ENGINEERING (4 SKS)
Learning Objective(s):
Combustion Engineering provide basic competency to investigate, analyze and learn about the

process of combustion of fuel, and the nature and behavior of flame. The course provides basic understanding to apply the laws of basic aerothermochemistry in the engineering calculation of practical combustion engineering. The student is expected to be able to analyze the combustion behavior of a flame and to develop knowledge in the field of combustion engineering.
Syllabus:
Syllabus: Important Meaning of Combustion Study; Basic Reaction and Stoikhiometry of Combustion; Gas Fuel (BBG); Liquid Fuel, Solid Fuel; Basic Thermochemistry and Fluid Dynamics of Combustion; Principles of Conservation of Mass and Continuity; Turbulence Premixed Flame Structure; Detonation; Combustion Technology; Fixed-Bed Combustion, Suspension, Fluidized-Bed; Study on Flame and Combustion Technology; Minimum Temperature Self-ignition (Auto/Self-Ignition); Flammability Limit; Fire spread, Fire Suppression Material, Combustion and the environment. **Pre-requisite(s):** Basic Chemistry, Basic Thermodynamics, Basic Fluid Mechanic, Heat and Mass Trasnfer.
Pre-requisite(s): -
Text Book(s):

1. Turn, S.R., An Introduction to Combustion, 3rd Edition, McGraw-Hill, Inc. 2011
2. Borman, G.L., and Ragland, K.W., Combustion Engineering, 2nd Edition, McGraw-Hill, Inc. 2011.
3. Griffi ths, J.F., and Barnard, J.A., Flame and Combustion, 3rd Edition, Blackie Academic and Professional, 1995.
4. Glassman, I., Combustion, 5th Edition, Academic Press, 2014.
5. Warnatz, J., Maas, U., and Dibble R.W., Combustion, 2nd Edition, Springer-Verlag, 1998.

ENME804111 - AERODYNAMICS ENGINEERING (4 SKS)
Learning Objective(s):
Aerodynamic Engineering is an advanced course of Fluid Mechanics which focusing on aeronautics applications. Through the course students is expected to be able to understand the fundamental principles and basic equations of aerodynamics and to apply them in the process of airfoil design and to understand performance characteristics of the airfoil. Student is able to understand the phenomenon of incompressible flow through the airfoil and finite wings. Student is expected to be able to have an understanding of subsonic and supersonic compressible flow phenomena through aerofoil and other compressible flow phenomena.
Syllabus:
Introduction on Aerodynamics; Basic and Principle Equations; Incompressible flow; Airfoil Aerodynamics Characteristics; Finite Wings; Incompressible Flow through Airfoil; Incompressible Flow through Finite Wings; Airfoil in Compressible Flow; Wings and Wings-Body Combination in Compressible Flow; Airfoil Design; Double Surface; Vortex Lift; Secondary Flow and Viscous Effect; Other Phenomena in Compressible Flow; Normal Shock Wave; Oblique Shock Wave; Expansion Wave; Supersonic Wave.
Pre-requisite(s): -
Text Book(s):

1. A.M. Kuethe and C.Y. Chow, Foundations of Aerodynamics, 5th Edition, John Wiley & Sons, Inc., 2009.
2. B.W. McCormick, Aerodynamics, Aeronautics, and Flight Mechanics, 6th Edition, John Wiley & Sons,Inc., 2010.
3. J Anderson, Fundamentals of Aerodynamics, 5th Edition, McGraw Hill, 2011.

ENME804112 - TURBOMACHINERY (4 SKS)
Learning Objective(s)
Students understand the different types of construction of gas and steam turbines, and their characteristics and performance, including support equipment.
Syllabus :
Characteristics and types of steam and gas turbines to the generated power output, the calculation of its performance, power improvement, condenser performance, combined cycle plant, system vibrations in turbine construction.
Pre-requisite(s): -

Text Book(s):

1. Thermische Stroomung Machine by Traupel

ENME801113 - VENTILATION AND AIR CONDITIONING SYSTEM (4 SKS)

Learning Objective(s) :

This course provide the understanding and basic competence in design the air conditioning system regarding a better air condition. The student will provided with knowledge about the environmentally friendly regrigerant.

Syllabus :

Basic of Air Conditioning: Air Cooled dan Water Cooled Chiller, Packaged Unit, Direct Expansion and Split Unit; Basic VAC Calculation : Design Condition, Load Estimating, Cooling Load; Sistem Ventilasi : Air Changes, Outdoor Air Requirement, Indoor Air Quality. Clean Space and Air Filter System in industry and hospotal; distribution system: Equal Friction Method and Static Regain, Duct and Piping Sizing; Air Conditioning System Components : Chiller, Cooling Tower, Fan, S and AHU; Control System in Building.

Pre-requisite(s): -

Text Book(s) :

1. Ronald Howell, Harry J.Sauer, Jr and William J.Coad : Principles of HVAC, ASHRAE 1998.
2. Carrier : Handbook of HVAC
3. ASHRAE Standard
4. Overseas Vocational Training Association Employment Promotion Corporation : Fundamentals of refrigeration and Air Conditioning.

ENME801129 – THERMOFLUID AND RADIATION (2 SKS)

Learning Objective(s):

Students are able to understand and implement the knowledge of fluid mechanics and heat transfer convection and radiation to describe and analyze the phenomenon of fire and its effects on the environment.

Syllabus :

This course will discuss the knowledge of thermofluid, the phenomenon of heat transfer by convection and radiation, phenomena of thermofluid and radiation in various forms of combustion such as smoldering, pool fire, gasification, as well as the formation and the occurrence of radiation that turned to achieve ignition.

Pre-requisite(s): -

Text Book(s):

1. Drysdale, D., An Introduction to Fire Dynamics, John Wiley & Sons Ltd, 1985.
2. Munson, B.R., Fundamentals of Fluid Mechanics 4th Ed, John Wiley & Sons, Inc. 2000
3. Frank P Incropere, 1. David P De Witt, Fundamental heat and mass transfer, 5th Ed., John Wiley & Sons, 1996, New York
4. Holman JP, Heat Transfer, 9th, Mc Graw Hill, 2003.
5. Koestoer, RA, Perpindahan Kalor untuk Mahasiswa Teknik, Salemba Teknika, 2003.

ENME801130 – INTRODUCTION TO FIRE DYNAMICS (2 SKS)

Learning Objective(s):

Students understand the basic and important parameters in the process of the fire, the phenomenon of fire dynamics and fire hazards.

Syllabus :

The fundamental laws of aerothermochemistry such as combustion thermodynamics, fluid mechanics, heat transfer, combustion chemical reactions in fire dynamics calculations. Students can perform experimental activities in the lab to understand the dynamics of fire behavior, with the equipment available, such as the phenomenon of flame premixed and non-premixed, ignition, combustion of solid and liquid, forming plumes and smoke production.

Pre-requisite(s): -

Text Book(s):

1. Drysdale, D., An Introduction to Fire Dynamics, John Wiley & Sons Ltd, 1985.
2. James G. Quintiere, Fundamentals of Fire Phenomena, John Wiley & Sons, Ltd ISBN: 0-470-09113-4, 2006
3. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
4. Kuo., K., Principles of Combustion, John Wiley & Sons Ltd, 1986.
5. Turn, S.R., An Introduction to Combustion 2nd Edition, McGraw-Hill, Inc. 2000.

ENME802131– FIRE PROTECTION SYSTEM (2 SKS)
Learning Objective(s):
Students are able to understand the fire protection system both passive and active.
Syllabus :
Compartmentalization of fires, Strategy of passive fire protection, natural ventilation systems for controlling smoke and heat from fire, fire resistant material and installation, integration of automatic fire protection systems for passive fire protection strategies, the design of passive fire protection systems,fire modeling for the design of passive protection system. Physical and chemical phenomena that are relevant to a wide range of hardware and software of a fire protection system such as automatic sprinkler, gaseous agent, foam and powder chemical systems. Installation of fire protection systems according to prevailing standards. Refractory materials and installation.
Pre-requisite(s): -
Text Book(s):

1. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
2. Fire Protection Association, Passive Fire Protection Handbook, 2011
3. Tewarson A, Khan MM (1991) The Role of Active and Passive Fire Protection Techniques in Fire Control,
4. Suppression and Extinguishment. Fire Safety Science 3:1007–1017. doi:10.3801/IAFSS.FSS.3-1007
5. Jurnal dan standar terkait

ENME804118 – BUILDING MECHANICAL AND ELECTRICAL SYSTEM (4 SKS)
Learning Objective(s):
The course's objective is to deliver knowledge, skills and understanding of the mechanical and electrical systems in a modern building that has been increasing in its requirements in terms of sophistication, efficiency, and low energy use.
Syllabus:
General Building Mechanical System, Plumbing System: SNI, Calculation, Waste Water Management, Building Energy System; Building Automation System; Lift and Escalator: Types, Round Trip Time, Handling Capacity, Waiting Time, Installation and Control System; Escalator Types, Application and Installation, Building Automation System,
Pre-requisite(s): -
Text Book(s):

1. Stein, Benjamin, Reynolds, John S., Grondzik, Walter T., Kwok, Alison G., "Mechanical and Electrical Equipment for Building", John Wiley and Sons, 2006.
2. Gina Barney, "Elevator Traffic Handbook, Theory and Practice", Spon Press, 2003.
3. The American Society of Mechanical Engineers, (ANSI A.17.1-2000), "American National Standard Safety Code for Elevator, Dumbwaiters, Escalators and Moving Walks", ANSI A.17.1-1971

ENME801121 – ENERGY MANAGEMENT SYSTEM (4 SKS)
Learning Objective(s):
Students are able to understand the concept, analysis and strategy of continuous improvement of energy performance by implementing effective energy management practices and energy processes in accordance with the standards and rules of both local and international as well as the use of associated technical equipment.
Syllabus :
Introduction, Energy Policy, Energy Plan, Implementation and operation of energy management systems, Energy Management Organizational Preparation, planning, implementation

and evaluation of Energy Management, Energy Management Review, software on an energy management system, case studies

Pre-requisite(s): -

Text Book(s):

1. Energy management handbook / by Wayne C. Turner & Steve Doty ©2007 by The Fairmont Press, Inc
2. Guide to energy management by Barney L. Capehart, Wayne C. Turner, William J. Kennedy--Fifth Edition--International Version ©2008 by The Fairmont Press.
3. Effective implementation of an ISO 50001 energy management system (EnMS) / Marvin T. Howell.American Society for Quality, Quality Press, Milwaukee 53203 © 2014

ENME803133 – ASSIGNMENT OF BUILDING UTILITY SYSTEM DESIGN (4 SKS)

Learning Objective(s):

Students are able to use and apply the concept of utility system design of the building that includes a ventilation system and HVAC, plumbing, fire protection, and sewage treatment.

Syllabus :

The course consists of the task of designing a system utility story buildings.

Pre-requisite(s): -

Text Book(s):

1. Stein, Benjamin, Reynolds, John S., Grondzik, Walter T., Kwok, Alison G., "Mechanical and Electrical Equipment for Building", John Wiley and Sons, 2006.
2. Gina Barney, "Elevator Traffic Handbook, Theory and Practice", Spon Press, 2003.
3. The American Society of Mechanical Engineers, (ANSI A.17.1-2000), "American National Standard Safety Code for Elevator, Dumbwaiters, Escalators and Moving Walks", ANSI A.17.1-1971

ENME803134 – ENCLOSURE FIRE DYNAMICS AND MODELLING (4 SKS)

Learning Objective(s):

Sudents understand the various stages of fires and provide basic knowledge methods and techniques applied in the analysis of fire development, and develop students' ability to critically analyze the methods of practical application. This course also aims to improve the ability to understand and analyze the fires model.

Syllabus:

Introduction to the process of combustion, premixed flame and diffusion flame, ignition and spread of fire, classification of fires and the influence of the geometry of the room. Calorimetry fire: heat release rate, mass loss rate and the relationship between time and heat release rate, the growth of fire in the room, as well as testing methods. The dynamics of the flame: fire plume and flame (flame), a high flame, the flame height correlation.

Pre-requisite(s): -

Text Book(s):

1. Dougal Dysdale, An Introduction to Fire Dynamics, 3rd Edition, John Wiley and Sons, 2011.
2. James G. Quintiere, Fundamentals of Fire Phenomena, John Wiley & Sons, Ltd ISBN: 0-470-09113-4, 2006
3. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
4. Thierry POINSOT, Denis VEYNANTE, Theoretical and Numerical Combustion.
5. Jurnal dan standar terkait.

ENME803115 – CLEAN ROOM (4 SKS)

Learning Objective(s):

Provide an understanding of the basic knowledge of clean room systems and its application in buildings, hospital and pharmaceutical industries. Understanding of the concept of air cleanliness, ventilation and fresh air exchange, application of laminar flow, the air pressure in the chamber and measuring systems, validation and its control.

Syllabus:

Indoor environment: human psychological and physiological aspects, BEAM IAQ assessment; Air quality: air cleanliness, ambient air quality, rationale for standards; Indoor air pollutants:

gaseous pollutants, airborne particulate, VOCs, radon, biological contaminants; Indoor air movement: air flow in confined and unconfined spaces, filtration systems; Instrumentation and measurement techniques; Control measures: improved IAQ by HVAC system design, removal of contaminants.

Pre-requisite(s): -

Text Book(s):

1. ASHRAE : HVAC Design Manual for Hospitals and Clinics Second Edition, 2013
2. W. Whyte, Clean Room Technology Fundamentals of Design, Testing and Operation, John Wiley & Sons Ltd., 2001
3. John D. Spengler, J.M.Samet, J.F McCarthy, Indoor Air Quality Handbook, McGrawHIll, 2001.

ENME803116 - PLUMBING AND WASTE WATER TREATMENT SYSTEM (4 SKS)

Learning Objective(s):

This course will study the specialization expertise and understanding of the system plumbing systems found on modern buildings which are increasing demands in terms of sophistication, efficiency, and use of more energy-efficient.

Syllabus :

Plumbing system in general, the calculation of water needs and hot water, water tanks, plumbing equipment unit, pumps, water hammer application, wastewater treatment systems. Will be given an understanding of the plumbing system of clean water for many multi-storey buildings and sewerage system and the filth and the effects of the foam pressure.

Pre-requisite(s): -

Text Book(s):

1. Soufyan M. Noerbambang, Takeo Morimura, “Perancangan dan Pemeliharaan Sistem Plambing”, Pradnya Paramita, 2009.
2. Louis S.Nielsen, “Standard Plumbing Engineering Design”, McGraw-Hill, 1982,
3. IPC, “International Plumbing Code”, International Code Council, 2009.
4. ASPE, “Plumbing Engineering Design Handbook- Volume 1 & 2”, ASPE, 2004.
5. B.B. Sharp & D.B Sharp, “Water Hammer – Practical Solutions”, Butterworth Heinemann, 2003.
6. Metcalf & Eddy, “Wastewater Engineering – Treatment and Reuse”, McGraw-Hill Co.,2003.
7. Shun Dar Lin, “Water and Wastewater Calculation Manual”, McGraw-Hill, 2007.
8. Michael Frankel, CPD, “Facility Piping Systems Handbook - For Industrial, Commercial, and Healthcare Facilities”, McGraw-Hill, 2010.
9. 2012 Uniform Plumbing Code, IIAPMO 2012

ENME803117 - BUILDING ENVIRONMENT ASSESSMENT (4 SKS)

Learning Objective(s):

Students are provided with an understanding to increase the awareness of environmental issues and the impact of buildings on the environment and be able to evaluate the ability of new and existing buildings to meet a wide range of environmental performance criteria.

Syllabus :

Global issues: electrical loading and equivalent CO2 production, ozone depletion and global warming, abusive use of natural resources; Local issues: demand of electricity, use of water, wastewater discharge, recycled material, local environmental impact; Building environmental assessment methods; Assessment of energy use; Energy audit; Indoor issues: indoor environmental quality factors, current legislation and standards; Pollutants in buildings; Indoor air quality; Health and safety; Safety audit; Health audit.

Pre-requisite(s): -

Text Book(s):

1. Energy-Efficient Building Systems Green Strategies for Operation and Maintenance, Dr. Lal Jayamaha, McGraw-Hill, 2006.
2. Bradon, S.P., and Lombardi, P., (2005) Evaluating Sustainable Development in the Built Environment, Blackwell Science Ltd., Oxford.

3. An Environmental Assessment for Existing Building Developments. Version 5/03, May 2003
4. An Environmental Assessment for New Building Developments. Version 4/03, May 2003
5. Energy audit of building systems : An engineering approach, Moncef Krarti, 2nd edition,CRC Press Taylor & Francis Group, 2011

ENME803135 – FIRE FIGHTING ENGINEERING AND STRATEGY (4 SKS)
Learning Objective(s):
This course will provide scientific and practical knowledge on all aspects of the techniques and strategies to effectively extinguish the fire source.
Syllabus :
Forcible Entry, Fire Extinguishing Technique (covers the types of extinguishing material), Fire Fighting of High Rise Building, Safe Work at Heights, Compartment Fires and Tactical Ventilation and Fire Communication and Mobilization Officer.
Pre-requisite(s): -
Text Book(s):
1. Delmar Cengage Learning, Firefighter's Handbook: Essentials of Firefighting and Emergency Response 2nd edition, ISBN-13: 978-1401835750, Delmar Thomson Learning, 2004
2. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
3. Jurnal dan standar terkait

ENME803136 – FIRE SAFETY MANAGEMENT IN BUILDING (4 SKS)
Learning Objective(s):
This course will provide scientific knowledge concerning all aspects of Safety Management in Buildings.
Syllabus :
Fire Safety Management, Fire Hazard Identification, Making Plans Activity, Organizational Structure and Development of Human Resources, and Fire Control and Prevention in the building.
Pre-requisite(s): -
Text Book(s):
1. Daniel E. Della-Giustina, Fire Safety Management Handbook, CRC Press, 2014
2. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
3. Jurnal dan standar terkait

ENME804118 – MECHANICAL SYSTEM FOR BUILDING (4 SKS)
Learning Objective(s):
These courses provide students a basic understanding and competency building mechanical system design that includes a ventilation system and HVAC, plumbing, fire protection, and sewage treatment.
Syllabus :
The course consists of the task of designing a buildings utility system.
Pre-requisite(s): -
Text Book(s):
1. Stein, Benjamin, Reynolds, John S., Grondzik, Walter T., Kwok, Alison G., "Mechanical and Electrical Equipment for Building", John Wiley and Sons, 2006.
2. Gina Barney, "Elevator Traffic Handbook, Theory and Practice", Spon Press, 2003.
3. The American Society of Mechanical Engineers, (ANSI A.17.1-2000), "American National Standard Safety Code for Elevator, Dumbwaiters, Escalators and Moving Walks", ANSI A.17.1-1971

ENME804119 – ACOUSTIC (4 SKS)
Learning Objective(s):
Provide a basic understanding of the concept of acoustic, acoustic systems in buildings as well as the concept of controlling the propagation of sound in the ventilation system and ventilation.
Syllabus :

Acoustic fundamentals: fundamental properties of sound and waves, sound propagation and transmission inside buildings and in air ducts; Acoustic design and planning: requirements for auditoria, lecture theatres, plant rooms and etc., directional and spacial impression, reverberation, echo, silencers, active noise control; Environment impact and local legislation; Vibration: acoustically driven vibration, control and transmission; Problem investigations: noise and vibration measurement, data analysis techniques, software packages.

Pre-requisite(s): -

Text Book(s):

1. Acoustic Noise Measurement. J. R. Hassall (1979).
2. An Environmental Assessment for Existing Office Buildings. BRE (1993).
3. CIBSE Guide B12 Sound Control (1976).
4. Concert Halls and Theatres: How they sound. L. L. Beranek (1996).
5. Engineering Principles of Acoustics. D. D. Reynolds (1981).
6. Fundamentals of Acoustics. L. E. Kinsler, A. R. Frey, A. B. Coppens and J. V. Sanders (1982).
7. Handbook of Acoustics, M.J. Crocker, Wiley (1998).
8. ASHRAE HVAC System and Equioment, ASHRAE Atlanta, 2012
9. Noise Control in Building Services. A. Fry (1988).

ENME804120 – MAINTENANCE MANAGEMENT OF BUILDING UTILITY (4 SKS)

Learning Objective(s):

After following this course, students will understand the strategic role of maintenance of buildings based on the need for maintenance management of assets built that includes a needs assessment, planning and prioritizing, budgeting and adequate information systems.

Syllabus :

Introduction, Scoping of Maintenance Function and Demand in Buildings, Essentials of Built Assets Maintenance Management, Assignment: Contemporary Issues in Asset Maintenance Management, Seminars/workshops

Pre-requisite(s): -

Text Book(s):

1. Armstrong, J. & Saville, A. (2005). Managing your building services, The Chartered Institution ofBuilding Services Engineers, London.
2. Harris, J. & Hastings, P. (2004). Business-focussed maintenance, BSRIA Publications.
3. Canter, B. & Swallow P. (1996). Building Maintenance Management, Blackwell Science. (ISBN: 0-632-03419-X)
4. Wood, B. (2003). Building Care. Blackwell Publishing. UK. (ISBN 0-632-06049-2)
5. Wordsworth, P. (2001). Lee's Building Maintenance Management, 4th Ed., Blackwell Science, UK.(ISBN 0-632-05362-3)
6. Building Services Handbook, Sixth edition, Fred Hall and Roger Greeno, Butterworth-Heinemann, 2011
7. ASHRAE Guideline 0-2005, The Commissioning Process

ENME804137 – FIRE INVESTIGATION ENGINEERING (4 SKS)

Learning Objective(s):

This course will provide an understanding and scientific knowledge of fire investigation within the scope of the legislature regarding fire safety regulations.

Syllabus :

Compartment Fires, Flame Spread, Forensic Science, Laboratory Analytical Techniques, Modelling for helping the investigation, and case studies on fire.

Pre-requisite(s): -

Text Book(s):

1. Drysdale, D., An Introduction to Fire Dynamics, John Wiley & Sons Ltd, 1985.
2. James G. Quintiere, Fundamentals of Fire Phenomena, John Wiley & Sons, Ltd ISBN: 0-470-09113-4, 2006
3. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
4. Jurnal dan standar terkait

ENME804138 – EVALUATION AND MAINTENANCE OF FIRE PROTECTION SYSTEM (4 SKS)
Learning Objective(s):
Students can evaluate the performance of the fire protection system and to know and be able to plan maintenance of fire protection systems.
Syllabus :
This course will provide engineering evaluation of the performance of fire protection systems are used in various types of buildings and engineering preparation of a management plan for decision-making. Fire protection systems will be elaborated into elements that can be evaluated quantitatively using various types of fire studies.
Pre-requisite(s):-
Text Book(s):
1. Dougal Dysdale, An Introduction to Fire Dynamics 3rd Edition, John Wiley and Sons, 2011.
2. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
3. Rasbach, D.J., et al., Evaluation of Fire Safety, John Wiley and Sons, 2004.
4. A.H. Buchanan, Fire Engineering Design Guide, New Zealand, 2001.
5. SNI, ASTM, NFPA, rules and standards

ENME804139 – FIRE PROTECTION IN PROCESS INDUSTRY (4 SKS)
Learning Objective(s):
This course will provide an understanding and scientific knowledge of fire protection systems in the process industry.
Syllabus :
Fire Hazard identification on Industry, Standard and applicable Law, Fire Protection in Industrial Processes, Evacuation Planning and Mitigation, and Modeling for Fire Hazard Prediction in Process Industries.
Pre-requisite(s): -
Text Book(s):
1. A.H. Buchanan, Fire Engineering Design Guide, New Zealand, 2001.
2. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
3. Jurnal dan standar terkait

ENME801140 – MATERIAL AND MANUFACTURING PROCESSES (4 SKS)
Learning Objective(s):
The course provides understanding and basic competence of theory, application method and product manufacturing processes that covers: working principle, process characteristics, process limitations, work and force due to the process, parameters that affects to the process and the relation of material with the process that needed for certain process.
Syllabus :
Manufacturing Process and Production Systems; Materials in Manufacturing; Theory and Method of Casting Processes; Theory and Method of Bulk Deformation Processes; Theory and Method of Metal Forming Processes; Theory and Method of Powder Metalurgy Processes; Theory and Method of Material Machining/ Cutting Processes; Theory and Method for Enhancing Manufactured Surface Quality; Theory and Method of Joining Processes; Theory and Method of Prototyping; Engineering Material Characteristics; The Relation between Process Characteristics and Material Characteristics; The Parameter Control of Process for Material; Assignment in Manufacturing Process and Material Selection for Market Needs.
Pre-requisite(s): -
Text Book(s):
1. Michael Ashby dan Kara Jhonson, Materials and Design : Arts and science in material selection in product design,Butterowrth-Heinemann, 2002
2. Michael Ashby, Material selection in Mechanical Design, Butterworrth Heinneman,2005
3. John A. Schey, Introduction to Manufacturing Processes, McGraw-Hill, 1999
4. Degarmo, E. Paul, Materials and Processes in Manufacturing, Prentice Hall Int. Inc, 8th edition, 2005

ENME801141 – PRODUCT DESIGN AND DEVELOPMENT METHODOLOGY (4 SKS)
Learning Objective(s):
Provide an understanding and mastery of the theory and methodology of design and product development include: planning, concept development, system design, detailed design, testing and screening, production ramp-up, in a series of factors to consider overall product development.
Syllabus :
Product Planning: Needs Identification Methods; Product Selection Method (Feasibility Study); Business Specifications: Concept Development and Selection; Aspects of Engineering in Product Development and Manufacturing (Process, Material, Thermal, Durability) Non- Technical Aspects in Product Development and Manufacturing; basic Design for Manufacturing and Assembly; Calculation of Economics of Product Development.
Pre-requisite(s): -
Text Book(s):
1. Karl T.Ulrich. Product Design and Development, 3rd edition, Mc.Graw Hill 2004.
2. Dieter, G.E., Engineering Design, 3rdedition, Mc.Graw Hill 2000

ENME802142 – DESIGNING AND MANUFACTURING TECHNOLOGY INTEGRATION (4 SKS)
Learning Objective(s):
Provide an understanding of competence and capability in designing and manufacturing process by utilizing peracangan / includes latest design and manufacturing system CAD / CAM and reverse engineering and prototype development to improve efficiency and accelerate the production process, reduce errors, improve quality and reduce production costs.
Syllabus :
System Overview of CAD / CAM; Hardware & Software Systems CAD / CAM: Geometric Modelling: Type a mathematical representation of the model curve, surface and solid 3D modeling methods and manipulation of 3D models; exchange of data within and between sistem-CAD/ CAM; CAD Laboratory Activity; Technology CNC; Tool Path Generation Method-CAM systems; Control 'quality of machining' (machined surface quality) in the system-CAM: Computer-Aided Process Planning CAPP; postprocessing; Practice CAM: 3D geometry measurements, principles and measurement based Coordinate Measuring Machine (CMM), the method of filtration data, the identification of boundary features, modeling and manipulation of point-based 3D models, 3D models for the modularization of the prototype, prototype and rapidprototyping method, discretization model, principles and application of SLS and SLM.
Pre-requisite(s): -
Text Book(s):
1. Kunwoo Lee, *Principles of CAD / CAM / CAE*, Prentice Hall, 2003
2. Gandjar K, *Hand out CAD/ CAM*, DTMUI, 2007
3. Connie L. Doston, *Fundamentals of Dimensional Metrology,* Delmar Learning, 2006
4. Ali K. Kamrani. Emad A Nasr, *Rapid Prototyping : Theory And Practice,* Birkhauser, 2006
5. Patri K. Venivinod, Weyin Ma, *Rapid Prototyping : Laser Based and Other Technologies,* 2003.

ENME803143 - MECHANICAL FAILURE (4 SKS)
Learning Objective(s):
This course provides an understanding and competence about principles and modes of mechanical failure may occur and should be avoided so that should be considered in the design of mechanical, including buckling, Corrosion, fatigue, creep, melting, fracture, thermal, and wear.
Syllabus:
Theory and Buckling Mode (Torsional-lateral, Plastic, Dynamic), Theory and Corrosion mode (Metal, Non-Metal, Glass); Corrosion Prevention; Theory and Fatigue Failure Mode; Theory and creep mode; Theory and Melting Mode; Theory and Type of Fracture mode, Theory and the thermal failure mode; Theory and Wear mode; Failure Analysis and Prevention to: Buckling, Corrosion, Fatigue, creep, Melting, Fracture, Thermal, and Wear
Pre-requisite(s): -
Text Book(s):

1. Jack A Collins, Materials Failure in Mechanical Design, Wiley - Interscience, 1993
2. S. Suresh, Fatigue of Materials, Cambridge University Press, 1998
3. M Jansenn, J. Zuidema, Fracture Mechanics, VSSD, 2006
4. Arthur J. McEvily, Metal Failures : Mechanisms, Analysis and Prevention, 2013

ENME803144 – DYNAMICS OF MECHANICAL SYSTEM (4 SKS)
Learning Objective(s):
Provide an understanding and competence in the principles and methods of dynamic analysis of mechanical systems as an important input in the design process to produce a mechanical system that has a better dynamic resistance and also know the effects they impose on other systems that interact.
Syllabus :
Kinematic Systems: Theory and Principles of Dynamic Systems: Dynamic Modeling Method: Block Diagrams and State-Variable Model: Analysis on Time-Domain System: Analysis of the Frequency-Domain System; Vibration; Stability: Dynamic Balance: Dynamic Analysis of Mechanical Components; Modeling and Analysis control system.
Pre-requisite(s): -
Text Book(s):
1. Palm, Modelling, Analysis, and Controlof Dynamic Systems, Wiley, 2006
2. Harold Joseph dan Ronald Huston, Dynamicof Mechanical System, CRC, 2002
3. Palm, System Dynamics, McGraw-Hill,2007
4. Chapman, Stephen J., Essentials of Matlab Programming, Thomson Nelson, 2006

ENME803145 - COMPOSITE PRODUCT DEVELOPMENT (4 SKS)
Learning Objective(s):
Provide expertise and competence to students in the field of designing and manufacturing of parts / mechanical construction using composite materials. This course provides an understanding of composite materials, including the characteristics, testing, manufacturing process, and special applications in the engineering field.
Syllabus:
Composite Type, Material, Properties, Mechanics; Knowledge and Characteristics of Fiber Composite, Strength, Hardness, and the composite thermal expansion; Theory of Combination Fiber and Matrix; Matrix Composite Characterization; Laminar Theory On Axis and Off Axis; Composite Product Design, Composite Fabrication Technique ; Testing Method; Future Applications.
Pre-requisite(s): -
Text Book(s):
1. Brent Strong, Fundamentals Of Composites Manufacturing: Materials, Methods and Applications - Technology & Engineering – 2007
2. By Daniel Gay, Suong V . Hoa, Stephen W. TsaiTranslated by Stephen W Tsai Contributor Suong V. Hoa, Stephen W. Tsai, Composite materials: Design and application, 2nd : CRC Press 2007
3. Soemardi,T.P. Diktat Mekanika komposit, Fabrikasi dan Testing. FTUI.2003.
4. Composites ASM handbook No 21

ENME803146 – FINITE ELEMENT AND MULTIPHYSICS (4 SKS)
Learning Objective(s):
Provide a basic understanding and skills regarding the principles of modeling, solution techniques such as 'finite element method' and its application in cases of design and engineering analysis. The models studied included physical aspects of the problem in Thermal, elasticity

(plates and shells), acoustic, and electromagnetic.

Syllabus :

The introduction of FEA (Finite Element Analysis); Fundamental FEA I (basic concepts and formulations FEA FEA) FEA Fundamentals II (failure modes, Dynamic Analysis, FEA Capabilities and limitations); Basic Finite Element Modeling: Modeling CAD for FEA; Building a Finite Element Model: Model simulation and interpretation of results; Thermal-Structural; Pressure-Structural; Electromagnetic-Thermal- Structural; Analysis of Thermal Actuator; Coating process: Key elements of Successful Implementation of Technology multiphysics; Introduction to CFD and Its Application.

Pre-requisite(s): -

Text Book(s):

1. William B J Zimmerman, Multiphysics Modeling with Finite Element Methods, World Scientific Publishing, 2006
2. Barry H V Topping, A. Bittner, Engineering Computational Technology, Civil Comp Press, Edinburgh, UK, 2002.
3. Indra Siswantara, Catatan Kuliah Teknologi Multihysics, 2008

ENME803147 - TOY PRODUCTION DESIGN (4 SKS)

Learning Objective(s):

Understanding the basics and design development of educational products in the industry props, product education, and game props.

Syllabus:

Brainstorming and express the ideas and opinions, Innovation and Development Themes, Basics of Toy Product Design, Basic Design Engineering and Mechanical, Basic Theory Make Sketch, Process Modeling Sketch Image, Design Aesthetics, Theory of Manufacturing and Selection of Materials for Viewer tool Games, Basic Theory Creation prototype, Portfolio Design, Presentation and Pitching Idea.

Pre-requisite(s): -

Text Book(s):

1. Karl Urlich, Steven Eppinger, 2015, Product Design Development Flow, 6th Edition, McGraw Hill.
2. Donald A. Norman, 2005, Emotional Design, 1st Edition, Basic Books.
3. Michael Michalko, 2006, Thinkertoys : A Hanbook of Creative Thinking Techniques, 2nd Edition, Ten Speed Press.

ENME803161 – MICROFABRICATION AND PRECISION MANUFACTURING (4 SKS)

Learning Objective(s):

In this course provides expertise of micro manufacturing process widely used in the making of MEMS (micro Electro mechanical system) at this time that has wide application of the biomedic system, sensors and micro-electronic devices (electronic devices). This course giving understanding of manufacturing techniques and basic structure mechanics in a product and also the micro-characterization of the process fabrication conducted in the laboratory. This course provides a basic competency of the principles in the design techniques which control the movement of the size or dimensions in a very small if compared with the size of the object that is designed and produced the correct design and the development machine and a precision mechanism

Syllabus:

Introduction to Engineering Micro Fabrication; Lithography: The design aspect, masks making, etching technique (And Wet Etching Dry Etching); Deposisi Engineering: Chemistry and Chemicals; Electroplating, Micromolding, Beam Processing; Microscaling consideration); Transport Processes and Metrology in the micro-scope; Lab Practice and Applications, Philosophy Precision Manufacturing; kinematic concept; Pro and contra Flexures Design; Materials for Precision Components; Self Calibration Concept; Manufacturing Process which is Important in Precision Manufacturing, Precision Instruments; Basic Concept of Tolerance on Dimensions and geometric.

Pre-requisite(s): Basic mechanical design, Mechatronics, Design assignment, : Metrology and Measurement, Engineering Materials, Manufacturing Process and Materials Selection

Pre-requisite(s): -

Text Book(s):

1. Madou, M.J. Fundamentals of microfabrication: the science of miniaturization, CRC Press, 2002.
2. McGeough, J (Ed.), Micromachining of Engineering Materials, Marcel Dekker, 2002, ISBN 0-8247-0644-7
3. Mainsah, E., Greenwood J.A. and Chetwynd D.G. Metrology and properties of engineering surfaces, Kluwer Academic Publ., 2010
4. Gardner J.W. and Hingle H.T. (Ed.) From Instrumentation to Nanotechnology, Gordon and Breach Science Publishers, 1991, ISBN 2-88124-794-.
5. Korvink J.G. and Greiner A. Semiconductors for Micro- and Nanotechnology – An Introduction for Engineers, WILEY-VCH Verlag GmbH, 2002, ISBN 3-527-30257-3.
6. Mark J. Jackson, Microfabrication and nanomanufacturing. Taylor and Francis, 2006

ENME804148 - DESIGN FOR MANUFACTURE AND ASSEMBLY (4 SKS)

Learning Objective(s):

Provide knowledge, understanding and competence in the product design process which is considering, including factor and oriented on: material, manufacturing capability and assembling process. Therefore the product is expected to have made ease of manufacture and assembly.

Syllabus:

Review of the materials selection and processes, product design for manual assembly, design for automated assembly, PCB design for manufacture and assembly, machining process design, injection molding, sheet metal forming processes, die-casting.

Pre-requisite(s): -

Text Book(s):

Boothroyd, Product Design for Manufacture and Assembly 3rd Ed, CRC Press, 2010

ENME804149 – NOISE AND VIBRATION (4 SKS)

Learning Objective(s) :

This course provides competency to students to complete the issue of application of vibration on the mechanical structure of the construction, and plate or vessel (vessel), perform the calculation of vibration reducer system design, system and engine holder enhancing of production equipment. Finally students have to make basic vibration measurements; forecasts predicted the damage engine, the vibration analysis of the data signal and the vibration spectrum and carry out machine performance diagnosis based on data analysis of vibration data and other data related

Syllabus :

Mechanical vibration with Many Degrees Freedom; Vibration on the Structure Construction; Vibration on plate and body shell (Vibration Plate and Shell); Vibration Isolation; Designing Vibration Absorber; Engineering Vibration Measurement; Vibration spectrum analysis; Performance Diagnostic Machine.

Pre-requisite(s): -

Text Book(s) :

1. Jerry H.G., “Mechanical and Structural Vibrations”, John Wiley, 2004
2. Demeter G.F., “Mechanical and Structural Vibrations”, John Wiley, 1995
3. Kenneth G.M., “Vibration Testing: Theory and practice 2nd ed”, Wiley, 2008
4. Werner Soedel, “Vibrations of Shells and Plates”, 3rd edition – revised and expanded, Marcel Dekker, INC., 2004

5. Randall R.B., "Frequency Analysis", Brüel & Kjær, 1987

6. Jens T.B., "Mechanical Vibration and Shock Measurement", Brüel & Kjær, 1980

ENME804162 – LASER ASSISTED PROCESS (4 SKS)
Learning Objective(s):
Students are expected to understand knowledges related to fabrication process assisted by laser, and its direct application
Mahasiswa dapat memahami ilmu yang terkait dengan proses fabrikasi yang dibantu dengan teknologi laser, dan aplikasi serta penerapan langsung dari proses fabrikasi yang dibantu oleh teknologi laser.
Syllabus :
Dasar – Dasar Teknologi Manufaktur berbasis Laser; Proses Pembentukan dibantu Laser; proses *joining* dengan dibantu teknologi laser; *Laser Assisted Surface Engineering;*Jenis-Jenis Laser, Penerapan Teknologi Laser, Dasar- Dasar interaksi laser dengan material dan Klasifikasi Proses Material dengan Teknologi Laser.
Pre-requisite(s): -
Text Book(s):
1. A.M. Hasofer, V.R. Beck, I.D. Bennetts, Risk Analysis in Building Fire Safety Engineering, Elsevier Butterworth-Heinemann, 2007.
2. Ralph W King and John Magid, Industrial Hazard and Safety Handbook, ISBN: 978-0-408-00304-9
3. SFPE Handbook of Fire Protection Engineering 5th edition, Springer, 2016
4. Jurnal dan standar terkait

ENME801150 – MANUFACTURING INFORMATION SYSTEM MANAGEMENT (4 SKS)
Learning Objective(s):
Provides understanding of the theory, method and application of information technology systems, management, and development of the concept of knowledge-based information systems (Knowledge Management System) and capable to apply in the manufacturing industry.
Syllabus :
Introduction to Information Systems; State of The Art Utilization Information System; Theory and System Methodology; Database Management Systems; System Design I: Overview functionality, enabling Technology (Automated Solution Assessments Quality, Multi Data Representation, Database Technology and XML); Design System II: (Database Design, Information Input, Output Information); Case Study: Documentation automation and Reporting System for Manufacturing; Introduction Knowledge Base Engineering, Concepts and Methodology in the KBE (System Specialists, Neural Network); KBE application..
Pre-requisite(s): -
Text Book(s):
1. Raymond McLeod Jr., *Strategic information Management : Challenges and Strategies in Managing Information System;* 3rd Edition, Butterworth-Heinnemen, 2003.
2. Cortada, James. *Total Quality Management,* McGraw Hill Book Co.
3. Ake, Kevin et al. *Information Technology for Manufacturing : Reducing Costs and Expanding Capabilities,* CRC Press, 2003.
4. Cecelja, Franco, *Manufacturing Information and Data System : Analysis Design and Practice,* Butterworth-Heinnemen, 2001.

ENME801151– MANUFACTURING SYSTEM AND PROCESSES (4 SKS)
Learning Objective(s):
Students are expected to know and be able to apply the conventional manufacturing process technology and non-conventional for the manufacture of a product and the parameters which inflence it are devoted to the metal forming processes, machining, rapid prototyping process. In addition, knowing, and understanding the existing production systems in the industry.
Syllabus :
Materials in Manufacturing: Theory and Method of Casting Process (Metal Casting); Theory and

Method of Bulk Formation Processes: Theory and Method of Formation Process Material Sheet (Sheet Metal Forming): Theory and Methods of Powder Metallurgy Process (Powder Metalurgy); Theory and Methods for Machining Processes / Cutting Materials: Theory and Methods of Product Surface Quality Improvement process: Concepts and methods of manufacturing systems.
Pre-requisite(s): -
Text Book(s):

1. Wagoner R., Chenot J.-L, *Fundamentals of Metal Forming*, John Wiley & Sons, Inc,2003
2. Degarmo P., *Materials and Process in Manufacturing*, Prentice Hall, 2004
3. Schey J., *Introduction to Manufacturing Process*, McGraw-Hill, 2004
4. Thomas E Vollman, *Manufacturing Planning and Control*, McGraw Hill 1997
5. Stanley B. Gershwin, *Manufacturing System Engineering*, Prentice Hall, 1993
6. John M. Nicholas, *Competitive Manufacturing Management*, 1997

ENME802152 - AUTOMATION AND ROBOTICS (4 SKS)
Learning Objective(s):
Automation and Robotics course discusses technology and application in the automation industry and the design and control the robot emphasizes: understanding the types of automation systems, particularly in the manufacturing industry and the mechanism, the design and development of automation system that emphasizes the 3 things: reliability, quality and cost and the understanding robot control system. Automation and Robotics Lectures given with the aim that students have an understanding in the implementation of technology Automation and Robotics, especially in the manufacturing industry.
Syllabus:
Automation System; Classification Type Manufacturing Automation machinery; Actuator; Sensor System; PLC Control System in the Manufacturing Automation machinery; Robot- cs: Definitions and Principles of Robot; Spatial Descriptions: Definitions and Principles, Methods and Applications Spatial descriptions; Forward Kinematics: Definition, Principles and The Forward Kinematics; Jacobians: Speed, explicit shape, definition and principle of inverse Kinematics; Dynamic: The form of explicit, Acceleration and inertia; Control system ronbotic: PID control, the Joint Space Control, Operational Control and Space Force Control; Robot Design Assignment.
Pre-requisite(s): -
Text Book(s):

1. Craig J., Introduction to Robotics 3rd ed, Prentice Hall, 2004.
2. Heath L., Fundamentals of Robotics, Theory and Applications, Prentice Hall, 1985.
3. Koren Y., Robotics for Engineer, McGraw Hill, Intl Edition, 1985.
4. Lentz K. W. Jr., Design of Automatic Machinery, Van Nostrand Reinhold, 1985.
5. Schilling R. J., Mikell P., Fundamentals of Robotics, Analysis and Control, Prentice Hall, 2000.
6. Kiswanto G., Otomasi dan Robotika, Diktat Kuliah Departemen Teknik Mesin, 2004.

ENME803153 - MACHINE VISION SYSTEM (4 SKS)
Learning Objective(s):
Machine Vision Industry Subjects provides the understanding and competency of the principles, methods and applications monitoring the production process by using visual-based camera technology, image processing, for the purpose of introducing the feature: product identification, selection and product screening, and quality control. With the completion of this course, students have the ability to apply and develop the visual method of monitoring the production process in the industry for the purpose.
Syllabus:
Basic Machine Vision Method: Binary Image, Binary Morphology and Gray-Scale, Texture analysis; Identification Method feature; image Processing Method Smart / Intelligent, Image Processing

System (Prolog); Control Equipment / Instruments Interface (Instruments, Signal, Protocol, PLC) ; Method Introduction Color image; Machine Vision Applications.
Pre-requisite(s): -
Text Book(s):

1. J.R. Parker, Algorithms for Image Processing and Computer Vision 2nd ed, Wiley, 2010
2. Butchelor B. G., Whelan P. F.,Intelligent Vision System for Industry, Springer, 2012
3. E.R. Davies, Machine Vision : Theory, Algorithm, Practicalities, Morgan Kauffman, 2004
4. Micheul S, Lawrence O'Gorman, Michael J S Practical Algorithms for Image Analysis : Description, Examples and Code, , Cambride Univ. Press, 2000
5. Rafael Gonzales, et.al, Digital Image Processing using Matlab, McGraw Hill, 2010.
6. A.S. Baskoro, Handout Sistem Machine Vision, Diktat kuliah, 2011.

ENME803154 - QUALITY AND PRODUCTION MANAGEMENT SYSTEM (4 SKS)
Learning Objective(s):
Provides knowledge, understanding and ability to perform management, analysis and improvement of production systems in the manufacturing industry with the principles of efficiency and effectiveness, and able to understand and implement and develop policies and procedures are needed to improve and control the various processes.
Syllabus :
Introduction to Manufacturing Systems, Manufacturing Principles, Resources, Production Process and Production Organization, Production Lay-Out, Design, Scheduling and Production Process Control; Productive Maintenance, Logistics and Inventory; Engineering Quality, Quality Control, Quality Function Deployment (QFD) , Total Quality Management; Quality Management System (8 Quality Management Principles, International Standard Quality Management System: ISO 9001, ISO 9004, ISO TS 16949, the International Management System Standard: ISO 14001, OHSAS 18001); System And Process Improvement: Cause - Effect Analysis, FMEA (Failure Mode and Effect Analysis), Lean Six Sigma.
Pre-requisite(s): -
Text Book(s):

1. Hitomi, Katsundo. Manufacturing System Engineering. Taylor & Francis. 2001
2. TQM : A Cross Functional Prespective, Rao, CARR, Dambolena, Kopp, Martin, Rafii, Schlesinger, John Willey, 1996
3. TQM, Text, Cases and Readings, Joel E. Ross, St. Lucie Press 100 E. Linton Blvd Suite 403 B Delray Beach, FL 33483

ENME803174 – RISK MANAGEMENT (4 SKS)
Learning Objective(s):
Students can explain and apply risk management in a risk assessment.
Syllabus:
Introduction to risk management, Value at Risk --VaR Risk measures for various asset classes, Monte Carlo Simulation, VaR Validation and Extremes, Regulatory Environment 25 years of risk related regulations, Multifactor models Discussion of multifactor analysis, Review of industry leading risk management system, Operational Risk and its Basel II requirements.
Pre-requisite(s): -
Text Book(s):

1. Jorion, Philippe, Value at Risk: The New Benchmark for Managing Financial Risk, 3rd edition, McGraw-Hill, 2007
2. Roger Lowenstein, When Genius Failed, Random House, 2000

ENME804155 - CAD/CAM (4 SKS)
Learning Objective(s):

This lecture will discuss about technology of CAD, CAM, Integration of CAD / CAM application in the industry and the emphasis on: the principles modeling and surface curve geometry (Geometric modeling), design of 2D and 3D models with computer assisted. The principle of data exchange between CAD/CAM systems also tool path design using computer for prismatic and sculptured model. Lectures CAD / CAM are provided with the aim that students have the understanding and applying technology of CAD / CAM: starting the process from design to production process with the computers assistance.

Syllabus:

Overview of CAD / CAM System; Hardware & Software System of CAD / CAM; Interactive Tools and Computer Graphics Concepts, Geometric Modeling: Type & Representation of mathematical model Curve, Surface & Solid ; Data Exchange in CAD / CAM system; Manufacturing Processes: Manufacturing Process Review Type and Parameter Calculation machining, Lab. practice of CAD; CNC Technology; Tool Path Generation Method in the CAM system; Control 'quality of machinery' in the CAM system; Computer Aided Process Planning-CAPP; Postprocessing; Lab. practice of CAM.

Pre-requisite(s): -

Text Book(s):

1. Kiswanto G., Handout CAD/CAM, Diktat kuliah, 2004.
2. Choi B. K., Jerard R. B., Sculptured Surface Machining,
3. Zeid, I., CAD/CAM Theory and Practice, McGraw-Hill, 2009.
4. Chang, T. -C., Computer Aided Manufacturing, 3rd ed, Prentice-Hall, 2005.
5. Korem, Y., Computer Control of Manufacturing Systems, McGraw-Hill

ENME804156 - MANUFACTURING PERFORMANCE ASSESMENT (4 SKS)

Learning Objective(s):

Provides knowledge about the basic concepts of performance assessment of manufacturing industry relating to product performance, process, manufacturing system and its relation to manufacturing excellence. At the end of this course, students are expected to understand the methodologies and assessment tools manufacturing performance and are able to identify, assess and analyze the performance of the manufacturing industry increase.

Syllabus:

Introduction, Traditional Performance Methodology & Tool: Dupont Financial Performance, Basic Performance Measurement process & tools: Data collection techniques, chart, graph & diagram, Process Improvement methodologies & tools: Process Capability, Measurement System Analysis (MSA), QFD, FMEA, six sigma & lean six sigma, Industry specific/ generic standards & best practices, Manufacturing Maturity model concept & measurements, Case study of Industrial performance Measurement (assignment & evaluation)

Pre-requisite(s): -

Text Book(s):

1. US Departement of Energy, United Sates of America, Performance Based Management, 2005 Oak Ridge Associated Universities,. "How to Measure Performance, A Hand Book of Techniques and Tools"
2. "World Class Manufacturing Performace Measures"
3. Harold T.Amrine, John A.Ritchey, Prentice Hall International Edition, "Manufacturing Organization and Management"
4. Will Kaydos, Productivity Press Portland Oregon, " Measuring, Managing and Maximizing Performance"

ENME801163 – VEHICLE ENGINEERING AND HEAVY DUTY EQUIPMENT (4 SKS)

Learning Objective(s):

This course provides the latest technology from the four-wheeled passenger vehicle, especially with covering all aspects of engineering in a vehicle. Lectures given vehicle engineering with

the aim that students have basic competence to do the engineering on the four-wheeled passenger vehicle in particular.

Syllabus :

Vehicle Kinematics & Dynamics; mover and transmission system; Breaking Systems, Wheel and Suspension; Security System: Active and passive at the time experiencing issues.

Pre-requisite(s): -

Text Book(s):

1. Bosch Automotive Handbook, Sixth Editions, 2006
2. Gillespie, Thomas D., Fundamentals of Vehicle Dynamics, 2004
3. Hei s ler, Heinz. Advanced Vehicle Technology, 2004
4. Hermann, Hans. SAE Handbook of Automotive Engineering, 2004
5. Miliken, William F., Douglas L. Milliken, Maurice Olley, Chassis Design : Principles and Analysis, 2004
6. Pacejka, Hans B. Tire & Vehicle Dynamics, SAE, 2006

ENME801164 – PRIME MOVER AND POWERTRAIN SYSTEM (4 SKS)

Learning Objective(s):

Students have the competency and skill in the principles and theory of prime mover including internal combustion motor, electric motor, hybrid motor which are connected to the powertrain system; understand and are able to calculate the construction and design.

Syllabus :

Combustion motor technology; reciprocating/rotary piston engine; electric motor technology (AC/DC motor); hybrid motor system; serial/parallel hybrid; transmission system: MT, AT, DCT, CVT; battery technology

Pre-requisite(s): -

Text Book(s):

1. Heywood, J., Internal Combustion Engines Fundamental, McGraw Hill, 1989
2. Khovakh, M., Motor Vehicle Engines, MIR Publisher, Moscow, 1971.
3. Bosch Automotive Handbook, SixthEditions, 2006
4. Gillespie, Thomas D., Fundamentals ofVehicle Dynamics, 2004
5. Heiszler, Heinz. Advanced VehicleTechnology, 2004
6. Hermann, Hans. SAE Handbook ofAutomotive Engineering, 2004

ENME802165 – VEHICLE FRAME AND BODY ENGINEERING (4 SKS)

Learning Objective(s):

Provides the understanding of several concepts related to design and analysis of vehicle frame such as:

- A brief understanding in the history of vehicle design development
- Understanding the different possible scenarios for vehicle design and interactivity of the process in the design and manufacture of vehicles, as well as various types of vehicle structure and its use.
- Understand how the load can be analyzed simply and with the use of computers as well as a simple structural analysis that highlights the processes involved in vehicle structures.
- Understanding the basic concepts related to the aerodynamic vehicle body and the basic calculations required in the form of an aerodynamic vehicle design

Syllabus :

Introduction to Innovation and breakthrough discoveries in the fild of automotive and industrial development of the automotive world today. Understanding the concept of loading on the vehicle structure, various types of chassis, structural analysis with a simple method of surface structure (Simple Structural Surface method) and method of computing the skeletal structure. aerodynamic force, reducing the lift force (drag force reduction), stability and concept of calculation of the vehicle body dynamics computation

Pre-requisite(s): -

Text Book(s):

1. Heinz Hei s ler, “Advance Vehicle Technology”, Society of Automotive Engineers, Inc. ISBN 0 7680 10713.
2. Brian Cantor, Patrick Grant and Colin Johnston, “Automotive Engineering Lightweight,

Functional, and Novel Materials", Taylor & Francis Group, 6000 Broken Sound Parkway NW, Suite 300, ISBN 978-0-7503-1001-7.
3. Giancarlo Genta, Lorenzo Morello, "The Automotive Chassis Vol. 1: Components Design", Springer Science+Business Media B.V., ISBN: 978-1-4020-8674-8 e-ISBN: 978-1-4020-8676-2.
4. David A. Crolla, "Automotive Engineering Powertrain, Chassis System and Vehicle Body", Butterworth-Heinemann is an imprint of Elsevier, Linacre House, Jordan Hill, Oxford OX2 8DP, UK ISBN: 978-1-85617-577-7.
5. Nick Tucker and Kevin Lindsey, "An Introduction to Automotive Composite", Rapra Technology Limited, ISBN: 1-85957- 279-0.
6. Jason C. Brown, A. John Robertson, and Stan T. Serpento, "Motor Vehicle Structures: Concepts and Fundamentals", Butterworth-Heinemann Linacre House, Jordan Hill, Oxford OX2 8DP, ISBN 0750651342
7. Liang Yun · Alan Bliault · Johnny Doo, WIG Craft and Ekranoplan, "Ground Effect Craft Technology", ISBN 978-1-4419-0041-8 e-ISBN 978-1-4419-0042-5, DOI 10.1007/978-1-4419-0042-5, Springer New York Dordrecht Heidelberg London.
8. Mat thew Huang , "Vehi c le Crash Mechanics", CRC Press LLC, International Standard Book Number 0-8493-0104-1.
9. Ahmed A. Shabana, Khaled E. Zaazaa and Hiroyuki Sugiyama, "Railroad Vehicle Dynamics a Computational Approach", CRC Press is an imprint of the Taylor & Francis Group, ISBN 978-1-4200-4581-9.

ENME803166 – VEHICLE CONTROL SYSTEM (4 SKS)

Learning Objective(s):

Students understand the basic features of the vehicle control system that has the ability to;

- Describes a simple method for the analysis of vehicle suspension systems and components;
- Describes the vehicle suspension system design requirements and how to achieve it;
- Analyze the various factors and issues that affect the design of suspension of driving;
- Understand the mechanics of the vehicle wheel;
- Describes recent developments in control of the braking system and braking system design and material needs an efficient;
- Analyze the influence of the steering system characteristics to the vehicle motion

Syllabus :

Introduction of the role of vehicle suspension systems, factors that affect the design, definitions and terminology in vehicle suspension systems, suspension mobility mechanisms, different types of suspension, kinematics analysis, the analysis center of rotation (roll center analysis), geometric style as well as lateral, suspension components. The basis of the braking system. Regulation, function and terms of use brake system, brake system components and confiurations as well as the kinematics of the braking system. Consideration of adhesion force proportional to the brake system and braking effiiency. Deformation, lateral force and slip angle on the tire when the vehicle is running. Penikungan characteristics (cornering characteristics) according to Fiala theoretical approach to the mathematical model and the effect is due to air pressure in tires.

Pre-requisite(s): -

Text Book(s):

1. Heinz Heisler, "Advance Vehicle Technology", Society of Automotive Engineers Inc. ISBN 0 7680 1071 3
2. Giancarlo Genta, Lorenzo Morello, "The Automotive Chassis Vol. 1: Components Design", Springer Science+Business Media B.V., ISBN: 978-1-4020-8674-8 e-ISBN: 978- 1-4020-8676-2.
3. Giancarlo Genta, Lorenzo Morello, "The Automotive Chassis Vol. 1: System Design", Springer Science+Business Media B.V., ISBN: 978-1-4020-8673-1 e-ISBN: 978-1- 4020-8675-5.
4. David A. Crolla, "Automotive Engineering Powertrain, Chassis System and Vehicle Body", Butterworth-Heinemann is an imprint of Elsevier, Linacre House, Jordan Hill, Oxford OX2 8DP, UK ISBN: 978-1-85617-577-7.

ENME803167 – MODERN VEHICLE TECHNOLOGY (4 SKS)
Learning Objective(s):
Students understand the concept of manufacturing technology and control systems on the vehicle so as to: • Analyze the condition of current technological advances to make fundamental changes in vehicle design a sustainable future.
• Design process to create an automatic control system that helps in controlling the vehicle.
• Designing vehicles with electronic control systems that can improve vehicle performance.
• Describes the integration of vehicle control systems and mechanicalelectrical interaction possibilities for the design of future vehicles.
Syllabus:
Knock control, Linear solenoid idle speed control, Sequential fuel injection, Distributorless ignition, Self-diagnosis for fail-safe operation, Crankshaft angular position measurement for ignition timing, Direct mass air flow sensor, Variable valve phasing,teknologi kendaraan Hybrid Electric Vehicles and Electric Vehicle.
Pre-requisite(s): -
Text Book(s):

1. Julian Happian-Smith, " An Introduction to Modern Vehicle Design", Butterworth-Heinemann Linacre House, Jordan Hill, Oxford OX2 8DP, ISBN 07506 5044 3.
2. Heinz Hei s ler, "Advance Vehicle Technology", Society of Automotive Engineers, Inc. ISBN 07680 1071 3.
3. Fuhs, Allen E., "Hybrid vehicles and the future of personal transportation", CRC Press, Taylor & Francis Group, ISBN-13: 978-1-4200-7534-2, ISBN-10: 1-4200- 7534-9.
4. Lino Guzzella and Christopher H. Onder, "Introduction to Modeling and Control of Internal Combustion Engine Systems", Springer-Verlag Berlin Heidelberg, ISBN 978-3-642-10774-0 e-ISBN 978-3-642- 10775-7, DOI 10.1007/978-3-642-10775-7, Library of Congress Control Number: 2009940323.
5. Iqbal Husain, "ELECTRIC and HYBRID VEHICLES Design Fundamentals", CRC PRESS Boca Raton London New York Washington, D.C., ISBN 0-203-00939-8 Master e-book ISBN, International Standard Book Number 0-8493-1466-6 (Print Edition), Library of Congress Card Number 2002041120.
6. Ali Emadi, "Handbook of Automotive Power Electronics and Motor Drives", Taylor & Francis Group, CRC Press is an imprint of Taylor & Francis Group, ISBN 0-8247-2361-9.
7. Nicolas Navet and Françoise Simonot- Lion, "Automotive Embedded Systems Handbook", CRC Press Taylor & Francis Group, 6000 Broken Sound Parkway NW, Suite 300, ISBN-13: 978-0-8493-8026-6, ISBN-10: 0-8493-8026-X
8. Paul Nieuwenhuis and Peter Wells, "The automotive industry and the environment A technical, business and social future", Woodhead Publishing ISBN 1 85573 713 2, CRC Press ISBN 0-8493-2072-0, CRC Press order number: WP2072.
9. Simon Tung, Bernard Kinker, and Mathias Woydt," Automotive Lubricant Testing and Advanced Additive Development", ASTM 100 Barr Harbor Drive PO Box C700, West Conshohocken, PA 19428-2959,ISBN: 978- 0-8031-4505-4.
10. James Larminie, John Lowry, "Electric Vehicle Technology Explained", Oxford Brookes University, Oxford, UK, Acenti Designs Ltd.,UK. ISBN 0-470-85163-5.

ENME803195 – OIL AND GAS DRILLING EQUIPMENT (4 SKS)
Learning Objective(s):
Provides additional insights regarding the implementation of basic knowledge of engineering competence that is at the core of oil and gas drilling techniques. Competencies expected of graduates capable of developing the engine with value added technical knowledge of oil and gas drilling equipment that is ready to be trained and shaped to be easily and immediately adapt to work without the awkwardness of the world's E / P oil and gas fields in general and in particular oil and gas drilling. Thus it has the advantages of graduates and a wider choice in the real world of work later. Objectives and learning outcomes to be achieved:

1. Enabled students to know the basic tools and their functions and how each is needed in an oil and gas drilling operations.
2. Students capable of explaining the technique of oil and gas drilling operations and its other related aspects such as equipment used, safety issues, safety equip-

ment, emergency and environmental issues.

3. Student s have a pret ty good understanding of the knowledge of drilling equipment and its operation so as to participate in an oil and gas drilling operations with confidence and readiness to increase knowledge and skills later on after graduation.

Syllabus:

Intro to oil / gas well, oil / gas Exploration, exploitation and production, drilling rig, the terminology, the problem of drilling, drilling fluid, drilling oil and gas in the system, hoisting system equipments, equipments rotating system, circulating system equipments, power system equipments, blowout prevention system equipments, well design, equipments and operations for safety and efficiency, process and equipments for cementing, drilling preparation, drilling operations, drilling and process problems (drill string vibration and whirling, collar failure, etc.) artificial lift methods and equipments, visit to the field of oil and gas drilling.

Pre-requisite(s): -

Text Book(s):

1. Don A. Gorman, Jerry W. Meyer, "Drilling Equipment and Operations", Action Systems Inc., Dallas, Texas – USA.
2. Adam T. Bourgoyne, Martin E. Chenevert, et. al., "Applied Drilling Engineering", Society of Petroleum Engineers, Richarson, Texas – USA.
3. Nguyen J.P., "Drilling-Oil and Gas Field Development Techniques", Institut Français du Pétrole Publication, 1996
4. Kermit E. Brown, "The Technology of Artificial Lift Methods", Volume 2a, Petroleum publishing Co., 1980
5. Amanat U.C., "Oil Well Testing handbook", Elsevier, 2004
6. Amanat U.C., "Gas Well Testing handbook", Elsevier, 2004

ENME804168 – RAILWAY VEHICLE ENGINEERING (4 SKS)

Learning Objective(s):

Provides the knowledge and design of rail vehicle.

Syllabus:

Engineering and economic analysis of rail vehicles; body structures and rail vehicles; structural analysis of flat car; coupler analysis; electrical and pressurized water; analysis and modeling of the bogie; axle; wheel; brake and pivot; suspension system and driving quality; dynamic load analysis; fatigue and cracks in rail vehicles; models of rail vehicles and track geometry; modeling components of rolling stock; response rail vehicle on the track tangent; lateral stability of the rail vehicle on the track tangent; response rail vehicle on a curved trajectory; wheel wear; rail vehicle dynamics.

Pre-requisite(s): -

Text Book(s):

1. Simon Iwnicki, handbook of railway vehicle dynamics, CRC Press, Taylor & Francis Group, 2006.

ENME804197 – MATERIAL HANDLING EQUIPMENT (4 SKS)

Learning Objective(s):

Provides expertise and competence to students in the field of design and development of lifting equipment and construction equipment

Syllabus:

Introduction and Scope of Construction Equipment; Tractor, Bulldozer, Dump Truck and shovel; Construction Equipment Mechanical Concept; Heavy equipment system: Pneumatic and Hydraulic; Basic Machine-lifting machinery and materials transporter; Cranes, hoist and conveyor; forklift: Moving Walks, Escalators, and Elevators

Pre-requisite(s): -

Text Book(s):

1. ASME. Handbook of Materials Handling.
2. Mc.Guiness. Mechanical and Electrical Equiment for Building.

ENME804198 – AIRCRAFT STABILITY AND CONTROL (4 SKS)
Learning Objective(s):
Provides the students with the knowledge and ability in analyzing the aircraft (A/C) stability and control.
Syllabus:
Systems of Aircraft Axes and Notation, Aircraft Static Equilibrium and Trim, The Equations of Aircraft Motion, Aircraft Longitudinal Dynamics, Aircraft Lateral–Directional Dynamics, Aircraft Maneuverability, Aircraft Stability, Aircraft Flying and Handling Qualities, Aircraft Stability Augmentation, Aircraft Aerodynamic Modelling, Aircraft Aerodynamic Stability and Control Derivatives
Pre-requisite(s) -
Text Book(s) :

1. Cook, Michael V., Flight Dynamics Principles, Elsevier Aerospace Engineering Series, 2007.
2. Russell, J.B., Performance and Stability of Aircraft, Butterworth Heinemann, 2003.
3. Von Mises, Richard, Theory of Flight, Dover Books on Aeronautical Engineering, 1959

ENME801179 – ADVANCED THERMOFLUIDS (4 SKS)
Learning Objective(s):
Students are expected to understand the concepts of mass, momentum, heat, work, energy, and entrophy in the mechanics of thermofluid. Understanding the basic principle of hydrostatics, flow measurement, identification of tehrmofluids system or controlled volume and flow from mass, momentum, heat, and work which are related to the given problems. Understanding of lift force and drag force. Using the 1st and 2nd Laws of Thermodynamics in the thermofluids system.
Syllabus :
Introduction to thermoflids, hydrostatic, control volume approach, Bernoulli equation, streamlined curves, the basic concepts of thermodynamics, the relationship properties and ideal gases, application of the fist and
second law of thermodynamics, temperature, entropy, entropy of use, fuel, control volume analysis, steady flow, gas turbines and jet engines.
Pre-requisite(s) -
Text Book(s):

1. Cengel, Y.A. & Boles, M.A. Thermodynamics: An Engineering Approach
2. Homsy, G.M.(Ed.) Mechanics of Fluids
3. Moran, M.J. & Shapiro, H.N. Fundamentals of Engineering Thermodynamics
4. Nakayama, Y.; & Boucher, R.F. Introduction to Fluid Mechanics
5. Rogers, G.F.C. & Mayhew, Y.R. Engineering Thermodynamics
6. Samimy, M., Et Al. A Gallery of Fluid Motion
7. Sonntag, R.E., Borgnakke, C., & Van Wylen, G.J. Fundamentals of Thermodynamics
8. Van Dyke, M. An Album of Fluid Motion

ENME801180 – MARITIME RESOURCES AND TECHNOLOGIES (4 SKS)
Learning Objective(s):
This course provides an understanding of maritime resources and opportunities, as well as risks related to the exploited potentials. Students will learn knowledges of formation, exploration and production of maritime resources: not only oil and gas, but also other minerals, and ocean flora and fauna, including its impact on environmental sustainability.
Syllabus :
Oil and gas from the ocean, seabed mining, energy from the melting of ice, ocean energy, ocean flora and fauna, marine environmental sustainability.
Pre-requisite(s): -
Text Book(s):

1. Research Council National Research Council, NEW Mining in the Outer Continental Shelf and in the Deep Ocean, University Press of the Pacific, 2005
2. Arthur H. Johnson, Michael D. Max, William P. Dillon, Natural Gas Hydrate - Arctic Ocean Deepwater Resource Potential, Springer, 2013
3. Khaligh, Alireza and Onar, Omer C., Energy Harvesting: Solar, Wind, and Ocean Energy Conversion Systems, CRC Pr I Llc, 2009

ENME802181 – MARITIME ENGINEERING AND MANAGEMENT (4 SKS)
Learning Objective(s):
This course provides knowledge about technologies for ocean transportation and the application of ocean-based energy sources. This course also aims to equip students with understanding of maritime opportunities that can be developed with the use of technology.
Syllabus :
Classification of ship based on its function, aspects to consider in ship designing, history of development of off-shore structure, ocean environment, typesof off-shore structure: fixed design and floating design, mooring and anchoring system, force calculation of off-shore structure, FPSO
Pre-requisite(s): -
Text Book(s):

1. International Energy Authority Renewable Energy Technology Deployment (IEA-RETD),
2. Offshore Renewable Energy: Accelerating the Deployment of Offshore Wind, Tidal, and Wave Technologies., IEA-RETD 2012.
3. Chakrabarti, Handbook of Offshore Engineering, Elsevier. 2007

ENME803182 – OCEAN ENERGY (4 SKS)
Learning Objective(s):
This course provides knowledge about technologies and principles related to the design of renewable ocean energy system
Syllabus :
Introduction to renewable ocean energy, introduction to wind turbine, tidal system and tidal energy system, OTEC, ocean flows, methods of economic/financial assessment for off-shore renewable energy system,wind energy, momentum theory and the limit of wind power output, tidal flow and its conversion to mechanical energy, description of wave energy sources, instruments of wave energy and instruments for simulation.
Pre-requisite : -
Text Book(s):

1. Twidell, J. and Weir, T., “Renewable Energy Resources. Second Edition”, Taylor and Francis Group, 2006.
2. Boyle, G., “Renewable energy power for a sustainable future, Second Edition”, Oxford University Press, 2005.
3. Walker J and Jenkins N, “Wind Energy Technology”, Wiley Unesco Energy Engineering Series, 1997.
4. Manwell JF, McGowan, JG and Rogers, AL., “Wind Energy explained: Theory, Design and Application”, Wiley. 2nd Edition. ISBN0-470-01500-4, 2010
5. Cruz, J., “Ocean Wave Energy: Current Status and Future Perspectives”, Springer-Berlin, 2007.
6. Falnes, J., “Ocean Waves and Oscillating Systems: Linear Interactions Including Wave-Energy Extraction”, Cambridge University Press, Cambridge, 2002.
7. Baker AC, “Tidal Power”, Peter Peregrinus Ltd, 1981.

ENME803183 - MARINE AND OFFSHORE STRUCTURE (4 sks)
Course Objective :
Provides the knowledge, understanding of the theory and principles of building offshore include the type, function, and offshore construction technology and techniques in performing design structure.
Syllabus :
Types of Offshore; Construction and Offshore Structures; Calculation of Style and Power

Offshore: Safety Requirements; Construction Semi-submersible; Single Buoy Mooring; FPSO; Offshore Maintenance and Repair.
Pre-requisite : -
References :

1. Cliff Gerwick, Construction of Marine and Off-shore Structures, CRC Press 1999
2. Subrata Chakrabarti, Handbook of Offshore Engineering, Elsevier Science, 2005
3. Yong Bai, Marine Structural Design, Elsevier Science, 2003

ENME803184 - SEA TRANSPORT AND PORT MANAGEMENT (4 sks)
Course Objective :
Provides the knowledge and understanding of various management approaches, maritime transport and port activities which also include risk factors, safety, and economy.
Syllabus :
Sea Transport Demand Trend: Marine Transportation Market Research; Inter Mode Transport System; System loading and unloading, Types of Sea Transport, Warehousing and Storage Cargo Systems, SystemsAgency, Survey Charge, Corporate Sailing economic calculation, Customs.
Pre-requisite : -
References :

1. P. Lorange, Shipping Management, Institution for shipping Research.
2. Patrick Alderton, Reeds Sea Transport : Operation and Management, Adlard Coles, 2008
3. Patrick Alderton, Port Management and Operations,Informa Business Publishing, 2005
4. Svein Kristiansen, Maritime Transportation : Safety management and Risk analysis, Butterworth-Heinemann, 2004
5. M. Stopford, Maritime Economics, Routledge, 1997
6. House, D.J, Cargo Work for Maritime Operation, Butterworth Heinemann, 2005

ENME803185 - MARITIME LAW AND REGULATION (4 sks)
Course Objective :
Provides knowledge and understanding of the laws and regulations on maritime activities both nationally and internationally.
Syllabus :
Introduction of maritime law; Regulation of Marine Pollution Prevention and Control; SOLAS; Prevention of Collisions Regulations; ISM Code; Statutory Rules; Passenger Ship Regulations; Tanker Regulations; Offshore Regulations: Accident Rescue Regulations; Other IMO rules. Accident prevention regulations; Risk assessment and analysis.
Pre-requisite : -
References :

1. International Convention for the Prevention of Pollution From Ships (MARPOL), International Maritime Organisation Publications
2. International Regulations for Preventing Collisions at Sea (COLREG), International Maritime Organisation Publications
3. International Convention for the *Safety of Life at Sea* (SOLAS), International Maritime Organisation Publications
4. International Safety Management Code (ISM Code) Guide Book, International Maritime Organisation Publications

5. Churchil R.R. dan Lowe A.V, The Law of the Sea, MUP 1999

ENME804186 - SPECIAL SHIP PROJECT (4 sks)
Course Objective :
Provides the knowledge, understanding of ship design for special purposes.
Syllabus :
Typology and special ship purposes; Material to special Ship, Design Considerations; Calculation of loading; Calculation of Ship Quantities; Computation Structures: Propulsion Systems; Motion System; Safety and Navigation System; Stability Calculation.
Pre-requisite : -
References :

1. Lars Larsson dan Rolf Eliasson, Principles of Yacht Design, International Marine/Ragged Mountain Press, 2007
2. Dave Gerr, The Elements of Boats Strength, International Marine/Ragged Mountain Press, 1999
3. Norman L. Skene, dan Marnard Bray, Elements of Yacht Design, Sheridan house, 2001
4. Steve Killing dan Doug Hunter, Yacht Design Explained : A Sailors Guide to the Principles and Practices of Design, W.W Norton and Company, 1998
5. S. Sleight, Modern Boat Building, Conway Maritime Press.

ENME804187 - SHIP PRODUCTION MANAGEMENT (4 sks)
Course Objective :
Provides knowledge and understanding of the various shipyard management and technique.
Syllabus :
Shipyard Layout; Ship Process Production; Steel Stock Yard Planning; Crane Calculation: Jamorang Calculation At Each Stage Production: Make Work Schedule: Work Break Down Structure; Integrated Hull Outfitting and Painting; Advanced Outfiting; Group Technology Methods for Ship Production; Ship launching; Ship trials.
Pre-requisite : -
References :

1. D.J. Eyres, Ship Construction, Butterworth- Heinemann, 2007
2. R.Shenoi, Ship Production Technology, Univ. Of Southampton.
3. National Research Council, Shipbuilding Technology and Education, National Academy Press, 1996

ENME804188 – MARITIME ENERGY MANAGEMENT (4 SKS)
Learning Objective(s) :
This course provides an understanding about energy optimization analysis with minimum fuel consumption. Additionally, it also provides optimization analysis with minimum initial energy
Syllabus :
Principle and regulation of maritime energy, planning and operation of an efficient ship, energy management for off-shore structure, energy management for port, renewable energy, huma resources aspect of energy management.
Pre-requisite(s) : -
Text Book(s) :

1. Hongyi Lai, “Asian Energy Security: The Maritime Dimension”, Palgrave MacMillan, 2009
2. Steve Doty, Wayne C. Turner, “Energy Management Handbook 8th Ed.”, Fairmont Press, 2012

3. Petrecca, Giovann, "Energy Conversion and Management: Principles and Applications," Springer, 2014

ENME804189 – MARITIME SAFETY (4 SKS)
Learning Objective(s) :
Provides knowledge and understanding related to the safety via regulations, management, and development of any forms of maritime transportation technology.
Syllabus :
SOLAS: Provisi Umum, konstruksi, alat keselamatan, radio komunikasi, navigasi keselamatan, pengangkutan barang, manajemen untuk keselamatan operasi kapal, MARPOL Annnex I-V peraturan untuk pencegahan polusi, keamanan maritim; ancaman perdangangan maritim, ancaman terhadap pengapalan, evolusi keamanan maritim, implementasi ISPS Code, perencanaan keamanan.
Pre-requisite(s): -
Text Book(s):

1. Jones. S. Maritime Security: A practical Guide, the nautical institute 2012
2. Consolidate Edition, MARPOL, International Maritime Organization, 2006
3. Consolidate Edition, SOLAS, International Maritime Organization, 2004

ENME804190 - ADVANCED WELDING ENGINEERING (4 SKS)
Learning Objective(s):
Provide knowledge, understanding of the theories, principles and design as well as the assessment of the quality of welding and welding applications.
Syllabus:
Introduction, review of welding term and definition, welding process type, standard power source, Oxy-gas welding, Shield Metal Arc Welding (SMAW), Gas Tungsten Arc Welding (GTAW), Gas Metal Arc Welding (GMAW), Submerged Arc Welding (SAW), Flux Cored Arc Welding (FCAW), Resistance welding, Friction Stir Welding, Other welding process: laser, electron beam, plasma, Cutting and other edge preparation processes, surfacing and spraying, Brazing and soldering, Joining processes for plastics, ceramics and composites, Welding metal: Ferrous-based metal, non-ferrous-based metal, Material behavior during welding process, Testing materials and the weld joint, Non Destructive Examination (NDE), DT (Destructive Test), Heat treatment of base materials and welded joints, Basic of welding design, Residual stresses and distortion, Welding Symbol, Behavior of welded structures under different types of loading, Design of welded structures under static and dynamic loading, welding defects, Design of welded pressure equipment, Welding Performance Qualification Record (WPQR), Welding Procedure Specification (WPS), Welding automation.
Pre-requisite(s): -
Text Book(s):

1. Sindo Kou, Welding Metallurgy, 2nd Edition, Wiley, 2002.
2. ASME Section IX, Welding and Brazing Qualifications
3. AWS D1.1., Structural Welding (Steel)
4. William A. Bowditch, Welding Fundamentals 5th Edition, Goodheart-Willcox, 2011.
5. Technical Manual TM 5-805-7. Welding Design, Procedures and Inspection Headquarters, Department of the Army.1985
6. Lloyds Register. Welding Procedures, Inspections and Qualifications.

MASTER PROGRAM IN MECHANICAL ENGINEERING – FAST TRACK PROGRAM

For capable students who wish to continue their undergraduate study to Master Program in Mechanical Engineering via the Fast Track program, a credit transfer is allowed up to 22 sks. From the 22 sks, it is broken down into: 14 sks from the core subjects and another 8 sks from the elective subjects.

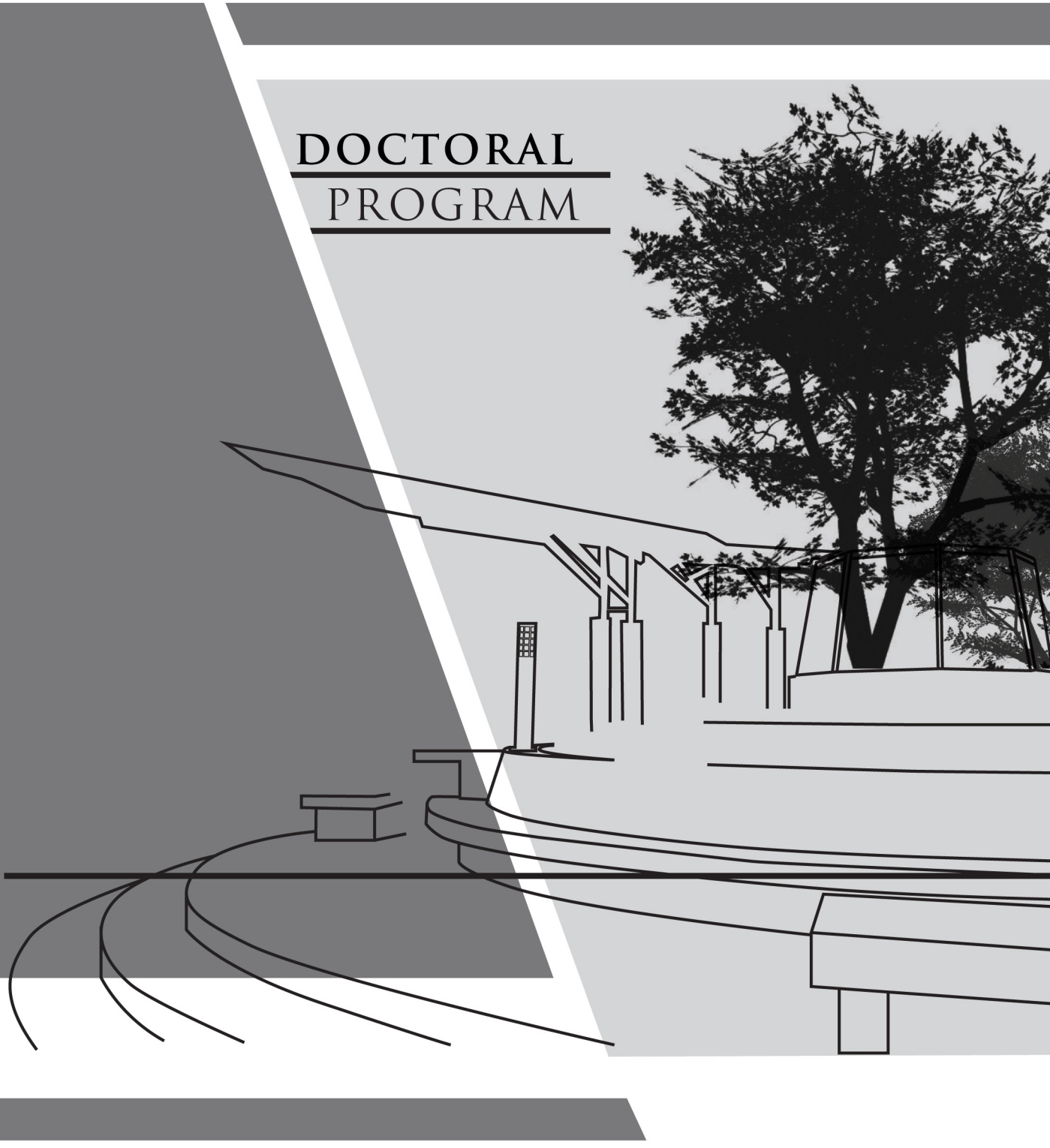
Transferrable core subjects and elective subjects are those admitted and are listed as options in the study program of Master in Mechanical Engineering.

Listed below are the requirements for students undertaking the Fast Track Program:

1. He/she must declare his/her intention in undertaking the Fast Track Program by writing an application letter to the head of the Department of Mechanical Engineering by also attaching a study plan in the form of subjects planning in the 6^{th}-8^{th} Semester (during the undergraduate degree) and in the 1^{st}-4^{th} Semester (during the Master Program) based on his/her specialization. This letter must be submitted by the end of the 5^{th} Semester of his/her undergraduate degree course in Mechanical Engineering or Naval Architecture and Marine Engineering.
2. He/she must have an excellent academic performance, shown by the cumulative GPA (Grade Point Average, Bahasa Indonesia: IPK) of at least 3.2 in the 5^{th} Semester and have passed all basic subjects.
3. He/she must have a guarantor and or a confirmed scholarship scheme to finish his/her undergraduate degree and master degree with the Fast Track Program.
4. He/she must declare his/her intention of undertaking the academic program under the Fast Track scheme in full-time.
5. If his/her application is accepted by the head of the Department/study program, then he/she must discuss with his/her academic advisor to finalize the study plan in the undergraduate degree and master degree program

The student of undergraduate degree program who have been accepted to enroll in the Fast Track program by the ehad of the Department needs to adjust his/her plan of taking which subjects in the 7^{th} and 8^{th} semester, especially by considering the available core and elective subjects available in the Master Degree Program according to his/her specialization.

DOCTORAL PROGRAM



7. DOCTORAL PROGRAM

FTUI holds Doctoral Program for the six following study programs:
1. Civil Engineering
2. Mechanical Engineering
3. Electrical Engineering
4. Metallurgy & Material Engineering
5. Chemical Engineering
6. Architecture
7. Industrial Engineering

FTUI Doctoral program was officially opened in 2000 with the opening of the Civil Engineering and Electrical Engineering Doctoral program followed by the emersion of the Opto-electrotechnique and Laser Application study program into the Postgraduate Program of FTUI. The Mechanical Engineering study program was officially opened in 2006 while the Metallurgy & Material Engineering and Chemical Engineering followed in 2007. And In 2009, respectively Department of Architecture opened the Architecture Doctoral Program. In 2001, the Opto-electrotechnique and Laser Application was closed and was emerged into the Electrical Engineering study program. Each Doctoral study program is headed by the Head of Study Program which is held ex-officio by the Head of Department in the Faculty of Engineering UI. The Doctoral study programs have one or more focus subjects to give a more specific knowledge on engineering field to all students of the program.
Currently, the Doctoral Program is held in two ways: Lecture & Research; and Research.

New Students Selection

Selection process for new students for the FTUI Doctoral Program is as follow:

1. Pre-admission stage: future student is encouraged to informally contact their prospective Promotor or the Head of Department to further discuss his/her desired dissertation topic. This is important to make sure the availability of Promotor in accordance to said research topic. Communication may be done through email or face to face. The Head of Department and future Promotor then would discuss the student's proposal internally.
2. Future student should register online via http://penerimaan.ui.ac.id and complete the required documents and prerequisites.
3. Future student will then take the entrance examination (SIMAK UI) which consists of: (i) Academic Potential Examination and (ii) English Proficiency Test.
4. The results of the Entrance Examination will then be sent to FTUI by the UI Entrance Examination Committee. These results will then be discussed in a Department Committee Meeting headed by the Head of Department to determine which students accepted, and the proposed research topic approved, and the availability of future Promotor. An interview have to be arrange with the future student to determine the suitability of research topic, with previous study field, and the student's commitment to participate in the Doctoral program full time. Interview may be done directly or through email or messanger application.
5. The outcome of the Department Committee Meeting will then be submitted to the UI Entrance Examination Committee to be announced.

Academic Counseling

Since the day a student is registered as student for the Doctoral program until the time that he/she passes qualification examination, the student will be under the guidance of an academic advisor who the student expected to be their Promotor or Co-Promotor. Head of Department accepts a proposal of future Promotor/Academic Advisor from a committee in the Department. Once the student pass the qualification examination, the student will earn status as Doctor Candidate and the Academic Advisor's status will revert to Promotor/Co-Promotor.

Promotor and Co-Promotor

Promotor and Co-Promotor for Doctoral Program are lecturers or experts from related field and are assigned by Head of Department based on a Rector's Decree to guide and advise a Doctor candidate in

conducting research and dissertation writing. Academic Advisor consist of 1 Promotor and a maximum of 2 (two) Co-Promotors. Promotor is a first chair Advisor who holds an academic degree of Professor or Doctor and a minimum of Senior Lecture academic position; has a relevant expertise in the field which the student's dissertation topic is; and is acknowledge as a full time faculty at the Universitas Indonesia, and for the last five years has produced at the latest: one scientific paper in an accredited national journal or a reputable international journal; or one other form of scientific product which is acknowledge by a group of experts set up by the Academic Senate of Universitas Indonesia.

Co-Promotors are the Promotor's companions who act as second and/or third chair advisor who hold academic degree of Doctor or Senior Lecturer, and has a relevant expertise in the field with the student's dissertation topic. Co-Promotor from outside of the Faculty of Engineering UI must have the approval from the Promotor. Promotor and Co-Promotors are appointed by the Rector based on the proposal submitted by the Dean which are also based on suggestions from the Head of Department after the student has pass the qualification examination. The appointment must be done at the latest 1 (one) semester after the qualification examination. A change of Promotor/Co-Promotor must be proposed by the Dean to the Rector based on a proposal from the Head of Department.

Program Specification

1	**Awarding Institution**		Universitas Indonesia
2	**Teaching Institution**		Universitas Indonesia
3	**Programme Title**		Doctoral Program in Civil Engineering Doctoral Program in Mechanical Engineering Doctoral Program in Electrical Engineering Doctoral Program in Metallurgy & Material Engineering Doctoral Program in Chemical Engineering Engineering Doctoral Program in Architecture Doctoral Program in Industrial Engineering
4	**Class**		Regular
5	**Final Award**		Doctor (Dr.)
6	**Accreditation / Recognition**		Civil Engineering Doctoral Program: Accreditation A from BAN-PT Mechanical Engineering Doctoral Program: A Accreditation A from BAN-PT Electrical Engineering Doctoral Program: Accreditation A from BAN-PT Metallurgy & Material Engineering Doctoral Program: Accreditation A from BAN-PT Chemical Engineering Engineering Doctoral Program: Accreditation A from BAN-PT Architecture Doctoral Program: Accreditation B from BAN-PT Industrial Engineering Doctoral Program: On Accreditation Process
7	**Language(s) of Instruction**		Indonesia
8	**Study Scheme (Full Time / Part Time)**		Full Time
9	**Entry Requirements**		Master graduate from study programs in line with study program chosen and pass the entrance examination
10	**Study Duration**		Designed for 3 years
	Type of Semester	Number of semester	Number of weeks /semester
	Regular	6	14 - 17
	Short (optional)	none	none

11	**Streams:** *The Civil Engineering Doctoral Program has six streams as follow:* • *Structure* • *Construction Management* • *Transportation* • *Water Resource Management* • *Project Management* • *Geotechnique* *The Mechanical Engineering Doctoral Program has four streams as follow:* • *Energy Conversion* • *Engineering Design and Product Development* • *Manufacture Engineering* • *Fire Safety Engineering and Management* *The Electrical Engineering Doctoral Program has eight streams as follow:* • *Telecommunication Engineering* • *Electrical Power and Energy Engineering* • *Photonic and Electronic Engineering* • *Control Engineering* • *Multimedia and Information Engineering* • *Security of Information Network Engineering* • *Telecommunication Management* • *Electrical Power and Energy Management* *The Metallurgy & Material Engineering Doctoral Program has two streams as follow:* • *Corrosion and Protection* • *Material Engineering and Manufacture Process* *The Chemical Engineering Doctoral Program has five streams as follow:* • *Industry Catalist* • *Gas Management* • *Product Design and Chemical Process* • *Environmental Protection and Work Safety* • *Gas Technology* *The Industrial Engineering Doctoral Program has two streams as follow:* • *Rekayasa Kualitas Manufaktur* • *Rekayasa Sistem Jasa*
12	**Graduate Profiles:** FTUI Doctoral Program Graduates haves the capabilities of demonstrating expansion, novelty breakthrough in research in the engineering or architecture field in accordance to certain stream or sub-stream. The FTUI Doctoral Program prepares student to work in academic and research in accordance to their own stream; dedicate their expertise in research laboratory, industry or government institution; or create a business based on their innovation. Graduates are able to posess the following skill: • Be able to show expertise in the engineering or architecture discipline; • Be able to uphold the academic and research ethics; • Be able to work collaboratively in research; • Be able to position themselves as leader in their community; • Be able to communicate well in their community and build networks; • Be able to demonstrate individual live skill in connection to human relationship; • Be able to demonstrate attitude, behavior and way of thinking which support their success in society.

13	**Graduates Competence:** The aim of Doctoral Program in FTUI is in line with the Doctoral Program of Universitas Indonesia, to produce quality graduates with the following competence: 1. Able to independently update their knowledge on science and technology in engineering or architecture through research based innovation breakthrough. 2. Able to show professionalism in their field of study that can be accountable towards the development of science and technology. 3. Able to write a scientific paper in engineering or architecture and convey the result of their research to the public both orally or written in an international scientific activity. 4. Able to recommend a solution for a complex problem faced by society in the field of engineering or architecture through inter, multi and trans discipline approach. 5. Able to lead a working or research team to solve problem in the field of engineering or architecture that can be of benefit for the good of mankind. 6. Able to develop and maintain a network of cooperation with fellow researcher and research community in the field of engineering and architecture both in national and international level.
14	**Classification of Subjects. (Course & Research)**

No	Classification	Credit Hours	Percentage
i	Course Component	18	34 %
ii	Research Component	34	66 %
	Total	52	100 %

14	**Classification of Subjects. (Research)**		
No	Classification	Credit Hours	Percentage
i	Course Component	0	0 %
ii	Research Component	52	100 %
	Total	52	100 %
15	**Total Credit Hours to Graduate**		52 CP

Curriculum Structure for FTUI Doctoral Program

The curriculum structure for the Doctoral Program in all study programs are the same, they are only differentiated by their codes for the research component. The code "xx" for each study programs are as follow:
ENCV for Civil Engineering, ENME for Mechanical Engineering, ENEE for Electrical Engineering, ENMT for Metallurgy & Material Engineering, ENAR for Architecture, and ENCH for Chemical Engineering.

The FTUI Doctoral Program is held in two program: Course and Research and Research.

1.1. DOCTORAL PROGRAM (COURSE & RESEARCH)

The following is the curriculum structure for Course & Research Doctoral Program in Table 1.
Table 1. The Curriculum Structure – Doctoral Program in Course and Research

KODE/CODE	MATA AJARAN	SUBJECT	SKS
	Semester 1	**1st Semester**	
ENGE900001	Metode Penelitian Lanjut	Advanced Research Method	6
ENME900001	Kekhususan 1	Special Subject 1	4
		Sub Total	**10**
	Semester 2	**2nd Semester**	
ENGE900002	Analisis Kualitatif & Kuantitatif	Qualitative & Quantitative Analysis	4
ENME900002	Kekhususan 2	Special Subject 2	4
ENME900004	Proposal Riset	Research Proposal	6
		Sub Total	**14**
	Semester 3	**3rd Semester**	
ENME900006	Publikasi – Konferensi Internasional	Publication – International Conference	4
		Sub Total	**4**
	Semester 4	**4th Semester**	
ENME900007	Ujian Hasil Riset	Research Result Examination	10
		Sub Total	**10**
	Semester 5	**5th Semester**	
ENME900008	Publikasi II – Jurnal Internasional	Publication II – International Journal	8
		Sub Total	**8**
	Semester 6	**6th Semester**	
ENME900010	Sidang Promosi	Sidang Promosi	6
		Sub Total	**6**
Total			**52**

The Lecture Component includes four subjects:
a) Advanced Research Method, 6 sks
b) Qualitative and Quantitative Analysis, 4 sks
c) Special Subject I, 4 SKS.
d) Special Subject II, 4 SKS.

The Research Component includes:
1. Research Proposal, 6 SKS
2. Publication – International Conference, 4 SKS

3. Research Result Examination, 10 SKS
4. Publication – International Journal, 8 SKS
5. Promotion Exam, 6 SKS

1.2. DOCTORAL PROGRAM (RESEARCH)

The following is the curriculum structure for Research Doctoral Program in Table 2.

Table 2. The Curriculum Structure – Doctoral Program in Research

KODE/CODE	MATA AJARAN	SUBJECT	SKS
	Semester 1	**1st Semester**	
ENME900003	Seminar Berkala Kelompok Ilmu	Research Group Periodic Seminar	8
		Sub Total	**8**
	Semester 2	**2nd Semester**	
ENME900004	Proposal Riset	Research Proposal	6
		Sub Total	**6**
	Semester 3	**3rd Semester**	
ENME900005	Publikasi I – Konferensi Internasional	Publication I – International Conference	4
		Sub Total	**4**
	Semester 4	**4th Semester**	
ENME900007	Ujian Hasil Riset	Research Result Examination	10
		Sub Total	**10**
	Semester 5	**5th Semester**	
ENME00008	Publikasi II – Jurnal Internasional	Publication II – International Journal	8
		Sub Total	**8**
	Semester 6	**6th Semester**	
ENME900009	Publikasi III – Jurnal Internasional	Publication III – International Conference	8
ENME900010	Sidang Promosi	Sidang Promosi	6
		Sub Total	**14**
Total			**52**

Description of Subjects

ENGE900001
ADVANCED RESEARCH METHOD
6 SKS
Learning Objective(s): Course participants are expected to: (a) master the scientific work process based on science philosophy, which is the scientific justification aspects, innovative aspects and scientific ethics aspects, (b) able to write a research proposal and or draft of scientific writing related to the student's doctoral topic, (c) can map research result from the latest international journal in their field and understand the state-of-the-art from their research topic, and can determine the knowledge gap yet explored in the international level for further research in their Doctoral Program.
Syllabus: (1) Relationship between philosophy and engineering science; (2) Science Philosophy; (3) Epystemology in Engineering Science; (4) Research Method; (5) Problem formulation and hypothesis; (6) Research and state of the art; (7) Research Evaluation; (8) Design Evaluation and research Stages; (9) Introduction to the analysis of the data processing method; (10) Benchmark on research output and conclusion formulation; (11) Various citation method; (12) Finalization of research proposal draft and / or scientific article draft.
Prerequisite(s): None
Textbooks:
Haryono Imam R dan C. Verhaak, Filsafat Ilmu Pengetahuan, Gramedia, Jakarta, 1995
Willie Tan, "Practical Research Methods", Prentice Hall, 2002.
R. Kumar, *Research Methodology, A Step-by-step Guide for Beginner*, 3rd ed., Sage Pub, 2012

ENGE900002
QUALITATIVE AND QUANTITATIVE ANALYSIS
4 SKS
Learning Objective(s): Discuss the qualitative and quantitative in data analysis and exploring specific data analysis areas. After participating in this subject which discuss the qualitative and quantitative approach in data analysis in exploring specific areas of data analysis. Students are expected to be able to build the following learning outcome: (1) awareness to situations requiring qualitative data analysis in the inductive paradigm; (2) awareness to situations requiring quantitative data analysis in the deductive paradigm; (3) appreciation toward various approaches; (4) possessing skills in giving critical appraisal; (5) possessing skills in performing qualitative and quantitative data analysis.
Syllabus: Introduction; Qualitative Analysis; Quantitative Analysis; Non-Parametric Analysis; Uncertainty Analysis; Critical Appraisal; Design of Experiment; ANOVA revisit; Multivariate Techniques.
Prerequisite(s): None
Textbooks:
Miles M & Huberman M, Qualitative Data Analysis, London Sage Publications, (1994)
Montgomery, D.C., & Runger, G.C, Applied Statistics and Probability for Engineers 3rd Ed., John Wiley and Sons, Inc., New York, (2003)
Kirkup, L, Experimental Method: An Introduction to the Analysis and Presentation, John Wiley and Sons, Australia, Ltd., Queensland, (1994)
Montgomery, D.C, Design and Analysis of Experiments 6th Ed., John Wiley and Sons, Inc., New York, (2005)
Hair, J.F., B.Black, B.Babin and R.E Anderson, Multivariate Data Analysis 6th Ed., Pearson Education Inc., New Jersey, (2006)

ENME900001
Special Subject 1
4 SKS

ENME900002
Special Subject 2
4 SKS

Special Subject 1 in the 1st first semester (4 SKS) and Special Subject 2 in the 2nd semester (4 SKS) are determined together with the student's Academic Advisor to support the student's research and/or to develop the student's knowledge with information and knowledge from unrelated field. Academic Advisor is also allowed to propose a special content for the student to Head of Department.
The following are the requirements for the implementation of Special Subject 1 and 2:

For students who do not have in line Master degree educational background from the Faculty of Engineering Universitas Indonesia, they are allowed to take the similar courses of the related field of study available at the Master Program in FTUI during the running semester.

Students are also allowed to take courses from other study programs within the Faculty of Engineering Universitas Indonesia or courses from other faculties in UI as stated in the Guidance Book or the Master/Doctoral Program Catalog.

Students are allowed to take classes in other Master Program in the Faculty of Engineering Universitas Indonesia or other faculties within the Universitas Indonesia as deemed necessary by their Academic Advisor

In the event where neither conditions is viable for the students, the Academic Advisor is allowed to conduct a class of said course.

ENME900003
Research Group Periodic Seminar
8 SKS

Research Group Periodic Seminar is an early activity of research in the Doctoral Program in Research where students conduct literature study in relation to the materials for their research. This literature study must be done intensively by mapping out the research results from the latest international journals in related field. The final aim was so that students have a state-of-the-art understanding of their research topic, and can determine the knowledge gap previously unexplored in the international level for further research in their Doctoral Program. The result of this literature study is compiled in a literature study report presented in the Research Group Periodic Seminar to be examined by a panel comprises of future Promoter/ Academic Advisor and Examiners from related field of study. Students will passed this Research Group Periodic Seminar if they received a minimum grade of B.

ENME900004
Research Proposal
6 SKS

Research Proposal is the continuous activity of the literature study, where after gaining a state-of-the-art knowledge of their research topic, students can formulize the scope of their Doctoral research and determine which research method will be use. The result of this activity is a comprehensive research proposal which include: goals, background and data analysis from early study or experiments done. Included in this research proposal is plan of work for each semester and its publication goals. At this level, it is expected for students to begin experiment activity or early study which can show the direction of their research is feasible and recent in his field. The early experiment or study result, the literature study and the whole research plan is then compiled in a Research Proposal Report to be presented and examined in a Research Proposal Examination. Students will passed this Research Proposal if they received a minimum grade of B.

ENME900007
Research Output Examination
10 SKS

At this stage, students are expected to have a research output with a minimum of 75% from their research plan. Doctorate candidate are expected to have reach a research outcome which is the main part of the originally planned contribution. The outcome of this research is measured through the Research Output Examination. The examination committee is appointed through the Dean's Decree based on the Head of Department's proposal. These examiners consist of experts related in the field of study of the Doctorate candidate with at least one examiner from an institution outside of Universitas Indonesia. Doctor Candidate will passed this Research Output Examination if they received a minimum grade of B. At this stage, a Doctor Candidate are allowed to design a scientific article framework to be published in an indexed International Journal and determine which International Journal they will send the article to.

ENME900006
Publication - International Conference
4 SKS

ENME900005
Publication I - International Conference
6 SKS

At this stage, students are expected to have an experiment result or study to focused on in their research topic and clarify their research direction. The result of the experiment must also show innovation or breakthrough, mastery of knowledge on their stream in relation to their research topic, the depth of their research materials, and the mastery of the state of the art development in their field or research interest, originality, and the contribution towards science and/or its implementation. Once presented in front of their promoter and co-promoter, the whole research result at this stage will be deemed worthy for international conference publication.

ENME900008
Publication II - International Journal
8 SKS

ENME900009
Publication III - International Journal
8 SKS

The scientific publication is an integral part of research activity and a prerequisite in participating in a Promotion Examination. International Journal meant here is an English language journal which its editorial board consists of member from at least three different countries or more. A mandatory publication must have an "Accepted" status before the Promotion Examination. FTUI itself publish their own international journal, the International Journal of Technology (IJTech), which students can utilize as one of the international journal to publish their Doctoral research.

ENME900008
Promotion Examination
6 SKS

Before deemed fit to participate in a Promotion Examination. Doctor Candidate are required to conduct additional research as a follow up from the Research Output Examination. The inputs and revisions given during the Research Output Examination must be completed and revised through a series of final research. At this stage, the Doctor Candidate must prove the authencity and originality of their research as new contribution to the scientific world. Thus, at this stage, the Doctor Candidate is required to have an "Accepted" for their international Journal, they are also required to complete their dissertation paper ready to be tested during the Promotion Examination.

Dissertation is an academic scientific paper study output and/or in depth research done independently and contained new contribution to issues that are temporary already known the answer or new questions ask on issues that are seen to have been established in the field of science and technology by the Doctor Candidate under the guidance of his Academic Advisor. A Doctor Candidate that has completed the revision of their dissertation are required to submit a completed version of their dissertation in five hard cover books and original approval form that has been signed by their advisors and submitted to PAF FTUI signifying the end of their study. The format for writing and binding the Dissertation should follow the writing and binding guidelines in the Technical Guidelines of Final Project Writing for Students of

Universitas Indonesia that can be downloaded at http://www.ui.ac.id/download.

Promotion Examination is a scheduled academic activity as a medium of evaluation for the Doctor Candidate Dissertation as a requirement to obtain the highest academic title, Doctor. The requirements and provision for Promotion Examination are as follow:

- Promotion Examination can be done if all the scientific publication requirements are completed by the Doctor Candidate: a minimum of one publication in an International Scientific Journal (in "Accepted" status) in relation to their dissertation research. The Publication is required to state Faculty of Engineering Universitas Indonesia as one of the affiliation institution.
- Promoter and Co-Promoter gave a written approval on the dissertation as a sign that the dissertation can move forward to the Promotion Examination.
- The Promotion Examination is carried out by the Committee of Promotion Examination which is appointed with a Rector's Decree based on a proposal from the Head of Department and the Dean of the Faculty of Engineering Universitas Indonesia.
- The Committee of the Promotion Examination comprises of: (a) Promoter and Co-Promoter, (b) The Examiners, (c) a minimum of one examiner from outside of Universitas Indonesia.
- Examiners consist of experts from related field of study. In a special circumstances, an expert that is not from the academic community can be invited as part of the examiners team.
- The Promotion Examination is led by the Head of the Examiners Committee that is also a member of the committee outside of the Promoter/Co-Promoter and outside examiner. If the Head of the Examiners Committee is unavailable, his/her position can be replaced by one of the member of the examiner team.
- The Promotion Examination is held as an open session for a period of maximum three hours divided into two stages: the dissertation presentation given by the Doctor Candidate for 15-30 minutes and a question and answer session for 120-165 minutes.
- The Doctor Candidate will pass the Promotion Examination if they received a minimum grade of B with GPA 3.00.

Facilities for Doctoral Program Students
To make sure that student of FTUI Doctoral Program are able to conduct full time research and produce excellent publications as required, FTUI provides the following facilities:

Doctoral Program Students' Workstation
Compact cubicles in comfortable rooms are available as Doctoral program students' workstation. The locations for these workstations are located on the 2nd and 3rd floor of the Engineering Center Building. Access to these workstations requires a swipe card to guarantee security. A round the clock wi-fi service is also available. To procure a workstation and access card, students are requested to register to the Associate Dean for General Affairs in the Dean's building, 2nd floor, FTUI Depok.

International Journal Article Writing Training
These free of charge trainings for the FTUI Doctoral program students are held several times each year. The information regarding these trainings are communicated through an announcement in SIAK-NG, posters at each Department, Doctoral program mailing list and FTUI website (www.eng.ui.ac.id).

Research Proposal Writing Training
These free of charge trainings for the FTUI Doctoral program students are held several times each year. The information regarding these trainings are communicated through an announcement in SIAK-NG, posters at each Department, Doctoral program mailing list and FTUI website (www.eng.ui.ac.id).

Line Editing Draft for International Journal Article
FTUI provides funds for line editing drafts for International Journal Articles. Requirement for applying for this funds are: the article must include the promoter name as part of the writing team and state FTUI as the main affiliation. To be grant this facility, students only needs to send a draft of their article through email to the FTUI Associate Dean of Academic and Research (risetft@eng.ui.ac.id). The time required for line editing is 2-4 weeks.

Doctoral Program Mailing-List
The Doctoral Program mailing list is used as a communication tool between the Dean's Faculty Heads, the Faculty Center Administration staff and all Doctoral program students in FTUI. Information regarding trainings, seminars, grants or other academic matters is announced through this mailing list. Complaints and suggestions are also accommodated by this mailing list. The mailing list address is: programdoktorft@group.eng.ui.ac.id

Research and Incentive Grants for Master and Doctoral Program
Research funds including consumables and tests for research as part of the thesis and dissertation writing is the responsibility of the student. There are a number of competitive research grants, incentive research grant schemes available from which Master and Doctoral program students may propose to finance his/her research. Complete guidance and research proposal examples are available at the Associate Dean for Research and Community Development secretary at the Dean's Building, 2nd floor or through http://research.eng.ui.ac.id.

International Journal Writing Incentive
This incentives are given to lecturer of State of Private Universities that have published an article in an international journal. Each proposer must be the first writer of the article and include an institution affiliation in Indonesia.

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