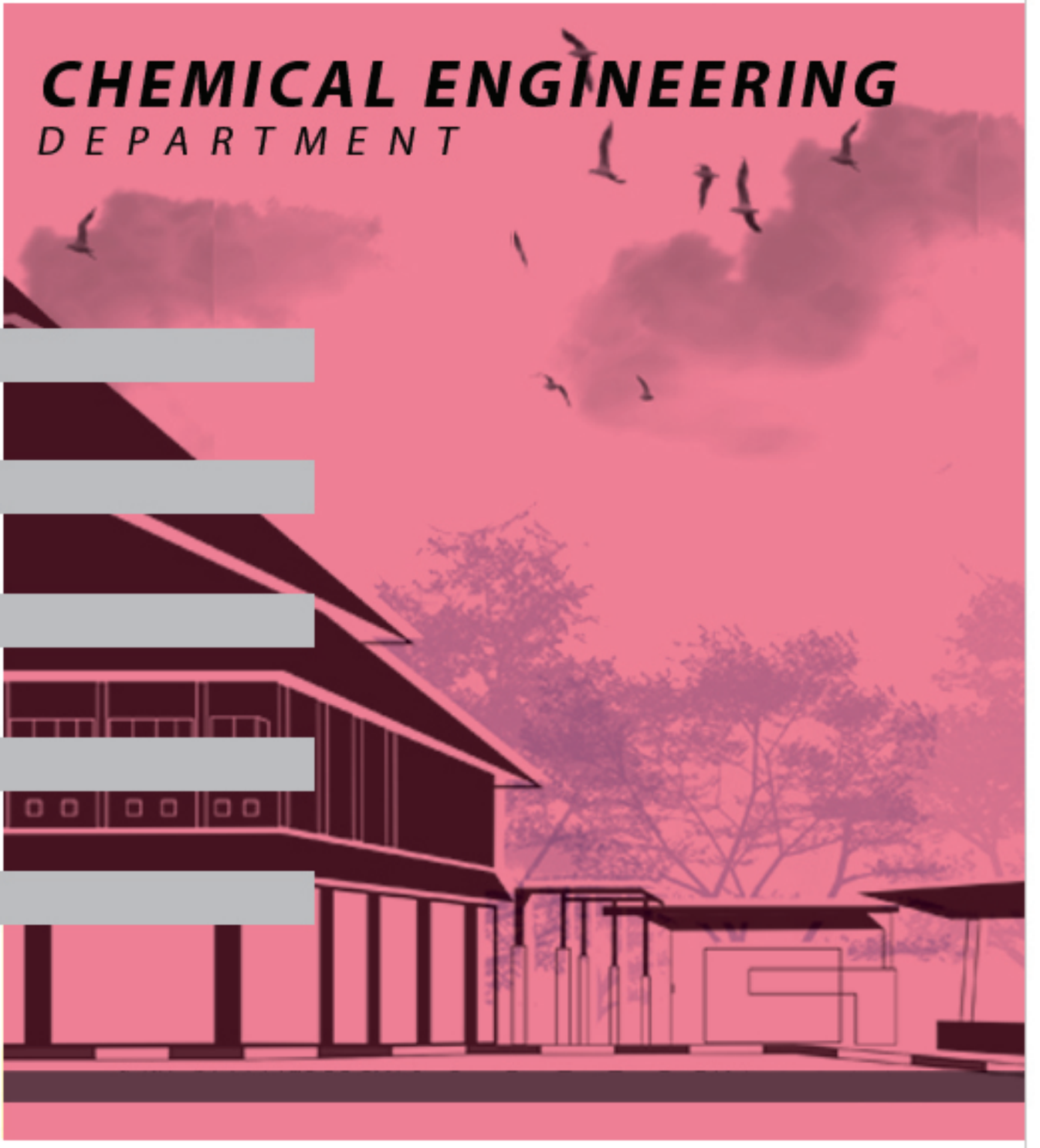
UNIVERSITAS INDONESIA

FACULTY OF ENGINEERING

ACADEMIC GUIDEBOOK

2017 edition

CHEMICAL 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.

Prof. Dr. James-Holm Kennedy, jhk@pixi.com (Electronic & optical beam management devices, micromechanical sensors, chemical & biochemical sensors, novel electronic devices, force sensors, gas sensors, magnetic sensors, optical sensors.), University of Hawaii, USA.

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. Michiharu Tabe, tabe.michiharu@shizuoka.ac.jp, (Nano Devices) Research Institute of Electronics, Shizuoka University

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 CHEMICAL ENGINEERING

GENERAL

The main mission of the Chemical Engineering Department is to provide the highest quality education so that graduates have the necessary knowledge, skills, and experience conducting research with current topics in the field of chemical engineering and biochemical engineering. Starting from the opening of the Gas Engineering Program in 1981, Chemical Engineering Department at UI is now one of the leading chemical engineering departments in Indonesia having excellent accreditation from National Accreditation Board of Indonesia (BAN) and the ASEAN University Network (AUN). Chemical Engineering Department has two study programs, Chemical Engineering (PSTK) and Bioprocess Technology (PSTB), 30 permanent academic staff and about 800 undergraduate and graduate students. In order to enhance the role of the department in the era of biotechnology and life sciences, PSTB was opened in 2008.

Chemical engineering department offers five academic programs: undergraduate program (regular, parallel, international), master program (regular and gas management at Salemba campus), and doctoral program. The chemical engineering department has been adhering to competency-based principles starting in curriculum 2000 up to the recently updated curriculum 2012. The present graduate competencies are based on those recommended by ABET and the Bologna Process and on feedbacks from graduates and industry representatives, aiming at producing graduates who are educated and able to contribute effectively to their communities wherever they choose to live and work. The chemical engineering department is conducting international classes in collaboration with three Australian universities: Monash University, Curtin University and University of Queensland. Students in this international class spend their first four semesters at UI, and spend the subsequent four semesters in Australia. At the end of their study, students will get a Sarjana Teknik degree from UI and a Bachelor of Engineering degree from the partner university. Since 2011, international program students may choose to enroll in a single-degree program at UI following a curriculum that is equivalent to the regular undergraduate curriculum. The department also has established double degree master programs with National Taiwan University of Science and Technology (NTUST) and Curtin University. In this double degree programs, students spend their first year at UI and the second year at NTUST or Curtin University. At the completion of their studies, students will be awarded a Master of Engineering degree from NTUST or Curtin University.

The updated curriculum is now more streamlined and integrated allowing students to take elective courses previously only available in a study program (PSTK or PSTB) or available for a certain level (undergraduate or graduate). It means that students could choose courses that are more suitable to their interest. For those who qualify, there is a fast-track program that allows undergraduate students to obtain both bachelor and master degrees in ten semesters instead of in twelve semesters. Chemical engineering master's program has also prepared a special curriculum for those without an educational background not in chemical engineering. By adopting this special curriculum, applicants with a non-chemical engineering degree are recommended to take the chemical engineering undergraduate core courses to master the fundamentals of chemical engineering before taking more advanced core graduate courses. Graduates of doctoral programs are expected to contribute to the development of science by conducting independent research, usually under supervision of a qualified professor.

Chemical engineering department as one of the departments in the Faculty of Engineering, University of Indonesia has taken part in a research effort with the theme "Sustainable chemical and bioengineering for energy and product development". This research theme is supported by four research groups: chemical and natural product design, sustainable energy, industrial bioprocess technology, and process intensification. Research activities conducted at the Chemical engineering department has received a lot of government funding to support the research activities of students.

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VISION, MISION AND OBJECTIVES OF CHEMICAL ENGINEERING DEPARTMENT – FTUI

Vision

"*To become a world class Chemical Engineering Department as center of excellence for education and research in chemical engineering.* "

Mision

The Department seeks to provide the best quality of undergraduate and postgraduate education. The Department will provide a broad-based education and design experience, enabling students to address chemical engineering problems. Furthermore, the Department will provide students with fundamental elements to develop in the profession in response to rapidly changing technology and societal needs and expectations, and, will also develop important soft skills such as problem solving, communication, and group skills.

STAFF OF THE DEPARTMENT OF CHEMICAL ENGINEERING

Head of Department
Prof. Ir. Sutrasno Kartohardjono, M.Sc, PhD
Vice Head of Department
Prof. Dr. Ir. Nelson Saksono, MT
Head of Chemical Engineering Study Program :
Prof. Ir. Sutrasno Kartohardjono, M.Sc, PhD
Head of Bioprocess Engineering Study Program
Dr. Dianursanti, ST., MT

HEAD OF LABORATORY
Head of Chemical and Natural Product Design Laboratory
Prof. Dr. Ir. Mohammad Nasikin, M.Eng
Head of Chemical Process Intensification Laboratory
Prof. Dr. Ir. Setijo Bismo, DEA
Head of Sustainable Energy Laboratory
Dr. Ir. Asep Handaya Saputra, M.Eng
Head of Bioprocess Engineering Laboratory
Dr. Tania Surya U, ST., MT
Head of Basic Chemical Process Laboratory
Ir. Rita Arbianti, M.Si
Head of Chemical Process System Laboratory
Dr.rer.nat. Ir. Yuswan Muharam, MT
Head of Basic Process and Operation Laboratory
Dr. Ir. Sukirno, M.Eng

BOARD OF PROFESSORS

Prof. Dr. Ir. Widodo W. Purwanto, DEA
widodo@che.ui.ac.id (Ir, ITS; DEA and Dr, ENSIGC-INP Toulouse, France): Sustainable energy.

Prof. Dr. Ir. Mohammad Nasikin, M.Eng
mnasikin@che.ui.ac.id (Ir, ITS; M.Eng, Tokyo Institute of Technology, Japan; Dr, UI): Heterogenous catalyst.

Prof. Ir. Sutrasno Kartohardjono, M.Sc, PhD
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Prof. Dr. Ir. Anondho Wijanarko, M.Eng
anondho@che.ui.ac.id (Ir, UI; M.Eng, Tokyo Institute of Technology, Japan; Dr, UI): Bioprocess engineering.

Prof. Dr. Ir. Setijo Bismo, DEA
bismo@che.ui.ac.id (Ir, ITB; DEA and Dr, ENSIGC Toulouse, France): Ozone and plasma technology.

Prof. Dr. Ir. Slamet, MT
slamet@che.ui.ac.id (Ir, UGM; MT, UI; Dr, UI): Photocatalysis.

Prof. Ir. Dr.-Ing. Misri Gozan, M.Tech
mgozan@che.ui.ac.id (Ir, UI; M.Tech, Massey University, New Zealand; Dr.-Ing, TU Dresden, Germany): Environmental bioprocess engineering, waste to energy.

Prof. Dr. Ir. Heri Hermansyah, M.Eng
heri@che.ui.ac.id (ST, UI; M.Eng and Dr, Tohoku University, Japan): Reaction process engineering, bioprocess and biocatalysis.

Prof. Ir. Mahmud Sudibandriyo, M.Sc., Ph.D
msudib@che.ui.ac.id (Ir, ITB; M.Sc and PhD, Oklahoma State University, USA): Thermodynamics adsorption & coalbed methane.

Prof. Dr. Ir. Nelson Saksono, MT
nelson@che.ui.ac.id (Ir, UI; MT, UI; Dr, UI): Elelctrolysis Plasma Technology

FULL-TIME FACULTY

Abdul Wahid wahid@che.ui.ac.id (Ir, UI; MT, UI; Dr, UTM): Modeling and simulation.

Andy Noorsaman Sommeng andy.n.sommeng@gmail.com (Ir, UI; DEA UTC, France; Dr, Ecole Centrale de Paris, France): Process system engineering.

Asep Handaya Saputra sasep@che.ui.ac.id (Ir, UI; M.Eng and Dr, Tokyo Institute of Technology, Japan): Composite material, natural gas transportation.

Bambang Heru bambanghs@che.ui.ac.id (ST, UI; MT, UI; Dr, UI): Bioconversion (biofuel), process computation.

Dewi T. Budi detris@che.ui.ac.id (Ir, UGM; MT, ITB; PhD, Chalmers University, Sweden): Process catalysis.

Dianursanti danti@che.ui.ac.id (ST, UI; MT, UI; Dr, UI): Biomass production and CO2 fixation of microalgae.

Dijan Supramono dsupramo@che.ui.ac.id (Ir, ITB; M.Sc, UMIST, UK): Fluid mechanics in combustion.

Eva Fathul Karamah eva@che.ui.ac.id (Ir, UI; MT, UI; Dr, UI): Wastewater treatment by advanced oxidation processes.

Eny Kusrini ekusrini@che.ui.ac.id (S.Si, UGM; Dr, USM, Malaysia): Lanthanide, nanocomposites, catalyst.

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Yuliusman usman@che.ui.ac.id (Ir, UI; M.Eng, UTM, Malaysia; Dr, UI): Liquid-liquid extraction, gas and polluttan adsorption, and purification of smoke.
Yuswan Muharam muharam@che.ui.ac.id (Ir, UI; MT, UI; Dr.rer.nat, University of Heidelberg, Germany): Modeling and simulation of chemical process.

PART-TIME FACULTY

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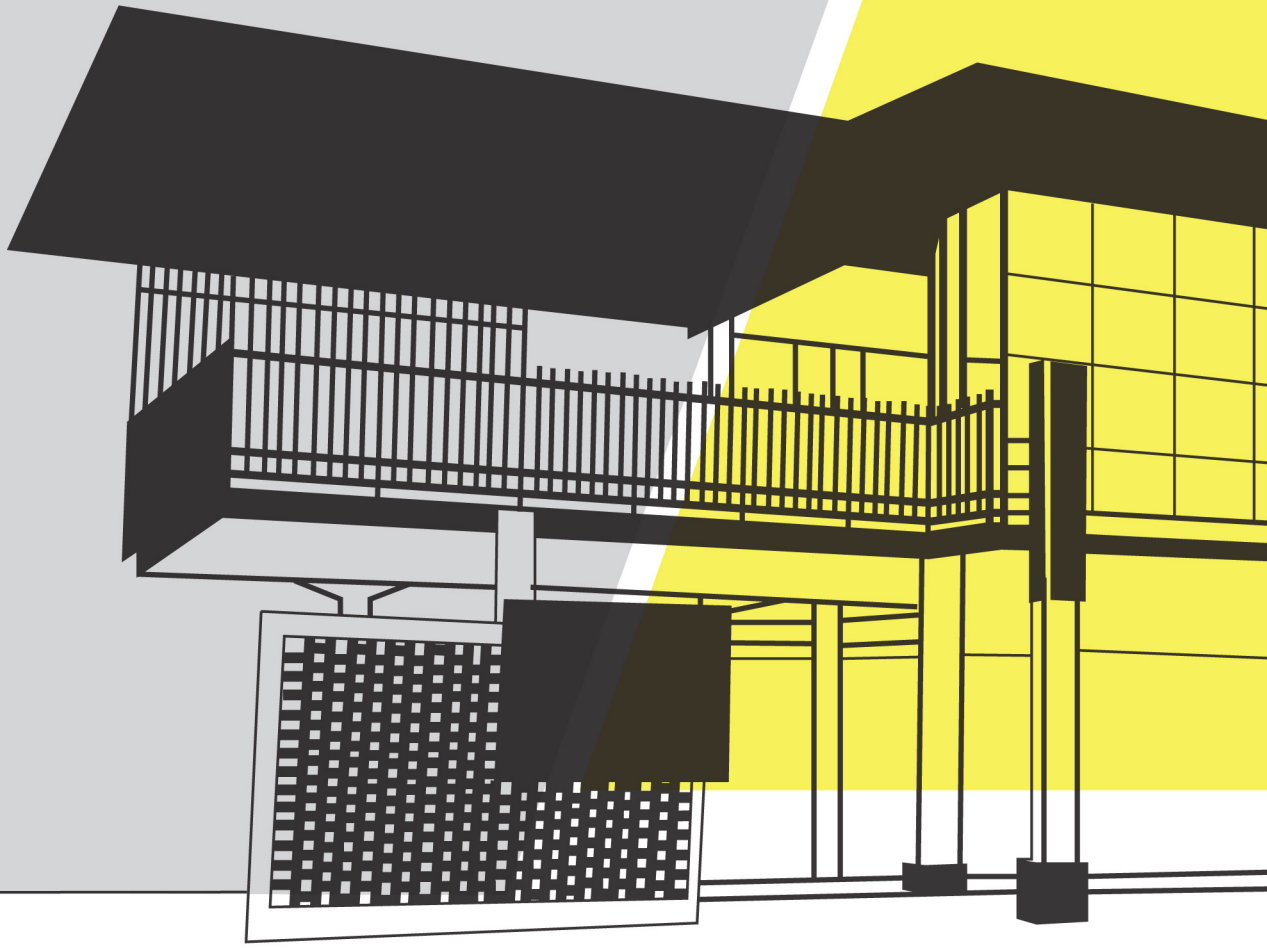
Tilani Hamid tilanihs@che.ui.ac.id (Ir, ITB; M.Si, UI): Material and corrosion science.
Elsa K. Mulia elsa_krisanti@yahoo.com (S.Si, ITB; PhD, Colorado School of Mines, USA): Applied chemistry, biomass conversion, teaching-learning methods.

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.

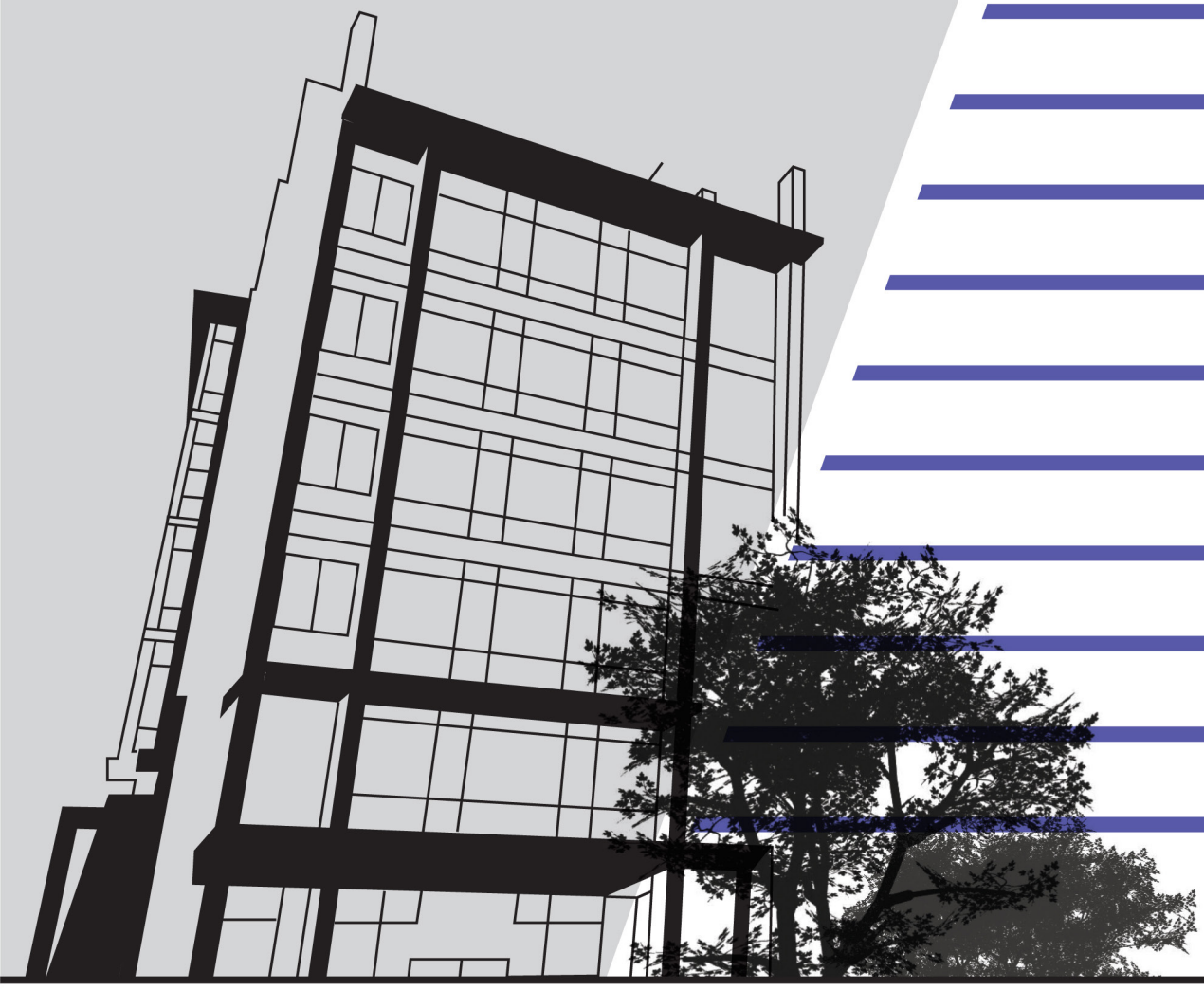
RESEARCH

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).

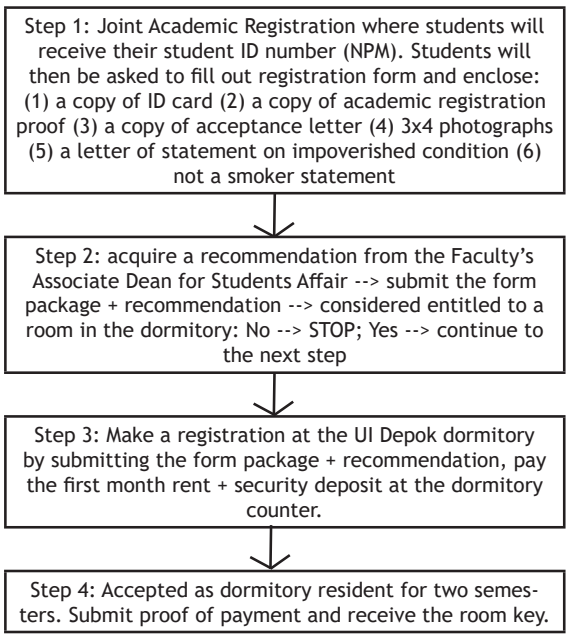
Facility
- Standard housing facility: Bed, table, chair, wardrobe, shoe rack, lamp, bathroom, wash basin.
- Technology facility: Public pay phone shops, public internet shop, photocopy
- Public facility: Cafeteria, praying room, laundry service, sport facility, car/motorcycle parking areas, minimart,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

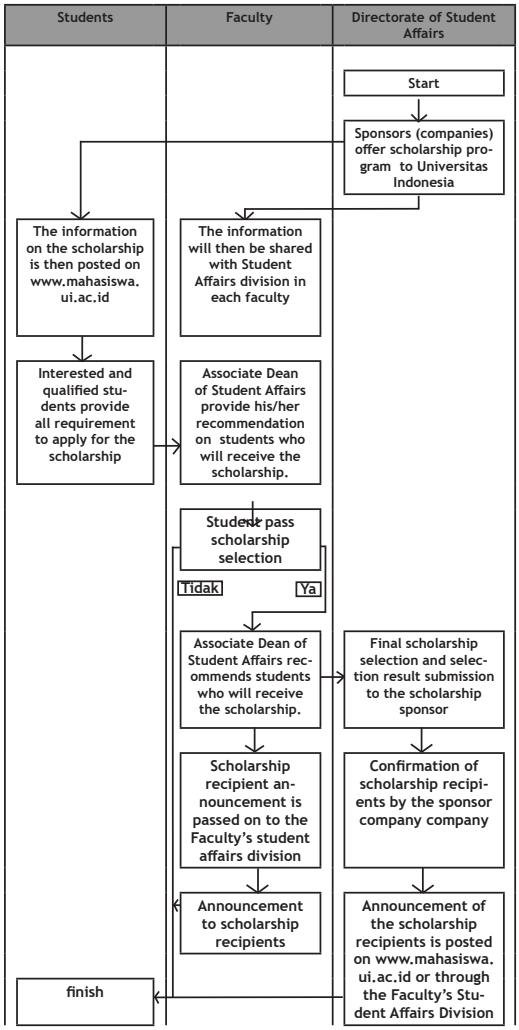
General requirement procedure for scholarship application from Donor/Sponsor:
- Submit application through the Faculty Head with a recommendation from the Associate Dean of Student Affairs.
- Submit a photocopy of academic transcript stating a GPA corresponding with the requirement given by the donor/sponsor.
- 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)

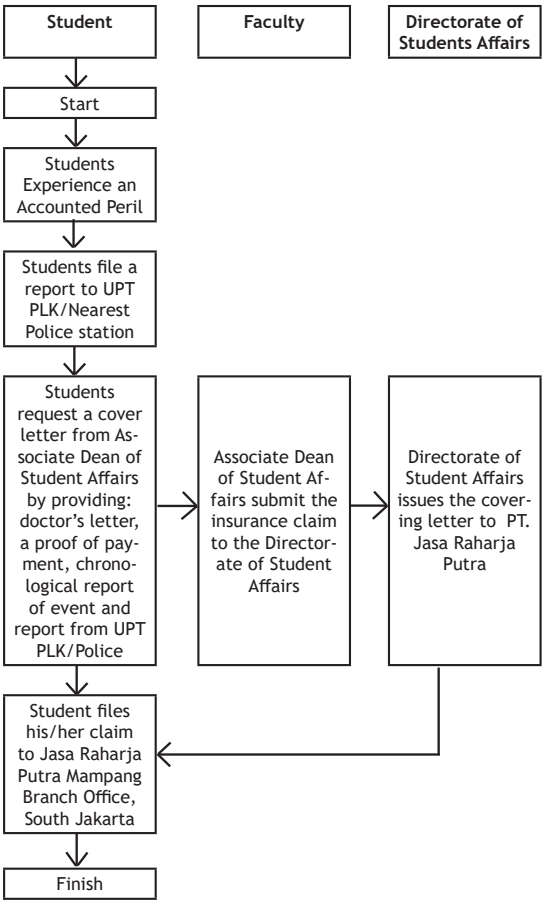
    Thesis
28. Indosat
29. Karya Salemba 4 (KS 4)
30. KORINDO
31. LGE
32. MARUBENI
33. MC.DERMONT
34. Part Time Job

Flow Chart 16 Scholarship Application



35. Posco (Thesis Aid)
36. PPA/BBM Angkatan 2009
    - PPA/BBM DIII
    - PPA/BBM S1
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 (Living Allowance)
    - YKPP - Pertamina (Tuition Fee)

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

4.10. UNDERGRADUATE PROGRAM IN CHEMICAL ENGINEERING

Program Specification

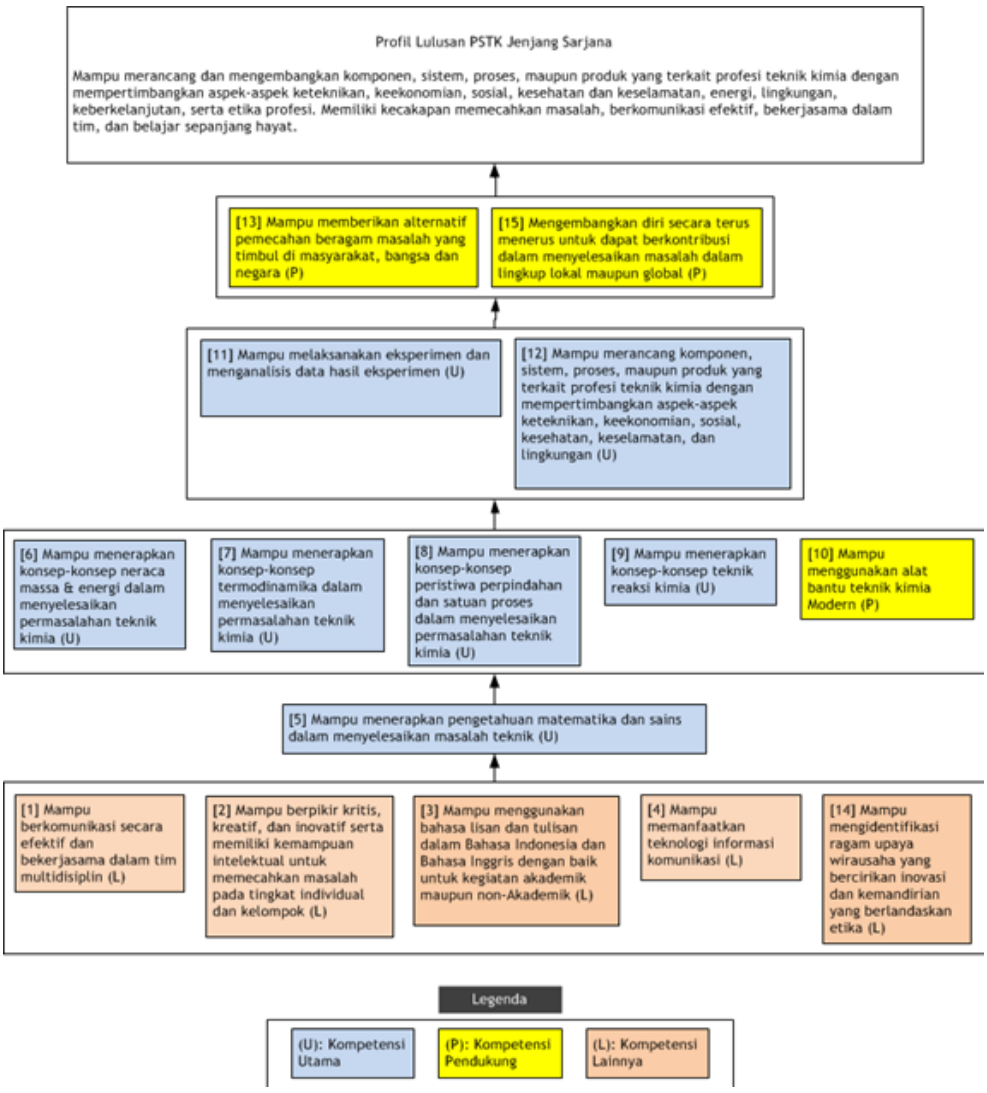
1	**Awarding Institution**		Universitas Indonesia and partner universities
2	**Teaching Institution**		Universitas Indonesia Universitas Indonesia and partner universities
3	**Programme Title**		Undergraduate Program in Chemical Engineering
4	**Type of Class**		Regular, Paralel, Internasional
5	**Degree Given**		Sarjana Teknik (S.T) Double degree: Sarjana Teknik (S.T) and Bachelor of Engineering (B.Eng)
6	**Accreditation status**		BAN-PT: A Accreditation AUN-QA
7	**Medium Language**		Indonesian and English
8	**Study Scheme(Full time/Part time)**		Full time
9	**Entry requirement**		High school /equivalent, or D3 / Polytechnique / equivalent, AND pass the entrance exam.
10	**Duration of Study**		Designed for 4 years
	Type of Semester	Number of semester	Number of weeks /semester
	Regular	8	16
	Short (optional)	3	8
12	**Graduate Profiles:** *Graduates of the undergraduate program of PSTK-FTUI should be able to contribute to the field of chemical engineering by applying chemical engineering principles with careful consideration of the engineering, economic, social, health and safety, energy, environment, sustainability, and ethics aspects; able to think critically, communicate effectively, and work together in multidisciplinary teams.*		
12	**Expected Learning Outcomes:** 1. Able to communicate effectively and work in multidisciplinary team. 2. Capable of critical, creative, and innovative thinking, and also have the intellectual ability to solve problems independently and and interdependently 3. Good at both spoken and written Bahasa Indonesia and English for academic and non-academic activity 4. Capable of utilizing communication information technology 5. Able to apply knowledge of mathematics and science in solving engineering problems 6. Able to apply concept of mass and energy balances in solving chemical engineering problems 7. Able to apply thermodynamic concepts in solving chemical engineering problems 8. Able to apply concepts of transport phenomena in solving chemical engineering problems 9. Able to apply the concepts of chemical reaction engineering 10. Able to use modern chemical engineering tools 11. Able to conducts experiments and analyze the data obtained		

12	12. Able to design components, systems, processes, and products related to chemical engineering profession with careful consideration of the engineering, economic, social, health and safety, energy, environment, sustainability, and ethics aspects 13. Able to provide solutions to various problems occurred wherever they live and work 14. Able to identify the kind of entrepreneurial approach needed based on innovation, self-reliance and ethics 15. Continuously develop oneself to contribute in solving local and global problems.		
13	**Course Composition**		
No	Type of Course	Credits	Percentage
i	General Course of University	18	12,4
ii	General Course of Engineering Faculty	25	17,2
iii	Skill Course	82	57
iv	Optional Course	12	8
v	Internship , Seminar, Final Project, Project	7	5
	Type of Course	144	100 %
14	**Total Credit Hours to Graduate**		**144 SKS**

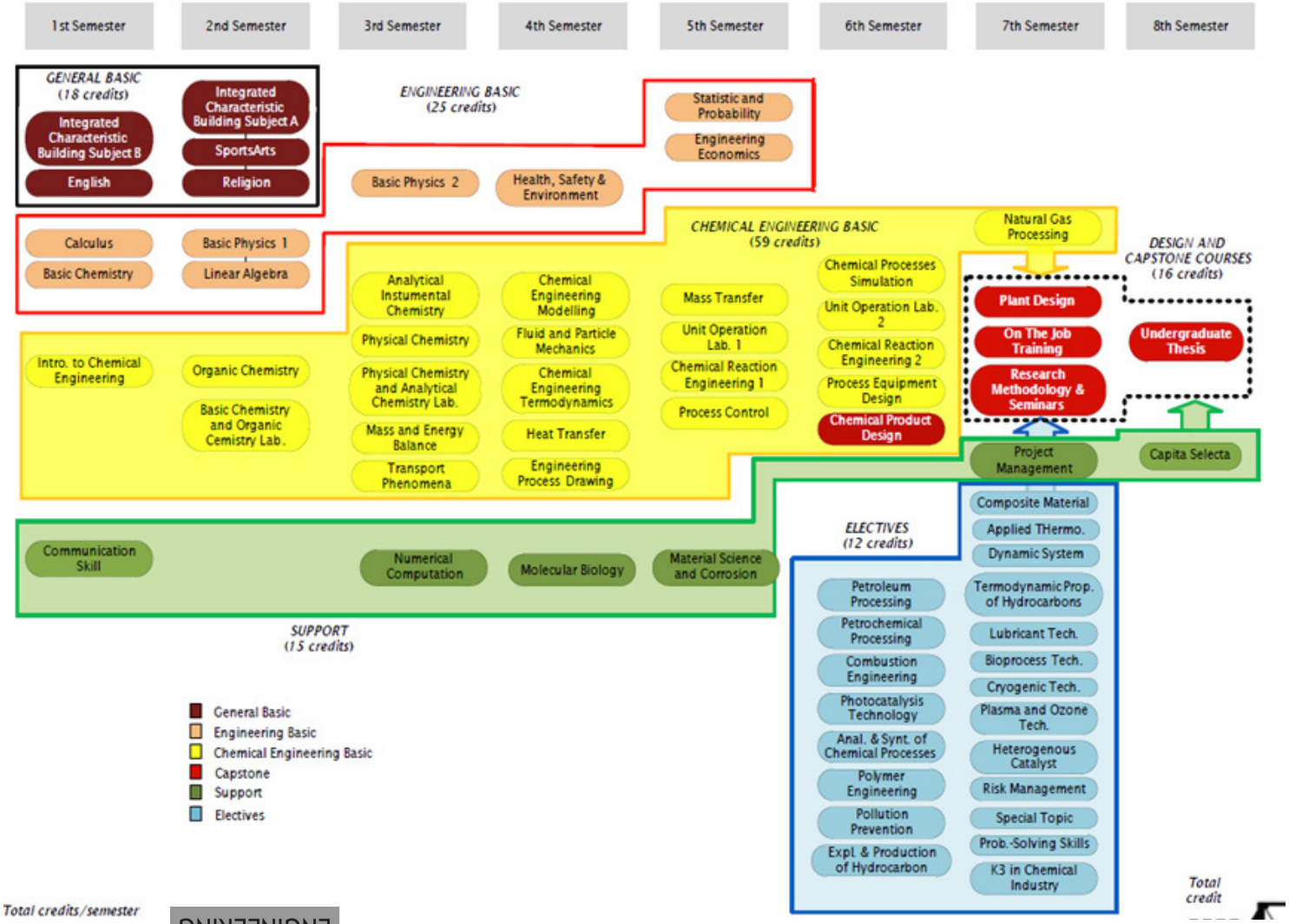
Employment Prospects

A graduate of the chemical engineering and bioprocess technology study programs can be described as a "Universal Engineer" as they learn the basics of engineering such as thermodynamics, reaction kinetics and reactor design, separation processes, as well as transport phenomena (momentum, energy and mass). Graduates of chemical engineering department at UI have contributed in the following areas: energy (oil and gas industry), engineering contractor companies (engineering, procurement, construction and trial operation), chemical industry (petrochemicals, bulk and specialty chemicals), research and development of process and/or chemical products, and processing and synthesis of food products and pharmaceuticals.

NETWORK COMPETENCE



FLOW DIAGRAM OF SUBJECT



CURRICULUM STRUCTURE UNDERGRADUATE CHEMICAL ENGINEERING

KODE	SUBJECT	CREDIT
CODE	**1st Semester**	
UIGE600002	Integrated Character Building B	6
UIGE600003	English	3
ENGE600003	Calculus	4
ENGE600009	Basic Chemistry	2
ENCH601001	Intro to Chemical Engineering	3
ENCH601002	Communication skills	2
	Total Credit Term 1	20
	2nd Semester	
UIGE600001	Integrated Character Building A	6
UIGE600010-15	Religion	2
ENGE600004	Linear Algebra	4
UIGE600020-48	Sport / Art	1
ENGE600005	Physics (Mechanics and Thermal)	3
ENGE600006	Physics (Mechanics and Thermal) Lab	1
ENCH602003	Organic Chemistry	3
ENCH602004	**Organic and Basic Chemistry Lab**	**1**
	Total Credit Term 2	21
	3rd Semester	
ENGE600007	Physics (Electricity, MWO)	3
ENGE600008	Physics (Electricity, MWO) Lab	1
ENCH603005	Numerical Computation	3
ENCH603006	Instrumental Analytical Chemistry	3
ENCH603007	Physical Chemistry	3
ENCH603008	Phys. Chem. and Anal. Chem. Lab	1
ENCH603009	Mass and Energy Balance	3
ENCH603010	Transport Phenomena	3
	Total Credit Term 3	20
	4th Semester	
ENCH604011	**Chemical Engineering Modeling**	**3**
ENCH604012	**Fluid and Particle Mechanics**	**3**
ENGE600010	**Statistic and Probability**	**2**
ENCH604013	**Chemical Eng. Thermodynamics**	**4**
ENCH604014	**Heat Transfer**	**3**
ENCH604015	**Process Engineering Drawing**	**2**
ENCH604016	**Molecular Biology**	**3**
	Total Credit Term 4	**20**
	5th Semester	
ENCH605017	Material Science and Corrosion	3
ENGE600012	HSE Protection	2
ENGE600011	Engineering Economics	3
ENCH605019	Mass Transfer	4
ENCH605020	Unit Operation Process Lab I	1

ENCH605021	Chemical Reaction Engineering 1	3
ENCH605022	Chemical Process Simulation	3
	Total Credit Term 5	**19**
	6th Semester	
ENCH606023	Process Control	3
ENCH606024	Unit Operation Process Lab II	1
ENCH606025	Chemical Reaction Engineering 2	3
ENCH606026	Process Equipment Design	3
ENCH606027	Chemical Product Design	4
	Elective 1	3
	Elective 2	3
	Total Credit Term 6	**20**
	7th Semester	
ENCH607028	Natural Gas Processing	3
ENCH607029	Industrial Project Management	2
ENCH600030	Plant Design	4
ENCH600031	Internship	2
ENCH600032	Research Methodology & Seminar	2
	Pilihan 3	3
	Pilihan 4	2
	Total Credit Term 7	**18**
	8th Semester	
ENCH600033	**Scription**	**4**
ENCH600034	**Capita Selecta**	**2**
	Total Credit Term 8	**6**

ELECTIVES

Kode	Elective Course for Odd Semester	Credit
ENCH801101	Food Technology	3
ENCH801102	Herbal Engineering	3
ENCH801103	Composite Material	3
ENCH801104	Hydrocarbon Thermodynamic	3
ENCH801105	Lubricants Engineering	3
ENCH801106	Combustion Engineering	3
ENCH801107	Heterogenous Catalyst	3
ENCH803101	Oleochemistry Industry	3
ENCH803102	Protein Engineering	3
ENCH803103	Applied Thermodynamics	3
ENCH803104	Dynamics System	3
ENCH803105	Cryogenics	3
ENCH803106	Plasma and Ozone Engineering	3
ENCH803107	Special Topics 1	3
ENCH803201	Renewable Energy	3

Kode	Elective Course for Even Semester	Credit
ENCE802101	Packaging and Storage Technology	3
ENCE802102	Bioinformatics	3
ENCE802103	Drugs and Cosmetics Technology	3
ENCE802104	Biomaterial	3
ENCE802105	Petroleum Processing	3
ENCE802106	Petrochemical Processing	3
ENCE802107	Photocatalysis Technology	3
ENCE812108	Polymer Engineering	3
ENCE802109	Pollution Prevention	3
ENCE802110	Exploration and Production of Hydrocarbon	3
ENCE802111	Utilities and Plant Maintenance	3
ENCE802112	Natural Gas Transportation and Utilization	3
ENCE812113	Drug Controlled Released Technology	3
ENCE802114	Analysis and Synthesis of Chemical Processes	3
ENCE802115	Geothermal Technology	3
ENCE802116	Problem-Solving Skills	3
ENCE802117	Special Topic 2	3

Resume	Wajib Universitas	18	Resume	General Course of University	18
	Wajib Fakultas	25		General Course of Engineering Faculty	25
	Wajib Program Studi	90		Skill Course	90
	Jumlah	133		Total	133
	Pilihan	12		Optional Course	12
	Total Beban Studi	145		Total Courses Load	145

COURSE STRUCTURE INTERNATIONAL UNDERGRADUATE CHEMICAL ENGINEERING

KODE	SUBJECT	CREDIT
CODE	**1st Semester**	
Compulsory		
UIGE610002	Academic Writing	3
ENGE 610005	Physics (Mechanics and Thermal)	3
ENGE 610006	Physics(Mechanics and Thermal) Laboratory	1
ENGE 610003	Calculus	4
ENGE 610009	Basic Chemistry	2
ENGE 610010	Statistics and Probability	2
ENCH611001	Introduction to Chemical Engineering	3
	Total	**18**
Elective		
	Total	**0**
	Total Credit Term 1	**18**
	2nd Semester	
Compulsory		
ENGE 610004	Linear Algebra	4

ENGE610007	Physics (Electric, Magnet,Wave & Optic)	3
ENGE610008	Physics (Electric, Magnet,Wave & Optic)Laboratory	1
ENCH612002	Organic Chemistry	3
ENCH612003	Mass and Energy Balances	3
ENCH612004	Basic Chem. and Org. Chem. Lab.	1
ENCH612005	Physical Chemistry	3
	Total	**18**
Elective		
	Total	**0**
	Total Credit Term 2	**18**
	3rd Semester	
Compulsory		
ENCH613006	Material Science and Corrosion	3
ENCH613007	Numerical Computation	3
ENCH613008	Instrumental Analytical Chemistry	3
ENCH613009	Fluid and Particle Mechanics	3
ENCH613010	Phys. Chem. and Anal. Chem. Lab.	1
ENCH613011	Chemical Engineering Thermodynamics	4
ENCH613012	Transport Phenomena	3
	Total	**20**
Elective		
	Total	**0**
	Total Credit Term 3	**20**
	4th Semester	
Compulsory		
ENCH614013	Chemical Engineering Modeling	3
ENCH614014	Mass Transfer	4
ENCH614015	Heat Transfer	3
ENCH614016	Process Engineering Drawing	2
ENCH614017	Chemical Process Simulation	3
ENCH614018	Molecular Biology	3
ENGE 6 1 0012	Health, Safety and Environmental Protection	2
	Total	**20**
Elective		
	Total	**0**
	Total Credit Term 4	**20**
	5th Semester	
Compulsory		
UIGE610004	Integrated Character Building B	6
ENGE610011	Engineering Economics	3
ENCH615019	Chemical Reaction Engineering 1	3
ENCH615020	Process Control	3
ENCH615021	Unit Operation Laboratory 1	1
ENCH615022	Industrial Project Management	2
	Total	**18**
Elective		
	Total	**0**
	Total Credit Term 5	**18**

	6th Semester	
Compulsory		
UIGE610001	Integrated Character Building A	6
UIGE610003	Sport/ Art	1
UIGE610005-9	Religion Studies	2
ENCH616023	Unit Operation Laboratory 2	1
ENCH616024	Chemical Reaction Engineering 2	3
ENCH616025	Process Equipment Design	3
ENCH616026	Chemical Product Design	4
	Total	**20**
Elective		
	Total	**0**
	Total Credit Term 6	**20**
	7th Semester	
Compulsory		
ENCH617027	Plant Design	4
ENCH610028	On the Job Training	2
ENCH610029	Research Methodology and Seminar	2
ENCH610030	Capita Selecta	2
	Total	**10**
Elective		
	Elective 1	3
	Elective 2	3
	Elective 3	3
	Total	**9**
	Total Credit Term 7	**19**
	8th Semester	
Compulsory		
ENCH618031	Natural Gas Processing	3
ENCH610032	Final Project	4
	Total	**7**
Elective		
	Elective 4	3
	Elective 5	3
	Total	**6**
	Total Credit Term 8	**13**

ELECTIVE COURSES

Code	Elective Course for Odd Semester	Credit
ENCH617101	Applied Termodynamics	3
ENCH617102	Thermodynamic Prop. Hydrocarbons	3
ENCH610103	Special Topics 1	3

Code	Elective Course for Even Semester	Credit
ENCH618104	Polymer Engineering	3
ENCH618105	Controlled Release of Drugs	3
ENCH618106	Special Topics 2	3

Resume	General Course of University	18
	General Course of Engineering Faculty	25
	Skill Course	88
	Total	131
	Optional Course	13
	Total Courses Load	144

SYLLABUS OF CHEMICAL ENGINEERING

TERM 1
UIGE600002
INTEGRATED CHARACTERISTIC BUILDING SUJECT B
6 CREDITS

Learning Objectives
Syllabus
Prerequisites
Textbook

UIGE600003
ENGLISH
3 CREDITS

Learning Objectives
Students able to use English for suporting study in Universitas Indonesia as well as continuing language learning indepedently.
Syllabus

1. Study Skills: (Becoming an active learner, Vocabulary Building: word formation and using the dictionary Listening strategies Extensive reading).
2. Grammar: (Revision of Basic grammar Types of sentences Adjective clauses, Adverb clauses Noun clauses, Reduced clauses).
3. Reading: (Reading skills: skimming, scanning, main idea, supporting ideas, Note-taking Reading popular science article, Reading an academic text)
4. Listening: (Listening to short conversations, Listening to a lecture and note-taking, Listening to a news broadcast, Listening to a short story)
5. Speaking: (Participating in discussions and meetings, Giving a presentation)
6. Writing: (Writing a summary of a short article Describing graphs and tables, Writing an academic paragraph, Writing a basic academic essay (5 paragraphs)

Prerequisites : -
Textbook : Poerwoto, C. et.al. - Reading Comprehension for Engineering Students

ENGE 6 0 0003
CALCULUS
4 CREDITS

Learning Objectives
After attending this subject, students are expected to capable of:
1. Understanding calculus basic concepts and competent to solve applied calculus problems.
2. Understanding the basic concepts of two or more variables function with its application.
3. Understanding the basic concepts of sequences and series as well as basic concepts of vectors and analytic geometry.

Syllabus :

Real number system, non-equivalency, Cartesians Coordination System, mathematic induction, Function and Limit, Continuous Function. Differential including chain's rule, implicit differential, and advanced differential function. Transcendent and differential Function. Applied Differential. Integral, basic integral function, Integration technique. Integral application on Cartesians and polar coordinate, indefinite. Sequences and infinite series. Spare rows and rows of positive change sign, Taylor and McLaurin series. Function of many variables and its derivatives. Maximum and Minimum. Lagrange Methods. Integral folding and its application.
Prerequisites : -
Textbook :
1. D.E.Vanberg and E.J, Purcell, Calculus with Analytic Geometry, 7th ed., Aplleton-Century-Crofts, 1996.
2. D.E.Vanberg, E.J Purcell, A.J Tromba, Calculus, 9th. Prentice-Hall, 2007.
3. G.B Thomas & R.L Finney, Calculus & Analytic Geometry 9th ed., 1996, Addison-Wesley

ENGE 6 0 0009
BASIC CHEMISTRY
2 CREDITS

Learning Objectives
1. Students able to resolve the problems of qualitative chemistry and indicate the reasons clearly as well as integrate various ideas in problem solving.
2. Students able to explain and model chemical and physical processes in the molecul level to explain the macroscopics properties.
3. Students able to classify materials based on conditions and bond properties by using periodic table as refference.
4. Students able to apply important theories such as kinetics of molecules or thermochemistry in chemical proble solving

Syllabus :

1. Materials and Measurements

2. Atoms, molecules, ions, and the Periodic Table

3. Stoichiometry: Calculations by using formulas of chemical equations

4. Chemical Reactions in Solution and stoichiometric solution

5. Thermochemistry; Chemical equilibrium

6. Acid and base

7. Electrochemistry

8. Chemical Kinetics

9. Application of Chemicals

Prerequisites : -
Textbook :
1. Ralph H. Petrucci, General Chemistry: Principles and Modern Applications, 8th Ed. Prentice Hall Inc. New York, 2001.
2. John McMurry, Robert C. Fay, Chemistry (3rd Ed.), Prentice Hall, 2001.
3. Raymond Chang, Williams College, Chemistry (7th Ed.), McGraw-Hill, 2003

ENCE601001
INTRODUCTION TO CHEMICAL ENGINEERING
3 CREDITS

Learning Objectives: Students are able to:
1. Distinguish chemical engineering from the other techniques
2. Explain the development of chemical engineering
4. Understand the fundamentals of chemical engineering of existing processes and systems as well
5. Do simple calculation from mass and energy balance, and know the criteria for process equipment.

Syllabus: Introduction to Chemical engineering (definition and history), Overview of the chemical engineering profession, employment, and the contribution of chemical engineering, chemical engineering code of ethics, processes and equipment of chemical industry, Chemical Engineering flow in particular industry.
Prerequisites: -
Textbook:
1. R.N. Shreve and G.T. Austin, Shreve's Chemical Process Industries, McGraw Hill, 1984
2. R.M. Felder and R.W. Rousseau, Elementary Principles of Chemical Processes, 3rd Edition, Wiley 2005
3. R. Schizininger and M. W. Martin. Introduction to Engineering Ethics. Mc. Graw-Hill, 2000.

ENBE601002
Communication Skill
2 Credits

Learning Objectives
Students are able to show their ability in identify of important component oral communication and effective writing as well as students are able to search references, read and criticize a writing. Students also able to write short accurate resume from reference. Students are able to apply skills in creating scientific research as well as presents it with clear and effective oral presentation that related to audience situation.

Syllabus : Introduction effective communication and audience analysis , Oral presentation, visual aids for oral presentation and assessment criteria, effective reading, making summary, preparing teaching notes, and assessment criteria, how to make memo writing and assessment criteria, writing processes - PKM GT guidelines including assessment criteria, Writing processes – referencing, Writing Process - how to make scientific poster and assessment criteria
Prerequisites : -
Textbook :
Donald R. Woods, Communicating effectively, McMaster University Bookstore, 1996.

TERM 2

UIGE600001
Integrated Characteristic Building Suject A
6 Credits

UIGE600010-15
RELIGIOUS STUDIES
2 CREDITS

General instructional objectives: Students have a concern for social issues, national and state based on religious moral values applied in the development of knowledge through intellectual skills.
Learning Objectives: After attending this subject, when students given a problem, students can:
1. Analyzed based on values their religion.

2. Analyzed by applying the steps to active learn.
3. Discuss and express their opinions by using Bahasa Indonesia in right and good manner, both in discussion and paper.
Syllabus: Adapted to the respective religion.
Prerequisite: -
Textbook: Adapted to the problem subject.

ENGE 6 0 0004
LINIEAR ALGEBRA
4 CREDITS

Learning Objectives: Students are able to explain/understand/apply linear algebra and associate this subject with other subjects.
Syllabus: Introduction of elementary linear algebra, Matrix, Determinant, Vectors in R2 and R3. Euclideas vector space, General vector space, Review of vector space, Product space, Value and diagonalization eigen vector, Linier Transformation, Application on the system of differential equation, Application on the quadratic surface, Decomposition of LU, Least Squares.
Prerequisite: -
Textbook:
1. H. Anton, Elementary Linear Algebra, 9th ed, John Wiley& Sons, 2005.
2. G.Strang, Introduction to Linear Algebra, Wellesley-Cambridge Press, 2007.

UIGE600020 – 48
Sports/Arts
1 Credit
Learning Objectives
Syllabus
Prerequisites
Textbook

ENGE 6 0 0005
PHYSICS MECHANICS AND HEAT
3 CREDITS

Learning Objectives
Students are able to understand the concepts and basic laws of mechanics physics and applied in a systematic and scientific problem solving which influenced by the force for both moving and not moving objects.

Syllabus
1. Scale, kinematics of point objects, mechanics of point objects, law of conservation of linear momentum and energy, harmonic motion, gravity, dynamics and kinematics of rigid objects.
2. Introduction and basic concept (pressure, thermodynamic system, state of the system, temperature), expansion, equilibrium energy (thermal state equation), heat transfer, ideal gas.
3. First law of thermodynamics, enthalpy and entropy, The first law of thermodynamics application for open and closed system, Second law of thermodynamics, kinetic theory of ideal gas.

Prerequisites : -
Textbook :
1. Halliday.D, R Resnick, Fisika I, edisi terjema-han P Silaban, Penerbit Erlangga 1986.
2. Ganijanti AS, Mekanika,Penerbit Salemba Teknik, 2000.
3. Tipler PA, Fisika I, ed III, terjemahan Lea Prasetio, Penerbit Erlangga, 1998.
4. Giancoli D.C, General Physics, Prentice Hall Inc, 1984.

5. Sears-Salinger, Thermodinamics, Kinetic theory and statistical thermodynamics, Wesley, 1975.
6. Giancoli, D.C, Physics: principles with aplica-tions, Prentice Hall Inc, 2000

ENGE 6 0 0006
PHYSICS MECHANICS AND HEAT LAB
1 CREDIT

Syllabus
Practical of Mechanics: Measurement, Moment of inertia, Gravity acceleration, Fluid density, Scratch coefficient, Collision, Swing torque, Viscosity of water, Young's modulus, Viscosity of Newtonian fluid, Fluids surface tension, Oscillation, Practical of Heat: Coefficient of linear expansion, Heat conductivity, Thermocouple calibration, Calorimeter, Joule Constant, Laplace Constant, Heat Collector, Determining of air Cp/Cv, Expansion of fluids and water anomaly.
Notes: For Architecture and Interior Architecture Program, practical is not mandatory.

ENCE 602003
ORGANIC CHEMISTRY
3 CREDITS

Learning Objectives: Students are able to:
Explain the link structure and stereochemistry, IUPAC name, physical properties, chemical reactivity, and reaction mechanisms
Determine the mechanisms of some organic chemical reactions and be able to estimate how to synthesize a simple organic chemical compounds.
Syllabus: Naming of organic compounds, the role of structure and stereochemistry of the physical / chemical an organic compound, the cracking reactions or free radicals alkane, polymerization of alkenes, aromatic electrophilic substitution on benzene, substitution and elimination reactions of alkyl halidas, acylation and esterification reactions, dehydration-polymerization on carboxylic compound
Prerequisites: -
Textbook:
4. Fessenden, alih bahasa : A. Hadiyana Pujatmaka, Kimia Organik, edisi Kedua Erlangga 1986
5. Morrison, RT and Boyd, RN, Organic Chemistry, 6th ed., Prentice Hall 1998.
6. Organic Chemistry lecture notes

ENCE602004
BASIC CHEMISTRY AND ORGANIC CHEMISTRY LAB.
2 CREDIT

Learning Objectives: Students are able to prepare a preliminary report on the theory behind the lab module, conducting experiments in the laboratory, process and analyze data from experiments, and create a final report containing the explanation of phenomena that occur during experiments.
Syllabus: General techniques and chemical lab safety aspect, physical and chemical properties, separation and purification of substances, the reaction of metals with acids, water crystals, suspension formed reaction, identification of hydrocarbons, alcohols and phenols identification, identification of carbonyl compounds, carbohydrates, lipid analysis, extraction and identification of fatty acids from corn oil.
Prerequisites: -

Textbook:
1. Fessenden, translation: A. Hadiyana Pujatmaka, Organic Chemistry, Second edition 1986 grants

2. Morrison, RT and Boyd, RN, Organic Chemistry, 6th ed., Prentice Hall 1998.
1. Vogel, Practical Organic Chemistry
4. TGP majors, Organic Chemistry Lab Instructions diktat (Basic Chemistry and Organic Chemistry Guide, Department of Chemical Engineering , FTUI)
5. Fieser, Organic Chemistry
6. Moran, L. dan Masciangioli, T.Safety and Security of Chemical Lab, the National Academies Press, 2010
7. Brown, T.L., H. E. LeMay and B.E. Bursten, Chemistry, ed. 8, Prentice Hall, 2000.
8. Vogel, Anorganic Qualitative Analyze, PT. Kalman Media Pustaka, 1985.

TERM 3

ENGE 6 0 0007
PHYSICS ELECTRICITY, MAGNETS, WAVE, AND OPTICS
3 CREDITS

Learning Objectives: Students are able to understand:
1. The concept and basic law of physics – electricity and magnetism and apply it systematically and scientifically in solving everyday magnetism and electricity physics problem.
2. The concept and basic law of wave and optical physics and apply systematic and scientific problem solving in a natural wave phenomenon or wave that arises from technical, physical properties of light and geometric optics.

Syllabus: Electric charge and Coulomb law, Electric field, Static and Gauss law, Electric potential, Capacitor, Direct electric current and basic circuit analysis, Magnetic field, Induction and electromagnetic, Faraday law and inductance, Material magnetism properties, A series of transient, Alternating current, Waves, Sounds, Polarization, Interference, Diffraction, Optical geometry, Lighting and photometry.
Prerequisite: -
Textbook:
1. Halliday, D, R. Resnick, Fisika II,edisi terjema-han P. Silaban, Penerbit Erlangga, 1986.
2. Ganijanti AS, Gelombang dan Optik, ed III, Jurusan Fisika FMIPA UI, 1981.
3. Tipler P.A, Fisika II, ed III terjemahan Bam-bang Sugiyono, Penerbit Erlangga, 2001.
4. D.C.Giancoli, General Physics, Prentice Hall Inc, 1984.

ENGE 6 0 0008
PHYSICS ELECTRICITY, MAGNETS, WAVE, AND OPTICS LAB
1 CREDIT
Syllabus:
Practical of Electricity: Electrolysis, Wheatstone bridge, Kirchhoff law, Earth's magnetic field, Temperature coefficient, Characteristic of series RLC circuit, Ohm law, Transformer. Practical of Optics: Polarimeter, Lens, Photometry, Prisms bias index, Spectrometer, Diffraction grid, Newton's ring.
ENBE603005
NUMERICAL COMPUTATION
3 CREDITS

Learning Objectives
Students are able to solve chemical process through computational methods
Syllabus :
Chemical process modeling, simple differential equation : initial problem value, simple differential equation : limitation problem value ; differential partial equations.
Prerequisites : -
Textbook : -

ENBE603006
INSTRUMENTAL ANALYTICAL CHEMISTRY
3 CREDITS

Learning Objectives: Students are able to explain and compare the various basic principles methods of analytical chemistry and apply it for qualitative and quantitative analysis of pure and mixture compounds
Syllabus: Skill workshop, Electrochemistry process, Potentiometry, Atomic Spectroscopy (AAS), Molecular spectroscopy (IR), Chromatography gas.
Prerequisite: -
Textbook:

1. Day R.A. dan A. L. Underwood, Analisis Kimia kuantitatif (terjemahan), Erlangga, 1986, atau buku aslinya dalam bahasa Inggris.
2. D. A. Skoog, et.al., Fundamentals of Analytical Chemistry, 5th. Ed., Saunders College Publishing, 1988. Atau edisi terbaru
3. G. D. Christian and J. E O'Reilly, Instrumental Analysis, 2nd. Ed., Allyn Bacon Inc., 1986.
4. Donald R. Woods, Problem based learning: How to gain the most from PBL, 2994, Mc-Master University, Hamilton, ON L8S 4L8.

ENBE603007
PHYSICAL CHEMISTRY
3 CREDITS

Learning Objectives: Students are able to understand the basic concepts of physical chemistry including the topics of thermodynamics, equilibrium reactions, and molecular spectroscopy, and apply these concepts to solve simple problems of chemical physics
Syllabus: Introduction, gas and liquids, Chemical Equilibrium, surface phenomena
Prerequisites: -
Textbook:

1. Levine, IN, Physical Chemistry, 6th ed., McGraw-Hill, 2008.
2. Atkins & de Paula, Atkin's Physical Chemistry, 9th ed., Oxford University Press, 2009
3. Samuel H. Maron, Jerome B. Lando, Fundamental of Physical Chemistry, Macmillan Publishing Co. Inc., Collier Macmillan Publishers, London1974

ENBE603008
PHYSICAL CHEMISTRY AND ANALYTICAL CHEMISTRY LAB
1 CREDIT

Learning Objectives:
Students are able to conduct pre-eliminary report which is supported laboratory module theories, practicing experiments in laboratory, and arrange final report that contains the results of processing and analysis data experiments as well as explain the phemomena
Syllabus: Isothermal adsorption, effect of concentration and temperature on reaction rate, colligative properties of solution, chemical equilibrium determination, determination of molecular properties based on gas density, potentiometric methods, spectrophotometry visible light, conductometric methods, Chromatoghraphy Gas
Prerequisite: Basic Chemistry, Physical Chemistry and Analytical Chemistry Instrumental
Textbook:

1. Physical Chemistry Lab Instructions FTUI TGP-1989.
2. Guidance of Physical Chemistry and Analytical Chemistry Lab, Chemical Engineering, Universitas Indonesia.
3. D. A. Skoog, et.al., Fundamentals of Analytical Chemistry 5th., Saunders College Publishing, 1998 atau edisi terbaru
4. Shoemaker, D.P., C.W. Garland, J.W. Nibler, Experiments in Physical Chemistry, ed. 6, Mc-Graw Hill, 1996.
5. Atkins & de Paula, Atkin's Physical Chemistry, 9th ed., Oxford University Press, 2009

ENBE603009
MASS AND ENERGY BALANCE
3 CREDITS

Learning Objectives: Students are able to solve the problem of mass balances, energy balances, and the combination of it.
Syllabus: Introduction, mass balance, solves mass balance for single unit without reactions, chemical reaction equation and stoichiometry, mass balance with reaction, mass balance involving units/equipments, recycle, bypass, purge, Energy : terminilogy, consepts and units, Introduction to energy balances in process without reaction, entalphy changes, application of energy balances without chemical reactions, energy balances : how to calculate chemical reactions, energy balances involving effects of chemical reaction, psychometric chart and the utilization
Prerequisites: Basic Chemistry, Introduction to Chemical Engineering
Textbook:
1. Himmelblau D.M. Basic Principles and Calculation in Chemical Engineering, 6th ed, Prentice Hall 1996
2. G. Reklaitis V. Introduction to Material and Energy Balances, John Wiley 1983
3. Felder, R.M. & R.W. Rousseau. Elemnetary Principle of Chemical Process. John Wiey & Sons inc. 2005.
4. Dictates of Mass and Energy Balance 2001

ENCE603010
TRANSPORT PHENOMENA
3 CREDITS

Learning Objectives: Students can identify and describe as well as analyze momentum, mass, and heat transfer phenomenon, through the application of macroscopic and microscopic balance.
Syllabus: Introduction, Viscosity and momentum transfer phenomenon, Velocity distribution of laminar flow, Thermal conductivity and energy transfer mechanism, Temperature and concentration distribution in solids and laminar flow, Diffusivity and mass transfer mechanism, Converter equation for isothermal system, Momentum transfer in turbulent flow, Mass and energy transfer in turbulent flow, Transfer between two phases, Macroscopic balance of isothermal and non-isothermal system, Macroscopic balance of multi-component system.
Prerequisites: Fluids mechanics particle, heat transfer, mass transfer
Textbook:
1. R. B. Bird, W. E. Stewart and E. N. Lightfoot, Transport Phenomena, 2nd Ed., John Wiley, 2002.
2. J.R. Welty et al., Fundamentals of Momentum, Heat and Mass Transfer, 3rd Ed., Wiley, 1984.
3. Brodkey, R. S and RC Herskey, Transport Phenomena, McGraw-Hill, 1998

4. Harry C. Hershey, Robert S. Brodkey, Transport Phenomena: A Unified Approach Vol. 1, McGraw-Hill, New York, 1987, 847 pp.,

TERM 4

ENCE604011
CHEMICAL ENGINEERING MODELING
3 CREDITS

Learning Objectives: Students are able to create a physicochemical model of a process system and solve it using numerical methods with the assistance of a programming language
Syllabus: Modeling chemical process systems, equation systems of linear algebra and non-linear

algebra; ordinary differential equations: initial value problem and boundary value problem; partial differential equations.
Prerequisites: Numerical computation
Textbook:
1. Rice, RG. And Duong D. D, Applied Mathematics and Modeling for Chemical Engineers, John Willey & Sons, New York, 1995.
2. Davis, M. E., Numerical Methods and Modeling for Chemical Engineers, John Willey & Sons, New York, 1984
3. Constantinides, A. and Mostouvi, N, Numerical Methods for Chemical Engineers with MATLAB Applications, Prentice Hall, 1999.
4. Tosun, I., Modeling in Transport Phenomena: A Conceptual Approach, Elsevier, 2002.

ENBE604012
FLUIDS AND MECHANICS PARTICLE
3 CREDITS

Learning Objectives: Students are able to apply the phenomenon of fluid flow and particle (continuity equation, Bernoulli, etc) to solve problem in process unit through calculation of energy and force, etc, especially in the fluid flow system of piping, rate measurer and fluid transportation tool, and in the system of fluid-solid flow (fluidization, filtration, sedimentation, particle motion in gas.
Syllabus: transfer process, Shell momentum balances, momentum balances with Navier-stokes equations, shell energy balances, sehell mass balances, momentum and energy movement in turbulent, transfer between phase, macroscopics balances of isothermal system, macroscopics balances of non isothermal, macroscopics balances in multicomponent system
Prerequisite: Calculus
Textbook:
1. R. B. Bird, W. E. Stewart, and E. N. Lightfoot, Transport Phenomena, John Wiley and Sons, New York, 2nd edition, 2002,

1. Harry C. Hershey, Robert S. Brodkey, Transport Phenomena: A Unified Approach Vol. 1, McGraw-Hill, New York, 1987, 847 pp.,

ENGE 6 0 0010
STATISTICS AND PROBABILITY
2 CREDITS

Learning Objectives
Syllabus
Prerequisites
Textbook

ENCE604013
CHEMICAL ENGINEERING THERMODYNAMICS
4 CREDITS

Learning Objectives: Students are able to explain the basic principles relating to the PVT and thermodynamic properties of pure and mixtures compounds, mass and energy balance, thermodynamic cycles, phase equilibrium and reaction, and be able to apply problem-solving strategies to resolve the thermodynamic problems in a group.
Syllabus: PVT properties of pure compounds, process track, steam table ; steady and non steady energy balances ; cyclic processes : rankine cycle for energy power and refrigerant

cycle ; ideal system phase equilibrium and approachment to activity coefficient ; phase equilibrium in high pressure : approachment in fugacity coefficient by cubic equational state ; equilibrium reactions.
Prerequisites: mass and energy balances
Textbook:

1. M.J. Moran and H.N. Saphiro, Fundamentals of Engineering Thermodynamics, 2nd/3rd ed., Wiley.

2. J.M. Smith, H.C. van Ness, and M.M. Abbott, Introduction to Chemical Engineering Thermodynamics, 6th/7th ed., McGraw Hill.

3. Kamarza Mulia dan Praswasti PDK Wulan, Diktat Termodinamika Teknik Kimia

4. Donald R. Woods, Problem-Based Learning: How to gain the most from PBL, McMaster Bookstore, Hamilton, Ontario, Canada, 1994

ENBE604014
HEAT TRANSFER
3 CREDITS

Learning Objectives: Students are able to develop knowledge in heat transfer as well as long-term learning skills to follow avance knowledge and technology that related to heat transfer
Syllabus: Introduction, skills workshop process, steady-state conduction, unsteady-state conduction, natural and forced convection, radiation and Evaporation
Prerequisite: Transport Phenomena
Textbook:

1. Holman, J.P., "Perpindahan Kalor (alih bahasa: E. Jasjfi), Edisi ke-6, Penerbit Erlangga, Jakarta 1993.
2. Mc. Adam, W. H., "Heat Transmission", 3rd Ed., Mc.Graw-Hill International Book Company, 1981.
3. Kern, D. Q., "Process Heat Transfer", Mc.Graw-Hill International Book Company, 1984.

ENCE604015
PROCESS ENGINEERING DRAWING
2 CREDITS

Learning Objectives: Students are able to draw it manually process flow diagrams, P & IDs and plant layout, familiar with the use of software for drawing, understand and able to read the meaning of the picture
Syllabus: The importance of engineering drawings, standard rules of the drawing, block diagrams, and symbols of industrial equipment, process flow diagrams, piping and instrumentation symbols, piping and Instrumentation diagram, plot plan, plant layout, isometric piping and equipment.
Prerequisites: -
Textbook:

1. W. Boundy, Engineering Drawing, McGraw-Hill Book Company
2. Colin Simmons and Dennis Maguire, Manual of Engineering Drawing, Edward Arnold
3. ISO 1101, Mechanical Engineering Drawings, International Organization for Standardization
4. Japanese Industrial Standard, Technical Drawing for Mechanical Engineering, Japanese Standard Association.
5. Warren J. Luzadder, Fundamentals of Engineering Drawing, Prentice-Hall, Inc.

ENCE604016
MOLECULAR BIOLOGY
3 CREDITS

Learning Objectives: Students are able to explain structure and chemical compounds in living things including the function, the synthesis and metabolism of chemical compounds that occur in cells. Chemical compounds include nucleic acids, proteins, carbohydrates, and lipids and metabolism involves basic reactions of metabolism, glycolysis, as well as lipid and steroid metabolism.
Syllabus: Molecular biology, nucleic acids, structure and replication of DNA and RNA, transcription and translation, amino acids, synthesis and structure of proteins, enzymes, and metabolism.
Prerequisite: -
Textbook:
1. Arumingtyas, Estri Laras dan Fatchiyah. (2011). Biologi Molekular Prinsip Dasar Analisis. Jakarta : Erlangga
2. Bruckner, Monica Z. Basic Cellular Staining.Serc.carleton.edu.
3. Aryulina, D., Manaf, S., Muslim, C., & Winarni, E.W. 2007. BIOLOGI 3. Jakarta : Esis. Binur
4. Robi. 2011. Teknologi RNA Innterference. Retrieved from Campbell, Reece. 2009. Biology. Sansome Street, San Francisco: Pearson Benjamin Cummings
5. Fatchiyah,Arumingtyas Estri Laras, Widyarti Sri, Rahayu Sri.2011. Biologi Molekular Prinsip Dasar Analisis. Erlangga. Jakarta.

TERM 5

ENCE605017
MATERIAL SCIENCE AND CORROSION
3 CREDITS

Learning Objectives
1. Students able to understand the role of materials selection in designing equipment
2. Students able to understand the characteristics of materials
3. Students able to understand corrosion : Process, prevention, testing and protection, as well as calculating and designing simple corrosion protection

Syllabus
1. History of Material Science in human civilization, material science applications in Chemical Engineering
2. Atomic, Molecular, Chemical Bonding and its correlation with the properties of materials
3. Crystal structure
4. Phase Diagram and its relation to the manufacture of metal
5. Mechanical properties of materials and ters equipments
6. Metal and the alloy
7. Corrosion and Chemical Industry
8. The basic concept of corrosion, electrochemical, polarization, passivity
9. The types of corrosion mechanism and its prevention
10. Cathodic protection and inhibitors
11. Corrosion monitoring

Prerequisites : -
Textbook
1. Ilmu Bahan dan Teknologi Bahan (Lawrence H.Van Vlack diterjemahkan oleh Ir. Sriati Djaprie, M.E.,M.Met). Bagian Pendahuluan

ENGE 6 0 0012
HEALTH, SAFETY AND ENVIRONMENT
2 CREDIT

Learning Objectives: Students are able to:
1. Identify various types of hazards, characterization, proposes a method which is suitable for risk reduction and mitigation and safety management system design.
2. Increase awareness of health and safety industry, and understand the regulatory framework and standard of safety and environmental programs.

Syllabus: Introduction to Regulation and Standards; Risk Perception, Assessment and Management; Machinery Hazards; Noise Hazards; Process Safety Hazard; Fire and Explosion Hazard; Electrical Hazard; Toxicology in The Workplace; Environmental Protection; Environmental Protection Control Processes; Hazard Communication to Employees; Personal Protective Equipment (PPE): Types of PPE and Selection of PPE; Safety Audits, Incident and Emergency Planning.
Prerequisite: -
Textbook:
1. Charles A. Wentz, Safety, Health and Environ-mental Protection, MGH, 1998.
2. Asfahl, C.R., Rieske, D.W., Industrial Safety and Health Management, 6th Ed., Pearson Education, Inc. 2010.
3. United Kingdom – Health and Safety Executive, http://www.hse.gov.uk/
4. Undang-undang dan Peraturan Nasional terkait dengan Sistem Manajemen K3 dan Lingkungan.
5. Related Journal, standards and Publications.

ENGE 605018
ENGINEERING ECONOMICS
3 CREDITS

Learning Objectives
Students are able to explain fundamentals of decision-making and feasibilty study by using ecpnomic approach
Syllabus :
1. The principels of engineering economics
2. Equivalence
3. Compound Interest Factor
4. Alternative Evaluation by equivalance value method
5. Alternative Evaluation by IRR Method
6. Comparing Alternatives
7. Benefit-cost ratio Method to cost (B/C ratio)
8. Depreciation
9. Income tax
10. Evaluation after Tax

Prerequisites : Statistics and Probability

Textbook :
1. Blank, L and Tarquin, A., Engineering Economy, McGraw Hill, New York, 2002
2. Sulivab, G. W., Bontadelli, J. A. and Wicks, E. M., Engineering Economy, 11th ed., Prentice Hall, New Jersey, 2000
3. Stermole, Frank J., Economic Evaluation and Investment Decision Methods, Investment Evaluations Corporation, Golden
4. Newman, Donald G., Engineering Economic Analysis, Engineering Press, Inc., san Jose, 1988
5. Bakuan Kompetensi INTAKINDO-2007

ENCE605019
MASS TRANSFER
4 CREDITS

Learning Objectives: Students are able to analyze the phenomenon of mass transfer and apply it to solve the problem of unit mass transfer process.
Syllabus: Batch and continuous distillation; a mixture of binary or multiple components, humidification and drying, gas absorption, solvent extraction.
Prerequisites: Chemical engineering thermodynamics, transport phenomena
Textbook:
1.Ketta, John J., Unit Operations Handbook, Vol 2: Mass Transfer, Marcel Dekker 1993
2.Treyball, R. E, Mass Transfer Operations, McGraw-Hill, 1984
3.Coulson, J. M. And J. Richardson R. Chemical Engineering Vol. 2, Pergamon Press. In 1989.

ENCE605020
UNIT OPERATION LABORATORY
11 CREDITS

Learning Objectives: Students be able to:
1. Verify the technique of chemical engineering concept in fluid mechanic (CHS 220804), heat transfer (CHS 220807) that applied on tools or process unit.
1. Operate the equipment and measuring the flow rate (orifice meter, venturimeter, rotameter), temperature (thermocouple), process and analyze the data, discussed and took the conclusion, convey the result in the writing report in standard format.

Syllabus: The modules operating unit including: fluid circuit, centrifugal pump, incompressible flow, filtration, fluidization, conduction, convection, double pipe heat exchange, mixing and compounding.
Prerequisites: Fluid Mechanics and Heat Transfer
Textbook: Practical Manual Processes and Operations Teknik1, UI Department of Chemical Engineering

ENCE605021
CHEMICAL REACTION ENGINEERING 1
3 CREDITS

Learning Objectives: Students are able to comprehend the concept of chemical kinetics and catalysis, design the experiment of kinetics data interpretation, formulate the kinetics models as well as analyze the performance of reaction
Syllabus: Basic concepts of chemical reaction kinetics, chemical reaction thermodynamics, experiments and kinetics data, formulation of kinetic models, the estimation method of constant values of the kinetic model, the sensitivity analysis of the kinetics model, catalyst and the influence of external and internal diffusion of the chemical reaction rate, the effectiveness factor, the effect of heat displacement at the catalytic reaction.
Prerequisites: Physical Chemistry
Textbook:
1. Davis, Mark E. and Davis, Robert J. (2003) Fundamentals of chemical reaction engineering.

McGraw-Hill Higher Education, New York, NY.
2. Fogler, H. S., Elements of Chemical Reaction Engineering, Prentice-Hall, 3rd Ed., 1999
3. Fogler, H. S., and LeBlanc, Strategies for Creative Problem Solving, Prentice-Hall, 1995.
4. Levenspiel, O., Chemical Reaction Engineering, 2nd Ed., John Wiley & Sons. Of 1972.
5. K. J. Leidler, Chemical Kinetics, 3rd ed., Harper Publish, 1987
6. Widodo, W. P., Slamet, Lecture diktat of Chemical Kinetics and Reactor Design, TGP-UI, 2002.

ENCE605022
SIMULATION OF CHEMICAL PROCESS
3 CREDITS

Learning Objectives: Students are able to use the latest chemical engineering software to make the steady state and dynamic simulations, and able to manipulate the process variable and the topology of the unit processes in the chemical industry.
Syllabus: steady state and dynamic models, stream, heat exchanger equipment, piping and rotating equipment, separation equipment, columns and towers, reactors, refrigeration system, the selection of PID controllers for temperature, pressure, level and flow, cascade control, model testing and tuning PID controllers.
Prerequisites: -
Textbook:
2. Fogler, HS, Elements of Chemical Reaction Engineering, Prentice-Hall
3. Douglas, J. M., 1998, Conceptual Design of Chemical Processes, McGraw-Hill, 1988
4. Peter, M.S, and K.D. Timmerhaus, 1991, Plant Design and Economic for Chemical Engineering 4th Edition, McGraw-Hill.
5. HYSYS Steady State Model and Tutorial
6. SuperPro Designer User Guide and Tutorial, intelligent, Inc.

TERM 6

ENCE606023
PROCESS CONTROL
3 CREDITS

Learning Objectives: Students are able to design a single loop control system and connected the dynamic process with the performance
Syllabus: Introduction to process control, objectives and benefits of control, the principle of mathematical modeling, process modeling and control analysis, the system dynamic behavior of a typical process, the identification of empirical models, loop-back baited, PID controllers, PID controller tuning, stability analysis,
Prerequisites: Numerical computation
Textbook:
1. T. Marlin, Process Control: Designing Processes and Control Systems for Dynamic Performance, 2nd Edition, McGraw-Hill, New York, 2000.
2. D. E Seborg, T. F. Edgar, D. A. Mellichamp, Process Dynamics and Control, John Wiley & Sons, 1989, ISBN 0-471-86389-0
2. Ogata, Katsuhiko, Teknik Kontrol Automatik (Sistem Pengaturan), Jilid 1, Penerbit Erlangga, 1985, Bandung
3. Bequette, R. W., Process Dynamics: Modeling, Analysis, and Simulation, Prentice Hall,1998
4. Luyben, William L., Process Modeling, Simulation and Control for Chemical Engineers, Second Edition, McGraw-Hill International Edition, 1990
5. Stephanopoulos, George, Chemical Process Control: An Introduction to Theory and Practice,

Prentice-Hall International, 1984

ENCE606024
UNIT OPERATION LAB 2
1 CREDIT

Learning Objectives: Students be able to:
1. Verify the technique of chemical engineering concept in transport phenomena theory (CHS 210802), Heat Transfer (CHS 220807), Process Control (CHS 310806) that applied on tools or process unit.
2. Operate the equipment and measuring the flow rate (orifice meter, venturimeter, rotameter), air humidity (humidity meter), temperature (thermocouple), process and analyze the data, discussed and took the conclusion, convey the result in the writing report in standard format.

Syllabus: The modules operating unit of mass transfer and the process controlling including: measuring the diffusivity coefficient of liquid gas, drainage, wetted wall column, gas absorption, climb film evaporation, flow rate control, pipe reactor.
Prerequisites: Mass Transfer and Process Controll
Textbook:
1. Practical Manual Processes and Technique Operations 2, UI Department of TGP
2. Literature for the course prerequisites

ENCE606025
CHEMICAL REACTION ENGINEERING 2
3 CREDITS

Learning Objectives: Students are able to design and analyze various types of chemical reactors
Syllabus: The basic concept of chemical reactor design, isothermal ideal reactor designs: batch, CSTR, and PFR / PBR, ideal-isothermal reactor designs: spherical reactor, membrane reactor, micro-reactor, reactor design for multiple reactions, non-isothermal reactor designs: CSTR, multiple steady state, non-isothermal reactor design: PFR / PBR, multi-bed reactor (interstage cooler / heater), multi-phase reactor design (multiple phase), non-ideal reactor design
Prerequisites: Chemical Reaction Engineering 1
Textbook:
1. Fogler, H. S., Elements of Chemical Reaction Engineering, Prentice-Hall, 3rd Ed., 1999
2. Fogler, H. S., and LeBlanc, Strategies for Creative Problem Solving, Prentice-Hall, 1995.
6. Levenspiel, O., Chemcial Reaction Engineering, 2nd Ed., John Wiley & Sons. Of 1972.
7. K. J. Leidler, Chemical Kinetics, 3rd ed., Harper Publish., 1987
8. Widodo, W. P., Slamet, Lecture diktat of Chemical Kinetics and Reactor Design, TGP-UI, 2002

ENCE606026
PROCESS EQUIPMENT DESIGN
3 CREDITS

Learning Objectives: Students are able to design chemical process equipment in accordance with the applicable standards.
Syllabus: Pumps, compressors, piping, pressure vessels and tanks, distillation columns, heat exchangers.
Prerequisites: Fluid Mechanics, Heat Transfer, Mass Transfer, Corrosion Materials Science.
Textbook:
1. Kern, D. Q., “Process Heat Transfer”, Mc.Graw-Hill International Book Company, 1984.
2. Ludwid, Applied Process Design for Chemical and Petrochemical Plant, Vol. 2, Gulf Publishing Co.

ENCE606027
CHEMICAL PRODUCT DESIGN
4 CREDITS

Learning Objectives: Students are able to design chemical products systematically and structured, and analyze the technical and economic feasibility.
Syllabus: An understanding of consumer needs, product specifications, creating and selecting the product concept, product formulation, manufacturing, supply chain, economic.
Prerequisites: Mass and Energy balances, fluids and mechanics particle, mass transfer, heat transfer, Chemical Reaction Engineering, Engineering Economics
Textbook:

1. Cussler, L., G.D. Moggridge, 2011, Chemical Product Design, Cambridge University Press.
2. Seider W.D., Seader J.D., Lewin D.R. Soemantri W., 2009, Product and Process Design Principles. Synthesis, Analysis and Evaluation, Wiley and Sons Inc.
3. Wesselingh J.A., Kiil, S. and Vigild M.E., 2007, Design and Development of Biological, Chemical, Food and Pharmaceutical Products, John Wiley & Sons, Ltd.
4. Ulrich K.T., Eppinger S.D., Product Design and Development, 5th edition, McGraw Hill
5. Birgit Kamm, Patrick R. Grubber, Michael Kamm, Wiley-VCH, Swiss 2005, Biorefineries – Industrial Processes and Products
6. Peter, M.S. and K.D. Timmerhaus, 1991, Plant Design and Economic for Chemical Engineering 4th edition, McGraw Hill.
7. Dolgui A., Soldek J. and Zaikin O., 2005, Supply Chain Optimization: Product/Process Design, Facility Location and Flow Control, Springer
8. Douglas, J.M., 1998, Conceptual Design of Chemical Processes, McGraw Hill.
9. Kirk-Othmer, 1991, Enyclopedia of Chemical Technology, 3rd edition, McGraw Hill.
10. Perry's chemical Handbook

TERM 7

ENCE607028
NATURAL GAS PROCESSING
3 CREDITS

Learning Objectives: Students are able to design the most appropriate process for the removal of natural gas impurities with the process simulator and able to evaluate the energy consumption of refrigeration system and natural gas liquefaction system
Syllabus: Front-end natural gas processing and products, the physical properties of hydrocarbon systems, systems of units of gas, natural gas dehydration (absorption, adsorption), gas sweetening, sulfur recovery, mercury removal, LPG processing, processing CNG, LNG processing.
Prerequisite: Chemical Process Simulation
Textbook:

1. Gas Conditioning and Processing Vol. 1
2. Gas Conditioning and Processing Vol. 2

ENBE607029
INDUSTRIAL PROJECT MANAGEMENT
2 CREDITS

Learning Objective :
Students are able to apply project management in their field of works exactly as well as apply it in other areas exclude main field
Syllabus :
Project-production concept, Life Cycle Project, Selection Project, Planning Project, Implementation Project, and Completion & Evaluation Project
Pre-requisites : -
Textbook : Suharto, Imam, Manajemen Proyek, 1990

ENBE600030
PLANT DESIGN
4 CREDITS

Learning Objectives: Student able to design process and plant of natural product and analysis their economic value.
Syllabus: the concepts in designing process/ plant, flow diagram processes, synthesis and analysis process using heuristic, process simulation,rule of thumb to construct process and material of equipment design, integration heat/process, plant flow sheet, and economic analysis
Prerequisite: process controll, equipment process design, chemical process simulation, engineering economics
Textbook :
1. Douglas, J. M., 1998, Conceptual Design of Chemical Processes, McGraw-Hill.
2. Seider W. D., Seader J. D., Lewin D. R., Sumatri Widagdo, 2008, Product and Product Design Principles. Synthesis, Analysis and Evaluation, Wiley and Sons Inc, 3 edition.
3. Turton, R., R. C. Bailie, W. B. Ehiting and J. A. Shaeiwitz, 1998, Analysis, Synthesis, and Design of Chemical Process, Prentice-Hall
4. Gavin Towler, R K Sinnott, 2012, Chemical Engineering Design: Principles, Practice and Economics of Plant and Process Design, Butterworth-Heinemann, Second Edition.
5. Peter, M. S, and K. D. Timmerhaus, Ronald West, and Max Peters, 2002, Plant Design and Economic for Chemical Engineering, 5 Edition, McGraw-Hill.
6. Biegler L. T, I. E, Grossmann and A. W. Westerberg, 1997, Systematic Methods for Chemical Process Design, Prentice-Hall.
7. Branan, C., 1998, Rule of Thumb for Chemical Engineers : A manual of quick, accurate solutions to everyday process engineering problems, 2nd edition, Gulf Publishing, Co.
8. Wallas, Stanley M. 1990, Chemical Process Equipment : Selection and Design, Buther Worths.
9. Ed Bausbacher, Roger Hunt, 1993, Process Plant Layout and Piping Design, Prentice Hall; 1 edition
10. CHEMCAD Manual, HEATEXET Manual, HYSYS/UNISIM ManualBerk, Z, Food Process Engineering and Technology, Academic Press, 2009
11. Peter, M. S. dan K. D. Timmerhaus, Plant design and Economic for Chemical Engineering, 4th Ed., McGraw Hill.
12. SuperPro Designer Manual. Intelligen, Inc

ENBE600031
INTERNSHIP
2 CREDITS

Learning Objectives:
Students are able to gain field experience, able to analyze process/ system/ operation product that available in Chemical industries and anle to apply various communication process : problem solving, intrepersonal communication, study in a group , and conduct a research.
Syllabus: -
Prerequisite: Students had to take a minimum of 110 SKS (minimum value of D) with a 2.0 GPA.
Textbook: -

ENBE600032
RESEARCH METHODOLOGY AND SEMINARS
2 CREDITS

Learning Objectives: Able to determine the appropriate method for research activities and produce the ideas, processes, and scientific research in writing and oral.
Syllabus: Introduction, technics of identifying problem and make a hypothesis, thinking logically, technics of scientific writing, technics of writing research proposal, technics of designing research, presentation technics, technics of collecting, analyzing, and presenting data.
Prerequisite: Students had to take a minimum of 90 SKS (minimum value of D) with a 2.0 GPA.
Textbook :
1. Handout
2. Research proposal format

TERM 8
ENBE600033
UNDERGRADUATE THESIS/ FINAL PROJECT
4 CREDITS

Learning Objectives: Able to design, conduct and analyze research in Chemical Engineering ; Present scientific research in writing and oral.
Syllabus: Material of thesis according to conducted research
Prerequisite: Research method and seminar
Textbook:
1. Guide book of undergraduate thesis, Depok, 1999.

ENBE600034
CAPITA SELECTA
2 CREDITS

Learning Objectives: Able to explain the development of industry and engineering, business opportunities and the problems it faces in general.
Syllabus: Held with invited guest lecturers who are competent in fields that fit the requirement of each program study (can be different in each semester).
Prerequisite: Students had to take a minimum of 90 SKS
Textbook: -

ELECTIVE COURSES

ELECTIVE COURSE FOR ODD SEMESTER

ENCE803101
OLEOCHEMICAL INDUSTRY
3 CREDITS

Learning Objectives: Students are able to know the various processes that are commonly used in the oleochemical industry, and able to make a plan to develop the manufacture of oleochemicals from vegetable oils.
Syllabus: Fatty acids, biodiesel, paints and polymers, detergents, soaps, fatty alcohol, glycerin, oils and fats, oil and greese, the development of oleochemicals, vegetable oil processing, vegetable oil technology in the process.
Prerequisites: Organic Chemistry
Textbook: Oleochemical Manufacture and Applications by Frank D. Gunstone, Richard J. Hamilton. Blackwell

ENCE801101
FOOD TECHNOLOGY
3 CREDITS

Learning Objectives: Students are able to understand the processes of making food in the food industry which includes the selection, handling and processing of raw materials, the operating unit of food production, packaging, storage and control the process from beginning stage to the end.
Syllabus: Introduction, physical properties of raw materials, the basic concepts of energy and mass transfer, reaction kinetics, process control. mixing, filtration, centrifugation, extraction and membrane processes, adsorption and ion exchange column, with the temperature settings, drying, preservation, packaging, food storage, and hygiene.
Prerequisites: -
Textbook:
1. Zeki Berk, Food Process Engineering and Technology, Academic Press, Elsevier 2009
2. Food Technology: an introduction by Anita Tull. Oxford University Press, 2002
3. Introduction to Food Engineering by R. Paul Singh, R. Paul Singh and Dennis R. Heldman. Academic Press
4. Introduction to Food Process Engineering by P. G. Smith. Springer
5. Fundamentals of Food Process Engineering by Romeo T. Toledo. Springer

ENCE803102
PROTEIN ENGINEERING
3 CREDITS

Learning Objectives: Students are able to determine protein engineering strategies for the benefit of separation, biocatalysts and medic.
Syllabus: Introduction, Protein docking methods, Protein tagging strategies, Gen synthesis design, Enzyme stabilization, Molecular exploration, Protein engineering, Case study.
Prerequisite: Organic Chemistry
Textbook:
1. Protein Engineering in Industrial Biotechnology, Lilia Alberghina, Harwood academic publishers, 2005
2. Proteins: Biotechnology and Biochemistry by Dr. Gary Walsh. Wiley
3. Protein engineering and design by Sheldon J. Park, Jennifer R. Cochran. CRC Press
4. Protein Engineering and Design by Paul R. Carey. Academic Press
5. Protein Engineering: Principles and Practice. Wiley-Liss

ENCE801102
HERBAL TECHNOLOGY
3 CREDITS

Learning Objectives: Students are able to explain the development of herbal technology, herbal separation technology, herbal formulatioin basis, herbal regulation, and distinguish with other pharmaceutical products
Syllabus: Definition and basic concepts of herbs, herbal materials, herbal separation technology, herbal formulations, herbal regulation.
Prerequisites: Organic Chemistry
Textbook: The Complete Technology Book on Herbal Perfumes & Cosmetics by H. Panda. National Institute of Industrial Research 2003

ENCE801103
COMPOSITE MATERIAL
3 CREDITS

Learning Objectives: Students are able to:
1. Explain the characteristics of composite materials and compare it with conventional materials.
2. Explain the manufacturing process, and research development of composite materials.

Syllabus: The position of composite materials in materials science in general, common characteristics of composite materials, the type of composite based on the composition, the types of polymer matrix and reinforcement, the role of surface treatment in the strength of composite materials, manufacturing processes, durability, the process of splicing and repair of composite materials, code and standards for application of composite materials, the development of composite materials research.
Prerequisites: Organic Chemistry
Textbook:
1. Fiber-reinforced Composites (Materials Engineering, Manufacturing and Design), P. K. Mallick, Marcel Dekker, Inc., 1993.
2. Handbook of Plastics, Elastomers, and Composites, 3rd ed., Charles A. Harper, McGraw-Hill, 1996.
3. Reinforced Plastics - Theory and Practice, 2nd ed., M. W. Gaylord, Chaners Books, 1974.

ENCE813103
APPLIED THERMODYNAMICS
3 CREDITS

Learning Objectives: Students are able to analyze problems of thermodynamics based on a thorough review including fundamental aspects of thermodynamics, experimental, and green chemistry, based on current information from scientific journals
Syllabus: The case study of industrial thermodynamic, example cycle processes, phase equilibrium, and chemical reaction equilibrium to process and product engineer; friendly solvents such as supercritical CO_2 and ionic liquid
Prerequisites: Chemical Engineering Thermodynamics
Textbook:
1. References relevant to a given problem.
2. Mulia, K and Wulan, PPDK, Textbook of Chemical Thermodynamics

ENCE803104
DINAMIC SYSTEM
3 CREDITS

Learning Objectives: Students are able to build dynamic models of process systems, biological, industrial, social and economic.

Syllabus: Introduction to dynamical systems, causal loops, model and validation, analysis, case study.
Prerequisites: Numerical Computation
Textbook:
1. Forrester, J. W., 2002, Principles of Systems, Productivity Press
2. Goodman, Michael R., 1998, Study Notes in System Dynamics, Productivity Press
3. Richardson, George P. and Pugh III, Alexander L., 1999, Introduction to System Dynamics Modeling, Pegasus Communications
4. Andersen, David, etc., Introduction to Computer Simulation - A System Dynamics: Systems Thinking and Modeling for a Complex World, McGraw-Hill

ENCE811104
THERMODYNAMIC SYSTEM OF HYDROCARBON
3 CREDITS

Learning Objectives: Students are able to predict the magnitude of thermodynamic properties of hydrocarbons and the phase condition, either manually or using software calculations.
Syllabus: introduction to hydrocarbon thermodynamics properties, basic thermodynamic concepts, P-V-T data correlations, physical properties of hydrocarbon fluids, computing aided thermodynamics properties, the vapor-liquid behavior of two-phase systems, water-hydrocarbon system behavior, product specifications in the disposal lease of hydrocarbon
Prerequisites: Chemical Engineering Thermodynamics

Textbook:
1. Wayne C. Edmister, Byung Ik Lee, Applied hydrocarbon thermodynamics, Volume 1, Gulf Publishing Company (1988), Houston, Texas.
2. John M. Campbell, Gas Conditioning and Processing, Vol. 1, 8th Edition Campbell Petroleum Series 2001.

ENCE801105
LUBRICANT ENGINEERING
3 CREDITS

Learning Objectives: Students are able to explain the working principles of lubrication, lubricant function and several parameter of the quality and lubricant classification, lubricant chemical, and its production technology either mineral lubricant, synthesis, and vegetal.
Syllabus: Principles of lubrication on friction and wear phenomena on the two surfaces of solid objects are moving together; mode lubrication: hydrodynamic and elastohydrodynamic; lubricants: mineral, synthetic, and vegetable; additives, formulations, degradation, contamination, and maintenance of lubricants; latest development of lubricant technology .
Prerequisites: Organic Chemistry
Textbook:
1. E. Richard Booster, Handbook of Lubricant: Theory and Practice of Tribology, Vol. I, Vol. II, Vol. III, CRC Press (1984), Inc., Boca Raton, Florida
2. Mervin H. Jones, Industrial Tribology: The Practical Aspect of Friction, Lubricant, and Wear., Elsevier Scientific Publishing Co., New York, 1983.
3. J. Halling, Principle of Tribology, Macmillan Press Ltd., London, 1978
4. Handout

ENCE803105
CRYOGENIC ENGINEERING
3 CREDITS

Learning Objectives: Students are able to explain the various processes to liquefy gas in cryogenic technology
Syllabus: History and development of cryogenic, cryogenic scope of work. Refrigeration and

liquefaction of natural gas, air, oxygen, nitrogen, helium, neon and argon.
Prerequisites: Chemical engineering thermodynamics
Textbook:
1. Timmerhaus, K.D., Cryogenic Process Engineering, Plenum Press 1989, New York.

ENCE801106
COMBUSTION ENGINEERING
3 CREDITS

Learning Objectives: Students are able to explain the phenomenon of combustion and resolve the problems that rendered correctly.
Syllabus: chemical kinetics and combustion, the flame, premix flame, diffusion flame, the combustion process applications.
Prerequisite: Transport Phenomena, Chemical Reaction Engineering 1, Chemical Engineering Thermodynamics
Textbook:
1. Warnatz, J., Maas, U. dan Dibble, R.W., Combustion: Physical and Chemical Fundamentals, Modeling and Simulation, Experiments, Pollutant Formation, 2nd ed., Springer, Heidelberg, 1999.
2. Turns, S.R., An Introduction to Combustion: Concepts and Applications, 2nd ed, McGraw-Hill, 2000.
3. Glassman, I., Combustion, Academic Press, 1997.
4. El-Mahallawy dan el-Din Habik, S., Fundamental and Technology of Combustion, Elsevier, 2002.
5. Combustion, T. J. Poinsot and D. P. Veynante, in Encyclopedia of Computational Mechanics, edited by Erwin Stein, Ren´e de Borst and Thomas J.R. Hughes, 2004 John Wiley & Sons, Ltd.
6. Introduction to Combustion, Concepts and Applications, Stephen R. Turns, 2nd edition, McGraw Hill, 2000
7. Introduction to Combustion Phenomena, A. Murty Kanury, Gordon and Breach Science Publishers, 1975
8. Heat Transfer from Burners, Charles E. Baukal, in Industrial Burners Handbook, edited by Charles E. Baukal, CRC Press, 2004.

ENCE803106
PLASMA AND OZONE ENGINEERING
3 CREDITS

Learning Objectives: Students are able to explain the physics and chemistry phenomena of plasma formation and release of electromagnetic energy and the use of plasma and ozone technology.
Syllabus: basic phenomena and physical-chemical processes of gases that are given an electrical charge (corona discharge), the generation process or formation of ozone, role and use of plasma technology and ozone in chemical engineering processes, the potential of ozone technology in control technology environmental pollution, the ozone generator module manufacturing equipment.
Prerequisite: Physics Electricity Magnetism
Textbook:
1. E. T. Protasevich: “Cold Non-Equilibrium Plasma”, Cambridge International science Publishing, Cambridge, 1999.
2. Rice, R. G., and M. E. Browning: “Ozone Treatment of Industrial Water wate”, Notes Data Corroraion, Park Ridyl, 1981.

3. Metcalf & Eddy, Inc. (Tchobano-glous, G., and FL Burton): "Wastewater Engineering: Treatment, Disposal, and Reuse", McGraw-Hill Book. Co., Singapore, 1991.

ENCE801107
HETEROGENEOUS CATALYST
3 CREDITS

Learning Objectives: Students are able to explain the phenomenon of basic concepts heterogeneous catalysts and its application
Syllabus: The general property of catalyst, thermodynamic of the reaction with catalyst, the distribution of the catalyst based on the type of reaction, the core function is active, the method of selecting catalysts for certain reactions, characterization of the corresponding want to know the nature of the target, the catalyst test methods, methods of development of the catalyst, and reaction products.
Prerequisites: Chemical Reaction Engineering 1
Textbook:
1. Satterfield, C. N., heterogeneous Catalysis in Industrial Practice, McGraw-Hill Inc., New York, 1991.
2. Rase, F. R., Commercial Catalyst, CRC Press, New York, 1991
3. Richardson, T, J., Principles of Catalyst Development, Plenum Press, New York, 1989
4. Thomas J.M. And WJ Thomas, Principles and Practice of Heterogenous Catalysis, VCH, Weinhem, Germany, 1997
5. Emmet, R. H., Catalysis, Reinhold Publishing Corporation, New York, 1961

ENCE801108
SUSTAINABLE ENERGY
3 CREDITS

Learning Objectives: Students are able to explain the relationship of energy with social aspect, economic and environmental and sustainability concepts, and able to analyze the performance of techno-economy and the continuity especially fossil energy system, new, and renewable.
Syllabus: Concept of sustainability and sustainable energy, energy hierarchy, energy linkages with economic, environmental and social, fossil energy / fuels and Impacts, global climate change and its mitigation, conversion, transportation / distribution and storage, analysis method of energy sustainability: LCA , sustainability index, hydrogen and fuel cells and nuclear energy, solar energy (PV and thermal), wind and ocean, hydropower, bioenergy, geothermal energy, energy efficiency and conservation, carbon capture and storage
Prerequisites: Chemical Engineering Thermodynamics or Biochemical Engineering
Textbook:
1. Jefferson W. Tester, et al., Sustainable Energy: Choosing Among Options, MIT Press, 2005.
2. Godfrey Boyle, et al., Energy Systems and Sustainability: Power for a Sustainable Future, Oxford University Press, 2003.
3. E. Cassedy S, Prospects for Sustainable Energy: A critical assessment, Cambridge University Press, 2000.
4. DeSimone et al, Eco-Efficiency. The Business Link to Sustainable Development, MIT Press, 1997.
5. D. Elliot, enerfy, Society, and Environment, Technology for a sustainable future, Rouledge, 1997
6. Miller, G. T., Environment Science. Sustaining Earth, Wardworld Publish Co. 1993

ENCE803107
RISK MANAGEMENT
3 CREDITS

Learning Objectives: Students can explain and apply risk management in a risk assessment.

Syllabus: Introduction to the risk, the basic principles and guidelines concerning risk, risk management standards, risk assessment, risk analysis, risk analysis and simulation, simulation of the risk with Montecarlo method, the risk of using software simulation crystal ball.
Prerequisites:
Textbook: J. F. A. Stoner, Management, 1986

ENCE803108
SPECIAL TOPIC 1
3 CREDITS

ELECTIVE COURSE FOR EVEN SEMESTER

ENCE802101
PACKAGING AND STORAGE TECHNOLOGY
3 CREDITS

Learning Objective : Students are able to describe characteristics, packaging and storage food technology, the relation between storage and packaging with quality of food, describe factors affecting deviation of food qualities as well as able to choose storage methods and packaging types which is appropriate to food materials.
Syllabus : hidratasi, material storage technology and food products, deviation of food material qualities, microbial contaminant, purpose and function of food packaging, interaction between food packaging and packaging material types
Prerequisite : -
Textboox : Examining Food Technology by Anne Barnett. Heinemann Secondary,1996

ENCE802102
BIOINFORMATICS
3 CREDITS

Learning Objective : Students are able to explore database and programs to be applied in genetic engineering sectors, proteomic etc
Syllabus : Database, genomics, genetic molecular, philogeny, protein structure, metabolism and tissues
Textbook :
1. Bioinformatics by Shalini Suri. APH Publishing, 2006
2. Bioinformatics: A Primer by Charles Staben and Staben. Jones & Bartlett Publishers, 2005

ENCE802103
DRUGS AND COSMETICS TECHNOLOGY
3 CREDITS

Syllabus :
Definition of drugs and cosmetics, types of skins and characteristics, cosmetic types, ethics and regulation of drugs and cosmetics, new drug development technology, process technology in drug and cosmetics industries, packaging technology of drugs and cosmetics technology.
Prerequisite : Organic Chemistry
Textbook :
1. Handbook of Cosmetic Science and Technology by Andre O. Barel, Marc Paye, Howard I. Maibach. INFRMA-HC 2009
2. Biodesign: The Process of Innovating Medical Technologies by Stefanos Zenios, Josh Makower , Paul Yock , Todd J. Brinton, Uday N. Kumar, Lyn Denend, Thomas M. Krummel. Cambridge University Press 2009

ENCE802104
BIOMATERIAL
3 CREDITS

Learning Objective : Students are able to describe the principle and concept of material technologies through biological as well as life cycle assesment (LCA), organic and inorganic materials for biomaterial, apply and develop knowledge about biomaterial for life
Syllabus: Introduction, solids structure, characteristics of materials, metal material for implant, bioceramic materials, structural properties of biomaterial, the respons of tissues to biomaterial implant, the replacement of soft tissues , the replacement of hard tissues, transplantation, and biological tissues engineering
Prerequisite :-
Textbook :
1. Joon Park, R.S. Lakes. Biomaterials an Introduction, springer
2. Biomaterials: Principles and Applications by Joon B. Park, Joseph D. Bronzino. CRC Press

ENCE802105
PETROLEUM PROCESSING
3 CREDITS

Learning Objectives: Students are able to explain petroleum characteristic and its refine product and the stages of the process from various petroleum processing technologies.
Syllabus: Introduction terminology, oil composition, thermal properties of petroleum, chemical processing of petroleum processing, distillation, hydrogenation and dehydrogenation, cracking processes, the processes of reforming, gas processing and petroleum light products, product improvement.
Prerequisites: Fluid and Particle Mechanics, Thermodynamics, Mass Transfer.

Textbook:
1. James G. Speight, The Chemistry and Technology of Petroleum, Marcel Dekker, 1991.
2. James H. Gary and Glenn E. Handwerk, Petroleum Refining, Marcel Dekker, 1974.
3. D. S. J. Jones, Elements of Petroleum Processing, John & Sons Woley

ENCE802106
PETROCHEMICAL PROCESSING
3 CREDITS

Learning Objectives: Students are able to explain the development of petrochemical products and raw material potential, upstream / downstream petrochemical production lines (olefin center, aromatic center, and the pathways of methane) and the major production processes of several petrochemical industry through methane, olefins and aromatics; able to analyze impact of industrial processes and petrochemical products to the environment.
Syllabus: History of the general petrochemical products development and raw material potential, the scope of the petrochemical industry, petrochemical classification process, the type and processing raw materials into petrochemical products, the details of various petrochemical industry: olefins center, aromatics and the center line of methane, industrial and environmental impact of products petrochemicals.
Prerequisites: Organic Chemistry
Textbook:
1. Martyn V. Twigg, “Catalyst Handbook”, 2nd Ed., Wolfe Pub. Ltd..
2. Lewis T. Hatch, Sami Matar, “From Hydrocarbon to Petrochemical”.

3. Wells, Margaret G., "Handbook of Petrochemicals and Processes", Gower Publishing Company Ltd., 1991.
4. Pandjaitan Maraudin, Petrochemical Industry and The effect of environment, Gadjah Mada University Press, 2002.

ENCE802107
PHOTOCATALYSIS TECHNOLOGY
3 CREDITS

Learning Objectives: Students are able to understand the basic concepts and photocatalysis and apply it in the various the simple daily problem, especially related with environment, health, and energy.
Syllabus: The basic concept photocatalysis processes, thermodynamics and kinetics of photocatlytic process, semiconductor photocatalyst materials, the basic parameters of photocatlytic process, Photocatalyst Nanomaterial Engineering, photocatlytic applications for degradation of organic pollutants and heavy metals, photocatalysis c applications for self-cleaning and anti fogging, photocatalysis applications for anti-bacterial and cancer therapy, photocatalysis applications for engineering 'daily life tools', photocatalysis applications in renewable energy sector, solar detoxification engineering with photocatalysis, intensification of photocatalysis process.
Prerequisites: Chemical Reaction Engineering 1
Textbook:
1. M. Schiavello, Heterogeneous Photocatalysis, John Wiley & Sons, 1997.
2. A. Fujishima, K. Hashimoto, and T. Watanabe, TiO_2 Photocatalysis: Fundamentals and Applications, BKC Inc. Japan, 1999.
3. J.B. Galvez, et.al., Solar Detoxification, Natural Sciences, Basic and Engineering Sciences, UNESCO.
4. M. Kaneko, I. Okura, Photacatalysis Science and Technology, Springer USA, 2002.
5. C.A. Grimes, G.K. Mor, TiO_2 Nanotube Arrays: Synthesis, Properties, and Applications, Springer, New York, 2009.
6. Paper-paper dan bahan lain dari berbagai Jurnal Ilmiah dan website.

ENCE812108
POLYMER ENGINEERING
3 CREDITS
Learning Objectives: Students are able to explain the basic principles and characteristics of polymer manufacturing until being able to keep abreast of the latest technology.
Syllabus: The concept of polymer and polymer characteristics, synthesis / polymerization, kinetics of polymerization, the polymer solution, characterization, process of making plastics.
Prerequisites: Organic Chemistry
Textbook:
1. R. J. Lovell, Introduction to Polymers, P. A. Lovell, Chapman & Hall.
2. R. B., Seymour, Polymers for Engineering Applications, ASM International.
3. F. W. Billmeyer, Textbook of Polymer Science, Wiley.
4. R. J. Crawford, Plastic Engineering, Pergamon Press.
5. Donald R. Woods, Problem Based Learning: How to gain the most PBL, 1994, Mc-Master University, Hamilton, ON L8S 4L8.

ENCE802109
POLLUTION PREVENTION
3 CREDITS
Learning Objectives: Students are able to explain the concepts of pollution prevention and able to design the waste treatment system.
Syllabus: Introduction to the concept of pollution prevention, waste water treatment outline and preparation, waste water treatment in physical, biological, and chemical as well as the

operating unit, bioremediation, bioseparation and biodegradation, advanced oxidation processes, the handling of waste gas, waste handling B3, solid waste handling , effluent treatment, gas, is unconventional.
Prerequisites: Chemical Reaction Engineering 1.
Textbook:

1. Freeman, H. M., Industrial Pollution Prevention Handbook, McGraw-Hill, New York, 1995.
2. Eckenfelder, W. W., Jr.., Industrial Water Pollution Control. 3rd ed. McGraw-Hill International Editions, New York, 2000.
3. Metcalf & Eddy. (Revised by Tchobanoglous, G. & F. L. Burton). Waste Water Engineering: Treatment, Disposal, Reuse, 3rd ed., McGraw-Hill, Singapore, 1991.
4. Heinson R. J. & R. L. Cable. Source and Control of Air Pollution. Prentice Hall. New Jersey. Of 1999.
5. Legislation on the prevention of pollution and waste management.
6. Journals, the Internet.

ENCE802110
EXPLORATION AND PRODUCTION OF HYDROCARBON
3 CREDITS

Learning Objectives: Students are able to explain the economic concept of natural gas and analyze the 4e economy.
Syllabus: Introduction of hydrocarbon, life cycle of field development, hydrocarbon form and hydrocarbon property and reservoir, hydrocarbon exploration: geology, geophysics, and drilling, field appraisal, reservoir development, drilling development, hydrocarbon production, HSE, hydrocarbon economy and lease, coal and hydrocarbon unconventional (CBM, Shale gas, and HYDRAT GAS)
Prerequisites:-
Textbook:

1. Frank Jahn et all, 2008, Hydrocarbon Exploration and Production, Developments in Petroleum Science, second edition
2. Babusiauz et al, 2004, Oil and Gas Exploration and Production. Reserves, Cost and Contracts, IFP-Technip,
3. M. Kelkar, 2008, Natural Gas Production Engineering, PennWell Publications
4. Norman J. Hyne, 2001, Nontechnical Guide to Petroleum Geology, Exploration, Drilling and Production, Pennwell Books, 2 edition.

ENCE802111
UTILITIES AND PLANT MAINTENANCE
3 CREDITS

Learning Objectives: Students are able to explain the strategy of plant and utility maintenance.
Syllabus: Plant maintenance strategy: maintenance program, maintainability, reliability, planning and scheduling
Prerequisite: Chemical Engineering Thermodynamics
Handbook:

1. 1 Dhillon, B.S., Engineering Maintenance: A Modern Approach, CRC Press, 2002.
2. Higgins, L.R., Mobley, R.K. dan Smith, R., Maintenance Engineering Handbook, McGraw-Hill, 2002.
3. Sanders, R.E., Chemical Process Safety, Elsevier, 2005.
4. Palmer, D., Maintenance Planning and Scheduling Handbook, McGraw-Hill, 1999.

ENCE802112
NATURAL GAS TRANSPORTATION AND UTILIZATION
3 CREDITS

ENCE812113
DRUG CONTROLLED RELEASED TECHNOLOGY
3 CREDITS
Learning objective : Students are able to describe the principle of control drug releasedor bioactive compound for medical purposes and utilize the principle to apply control drug released technology
Syllabus : polymeric biomaterial that is easily degradable , various methods to drug encapsulation and bioactive compounds in nano/microsfer, diffusion and permeasi, strategy of control released, case study
Prerequisite : Organic Chemistry
Textbook :
1. Saltzman, W.M., Drug Delivery: Engineering Principles for Drug Therapy, Oxford University Press, 2001.
2. Wen, H. and Park, K, ed., Oral Controlled Release Formulation Design and Drug Delivery, Wiley, 2010.

ENCE802114
ANALYSIS AND SYNTHESIS OF CHEMICAL PROCESSES
3 CREDITS

Learning Objectives: Students are able to analyze and synthesize the chemical processes in an integrated system of technical and economic aspects
Syllabus: The strategy of synthesis and analysis process, design concepts development and the determination of the best flow sheet, a preliminary optimization process, the retrofit process, the use of computer aided design system for simulation and analysis process.
Prerequisites: Simulation of Chemical Processes
Textbook:
1. James M Douglas, Conceptual Design of Chemical Process, McGraw-Hill International Edition, 1988.
2. Hartman, Klaus, and Kaplick, Klaus, Analysis and Synthesis of Chemical Process Systems
3. Lorenz T Biegler, Systematic Methods of Chemical Process Design, Prentice Hall Inc., 1997.

ENCE802115
GEOTHERMAL TECHNOLOGY
3 CREDITS

ENCE802116
PROBLEM-SOLVING SKILLS
3 CREDITS

ENCE802117
SPECIAL TOPIC 2
3 CREDITS

4.11. UNDERGRADUATE PROGRAM IN BIOPROCESS ENGINEERING

Program Specification

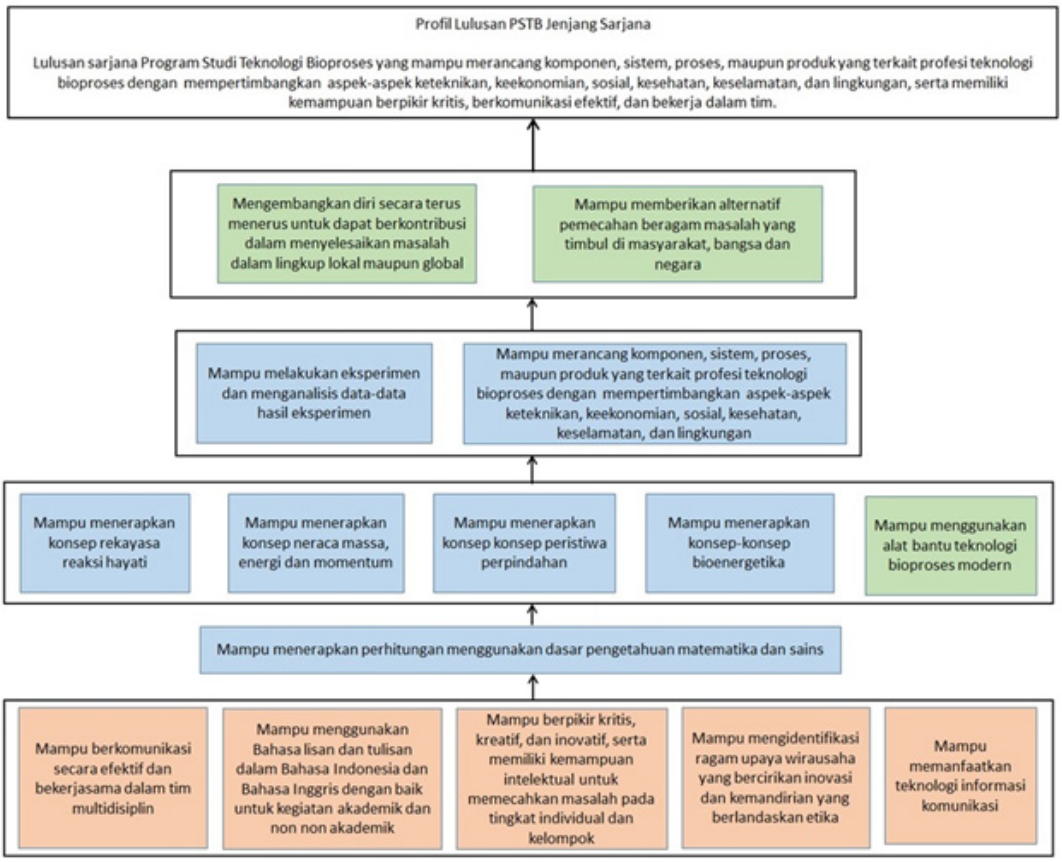
1	**Awarding Institution**		Universitas Indonesia
2	**Teaching Institution**		Universitas Indonesia
3	**Programme Title**		Undergraduate Program in Bioprocess Engineering
4	**Type of Class**		Regular
5	**Degree Given**		Sarjana Teknik (S.T)
6	**Accreditation status**		BAN-PT: A Accredited
7	**Medium Language**		Indonesia
8	**Study Scheme(Full time/Part time)**		Full time
9	**Entry requirement**		High School
10	**Duration of Study**		Scheduled for 4 years
	Type of Semester	Number of semester	Number of weeks /semester
	Regular	8	16
	Short (optional)	3	8
11	**Graduate Profiles:** *Bioprocess Engineering Graduates who are able to design components, systems, processes, and products related to bioprocess engineering profession by considering the aspects of*		
12	**Expected Learning Outcomes:** 1. Able to communicate effectively and work in multidisciplinary team. 2. Capable of critical thinking, creative, and innovative, and also have the intellectual ability to solve the problems at individual and group level. 3. Good at both spoken and written in Bahasa Indonesia and English for academic and non-academic activity. 4. Able to identify the kind of entrepreneurial effort which includes innovative and independent characteristic based on ethics 5. Capable of utilizing information communication technology. 6. Able to apply the knowledge of the mathematics and sciences in solving engineering problems. 7. Able to apply energy, momentum and mass balance concepts in solving bioprocess problems. 8. Able to apply bioenergetics concept in solving bioprocess problems. 9. Able to apply transport phenomena concepts in solving problems. 10. Able to apply bioprocess reaction engineering concepts in solving bioprocess problems. 11. Able to use the modern bioprocess engineering tools. 12. Able to conducts experiments and analyse the data of experiment results. 13. Able to design components, systems, processes, and products related to bioprocess engineering profession by considering the aspects of the engineering, economic, social, 14. Able to provide the solutions of various problems occurred in community, nation, and country. 15. Develop themselves continuously to contribute in solving local and global problems.		

13	**Course Composition**		
No	Type of Course	Credits	Percentage
i	University General Subjects	18	12.5 %
ii	Basic Engineering Subjects	25	17.4 %
iii	Core Subjects	85	59.0 %
iv	Elective Subjects	9	6.3 %
v	Internship , Seminar, Undergraduate Thesis, Project	7	4.9 %
	Total	144	100 %
14	Total Credit Hours to Graduate		144 SKS

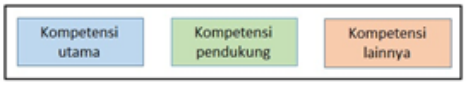
Employment Prospects

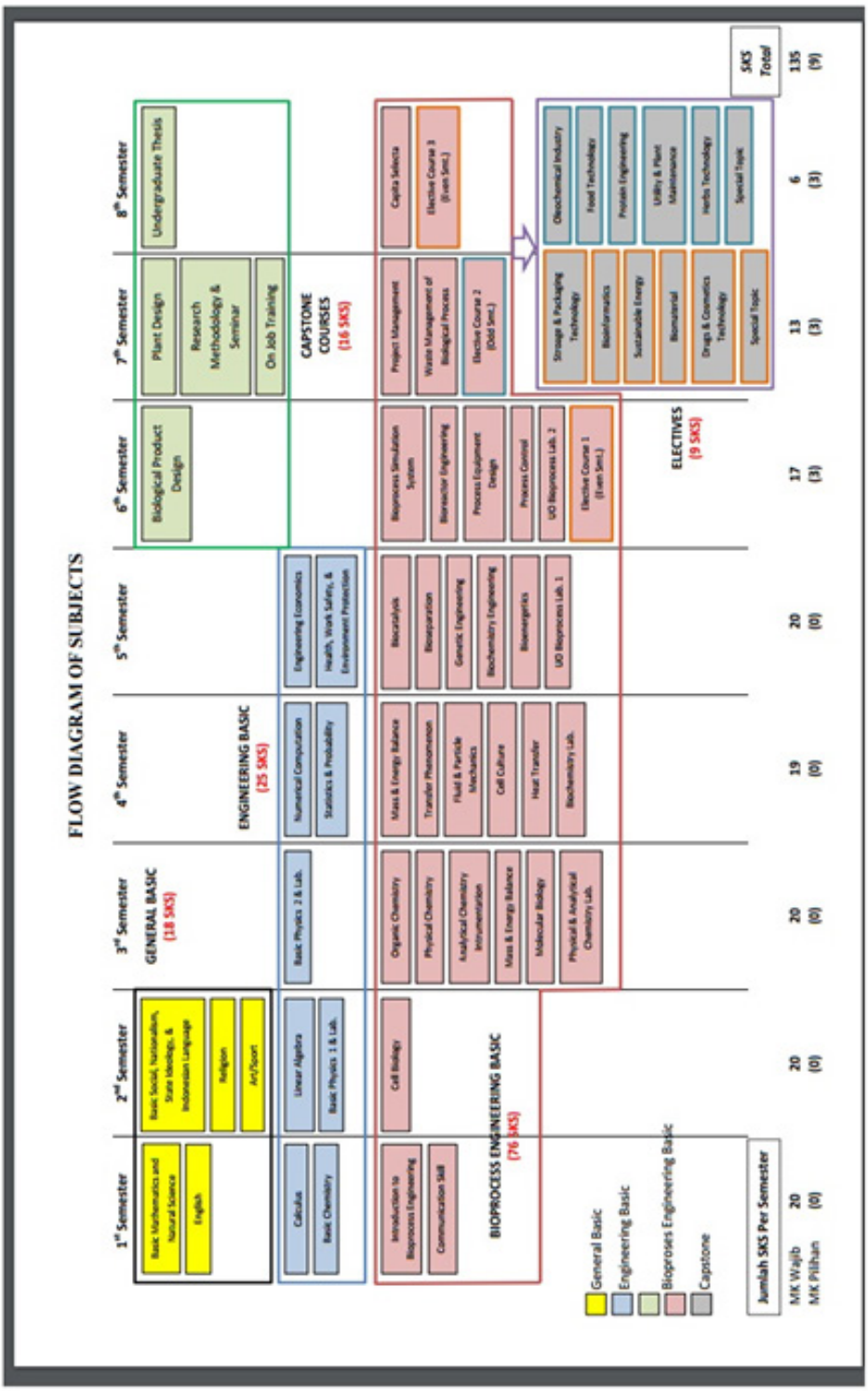
The graduates be able to carrier in food industry; pharmaceutical ,cosmetics and biotechnology industries; oleochemicals; consulting and engineering company; environmental and renewable energy industry; govermnent; education and so on.

LEARNING OUTCOME



LEGENDS




FLOW DIAGRAM OF SUBJECTS
1st Semester
2nd Semester
3rd Semester
4th Semester
5th Semester
6th Semester
7th Semester
8th Semester
GENERAL BASIC (18 SKS)
ENGINEERING BASIC (25 SKS)
BIOPROCESS ENGINEERING BASIC (76 SKS)
CAPSTONE COURSES (16 SKS)
ELECTIVES (9 SKS)
Basic Mathematics and Natural Science
English
Basic Social, Nationalism, State Ideology, & Indonesian Language
Religion
Art/Sport
Calculus
Basic Chemistry
Linear Algebra
Basic Physics 1 & Lab.
Basic Physics 2 & Lab.
Numerical Computation
Statistics & Probability
Engineering Economics
Health, Work Safety, & Environment Protection
Introduction to Bioprocess Engineering
Communication Skill
Cell Biology
Organic Chemistry
Physical Chemistry
Analytical Chemistry Instrumentation
Mass & Energy Balance
Molecular Biology
Physical & Analytical Chemistry Lab.
Mass & Energy Balance
Transfer Phenomenon
Fluid & Particle Mechanics
Cell Culture
Heat Transfer
Biochemistry Lab.
Bioanalysis
Bioseparation
Generic Engineering
Biochemistry Engineering
Bioenergetics
UO Bioprocess Lab. 1
Biological Product Design
Bioprocess Simulation System
Bioreactor Engineering
Process Equipment Design
Process Control
UO Bioprocess Lab. 2
Elective Course 1 (Even Sem.)
Plant Design
Research Methodology & Seminar
On Job Training
Undergraduate Thesis
Project Management
Waste Management of Biological Process
Elective Course 2 (Odd Sem.)
Capita Selecta
Elective Course 3 (Even Sem.)
Storage & Packaging Technology
Bioinformatics
Sustainable Energy
Biomaterial
Drugs & Cosmetics Technology
Special Topic
Oleochemical Industry
Food Technology
Protein Engineering
Utility & Plant Maintenance
Herbs Technology
Special Topic
General Basic
Engineering Basic
Bioprosses Engineering Basic
Capstone
Jumlah SKS Per Semester
MK Wajib 20 20 20 19 20 17 13 6
MK Pilihan (0) (0) (0) (0) (0) (3) (3) (3)
SKS Total 135 (9)

CURRICULUM STRUCTURE
UNDERGRADUATE BIOPROCESS ENGINEERING

KODE	SUBJECT	CREDIT
CODE	**1st Semester**	
UIGE600002	Integrated Character Building B	6
UIGE600003	English	3
ENGE600003	Calculus	4
ENGE600009	Basic Chemistry	2
ENBE601002	Intro to Bioprocess Engineering	3
ENBE601003	Communication skills	2
	Total Credit Term 1	20
	2nd Semester	
UIGE600001	Integrated Character Building A	6
ENGE600005	Physics (Mechanics and Thermal)	3
ENGE600004	Linear Algebra	4
ENBE601002	Cell Biology	3
UIGE600010-15	Religion	2
UIGE600020 - 48	Sport / Art	1
ENGE600006	Physics (Mechanics and Thermal) Lab	1
	Total Credit Term 2	20
	3rd Semester	
ENGE600007	Physics (Electricity, MWO)	3
ENBE603004	Organic Chemistry	3
ENBE603005	Instrumental Analytical Chemistry	3
ENBE603006	Physical Chemistry	3
ENBE603007	Physic Chemistry & Analytics Lab	1
ENBE603008	Mass and Energy Balance	3
ENBE603009	Molecular Biology	3
ENGE600008	Physics (Electricity, MWO) Lab	1
	Total Credit Term 3	20
	4th Semester	
ENBE604010	Transport Phenomena	3
ENBE604011	Fluid and Particle Mechanics	3
ENBE604012	Numerical Computation	3
ENBE604013	Cell Culture	3
ENBE604014	Heat Transfer	3
ENBE604015	Biochemistry Laboratory	2
ENGE600010	Statistic and Probability	2
	Total Credit Term 4	19
	5th Semester	
ENBE605016	Biocatalysis	3
ENBE605017	Separation	3
ENGE600011	Engineering Economics	3
ENBE605018	Genetic Engineering	3
ENBE605019	Bioprocess Unit Operation Lab I	1
ENBE605020	Biochemical Engineering	3
ENGE600012	HSE Protection	2
ENBE605021	Bioenergetics	2

	Total Credit Term 5	20
	6th Semester	
ENBE606012	Bioprocess System Simulation	3
ENBE606013	Bioprocess Unit Operation Lab II	1
ENBE606014	Bioreactor Engineering	3
ENBE606015	Bioprocess Equipment Design	3
ENBE606016	Bio Product Design	4
ENBE606017	Process Controll	3
	Elective 1	3
	Total Credit Term 6	20
	7th Semester	
ENBE607018	Bioprocess Waste Treatment	3
ENBE607019	Industrial Project Management	2
ENBE607020	Plant Design	4
ENBE600021	Internship	2
ENBE600022	Research Methodology & Seminar	2
	Elective 2	3
	Total Credit Term 7	16
	8th Semester	
ENBE600023	Scription	4
ENBE608024	Capita Selecta	2
	Elective 3	3
	Total Credit Term 8	9

ELECTIVES

Kode	Elective Course for Odd Semester	Credit
ENCH801101	Foor Technology	3
ENCH801102	Herbal Engineering	3
ENCH801103	Composite Material	3
ENCH801104	Hydrocarbon Thermodynamic	3
ENCH801105	Lubricants Engineering	3
ENCH801106	Combustion Engineering	3
ENCH801107	Heterogenous Catalyst	3
ENCH803101	Oleochemistry Industry	3
ENCH803102	Protein Engineering	3
ENCH803103	Applied Thermodynamics	3
ENCH803104	Dynamics System	3
ENCH803105	Cryogenics	3
ENCH803106	Plasma & Ozone Engineering	3
ENCH803107	Special Topics 1	3
ENCH803201	Renewable Energy	3

Kode	Elective Course for Even Semester	Credit
ENCH802105	Storage & Packaging Techno	3
ENCH802106	Bioinformatics	3
ENCH802107	Cosmetics and Drugs	3
ENCH802108	Biomaterial	3
ENCH802109	Crude Oil Processing	3
ENCH802110	Petrochemical Process	3
ENCH802111	Photocatalysis Engineering	3
ENCH802112	Polimer	3
ENCH802113	Polution Prevention	3
ENCH802114	Explor & Product of Hydrocarbon	3
ENCH802115	Plant Utility and Maintenance	3
ENCH802116	Drug Controlled Release Techno	3
ENCH802117	Analysis & Synthesis of Process	3
ENCH802118	Geothermal Engineering	3
ENCH802119	Problem Solving Skills	3
ENCH802120	Special Topics 2	3
ENCH802201	Trans & Utilization of Natural Gas	3
ENCH802203	Risk Management	3

Resume	Wajib Universitas	18
	Wajib Fakultas	25
	Wajib Program Studi	92
	Jumlah	135
	Pilihan	9
	Total Beban Studi	144

SYLLABUS OF BIOPROCESS ENGINEERING

TERM 1
UIGE600002
INTEGRATED CHARACTERISTIC BUILDING SUJECT B
6 CREDITS

Learning Objectives
Syllabus
Prerequisites
Textbook

UIGE600003
ENGLISH
3 CREDITS

Learning Objectives
Students able to use English for suporting study in Universitas Indonesia as well as continuing language learning indepedently.
Syllabus

1. Study Skills: (Becoming an active learner, Vocabulary Building: word formation and using the dictionary Listening strategies Extensive reading).
2. Grammar: (Revision of Basic grammar Types of sentences Adjective clauses, Adverb clauses Noun clauses, Reduced clauses).
3. Reading: (Reading skills: skimming, scanning, main idea, supporting ideas, Note-taking Reading popular science article, Reading an academic text)
4. Listening: (Listening to short conversations, Listening to a lecture and note-taking, Listening to a news broadcast, Listening to a short story)
5. Speaking: (Participating in discussions and meetings, Giving a presentation)
6. Writing: (Writing a summary of a short article Describing graphs and tables, Writing an academic paragraph, Writing a basic academic essay (5 paragraphs)

Prerequisites : -
Textbook : Poerwoto, C. et.al. - Reading Comprehension for Engineering Students

ENGE 6 0 0003
CALCULUS
4 CREDITS

Learning Objectives
After attending this subject, students are expected to capable of:
1. Understanding calculus basic concepts and competent to solve applied calculus problems.
2. Understanding the basic concepts of two or more variables function with its application.
3. Understanding the basic concepts of sequences and series as well as basic concepts of vectors and analytic geometry.

Syllabus :

Real number system, non-equivalency, Cartesians Coordination System, mathematic induction, Function and Limit, Continuous Function. Differential including chain's rule, implicit differential, and advanced differential function. Transcendent and differential Function. Applied Differential. Integral, basic integral function, Integration technique. Integral application on Cartesians and polar coordinate, indefinite. Sequences and infinite series. Spare rows and rows of positive change sign, Taylor and McLaurin series. Function of many variables and its derivatives. Maximum and Minimum. Lagrange Methods. Integral folding and its application.
Prerequisites : -
Textbook :
1. D.E.Vanberg and E.J, Purcell, Calculus with Analytic Geometry, 7th ed., Aplleton-Century-Crofts, 1996.
2. D.E.Vanberg, E.J Purcell, A.J Tromba, Calculus, 9th. Prentice-Hall, 2007.
3. G.B Thomas & R.L Finney, Calculus & Analytic Geometry 9th ed., 1996, Addison-Wesley

ENGE 6 0 0009
BASIC CHEMISTRY
2 CREDITS

Learning Objectives
1. Students able to resolve the problems of qualitative chemistry and indicate the reasons clearly as well as integrate various ideas in problem solving.
2. Students able to explain and model chemical and physical processes in the molecul level to explain the macroscopics properties.
3. Students able to classify materials based on conditions and bond properties by using periodic

table as refference.
4. Students able to apply important theories such as kinetics of molecules or thermochemistry in chemical proble solving

Syllabus :
1. Materials and Measurements
2. Atoms, molecules, ions, and the Periodic Table
3. Stoichiometry: Calculations by using formulas of chemical equations
4. Chemical Reactions in Solution and stoichiometric solution
5. Thermochemistry; Chemical equilibrium
6. Acid and base
7. Electrochemistry
8. Chemical Kinetics
9. Application of Chemicals

Prerequisites : -
Textbook :
1. Ralph H. Petrucci, General Chemistry: Principles and Modern Applications, 8th Ed. Prentice Hall Inc. New York, 2001.
2. John McMurry, Robert C. Fay, Chemistry (3rd Ed.), Prentice Hall, 2001.
3. Raymond Chang, Williams College, Chemistry (7th Ed.), McGraw-Hill, 2003

ENBE601002
INTRODUCTION TO BIOPROCESS ENGINEERING
3 CREDITS

Learning Objectives
Students able to explain the scope of bioprocess engineering and the related industries
Syllabus
Microbial Structure, Microbial Growth, Nutrition & Culture Medium Control of biochemistry, physiology, stoichiometry and kinetics of growth and metabolism, Basic of prokaryotes and fungi genetic engineering, Food Industry, Healthcare Industry. Energy Industry.
Prerequisites : -
Textbook :
1. Hand Out/diktat perkuliahan dari dosen
2. Mosler, N. S, Modern Biotechnology, John Wiley & Sons, 2009
3. Bioprocess Engineering: Basic Concepts by Michael Shuler. Pearson

ENBE601002
Communication Skill
2 Credits

Learning Objectives
Students are able to propose communication products through the analysis of audience then arrange into a series of coherent messages, as well as present it effectively by using appropriate media technology
Syllabus :
Effective communications, analysis of audiences, writing process, creating memo, resuming abstract, structural engineering papers, oral presentation
Prerequisites : -
Textbook :
Donald R. Woods, Communicating effectively, McMaster University Bookstore, 1996.

TERM 2

UIGE600001
INTEGRATED CHARACTERISTIC BUILDING SUJECT A
6 CREDITS

ENGE 6 0 0005
PHYSICS MECHANICS AND HEAT
3 CREDITS

Learning Objectives
Students are able to understand the concepts and basic laws of mechanics physics and applied in a systematic and scientific problem solving which influenced by the force for both moving and not moving objects.

Syllabus
1. Scale, kinematics of point objects, mechanics of point objects, law of conservation of linear momentum and energy, harmonic motion, gravity, dynamics and kinematics of rigid objects.
2. Introduction and basic concept (pressure, thermodynamic system, state of the system, temperature), expansion, equilibrium energy (thermal state equation), heat transfer, ideal gas.
3. First law of thermodynamics, enthalpy and entropy, The first law of thermodynamics application for open and closed system, Second law of thermodynamics, kinetic theory of ideal gas.

Prerequisites : -
Textbook :
1. Halliday.D, R Resnick, Fisika I, edisi terjema-han P Silaban, Penerbit Erlangga 1986.
2. Ganijanti AS, Mekanika,Penerbit Salemba Teknik, 2000.
3. Tipler PA, Fisika I, ed III, terjemahan Lea Prasetio, Penerbit Erlangga, 1998.
4. Giancoli D.C, General Physics, Prentice Hall Inc, 1984.
5. Sears-Salinger, Thermodinamics, Kinetic theory and statistical thermodynamics, Wesley, 1975.
6. Giancoli, D.C, Physics: principles with aplica-tions, Prentice Hall Inc, 2000

ENGE 6 0 0006
PHYSICS MECHANICS AND HEAT LAB
1 CREDIT

Syllabus :
Practical of Mechanics: Measurement, Moment of inertia, Gravity acceleration, Fluid density, Scratch coefficient, Collision, Swing torque, Viscosity of water, Young's modulus, Viscosity of Newtonian fluid, Fluids surface tension, Oscillation, Practical of Heat: Coefficient of linear expansion, Heat conductivity, Thermocouple calibration, Calorimeter, Joule Constant, Laplace Constant, Heat Collector, Determining of air Cp/Cv, Expansion of fluids and water anomaly. Notes: For Architecture and Interior Architecture Program, practical is not mandatory.

ENGE 6 0 0004
LINIEAR ALGEBRA
4 CREDITS

Learning Objectives: Students are able to explain/understand/apply linear algebra and associate this subject with other subjects.
Syllabus: Introduction of elementary linear algebra, Matrix, Determinant, Vectors in R2 and R3. Euclideas vector space, General vector space, Review of vector space, Product space, Value and diagonalization eigen vector, Linier Transformation, Application on the system of differential equation, Application on the quadratic surface, Decomposition of LU, Least Squares.
Prerequisite: -
Textbook:
1. H. Anton, Elementary Linear Algebra, 9th ed, John Wiley& Sons, 2005.
2. G.Strang, Introduction to Linear Algebra, Wellesley-Cambridge Press, 2007.

ENBE601002
CELL BIOLOGY
3 CREDITS

Learning Objectives: Student able to explain the difference between prokaryotic cells, arkhea and eukaryotic cells,cell genetic and organization, the technics to see and manipulate the cells, and the interaction between cells and cells life cycle.
Syllabus: Cells and tissues, microscopy technics and analysis of cells, membranes and organels, role of DNA and protein, energy in cells, potential work, intercellular communication, mechanical molecule, cell life cycle, apoptosis.
Prerequisite: -
Handbook:
1. Bolsover et al., Cell Biology, John Willey and Son 2004
2. Essential Cell Biology by Bruce Alberts, Dennis Bray, Karen Hopkin and Alexander Johnson (Mar 27, 2009). Garland Science
3. Molecular Cell Biology (Lodish, Molecular Cell Biology) by Harvey Lodish, Arnold Berk, Chris A. Kaiser and Monty Krieger. W. H. Freeman; 6th edition
4. Biological Science Volume 1 (4th Edition) by Scott Freeman (Feb 13, 2010). Benjamin Cummings

UIGE600010-15
RELIGIOUS STUDIES
2 CREDITS

General instructional objectives: Students have a concern for social issues, national and state based on religious moral values applied in the development of knowledge through intellectual skills.
Learning Objectives: After attending this subject, when students given a problem, students can:
1. Analyzed based on values their religion.
2. Analyzed by applying the steps to active learn.
3. Discuss and express their opinions by using Bahasa Indonesia in right and good manner, both in discussion and paper.

Syllabus: Adapted to the respective religion.
Prerequisite: -
Textbook: Adapted to the problem subject.

UIGE600020 – 48
Sports/Arts
1 Credit
Learning Objectives
Syllabus
Prerequisites
Textbook

TERM 3

ENGE 6 0 0007
PHYSICS ELECTRICITY, MAGNETS, WAVE, AND OPTICS
3 CREDITS

Learning Objectives: Students are able to understand:
1. The concept and basic law of physics – electricity and magnetism and apply it systematically and scientifically in solving everyday magnetism and electricity physics problem.
2. The concept and basic law of wave and optical physics and apply systematic and scientific problem solving in a natural wave phenomenon or wave that arises from technical, physical properties of light and geometric optics.

Syllabus: Electric charge and Coulomb law, Electric field, Static and Gauss law, Electric potential, Capacitor, Direct electric current and basic circuit analysis, Magnetic field, Induction and electromagnetic, Faraday law and inductance, Material magnetism properties, A series of transient, Alternating current, Waves, Sounds, Polarization, Interference, Diffraction, Optical geometry, Lighting and photometry.
Prerequisite: -
Textbook:
1. Halliday, D, R. Resnick, Fisika II,edisi terjema-han P. Silaban, Penerbit Erlangga, 1986.
2. Ganijanti AS, Gelombang dan Optik, ed III, Jurusan Fisika FMIPA UI, 1981.
3. Tipler P.A, Fisika II, ed III terjemahan Bam-bang Sugiyono, Penerbit Erlangga, 2001.
4. D.C.Giancoli, General Physics, Prentice Hall Inc, 1984.

ENGE 6 0 0008
PHYSICS ELECTRICITY, MAGNETS, WAVE, AND OPTICS LAB
1 CREDIT
Syllabus:
Practical of Electricity: Electrolysis, Wheatstone bridge, Kirchhoff law, Earth's magnetic field, Temperature coefficient, Characteristic of series RLC circuit, Ohm law, Transformer. Practical of Optics: Polarimeter, Lens, Photometry, Prisms bias index, Spectrometer, Diffraction grid, Newton's ring.
Prerequisite : Physics electricity, magnets and optics

ENBE603004
ORGANIC CHEMISTRY
3 CREDITS

Learning Objectives:
Students are able to:
Explain the link structure and stereochemistry, IUPAC name, physical properties, chemical reactivity, and reaction mechanisms
Determine the mechanisms of some organic chemical reactions and be able to estimate how to synthesize a simple organic chemical compounds.
Syllabus:
Naming of organic compounds,
the role of structure and stereochemistry of the physical / chemical an organic compound, the cracking reactions or free radicals alkane, polymerization of alkenes, aromatic electrophilic substitution on benzene, substitution and elimination reactions acylation and esterification reactions, dehydration-polymerization reactions
Prerequisites: -
Textbook:
1. Fessenden, alih bahasa : A. Hadiyana Pujatmaka, Kimia Organik, edisi Kedua Erlangga 1986
2. Morrison, RT and Boyd, RN, Organic Chemistry, 6th ed., Prentice Hall 1998.
3. Organic Chemistry lecture notes

ENBE603005
INSTRUMENTAL ANALYTICAL CHEMISTRY
3 CREDITS

Learning Objectives: Students are able to explain and compare the various basic principles methods of analytical chemistry and apply it for qualitative and quantitative analysis of pure and mixture compounds
Syllabus: Skill workshop, Electrochemistry process, Potentiometry, Atomic Spectroscopy (AAS), Molecular spectroscopy (IR), Chromatography gas.
Prerequisite: -
Textbook:

1. Day R.A. dan A. L. Underwood, Analisis Kimia kuantitatif (terjemahan), Erlangga, 1986, atau buku aslinya dalam bahasa Inggris.
2. D. A. Skoog, et.al., Fundamentals of Analytical Chemistry, 5th. Ed., Saunders College Publishing, 1988. Atau edisi terbaru
3. G. D. Christian and J. E O'Reilly, Instrumental Analysis, 2nd. Ed., Allyn Bacon Inc., 1986.
4. Donald R. Woods, Problem based learning: How to gain the most from PBL, 2994, Mc-Master University, Hamilton, ON L8S 4L8.

ENBE603006
PHYSICAL CHEMISTRY
3 CREDITS

Learning Objectives: Students are able to understand the basic concepts of physical chemistry including the topics of thermodynamics, equilibrium reactions, and molecular spectroscopy, and apply these concepts to solve simple problems of chemical physics
Syllabus: pvT properties: gas properties: ideal gas laws, kinetic theory of gases, the viscosity of gas; the properties of liquids and solutions: fluid viscosity, colligative properties of solution, electrolyte solution, Arrhenius and Debye-huckel theory; chemical bond and spectroscopy: atomic orbital, molecular orbital, hybrid orbital, visible light / infrared / ultraviolet spectroscopy; phase and chemical equilibrium: liquid-vapor phase equilibrium and Raoult's law, the application of Le Chatelier's principle to equilibrium reactions.
Prerequisites: -
Textbook:
1. Levine, IN, Physical Chemistry, 6th ed., McGraw-Hill, 2008.
2. Atkins & de Paula, Atkin's Physical Chemistry, 9th ed., Oxford University Press, 2009

ENBE603007
PHYSICAL CHEMISTRY AND ANALYTICAL CHEMISTRY LAB
1 CREDIT

Learning Objectives:
Students are able to conduct pre-eliminary report which is supported laboratory module theories, practicing experiments in laboratory, and arrange final report that contains the results of processing and analysis data experiments as well as explain the phemomena
Syllabus: Isothermal adsorption, effect of concentration and temperature on reaction rate, colligative properties of solution, chemical equilibrium determination, determination of molecular properties based on gas density, potentiometric methods, spectrophotometry visible light, conductometric methods, Chromatoghraphy Gas
Prerequisite: Basic Chemistry, Physical Chemistry and Analytical Chemistry Instrumental
Textbook:
1. Physical Chemistry Lab Instructions FTUI TGP-1989.
2. Guidance of Physical Chemistry and Analytical Chemistry Lab, Chemical Engineering, Universitas Indonesia.
3. D. A. Skoog, et.al., Fundamentals of Analytical Chemistry 5th., Saunders College Publishing, 1998 atau edisi terbaru
4. Shoemaker, D.P., C.W. Garland, J.W. Nibler, Experiments in Physical Chemistry, ed. 6, Mc-Graw Hill, 1996.
5. Atkins & de Paula, Atkin's Physical Chemistry, 9th ed., Oxford University Press, 2009

ENBE603008
MASS AND ENERGY BALANCE
3 CREDITS

Learning Objectives: Students are able to solve the problem of mass balances, energy balances, and the combination of it.
Syllabus: Basic concept of mass and energy balance in the chemical process, chemical equations and stoichiometry, the principles of mass balance, mass balance with and without chemical reactions, recycle, bypass and purge, the mass balance in the system with lots of tools, general equation of energy balance, enthalpy changes, energy balance application for the system without and with chemical reactions, the solution of system combined heat balance and energy balance.
Prerequisites: -
Textbook:
1. Himmelblau D.M. Basic Principles and Calculation in Chemical Engineering, 6th ed, Prentice Hall 1996
2. G. Reklaitis V. Introduction to Material and Energy Balances, John Wiley 1983
3. Felder, R.M. & R.W. Rousseau. Elemnetary Principle of Chemical Process. John Wiey & Sons inc. 2005.
4. Dictates of Mass and Energy Balance 2001

ENBE603009
MOLECULAR BIOLOGY
3 CREDIT

Learning Objectives: Students are able to explain the relation of nucleic acids, protein, carbohydrate, as well as lipid with its functions, synthesis, and the metabolisme of chemical compounds in cell.
Syllabus: Molecular biology, nucleic acids, structure and replication of DNA and RNA, transcription

and translation, amino acids, synthesis and structure of proteins, enzymes, and metabolism.
Prerequisite: -
Textbook:
1. Lehninger Principles of Biochemistry & eBook by Albert Lehninger, David L. Nelson and Michael M. Cox (Jun 15, 2008)
2. Biochemistry (3rd Edition) by Christopher K. Mathews, Kensal E. van Holde and Kevin G. Ahern (Dec 10, 1999)

TERM 4

ENBE604010
TRANSPORT PHENOMENA
3 CREDITS

Learning Objectives: Students can identify and describe as well as analyze momentum, mass, and heat transfer phenomenon, through the application of macroscopic and microscopic balance.
Syllabus: Viscosity and momentum transfer phenomenon, Velocity distribution of laminar flow, Thermal conductivity and energy transfer mechanism, Temperature and concentration distribution in solids and laminar flow, Diffusivity and mass transfer mechanism, Converter equation for isothermal system, Momentum transfer in turbulent flow, Mass and energy transfer in turbulent flow, Transfer between two phases, Macroscopic balance of isothermal and non-isothermal system, Macroscopic balance of multi-component system.
Prerequisites:
Textbook:
1. Rubenssien, D, Bioflued Mechanics, Elsevier Academic Press, 2012
2. Konsool, Signal and System for Bioengineer,Academic Press, 2nd Ed, 2012
3. Sekar V, Transport Phenomena of Food and Biological Material, CRC,2000
4. R. B. Bird, W. E. Stewart dan E. N. Lightfoot, Transport Phenomena, John Wiley, 1965.
5. J.R. Welty et al., Fundamentals of Momentum, Heat and Mass Transfer, 3rd ed., Wiley, 2984.
6. Brodkey, R. S dan RC Herskey, Transport Phenomena, McGraw-Hill, 1998

ENBE604011
FLUIDS AND MECHANICS PARTICLE
3 CREDITS

Learning Objectives: Students are able to apply the phenomenon of fluid flow and particle (continuity equation, Bernoulli, etc) to solve problem in process unit through calculation of energy and force, etc, especially in the fluid flow system of piping, rate measurer and fluid transportation tool, and in the system of fluid-solid flow (fluidization, filtration, sedimentation, particle motion in gas.
Syllabus: Fluid properties; static fluid and its application; basic equation of fluid flow (mass balance and continuity equation, energy balance and Bernoulli Equation); the application of Bernoulli equation to measuring flow rate; friction loss in fluid flow through piping, The equipment of fluid transport: pump, compressor, turbine; high velocity gas flow; particle motion in fluid; fluidization; filtration; sedimentation.
Prerequisite: Transport Phenomena
Textbook:
1. A. W. Nienow, Bioreactor and Bioprocess Fluid Dynamics – Wiley, 1 edition (April 15, 1993)
2. Noel de Nevers, Fluid Mechanics for Chemical Engineers, 2nd Ed., McGraw-Hill, 1991.
3. Bruce R. Munson, Donald F. Young, Theodore H. Okiishi, Fundamentals of Fluid Mechanics, John Wiley & Sons, 2006.

ENBE604012
NUMERICAL COMPUTATION
3 CREDITS

Learning Objectives
Students are able to solve chemical and biological process through computational methods
Syllabus
1. Binary computing system
2. Computer memory
3. Algorithms and efficiency of the system
4. Dynamic and MonteCarlo
5. Stocastic and random
6. Error and mistakes reduction

Prerequisites : -
Textbook : -

ENBE604013
CELL CULTURE
3 CREDITS

Learning Objectives:
Students are able to explain technique of cells culture including procaryotic cells, eucariotic cells,

mammals, and plant cell) and able to design cell culture in industrial level.
Syllabus: introduction to cell culture medium, procedures of cell culture, developing of growth media, bioprocess development of line cell.
Prerequisite: Cell Biology
Handbook:
1. Cell Culture Engineering (Advances in Biochemical Engineering Biotechnology) by Wei Shu Hu (Editor). Springer .
2. Cell Culture Engineering VI by Michael J. Betenbaugh. Springer.

ENBE604014
HEAT TRANSFER
3 CREDITS

Learning Objectives: Students are able to develop knowledge in heat transfer as well as longterm learning skills to follow avance knowledge and technology that related to heat transfer
Syllabus: Introduction, skills workshop process, steady-state conduction, unsteady-state conduction, natural and forced convection, radiation.
Prerequisite: Transport Phenomena
Textbook:
1. Holman, J.P., "Perpindahan Kalor (alih bahasa: E. Jasjfi), Edisi ke-6, Penerbit Erlangga, Jakarta 1993.
2. Mc. Adam, W. H., "Heat Transmission", 3rd Ed., Mc.Graw-Hill International Book Company, 1981.
3. Kern, D. Q., "Process Heat Transfer", Mc.Graw-Hill International Book Company, 1984.
4. Treybal, R.E., "Mass Transfer Operation", McGraw-Hill International Book Company, 1984.
5. Coulson, J.M. dan Richardson, J.R., "Chemical Engineering", Vol.2, Pergamon Press, 1989.
6. Donald R. Woods, Problem based learning: How to gain the most from PBL, 1994, McMaster University, Hamilton, ON L8S 4L8.

ENBE604015
BIOCHEMISTRY LAB
2 CREDITS
Learning Objectives: Student is able to arrange initial report about theory of the experiments, perform lab experiments, analys the data of experiments, and submit final reports.

Syllabus:
1. Physical and Chemical properties
2. Separation and purification of subtances
3. Metal reactions with acids
4. Crystal Water
5. Identification of hydrocarbon compounds
6. Identification of alcohol and Phenol
7. Identification of lipid compounds
8. Nucleic acids
9. Carbonil
10. Carbohydrate
11. Lipid Analysis
12. Extraction and identification of lipid acid from corn oil
13. Bacteria culture

Prerequisite: natural organic chemistry, molecular byologi and cell culture
Textbook :
1. Fessenden, alih 1. bahasa: A. Hadiyana Pujatmaka, Kimia Organik, Erlangga 1986
2. Morrison, RT and Boyd, RN, Organic Chemistry, 6th ed., Prentice Hall 1998.
3. Vogel, Practical Organic Chemistry
4. Penuntun Praktikum Kimia Dasar dan Kimia Organik, Departemen Teknik Kimia, FTUI
5. Moran, L. dan Masciangioli, T. Keselamatan dan Keamanan Laboratorium Kimia, the National Academies Press, 2010
6. Brown, T.L., H. E. LeMay and B.E. Bursten, Chemistry, ed. 8, Prentice Hall, 2000.
7. Vogel, Analisis Anorganik Kualitatif, PT.Kalman Media Pustaka, 1985.
8. Lehninger Principles of Biochemistry &eBook by Albert Lehninger, David L. Nelson and Michael

M. Cox (Jun 15, 2008)
9. Biochemistry (3rd Edition) by Christopher
10. Mathews, Kensal E. van Holde and Kevin
11. G. Ahern (Dec 10, 1999)

ENGE 6 0 0010
STATISTICS AND PROBABILITY
2 CREDITS

Learning Objectives
Syllabus
Prerequisites
Textbook

TERM 5

ENBE605016
BIOCATALYSIS
3 CREDITS

Learning Objectives: Student able to explain biocatalyst in chemical and biological reactions and the factors influenced it and its application in industry.
Syllabus: catalysis and biocatalysis, enzymes classification and activity, immobilization of enzyme methods, the factors influence biocatalyst performance, inactivations of biocatalyst, biocatalyst reaction kinetics, enzyme productions, methods, product recovery, applications of biocatalyst in industry.
Prerequisite: Molecular biology and Biochemical Engineering
Textboook :
1. Enzyme biocatalysis: principles and applications by Andres Illanes. Springer 2008
2. Biocatalysts and Enzyme Technology by Klaus Buchholz , Volker Kasche , Uwe Theo Bornscheuer. Wiley-VCH, 2005
3. James E. Bailey, David F. Ollis, Biochemical Engineering Fundamentals, McGraw-Hill International Editions, second edition, 1986.
4. Douglas S Clark, Harvey W Blanch, Biochemical Engineering, Marcel Dekker Inc, 1997.
5. Heri Hermansyah, Kinetika Reaksi Biokatalisis, UI Press, 2010
6. Ching T Hou, Handbook of Industrial Biocatalysis, CRC Press, 2005

ENBE605017
SEPARATION
3 CREDITS

Learning Objectives :Understanding basic separation technic, able to design separation process which is effective and efficient, able to design quality control process from the isolated product.
Syllabus: separation concept, mass transport concept, Distillation, Absorption and Stripping, Extraction, Leaching, Membrane process, Ion exchange, cristalization, Bubble and Foam Separation, chromatography, Ultrafiltration dan Reverse osmosis, Membrane dialysis process, selection strategy of separation process.
Prerequisite: Transport phenomena
Handbook:
1. Warren L. McCabe, Julian C. Smith, PeterHarriot. Unit Operation of Chemical Engineering, Mc. Graw Hill. 1993
2. Coulson and Richardson's Chemical Engineering: Chemical Engineering Design v. 6 (Coulson & Richardson's chemical engineering) by R.K. Sinnott. Butterworth- Heinemann Ltd

ENGE 6 0 0011
ENGINEERING ECONOMICS
3 CREDITS

Learning Objectives
Students are able to explain fundamentals of decision-making and feasibilty study by using ecpnomic approach
Syllabus :
1. The principels of engineering economics
2. Equivalence

3. Compound Interest Factor

4. Alternative Evaluation by equivalance value method

5. Alternative Evaluation by IRR Method

6. Comparing Alternatives

7. Benefit-cost ratio Method to cost (B/C ratio)

8. Depreciation

9. Income tax

10. Evaluation after Tax

Prerequisites : Statistics and Probability
Textbook :
1. Blank, L and Tarquin, A., Engineering Economy, McGraw Hill, New York, 2002
2. Sulivab, G. W., Bontadelli, J. A. and Wicks, E. M., Engineering Economy, 11th ed., Prentice Hall, New Jersey, 2000
3. Stermole, Frank J., Economic Evaluation and Investment Decision Methods, Investment Evaluations Corporation, Golden
4. Newman, Donald G., Engineering Economic Analysis, Engineering Press, Inc., san Jose, 1988
5. Bakuan Kompetensi INTAKINDO-2007

ENBE605018
GENETICS ENGINEERING
3 CREDITS

Learning Objectives : Students are able to explain basic concept, techniques used as well as application from genetics engineering process.
Syllabus : Introduction, bacic principles of genetics, Cutting and joining DNA, Plasmid, Cloning strategy and genetics engineering technology
Prerequisites : Cell Byology and Molecular Byology
Textbook :
1. Primrose SB, Twyman RM, and Old RW. “Principles of Gene Manipulation” sixth edition, Blackwell science Ltd. 2001
2. An Introduction to Genetic Engineering by Desmond S. T. Nicholl (Jun 23, 2008). Cambridge University Press
3. Genetic Engineering: Manipulating the Mechanisms of Life (Genetics & Evolution) by Russ Hodge and Nadia Rosenthal (May 2009). Facts on File
4. Principles of Gene Manipulation and Genomics by Sandy B. Primrose and Richard Twyman. Wiley-Blackwell
5. Introduction to Biotechnology and Genetic Engineering by A. J. Nair. Jones & Bartlett Publishers

ENBE605019
BIOPROCESS UNIT OPERATION LAB I
1 CREDIT

Learning Objectives: Student have experience to operate process equipment and conduct the experiment, able to analysis and explain the phenomena occurred in each experiment acticity.
Syllabus: Fluid sircuit mechanic, conduction heat transfer in multiple pipe systems, filtrationprocess, fluidization process and its effect on heat transfer system, fermentation process in biofermentor reactor system.
Prerequisite: Bioseparation, fluids mechanics and particle, Biochemical Engineering
Handbook:
1. Buku Petunjuk Praktikum Proses dan Operasi Bioproses 1, DTK FTUI
2. Literatur untuk mata kuliah prasyarat

ENBE605020
BIOCHEMICAL ENGINEERING
3 CREDITS

Learning Objectives: Students are able to explain the concepts of biochemistry engineering in cell growth, metabolism and product of biochemistry process.
Syllabus: metabolic reactions, energetic, catabolism , carbon, respiration, photosynthesis,biosynthesis, transport in cell membrane, the last product of metabolism, microbes and cell growth, substrate utilization, product synthesis
Prerequisite: Physical Chemistry
Handbook:
1. James E. Bailey, David F. Ollis, Biochemical Engineering Fundamentals, McGraw-Hill International Editions, second edition, 1986.
2. Douglas S Clark, Harvey W Blanch, Biochemical Engineering, Marcel DekkerInc, 1997.

ENGE 6 0 0012
HEALTH, SAFETY AND ENVIRONMENT
2 CREDIT

Learning Objectives: Students are able to:
1. Identify various types of hazards, characterization, proposes a method which is suitable for risk reduction and mitigation and safety management system design.
2. Increase awareness of health and safety industry, and understand the regulatory framework and standard of safety and environmental programs.

Syllabus: Introduction to Regulation and Standards; Risk Perception, Assessment and Management; Machinery Hazards; Noise Hazards; Process Safety Hazard; Fire and Explosion Hazard; Electrical Hazard; Toxicology in The Workplace; Environmental Protection; Environmental Protection Control Processes; Hazard Communication to Employees; Personal Protective Equipment (PPE): Types of PPE and Selection of PPE; Safety Audits, Incident and Emergency Planning.
Prerequisite: -
Textbook:
1. Charles A. Wentz, Safety, Health and Environ-mental Protection, MGH, 1998.
2. Asfahl, C.R., Rieske, D.W., Industrial Safety and Health Management, 6th Ed., Pearson Education, Inc. 2010.
3. United Kingdom – Health and Safety Executive, http://www.hse.gov.uk/
4. Undang-undang dan Peraturan Nasional terkait dengan Sistem Manajemen K3 dan Lingkungan.
5. Related Journal, standards and Publications.

ENBE605021
BIOENERGETICS
2 CREDIT
Learning Objectives: Students are able to apply basic concept of bioenergetics in simple problems that related to energy changes accompanying biochemical reactions.
Syllabus : Energy demands, thermodynamics Law, ATP and Chemical energy transfer, ATP synthesis setting : kinetical aspects, Biological oxidation, respiration energy. Photosynthesis in plant and bactreia
Prerequisites : Physics Mechanics and Heat
Textbook :
1. Robert A. Alberty, Thermodynamics of Biochemical Reactions, Wiley Interscience, 2003.
2. Lehninger A., Bioenergetics The Molecular Basis of Biological Energy Transformation 5th edition, The Benjadmin/Cummings Publishing Company, 2008
3. Lehninger A., Principles of Biochemistry 5th edition, W.H. Freeman and Company, 2009

TERM 6

ENBE606012
BIOPROCESS SYSTEM SIMULATION
3 CREDITS

Learning Objectives: Students are capable of synthesizing and modeling the biological chemistry process,and have an experience with commercial simmulation software.
Syllabus: benefits and position of bioprocess simulation, software requirement (installation, unit structure, task, economic, etc), simple system: fermentation and filtration, pure components registration which are available/not available on software, mixture components registration, unit selection, case study: galactosidase.
Prerequisite: Numerical Computation
Textbook :
1. SuperPro Designer Manual, Intelligen, Inc.
2. Biorefineries – Industrial Processes and Products: Status Quo and Future Directions (Volume 1-2), by Birgit Kamm and Patrick R. Gruber.

ENBE606013
BIOPROCESS UNIT OPERATION LAB II
1 CREDIT

Learning Objectives: Student have experience to operate process equipment and conduct the experiment, able to analysis and explain the phenomena occurred in each experiment acticity.
Syllabus: Absorption process, Flow control,Wet Wetted Column, Pressure Control, Biofilter/Biofixation CO2.
Prerequisite: Bioseparation and process controll
Handbook:
1. Buku Petunjuk Praktikum Proses dan Operasi Bioproses 1, DTK FTUI
2. Literatur untuk mata kuliah prasyarat

ENBE606014
BIOREACTOR ENGINEERING
3 CREDITS

Learning Objectives: Students are able to design bioreactor.
Syllabus: Introduction to reactor and bioreactor, fermentation technology, reactor engineering for animal and plant cell, ideal reactor, modeling of stirred-tank bioreactor, modeling bubble column bioreactor, reactor dynamic, non-ideal bioreactor, sterilization of bioreactor,bioreactor multiphase, philosophy and rule of thumb in designing bioreactor, design agitation system, analysis and design bioreactor.
Prerequisite: Biochemistry engineering

Handbook:
1. Blanch HW and DS Clark, Biochemical Engineering, Marcel Dekker Inc., New York, 1997.
2. Bailey JE and Ollis, Biochemical Engineering Fundamental, McGraw Hill Book Co., New York, 1986.
3. John Viladsen, Jens Nielsen, Gunar Liden,Bioreaction engineering fundamental,springer, 2011
4. K Schugerl, KH Bellgardt, Bioreaction Engineering Modelling and Control

ENBE606015
PROCESS EQUIPMENT ENGINEERING
3 CREDITS

Learning Objective : Sudents are able to design chemical and biological process based on applicable standard
Syllabus : pump, compressor, pipeline, presure vessel and Tank, distillation column and heat exchanger.
Prerequisite : fluids and mechanics particle and bioseparation
Textbook :
1. Kern, D. Q., “Process Heat Transfer”, Mc.Graw-Hill International Book Company, 1984.
2. Ludwid, Applied Process Design for Chemical and Petrochemical Plant, Vol. 2, Gulf Publishing Co.

ENBE606016
BIOLOGICAL PRODUCT DESIGN
4 CREDITS

Learning Objectives: students are able to design product based on natural resource and analysis their economic value.
Syllabus: Understanding consumer needs, product spesification, product formulation,product manufacturing, supply chain and economics
Prerequisite: process equipment design (passed or parallel), economic engineering.
Handbook:
1. Cussler, L., G. D. Moggridge, 2011, Chemical Product Design, Cambridge University, 2 edition
2. Ulrich K. T., Eppinger S. D., 2003, Product Design and Development, 3rd ed., McGraw-Hill
3. Seider W. D., Seader J. D., Lewin D. R., Soemantri Widagdo, 2008, Product and Product Design Principles. Synthesis, Analysis and Evaluation, Wiley and Sons Inc, 3 edition
4. Wesselingh, J.A., et al., 2007, Design and Development of Biological, Chemical, Food, and Pharmaceutical Products, John Wiley & Sons

ENBE606017
PROCESS CONTROLLING
3 CREDITS

Learning Objective : Students are able to design single loop control system as well as combine process dinamics witk work.
Syllabus : Introduction to process cintrolling, objective and controlling benefits, the principle of mathemtics modelling, modelling and analysis of process controlling, specific dynamics process system properties, identification of empirical methods, feedback loop, controller PID, setting PID controller, stability analysis
Prerequisite : Numerical computation
Textbook :
1. Smith & Corripio, Principles and Practice of Automatic Process Control,1985, John Wiley
2. Bequette, R. W., Process dynamic: Modelling, Analysis, and Simulation, Prenctice Hall, 1998

TERM 7

ENBE607018
WASTE MANAGEMENT OF BIOLOGICAL PROCESS
3 CREDITS

Learning Objectives: Understanding the
concepts of pollution prevention and waste management in clean production, and also design waste management system.
Syllabus: Introduction to pollution prevention concepts, waste water treatment and its preparation, physical, biological, and chemical waste water, unit operation, bioremediation,bioseparation and biodegradation, advanced oxidation process, waste gas treatment, B3 treatment, solid waste treatment, inconventional liquid and gas waste treatment.
Prerequisite: Cell Biology
Handbook:
1. Biowaste and biological waste treatment by Gareth Evarts. James & James, 2001

ENBE607019
INDUSTRIAL PROJECT MANAGEMENT
2 CREDITS

Learning Objective :
Students are able to apply project management in their field of works exactly as well as apply it in other areas exclude main field

Syllabus :
Project-production concept, Life Cycle Project, Selection Project, Planning Project, Implementation Project, and Completion & Evaluation Project
Pre-requisites : Engineering Economics
Textbook : Suharto, Imam, Manajemen Proyek, 1990

ENBE607020
PLANT DESIGN
4 CREDITS

Learning Objectives: Student able to design process and plant of natural product and analysis their economic value.
Syllabus: the concepts in designing process/ plant, flow diagram processes, synthesis and analysis process using heuristic, process simulation,rule of thumb to construct process and material of equipment design, integration heat/process, plant flow sheet, and economic analysis
Prerequisite: Process controlling, engineering economic, Bioprocess system simulation, process equipment design.
Textbook :
1. Douglas, J. M., 1998, Conceptual Design of Chemical Processes, McGraw-Hill.
2. Seider W. D., Seader J. D., Lewin D. R., Sumatri Widagdo, 2008, Product and Product Design Principles. Synthesis, Analysis and Evaluation, Wiley and Sons Inc, 3 edition.
3. Turton, R., R. C. Bailie, W. B. Ehiting and J. A. Shaeiwitz, 1998, Analysis, Synthesis, and Design of Chemical Process, Prentice-Hall
4. Gavin Towler, R K Sinnott, 2012, Chemical Engineering Design: Principles, Practice and Economics of Plant and Process Design, Butterworth-Heinemann, Second Edition.
5. Peter, M. S, and K. D. Timmerhaus, Ronald West, and Max Peters, 2002, Plant Design and Economic for Chemical Engineering, 5 Edition, McGraw-Hill.
6. Biegler L. T, I. E, Grossmann and A. W. Westerberg, 1997, Systematic Methods for Chemical Process Design, Prentice-Hall.
7. Branan, C., 1998, Rule of Thumb for Chemical Engineers : A manual of quick, accurate solutions to everyday process engineering problems, 2nd edition, Gulf Publishing, Co.
8. Wallas, Stanley M. 1990, Chemical Process Equipment : Selection and Design, Buther Worths.
9. Ed Bausbacher, Roger Hunt, 1993, Process Plant Layout and Piping Design, Prentice Hall; 1 edition
10. CHEMCAD Manual, HEATEXET Manual, HYSYS/UNISIM ManualBerk, Z, Food Process Engineering and Technology, Academic Press, 2009
11. Lydersen BK, Bioprocess Engineering: System, Equipment and Facilities, John & Wiley & Sons, Inc., New York, 1993.
12. Peter, M. S. dan K. D. Timmerhaus, Plant design and Economic for Chemical Engineering, 4th Ed., McGraw Hill.
13. SuperPro Designer Manual. Intelligen, Inc

ENBE600021
INTERNSHIP
2 CREDITS

Learning Objectives:
Students are able to gain field experience, able to analyze process/ system/ operation product that available in Chemical industries and anle to apply various communication process : problem solving, intrepersonal communication, study in a group , and conduct a research.
Syllabus: -
Prerequisite: Students had to take a minimum of 110 SKS (minimum value of D) with a 2.0 GPA.
Textbook: -

ENBE600022
RESEARCH METHODOLOGY AND SEMINARS
2 CREDITS

Learning Objectives: Able to determine the appropriate method for research activities and produce the ideas, processes, and scientific research in writing and oral.
Syllabus: Introduction, technics of identifying problem and make a hypothesis, thinking logically, technics of scientific writing, technics of writing research proposal, technics of designing research, presentation technics, technics of collecting, analyzing, and presenting data.
Prerequisite: Students had to take a minimum of 90 SKS (minimum value of D) with a 2.0 GPA.
Textbook :
1. Handout
2. Research proposal format

TERM 8
ENBE600023
UNDERGRADUATE THESIS/ FINAL PROJECT
4 CREDITS

Learning Objectives: Able to design, conduct and analyze research in bioprocess technology ; Present scientific research in writing and oral.
Syllabus: Material of thesis according to conducted research

Prerequisite: Research method and seminar
Textbook:
1. Guide book of undergraduate thesis, Depok, 1999.
ENBE608024
CAPITA SELECTA
2 CREDITS

Learning Objectives: Able to explain the development of industry and engineering, business opportunities and the problems it faces in general.
Syllabus: Held with invited guest lecturers who are competent in fields that fit the requirement of each program study (can be different in each semester).
Prerequisite: Students had to take a minimum of 90 SKS
Textbook: -

ELECTIVE COURSES

ELECTIVE COURSE FOR ODD SEMESTER

ENCE803101
OLEOCHEMICAL INDUSTRY
3 CREDITS

Learning Objectives: Students are able to know the various processes that are commonly used in the oleochemical industry, and able to make a plan to develop the manufacture of oleochemicals from vegetable oils.
Syllabus: Fatty acids, biodiesel, paints and polymers, detergents, soaps, fatty alcohol, glycerin, oils and fats, oil and greese, the development of oleochemicals, vegetable oil processing, vegetable oil technology in the process.
Prerequisites: Organic Chemistry
Textbook: Oleochemical Manufacture and Applications by Frank D. Gunstone, Richard J. Hamilton. Blackwell

ENCE801101
FOOD TECHNOLOGY
3 CREDITS

Learning Objectives: Students are able to understand the processes of making food in the food industry which includes the selection, handling and processing of raw materials, the operating unit of food production, packaging, storage and control the process from beginning stage to the end.
Syllabus: Introduction, physical properties of raw materials, the basic concepts of energy and mass transfer, reaction kinetics, process control. mixing, filtration, centrifugation, extraction and membrane processes, adsorption and ion exchange column, with the temperature settings, drying, preservation, packaging, food storage, and hygiene.
Prerequisites: -
Textbook:
1. Zeki Berk, Food Process Engineering and Technology, Academic Press, Elsevier 2009
2. Food Technology: an introduction by Anita Tull. Oxford University Press, 2002
3. Introduction to Food Engineering by R. Paul Singh, R. Paul Singh and Dennis R. Heldman. Academic Press
4. Introduction to Food Process Engineering by P. G. Smith. Springer
5. Fundamentals of Food Process Engineering by Romeo T. Toledo. Springer

ENCE803102
PROTEIN ENGINEERING
3 CREDITS

Learning Objectives: Students are able to determine protein engineering strategies for the benefit of separation, biocatalysts and medic.
Syllabus: Introduction, Protein docking methods, Protein tagging strategies, Gen synthesis design, Enzyme stabilization, Molecular exploration, Protein engineering, Case study.
Prerequisite: Organic Chemistry
Textbook:
1. Protein Engineering in Industrial Biotechnology, Lilia Alberghina, Harwood academic publishers, 2005
2. Proteins: Biotechnology and Biochemistry by Dr. Gary Walsh. Wiley
3. Protein engineering and design by Sheldon J. Park, Jennifer R. Cochran. CRC Press
4. Protein Engineering and Design by Paul R. Carey. Academic Press
5. Protein Engineering: Principles and Practice. Wiley-Liss

ENCE801102
HERBAL TECHNOLOGY
3 CREDITS

Learning Objectives: Students are able to explain the development of herbal technology, herbal separation technology, herbal formulatioin basis, herbal regulation, and distinguish with other pharmaceutical products
Syllabus: Definition and basic concepts of herbs, herbal materials, herbal separation technology, herbal formulations, herbal regulation.
Prerequisites: Organic Chemistry
Textbook: The Complete Technology Book on Herbal Perfumes & Cosmetics by H. Panda. National Institute of Industrial Research 2003
ENCE801103
COMPOSITE MATERIAL
3 CREDITS

Learning Objectives: Students are able to:
1. Explain the characteristics of composite materials and compare it with conventional materials.
2. Explain the manufacturing process, and research development of composite materials.

Syllabus: The position of composite materials in materials science in general, common characteristics of composite materials, the type of composite based on the composition, the types of polymer matrix and reinforcement, the role of surface treatment in the strength of composite materials, manufacturing processes, durability, the process of splicing and repair of composite materials, code and standards for application of composite materials, the development of composite materials research.
Prerequisites: Organic Chemistry
Textbook:
1. Fiber-reinforced Composites (Materials Engineering, Manufacturing and Design), P. K. Mallick, Marcel Dekker, Inc., 1993.
2. Handbook of Plastics, Elastomers, and Composites, 3rd ed., Charles A. Harper, McGraw-Hill, 1996.
3. Reinforced Plastics - Theory and Practice, 2nd ed., M. W. Gaylord, Chaners Books, 1974.

ENCE813103
APPLIED THERMODYNAMICS
3 CREDITS

Learning Objectives: Students are able to analyze problems of thermodynamics based on a thorough review including fundamental aspects of thermodynamics, experimental, and green chemistry, based on current information from scientific journals
Syllabus: The case study of industrial thermodynamic, example cycle processes, phase equilibrium, and chemical reaction equilibrium to process and product engineer; friendly solvents such as supercritical CO_2 and ionic liquid
Prerequisites: Chemical Engineering Thermodynamics
Textbook:
1. References relevant to a given problem.
2. Mulia, K and Wulan, PPDK, Textbook of Chemical Thermodynamics

ENCE803104
DINAMIC SYSTEM
3 CREDITS

Learning Objectives: Students are able to build dynamic models of process systems, biological, industrial, social and economic.
Syllabus: Introduction to dynamical systems, causal loops, model and validation, analysis, case study.
Prerequisites: Numerical Computation
Textbook:
1. Forrester, J. W., 2002, Principles of Systems, Productivity Press
2. Goodman, Michael R., 1998, Study Notes in System Dynamics, Productivity Press
3. Richardson, George P. and Pugh III, Alexander L., 1999, Introduction to System Dynamics Modeling, Pegasus Communications
4. Andersen, David, etc., Introduction to Computer Simulation - A System Dynamics: Systems Thinking and Modeling for a Complex World, McGraw-Hill

ENCE811104
THERMODYNAMIC SYSTEM OF HYDROCARBON
3 CREDITS

Learning Objectives: Students are able to predict the magnitude of thermodynamic properties of hydrocarbons and the phase condition, either manually or using software calculations.
Syllabus: introduction to hydrocarbon thermodynamics properties, basic thermodynamic concepts, P-V-T data correlations, physical properties of hydrocarbon fluids, computing aided thermodynamics properties, the vapor-liquid behavior of two-phase systems, water-hydrocarbon system behavior, product specifications in the disposal lease of hydrocarbon
Prerequisites: Chemical Engineering Thermodynamics

Textbook:
1. Wayne C. Edmister, Byung Ik Lee, Applied hydrocarbon thermodynamics, Volume 1, Gulf Publishing Company (1988), Houston, Texas.
2. John M. Campbell, Gas Conditioning and Processing, Vol. 1, 8th Edition Campbell Petroleum Series 2001.

ENCE801105
LUBRICANT ENGINEERING
3 CREDITS

Learning Objectives: Students are able to explain the working principles of lubrication, lubricant function and several parameter of the quality and lubricant classification, lubricant chemical, and its production technology either mineral lubricant, synthesis, and vegetal.
Syllabus: Principles of lubrication on friction and wear phenomena on the two surfaces of solid objects are moving together; mode lubrication: hydrodynamic and elastohydrodynamic; lubricants: mineral, synthetic, and vegetable; additives, formulations, degradation, contamination, and maintenance of lubricants; latest development of lubricant technology .
Prerequisites: Organic Chemistry
Textbook:

1. E. Richard Booster, Handbook of Lubricant: Theory and Practice of Tribology, Vol. I, Vol. II, Vol. III, CRC Press (1984), Inc., Boca Raton, Florida
2. Mervin H. Jones, Industrial Tribology: The Practical Aspect of Friction, Lubricant, and Wear., Elsevier Scientific Publishing Co., New York, 1983.
3. J. Halling, Principle of Tribology, Macmillan Press Ltd., London, 1978
4. Handout

ENCE803105
CRYOGENIC ENGINEERING
3 CREDITS

Learning Objectives: Students are able to explain the various processes to liquefy gas in cryogenic technology
Syllabus: History and development of cryogenic, cryogenic scope of work. Refrigeration and liquefaction of natural gas, air, oxygen, nitrogen, helium, neon and argon.
Prerequisites: Chemical engineering thermodynamics
Textbook:
1. Timmerhaus, K.D., Cryogenic Process Engineering, Plenum Press 1989, New York.

ENCE801106
COMBUSTION ENGINEERING
3 CREDITS

Learning Objectives: Students are able to explain the phenomenon of combustion and resolve the problems that rendered correctly.
Syllabus: chemical kinetics and combustion, the flame, premix flame, diffusion flame, the combustion process applications.
Prerequisite: Transport Phenomena, Chemical Reaction Engineering 1, Chemical Engineering Thermodynamics
Textbook:
1. Warnatz, J., Maas, U. dan Dibble, R.W., Combustion: Physical and Chemical Fundamentals, Modeling and Simulation, Experiments, Pollutant Formation, 2nd ed., Springer, Heidelberg, 1999.
2. Turns, S.R., An Introduction to Combustion: Concepts and Applications, 2nd ed, McGraw-Hill, 2000.
3. Glassman, I., Combustion, Academic Press, 1997.
4. El-Mahallawy dan el-Din Habik, S., Fundamental and Technology of Combustion, Elsevier, 2002.
5. Combustion, T. J. Poinsot and D. P. Veynante, in Encyclopedia of Computational Mechanics, edited by Erwin Stein, Ren´e de Borst and Thomas J.R. Hughes, 2004 John Wiley & Sons, Ltd.
6. Introduction to Combustion, Concepts and Applications, Stephen R. Turns, 2nd edition, McGraw Hill, 2000
7. Introduction to Combustion Phenomena, A. Murty Kanury, Gordon and Breach Science Publishers, 1975
8. Heat Transfer from Burners, Charles E. Baukal, in Industrial Burners Handbook, edited by Charles E. Baukal, CRC Press, 2004.

ENCE803106
PLASMA AND OZONE ENGINEERING
3 CREDITS

Learning Objectives: Students are able to explain the physics and chemistry phenomena of plasma formation and release of electromagnetic energy and the use of plasma and ozone technology.
Syllabus: basic phenomena and physical-chemical processes of gases that are given an electrical charge (corona discharge), the generation process or formation of ozone, role and use of plasma technology and ozone in chemical engineering processes, the potential of ozone technology in control technology environmental pollution, the ozone generator module manufacturing equipment.
Prerequisite: Physics Electricity Magnetism
Textbook:
1. E. T. Protasevich: “Cold Non-Equilibrium Plasma”, Cambridge International science Publishing, Cambridge, 1999.
2. Rice, R. G., and M. E. Browning: “Ozone Treatment of Industrial Water wate”, Notes Data Corroraion, Park Ridyl, 1981.
3. Metcalf & Eddy, Inc. (Tchobano-glous, G., and FL Burton): “Wastewater Engineering: Treatment, Disposal, and Reuse”, McGraw-Hill Book. Co., Singapore, 1991.

ENCE801107
HETEROGENEOUS CATALYST
3 CREDITS

Learning Objectives: Students are able to explain the phenomenon of basic concepts heterogeneous catalysts and its application
Syllabus: The general property of catalyst, thermodynamic of the reaction with catalyst, the distribution of the catalyst based on the type of reaction, the core function is active, the method

of selecting catalysts for certain reactions, characterization of the corresponding want to know the nature of the target, the catalyst test methods, methods of development of the catalyst, and reaction products.
Prerequisites: Chemical Reaction Engineering 1
Textbook:
1. Satterfield, C. N., heterogeneous Catalysis in Industrial Practice, McGraw-Hill Inc., New York, 1991.
2. Rase, F. R., Commercial Catalyst, CRC Press, New York, 1991
3. Richardson, T, J., Principles of Catalyst Development, Plenum Press, New York, 1989
4. Thomas J.M. And WJ Thomas, Principles and Practice of Heterogenous Catalysis, VCH, Weinhem, Germany, 1997
5. Emmet, R. H., Catalysis, Reinhold Publishing Corporation, New York, 1961

ENCE801108
SUSTAINABLE ENERGY
3 CREDITS

Learning Objectives: Students are able to explain the relationship of energy with social aspect, economic and environmental and sustainability concepts, and able to analyze the performance of techno-economy and the continuity especially fossil energy system, new, and renewable.
Syllabus: Concept of sustainability and sustainable energy, energy hierarchy, energy linkages with economic, environmental and social, fossil energy / fuels and Impacts, global climate change and its mitigation, conversion, transportation / distribution and storage, analysis method of energy sustainability: LCA , sustainability index, hydrogen and fuel cells and nuclear energy, solar energy (PV and thermal), wind and ocean, hydropower, bioenergy, geothermal energy, energy efficiency and conservation, carbon capture and storage
Prerequisites: Chemical Engineering Thermodynamics or Biochemical Engineering
Textbook:
1. Jefferson W. Tester, et al., Sustainable Energy: Choosing Among Options, MIT Press, 2005.
2. Godfrey Boyle, et al., Energy Systems and Sustainability: Power for a Sustainable Future, Oxford University Press, 2003.
3. E. Cassedy S, Prospects for Sustainable Energy: A critical assessment, Cambridge University Press, 2000.
4. DeSimone et al, Eco-Efficiency. The Business Link to Sustainable Development, MIT Press, 1997.
5. D. Elliot, enerfy, Society, and Environment, Technology for a sustainable future, Rouledge, 1997
6. Miller, G. T., Environment Science. Sustaining Earth, Wardworld Publish Co. 1993

ENCE803107
RISK MANAGEMENT
3 CREDITS

Learning Objectives: Students can explain and apply risk management in a risk assessment.
Syllabus: Introduction to the risk, the basic principles and guidelines concerning risk, risk management standards, risk assessment, risk analysis, risk analysis and simulation, simulation of the risk with Montecarlo method, the risk of using software simulation crystal ball.
Prerequisites:
Textbook: J. F. A. Stoner, Management, 1986

ENCE803108
SPECIAL TOPIC 1
3 CREDITS

ELECTIVE COURSE FOR EVEN SEMESTER

ENCE802101
PACKAGING AND STORAGE TECHNOLOGY
3 CREDITS

Learning Objective : Students are able to describe characteristics, packaging and storage food technology, the relation between storage and packaging with quality of food, describe factors affecting deviation of food qualities as well as able to choose storage methods and packaging types which is appropriate to food materials.
Syllabus : hidratasi, material storage technology and food products, deviation of food material qualities, microbial contaminant, purpose and function of food packaging, interaction between food packaging and packaging material types
Prerequisite : -
Textboox : Examining Food Technology by Anne Barnett. Heinemann Secondary,1996

ENCE802102
BIOINFORMATICS
3 CREDITS

Learning Objective : Students are able to explore database and programs to be applied in genetic engineering sectors, proteomic etc

Syllabus : Database, genomics, genetic molecular, philogeny, protein structure, metabolism and tissues
Textbook :
1. Bioinformatics by Shalini Suri. APH Publishing, 2006
2. Bioinformatics: A Primer by Charles Staben and Staben. Jones & Bartlett Publishers, 2005

ENCE802103
DRUGS AND COSMETICS TECHNOLOGY
3 CREDITS

Syllabus :
Definition of drugs and cosmetics, types of skins and characteristics, cosmetic types, ethics and regulation of drugs and cosmetics, new drug development technology, process technology in drug and cosmetics industries, packaging technology of drugs and cosmetics technology.
Prerequisite : Organic Chemistry
Textbook :
1. Handbook of Cosmetic Science and Technology by Andre O. Barel, Marc Paye, Howard I. Maibach. INFRMA-HC 2009
2. Biodesign: The Process of Innovating Medical Technologies by Stefanos Zenios, Josh Makower , Paul Yock , Todd J. Brinton, Uday N. Kumar, Lyn Denend, Thomas M. Krummel. Cambridge University Press 2009

ENCE802104
BIOMATERIAL
3 CREDITS

Learning Objective : Students are able to describe the principle and concept of material technologies through biological as well as life cycle assesment (LCA), organic and inorganic materials for biomaterial, apply and develop knowledge about biomaterial for life
Syllabus: Introduction, solids structure, characteristics of materials, metal material for implant, bioceramic materials, structural properties of biomaterial, the respons of tissues to biomaterial implant, the replacement of soft tissues , the replacement of hard tissues, transplantation, and biological tissues engineering
Prerequisite :-
Textbook :
1. Joon Park, R.S. Lakes. Biomaterials an Introduction, springer
2. Biomaterials: Principles and Applications by Joon B. Park, Joseph D. Bronzino. CRC Press

ENCE802105
PETROLEUM PROCESSING
3 CREDITS

Learning Objectives: Students are able to explain petroleum characteristic and its refine product and the stages of the process from various petroleum processing technologies.
Syllabus: Introduction terminology, oil composition, thermal properties of petroleum, chemical processing of petroleum processing, distillation, hydrogenation and dehydrogenation, cracking processes, the processes of reforming, gas processing and petroleum light products, product improvement.
Prerequisites: Fluid and Particle Mechanics, Thermodynamics, Mass Transfer.

Textbook:
1. James G. Speight, The Chemistry and Technology of Petroleum, Marcel Dekker, 1991.
2. James H. Gary and Glenn E. Handwerk, Petroleum Refining, Marcel Dekker, 1974.
3. D. S. J. Jones, Elements of Petroleum Processing, John & Sons Woley

ENCE802106
PETROCHEMICAL PROCESSING
3 CREDITS

Learning Objectives: Students are able to explain the development of petrochemical products and raw material potential, upstream / downstream petrochemical production lines (olefin center, aromatic center, and the pathways of methane) and the major production processes of several petrochemical industry through methane, olefins and aromatics; able to analyze impact of industrial processes and petrochemical products to the environment.
Syllabus: History of the general petrochemical products development and raw material potential, the scope of the petrochemical industry, petrochemical classification process, the type and processing raw materials into petrochemical products, the details of various petrochemical industry: olefins center, aromatics and the center line of methane, industrial and environmental impact of products petrochemicals.
Prerequisites: Organic Chemistry
Textbook:
1. Martyn V. Twigg, “Catalyst Handbook”, 2nd Ed., Wolfe Pub. Ltd..
2. Lewis T. Hatch, Sami Matar, “From Hydrocarbon to Petrochemical”.
3. Wells, Margaret G., “Handbook of Petrochemicals and Processes”, Gower Publishing Company

Ltd., 1991.
4. Pandjaitan Maraudin, Petrochemical Industry and The effect of environment, Gadjah Mada University Press, 2002.

ENCE802107
PHOTOCATALYSIS TECHNOLOGY
3 CREDITS

Learning Objectives: Students are able to understand the basic concepts and photocatalysis and apply it in the various the simple daily problem, especially related with environment, health, and energy.
Syllabus: The basic concept photocatalysis processes, thermodynamics and kinetics of photocatlytic process, semiconductor photocatalyst materials, the basic parameters of photocatlytic process, Photocatalyst Nanomaterial Engineering, photocatlytic applications for degradation of organic pollutants and heavy metals, photocatalysis c applications for self-cleaning and anti fogging, photocatalysis applications for anti-bacterial and cancer therapy, photocatalysis applications for engineering 'daily life tools', photocatalysis applications in renewable energy sector, solar detoxification engineering with photocatalysis, intensification of photocatalysis process.
Prerequisites: Chemical Reaction Engineering 1
Textbook:
1. M. Schiavello, Heterogeneous Photocatalysis, John Wiley & Sons, 1997.
2. A. Fujishima, K. Hashimoto, and T. Watanabe, TiO_2 Photocatalysis: Fundamentals and Applications, BKC Inc. Japan, 1999.
3. J.B. Galvez, et.al., Solar Detoxification, Natural Sciences, Basic and Engineering Sciences, UNESCO.
4. M. Kaneko, I. Okura, Photacatalysis Science and Technology, Springer USA, 2002.
5. C.A. Grimes, G.K. Mor, TiO_2 Nanotube Arrays: Synthesis, Properties, and Applications, Springer, New York, 2009.
6. Paper-paper dan bahan lain dari berbagai Jurnal Ilmiah dan website.

ENCE812108
POLYMER ENGINEERING
3 CREDITS
Learning Objectives: Students are able to explain the basic principles and characteristics of polymer manufacturing until being able to keep abreast of the latest technology.
Syllabus: The concept of polymer and polymer characteristics, synthesis / polymerization, kinetics of polymerization, the polymer solution, characterization, process of making plastics.
Prerequisites: Organic Chemistry
Textbook:
1. R. J. Lovell, Introduction to Polymers, P. A. Lovell, Chapman & Hall.
2. R. B., Seymour, Polymers for Engineering Applications, ASM International.
3. F. W. Billmeyer, Textbook of Polymer Science, Wiley.
4. R. J. Crawford, Plastic Engineering, Pergamon Press.
5. Donald R. Woods, Problem Based Learning: How to gain the most PBL, 1994, Mc-Master University, Hamilton, ON L8S 4L8.

ENCE802109
POLLUTION PREVENTION
3 CREDITS
Learning Objectives: Students are able to explain the concepts of pollution prevention and able to design the waste treatment system.
Syllabus: Introduction to the concept of pollution prevention, waste water treatment outline and preparation, waste water treatment in physical, biological, and chemical as well as the operating unit, bioremediation, bioseparation and biodegradation, advanced oxidation processes, the handling of waste gas, waste handling B3, solid waste handling , effluent treatment, gas, is unconventional.
Prerequisites: Chemical Reaction Engineering 1.
Textbook:
1. Freeman, H. M., Industrial Pollution Prevention Handbook, McGraw-Hill, New York, 1995.
2. Eckenfelder, W. W., Jr.., Industrial Water Pollution Control. 3rd ed. McGraw-Hill International Editions, New York, 2000.
3. Metcalf & Eddy. (Revised by Tchobanoglous, G. & F. L. Burton). Waste Water Engineering: Treatment, Disposal, Reuse, 3rd ed., McGraw-Hill, Singapore, 1991.
4. Heinson R. J. & R. L. Cable. Source and Control of Air Pollution. Prentice Hall. New Jersey. Of 1999.
5. Legislation on the prevention of pollution and waste management.
6. Journals, the Internet.

ENCE802110
EXPLORATION AND PRODUCTION OF HYDROCARBON
3 CREDITS

Learning Objectives: Students are able to explain the economic concept of natural gas and analyze the 4e economy.
Syllabus: Introduction of hydrocarbon, life cycle of field development, hydrocarbon form and hydrocarbon property and reservoir, hydrocarbon exploration: geology, geophysics, and drilling, field

appraisal, reservoir development, drilling development, hydrocarbon production, HSE, hydrocarbon economy and lease, coal and hydrocarbon unconventional (CBM, Shale gas, and HYDRAT GAS)
Prerequisites:-
Textbook:
1. Frank Jahn et all, 2008, Hydrocarbon Exploration and Production, Developments in Petroleum Science, second edition
2. Babusiauz et al, 2004, Oil and Gas Exploration and Production. Reserves, Cost and Contracts, IFP-Technip,
3. M. Kelkar, 2008, Natural Gas Production Engineering, PennWell Publications
4. Norman J. Hyne, 2001, Nontechnical Guide to Petroleum Geology, Exploration, Drilling and Production, Pennwell Books, 2 edition.

ENCE802111
UTILITIES AND PLANT MAINTENANCE
3 CREDITS

Learning Objectives: Students are able to explain the strategy of plant and utility maintenance.
Syllabus: Plant maintenance strategy: maintenance program, maintainability, reliability, planning and scheduling
Prerequisite: Chemical Engineering Thermodynamics
Handbook:
1. 1 Dhillon, B.S., Engineering Maintenance: A Modern Approach, CRC Press, 2002.
2. Higgins, L.R., Mobley, R.K. dan Smith, R., Maintenance Engineering Handbook, McGraw-Hill, 2002.
3. Sanders, R.E., Chemical Process Safety, Elsevier, 2005.
4. Palmer, D., Maintenance Planning and Scheduling Handbook, McGraw-Hill, 1999.

ENCE802112
NATURAL GAS TRANSPORTATION AND UTILIZATION
3 CREDITS

ENCE812113
DRUG CONTROLLED RELEASED TECHNOLOGY
3 CREDITS
Learning objective : Students are able to describe the principle of control drug releasedor bioactive compound for medical purposes and utilize the principle to apply control drug released technology
Syllabus : polymeric biomaterial that is easily degradable , various methods to drug encapsulation and bioactive compounds in nano/microsfer, diffusion and permeasi, strategy of control released, case study
Prerequisite : Organic Chemistry
Textbook :
1. Saltzman, W.M., Drug Delivery: Engineering Principles for Drug Therapy, Oxford University Press, 2001.
2. Wen, H. and Park, K, ed., Oral Controlled Release Formulation Design and Drug Delivery, Wiley, 2010.

ENCE802114
ANALYSIS AND SYNTHESIS OF CHEMICAL PROCESSES
3 CREDITS

Learning Objectives: Students are able to analyze and synthesize the chemical processes in an integrated system of technical and economic aspects
Syllabus: The strategy of synthesis and analysis process, design concepts development and the determination of the best flow sheet, a preliminary optimization process, the retrofit process, the use of computer aided design system for simulation and analysis process.
Prerequisites: Simulation of Chemical Processes
Textbook:
1. James M Douglas, Conceptual Design of Chemical Process, McGraw-Hill International Edition, 1988.
2. Hartman, Klaus, and Kaplick, Klaus, Analysis and Synthesis of Chemical Process Systems
3. Lorenz T Biegler, Systematic Methods of Chemical Process Design, Prentice Hall Inc., 1997.

ENCE802115
GEOTHERMAL TECHNOLOGY
3 CREDITS

ENCE802116
PROBLEM-SOLVING SKILLS
3 CREDITS

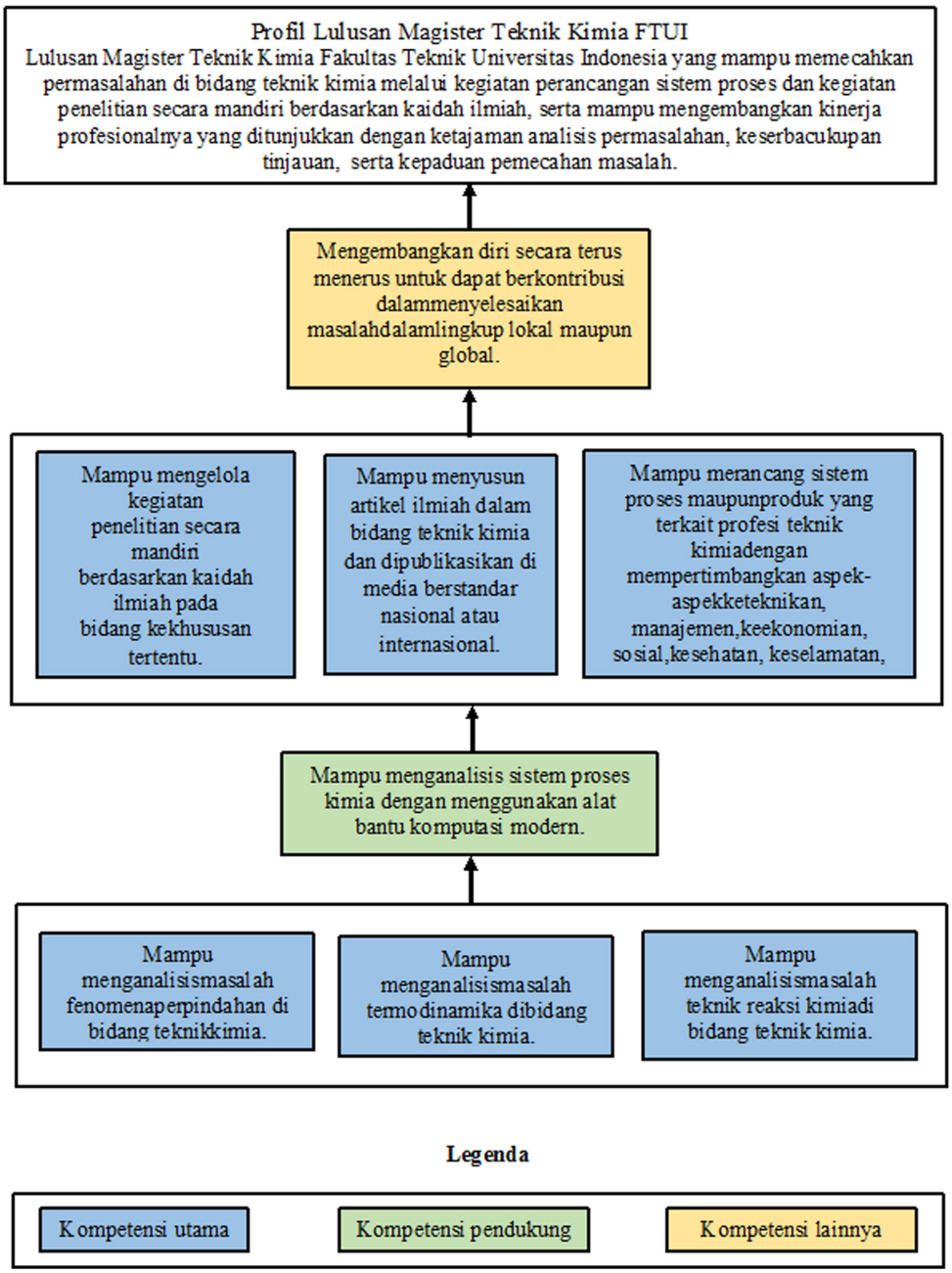
ENCE802117
SPECIAL TOPIC 2
3 CREDITS

MASTER PROGRAM

6.5. MASTER PROGRAM IN CHEMICAL ENGINEERING

Program Specification

1	Awarding institution		Universitas Indonesia
2	Organized Instituion		Universitas Indonesia
3	Study Program Name		Chemical Engineering Master Program
4	Type of Class		Regular / Gas Management
5	Degree given		Magister Teknik (MT)
6	Accreditation status		BAN-PT: Akreditasi A
7	Medium Language		Indonesia
8	Study Scheme (Full time/Part time)		Full time
9	Entry requirement		Bachelor Degree
10	Study Duration		Designated for 2 years
11.	Type of Semester	Number of semester	Number of weeks /semester
	Regular	4	17
	Short (optional)	-	-
12	**Graduate Profile:** Master of Chemical Engineering, Faculty of Engineering, Universitas Indonesia who is able to do problem-solving in chemical engineering field through system process design and independent research activities based on scientific principles as well as able to develop professional performance as indicated by keenness of problem analysis, multifariousness aspects, and linearity in troubleshooting.		
13	**Expected learning outcome:** 1. Able to analyze problems in transport phenomena in Chemical Engineering field. 2. Able to analyze problems in thermodynamics in Chemical Engineering field 3. Able to analyze problems in chemical reaction engineering in Chemical Engineering field 4. Able to analyze problems in chemical process system in Chemical Engineering field 5. Able to manage research activities independently based on scientific principles in certain specific fields. 6. Able to design process system as well as related product in chemical engineering fields by considering engineering principles, management, economy, social, health, safety, and environment. 7. Able to prepare scientific articles in chemical engineering field and published in national or international media standards. 8. Continously develop one-self to contribute in solving problems locally as well as globally.		
13	**Classification of Subjects**		
No	Classification	Credit Hours (SKS)	Percentage
i	Total compulsary credits	17	40%
ii	Total elective credits	15	36%
iii	Seminar and Thesis	10	24%
	Total	42	100%
14	**Total Credit Hours to Graduate**		**42 SKS**


Profil Lulusan Magister Teknik Kimia FTUI
Lulusan Magister Teknik Kimia Fakultas Teknik Universitas Indonesia yang mampu memecahkan permasalahan di bidang teknik kimia melalui kegiatan perancangan sistem proses dan kegiatan penelitian secara mandiri berdasarkan kaidah ilmiah, serta mampu mengembangkan kinerja profesionalnya yang ditunjukkan dengan ketajaman analisis permasalahan, keserbacukupan tinjauan, serta kepaduan pemecahan masalah.
Mengembangkan diri secara terus menerus untuk dapat berkontribusi dalammenyelesaikan masalahdalamlingkup lokal maupun global.
Mampu mengelola kegiatan penelitian secara mandiri berdasarkan kaidah ilmiah pada bidang kekhususan tertentu.
Mampu menyusun artikel ilmiah dalam bidang teknik kimia dan dipublikasikan di media berstandar nasional atau internasional.
Mampu merancang sistem proses maupunproduk yang terkait profesi teknik kimiadengan mempertimbangkan aspek-aspekketeknikan, manajemen,keekonomian, sosial,kesehatan, keselamatan,
Mampu menganalisis sistem proses kimia dengan menggunakan alat bantu komputasi modern.
Mampu menganalisismasalah fenomenaperpindahan di bidang teknikkimia.
Mampu menganalisismasalah termodinamika dibidang teknik kimia.
Mampu menganalisismasalah teknik reaksi kimiadi bidang teknik kimia.
Legenda
Kompetensi utama
Kompetensi pendukung
Kompetensi lainnya

CURRICULUM STRUCTURE MASTER PROGRAM CHEMICAL ENGINEERING

Teknik Kimia Reguler asal S1 Teknik Kimia - Chemical Engineering (Regular) Based on Chemical Engineering Undergraduate Program

KODE	SUBJECT	CREDIT
CODE	**Term 2**	
ENCH801001	Adv Chemical Eng Thermodynamics	3
	Elective 1	3
	Elective 2	3
	Elective 3	3
	Total	**12**
	Term 2	**SKS**
ENCH802101	Advanced Transport Phenomena	3
ENCH802102	Advanced Chemical Reaction Engineering	3
ENCH802103	Adv Chemical Eng. Modeling	3
ENCH802104	Research Methodology	3
	Total	**12**
	Term 3	**SKS**
ENCH800002	Pra Tesis	2
	Elective 4	3
	Elective 5	3
	Total	**8**
	Term 4	**SKS**
ENCH800003	Tesis	8
ENCH800004	Scientific Publication	2
	Total	**10**
	Sub Total	**42**

Teknik Kimia Reguler asal S1 non-Teknik Kimia - Chemical Engineering (Regular) Based on non-Chemical Engineering Undergraduate Program

KODE	SUBJECT	CREDIT
CODE	**Term 1**	
Matrikulasi	Transport Phenomena	
Matrikulasi	Numerical Computation	
Matrikulasi	Chemical Reaction Engineering 1	
	Elective 1	3
	Elective 2	3
	Total	**6**
	Term 2	
Matrikulasi	Chemical Eng Thermodynamics	
ENCH802101	Advanced Transport Phenomena	3
ENCH802102	Advanced Chemical Reaction Engineering	3
ENCH802103	Adv Chemical Eng. Modeling	3
ENCH802104	Research Methodology	3
	Total	**12**

	Term 3	
ENCH801001	Adv Chemical Eng Thermodynamics	3
ENCH800002	Pra Tesis	2
	Elective 3	3
	Elective 4	3
	Total	**11**
	Term 4	
ENCH800003	Tesis	8
ENCH800004	Scientific Publication	2
	Elective 5	3
	Total	**13**
	Sub Total	**42**

Managemen Gas - Gas Management

KODE	SUBJECT	CREDIT
CODE	**Term 1**	
ENCH801203	Explor & Product of Hydrocarbon	3
ENCH801202	Natural Gas Processing	3
ENCH801204	Natural Gas Project Management	3
ENCH801001	Adv Chemical Eng Thermodynamics	3
	Total	**12**
	Term 2	
ENCH802201	Trans & Utilization of Natural Gas	3
ENCH802202	Natural Gas Economics	3
ENCH802203	Risk Management	3
ENCH802204	Management Systems Eng.	3
	Total	**12**
	Term 3	
ENCH803201	Renewable Energy	3
ENCH803202	OHS in Natural Gas Industry	3
ENCH800002	Pra Tesis	2
	Total	**8**
	Term 4	
ENCH800003	Tesis	8
ENCH800004	Scientific Publication	2
	Total	**10**
	Sub Total	**42**

MATA KULIAH PILIHAN / ELECTIVE COURSE

Kode	Elective Course for Odd Semester	Credit
ENCH801101	Food Technology	3
ENCH801102	Herbal Engineering	3
ENCH801103	Composite Material	3
ENCH801104	Hydrocarbon Thermodynamic	3
ENCH801105	Lubricants Engineering	3
ENCH801106	Combustion Engineering	3

ENCH801107	Heterogenous Catalyst	3
ENCH803101	Oleochemistry Industry	3
ENCH803102	Protein Engineering	3
ENCH803103	Applied Thermodynamics	3
ENCH803104	Dynamics System	3
ENCH803105	Cryogenics	3
ENCH803106	Plasma & Ozone Engineering	3
ENCH803107	Special Topics 1	3
ENCH803201	Renewable Energy	3

Kode	Elective Course for Even Semester	Credit
ENCH802105	Storage & Packaging Tech	3
ENCH802106	Bioinformatics	3
ENCH802107	Cosmetics and Drugs	3
ENCH802108	Biomaterial	3
ENCH802109	Natural Gas Processing	3
ENCH802110	Petrochemical Process	3
ENCH802111	Photocatalysis Engineering	3
ENCH802112	Polimer	3
ENCH802113	Polution Prevention	3
ENCH802114	Explor & Product of Hydrocarbon	3
ENCH802115	Plant Utility and Maintenance	3
ENCH802116	Drug Controlled Release Tech	3
ENCH802117	Analysis & Synthesis of Process	3
ENCH802118	Geothermal Engineering	3
ENCH802119	Problem Solving Skills	3
ENCH802120	Special Topics 2	3
ENCH802201	Trans & Utilization of Natural Gas	3
ENCH802203	Risk Management	3

SYLLABUS OF MASTER PROGRAM CHEMICAL ENGINEERING DEPARTMENT
A. CHEMICAL ENGINEERING (REGULAR) BASED ON CHEMICAL ENGINEERING UNDERGRADUATE PROGRAM

TERM 1

ENCE801001
ADVANCED CHEMICAL ENGINEERING MODELLING
3 CREDITS

Learning Objectives: Students are able to develop physicochemical model systems in chemical processes and solve it by using numerical methods with assistance of software programme

Syllabus: Emphirical modelling and physicochemical system in Chemical process ; linear and non linear algebra equation system, simple differential equation, initial problem value and limits problem value, partial differential equation.

Prerequisite: Numerical Computation

Textbook:

1. Bismo, S. dan Muharam, Y., Metode Numerik & Komputasi dengan FORTRAN dan Pascal, 2011.
2. Constantinides, A. dan Mostouvi, N., Numerical Methods for Chemical Engineers with MATLAB Applications, Prentice Hall, 1999.
3. Davis, M.E., Numerical Methods and Modeling for Chemical Engineer, JohnWilley & Sons, New York, 1984.
4. Rice, G.R. dan Duong D.D., Applied Mathematics and Modeling for Chemical Engineers, John Willey & Sons, New York,1995.
5. Tosun, I., Modeling in Transport Phenomena: A Conceptual Approach, Elsevier, 2002.

ENCE801002
ADVANCED CHEMICAL ENGINEERING THERMODYNAMICS
3 CREDITS

Learning Objectives: Students are able to understand the basics of thermodynamics, fluid properties, phase equilibrium and reaction and be able to apply it to solve problems of chemical engineering.
Syllabus: Analysis the system using the several form of the first and second laws, the equation network of thermodynamic for thermodynamic properties, condition equation, fluid phase equilibrium, chemical reaction equilibrium
Prerequisite: Chemical Engineering Thermodynamics

Textbook:

1. Kyle, B.G., Chemical and Process Thermodynamics, 2nd ed., Pretice Hall, 1992.
2. Hand-out Kuliah.
3. Smith J.M. dan van Ness, H.C., Introduction to Chemical Engineering Thermodynamics, 4th ed., McGraw-Hill, 1985.
4. Callen, H.B., Thermodynamics and An Introduction to Thermostatics, 2nd ed., John Wiley and Sons, 1985.

TERM 2
ENCE802001
ADVANCED TRANSPORT PHENOMENA
3 CREDITS

Learning Objectives: Students are able to understand the transport phenomenon of momentum, mass and heat simultaneously and able to apply it at the unit processes that involve the flow of single phase or multiple phase
Syllabus: Review of the theory of transfer of momentum, mass and heat simultaneously; analysis and application of single-phase system: mixing and dispersion, mixer; analysis and application of a combination system of gas-liquid phase, gas-solid, liquid-liquid, liquid-solid, gas -liquid-solid
Prerequisite: Peristiwa Perpindahan.

Textbook:

1. Bird R.B., Stewart, W.E. dan Lightfoot, E.N., Transport Phenomena, John Wiley & Sons, 2002.
2. Tosun, I., Modellling in Transport Phenomena, Elsevier, 2002.
3. Griskey, R.G., Transport Phenomena and Unit Operation: A Combined Approach, John Wiley & Sons, 2002.
4. Brodkey, R.S. dan Hershey, H.C., Transport Phenomena: A Unified Approach, McGraw-Hill, 1988.

ENCE802002
ADVANCED CHEMICAL REACTION ENGINEERING
3 CREDITS

Learning objectives: Students are able to analyze the phenomenon of chemical kinetics, the kinetics reaction data to determine the equation mechanistic reaction rate; able to design and analyze the performance of non ideal homogeneous and multi phase chemical reactors.
Syllabus: Thermodynamics of the reaction; definitions and basic concepts: the rate of reaction, the reaction rate equation, the Arrhenius equation: reaction modeling and data analysis for the determination of reaction rate equations; the introduction of gas-solid heterogeneous catalysts: a reduction in reaction rate equations and data of heterogeneous catalytic reactions of solid-gas; effects of diffusion and heat transfer in the catalytic reaction data interpretation. design of batch reactor and CSTR (isothermal, non-isothermal) reactor design PFR and PBR (isothermal, non-isothermal) sphere and the membrane reactor design; design-solid heterogeneous catalytic reactors with interstage gas cooler / heater; design of reactors for multiple reactions and mss (multiple steady state). design of non-ideal reactor (residence time distribution).
Prerequisite: Chemical Reaction Engineering 2

Textbook:

1. Fogler, H.S., Elements of Chemical Reaction Engineering, Prentice-Hall, 4th Ed., 2006.
2. Smith, J.M., Chemical Engineering Kinetics, 3rd ed., 1981, McGraw-Hill.
3. Thomas, JM, and Thomas WJ., Principles and Practice of Heterogeneous Catalysis, VCH Weinheim, 1997.

ENCE800001
RESEARCH METHODOLOGY
3 CREDITS

Learning Objectives : Students are able to determine the appropriate method for research activities and produce the ideas, processes, and scientific research in writing and oral.
Syllabus: Introduction, techniques to identify problems and arrange hypotheses, think logically, the techniques of scientific writing, technical writing research proposals, designing research techniques, presentation techniques, techniques to collect data, analyze it and present it.
Prerequisites: Students have to take a minimum of 12 credits (minimum value of D) with a GPA of 2.0
Textbook

1. Handout.
2. Research Proposal Format The preparation of various agencies

TERM 3
ENCE800002
SEMINAR
3 CREDITS

Learning Objectives : Students are able to produce the ideas, processes, and scientific research in writing and oral.
Syllabus: Introduction, techniques to identify problems and arrange hypotheses, think logically, the techniques of scientific writing, technical writing research proposals, designing research techniques, presentation techniques, techniques to collect data, analyze it and present it.
Prasyarat: -

Buku ajar: -

TERM 4

ENCE800003
THESIS
7 CREDITS

Learning Objectives : Students are able to design, conduct, and analyze research in Chemical fields ; present reserch result in oral andwriting

Syllabus : Thesis material based on research topic

Prerequisite: Based on regulation

Textbook :

Buku petunjuk praktis pelaksanaan MK Tesis, Depok, 1999.

ENCE800004
SCIENTIFIC PUBLICATIONS
2 CREDITS
Learning Objective :
Syllabus
Prerequisite
Textbook

B. CHEMICAL ENGINEERING (REGULAR) BASED ON NON-CHEMICAL ENGINEERING UNDERGRADUATE PROGRAM

Matriculation
TRANSPORT PHENOMENA
3 CREDITS

Learning Objective: Students can identify and describe as well as analyze momentum, mass, and heat transfer phenomenon, through the application of macroscopic and microscopic balance.
Syllabus: Viscosity and momentum transfer phenomenon, Velocity distribution of laminar flow, Thermal conductivity and energy transfer mechanism, Temperature and concentration distribution in solids and laminar flow, Diffusivity and mass transfer mechanism, Converter equation for isothermal system, Momentum transfer in turbulent flow, Mass and energy transfer in turbulent flow, Transfer between two phases, Macroscopic balance of isothermal and non-isothermal system, Macroscopic balance of multi-component system.
Prerequisite: -

Textbook:

1. R.B. Bird, W.E. Stewart dan E.N. Lightfoot, Transport Phenomena, John Wiley, 1965.
2. Tosun, I., Modeling in Transport Phenomena: A Conceptual Approach, Elsevier, 2002.
3. J.R. Welty et al., Fundamentals of Momentum, Heat and Mass Transfer, 3rd ed., Wiley, 2984.
4. Brodkey, R. S dan RC Herskey, Transport Phenomena, McGraw-Hill, 1998.

Matriculation
CHEMICAL REACTION ENGINEERING 1
3 CREDITS

Learning Objective: Students are able to comprehend the concept of chemical kinetics and catalysis

Syllabus: Basic concepts of chemical reaction kinetics, chemical reaction thermodynamics, experiments and kinetics data, formulation of kinetic models, the estimation method of constant values of the kinetic model, the sensitivity analysis of the kinetics model, catalyst and the influence of external and internal diffusion of the chemical reaction rate, the effectiveness factor, the effect of heat displacement at the catalytic reaction.

Prerequisite: Kimia Fisik

Textbook:

1. Fogler, H.S., Elements of Chemical Reaction Engineering, Prentice-Hall, 3rd Ed., 1999
2. Fogler, H. S., and LeBlanc, Strategies for Creative Problem Solving, Prentice-Hall, 1995.
3. Levenspiel, O., Chemical Reaction Engineering, 2nd Ed., John Wiley & Sons., 1972.
4. K. J. Leidler, Chemical Kinetics, 3rd ed., Parper Publish, 1987.
5. Widodo, W.P., Slamet, Diktat Kuliah Kinetika dan Perancangan Reaktor Kimia, TGP-FTUI, 2002.

TERM 2

CHEMICAL ENGINEERING THERMODYNAMICS

4 CREDITS

Learning Objective: Students are able to explain the basic principles relating to the PVT and thermodynamic properties of pure and mixtures compounds, mass and energy balance, thermodynamic cycles, phase equilibrium and reaction, and be able to apply problem-solving strategies to resolve the thermodynamic problems in a group.
Syllabus: Skills assessment: The first law of thermodynamics: energy, enthalpy, steam tables, mass and energy balance of steady state and non-steady system; second law of thermodynamics and cyclic processes: entropy signification, Rankine cycle and refrigeration cycle; thermodynamic properties of pure and mixed compounds: the amount of residual and partial molar quantities; Equilibrium: Raoult's law and liquid-vapor phase equilibrium, activity coefficients and coefficients fugacity no ideal system, the chemical reaction equilibrium and Le Chatelier's principle; Simulation process: module of thermodynamics properties, phase equilibrium module, and reaction equilibrium module .
Prerequisites: -

Textbook:

1. J. M. Smith, H.I.C. van Ness, and M. M. Abbott, Introduction for Chemical Engineering Thermodynamic, 5th ed., McGraw-Hill, 1996.
2. Donald R. Woods, Problem-based Learning: How to gain the most PBL, 1994, Mc-Master University, Hamilton, ON L8S 4L8.
3. Mulia, K dan Wulan, PPDK, Buku Ajar Termodinamika Teknik Kimia.

NUMERICAL COMPUTATION
3 CREDITS

Tujuan pembelajaran:

Students are able to solve Mathematical problems by using numerical methods : method of calculating root of a non-linear algebra equation, method of calculating a linear algebra equation system, methods of calculating non-linear algebra equation system, regression, numerical integration, numerical differentation.

Syllabus: The solution of single non-linear algebra equation, solution of linear algebra equation system, solution of non linear algebra equations system, regression, numerical integration, numerical differentation.

Prerequisite: Calculus

1. Bismo, S. dan Muharam, Y., Metode Numerik & Komputasi dengan FORTRAN dan Pascal, 2011.
2. Constantinides, A. 1. dan Mostouvi, N., Numerical Methods for Chemical Engineers with MATLAB Applications, Prentice Hall, 1999.

ENCE802001
ADVANCED TRANSPORT PHENOMENA
3 CREDITS

Learning Objectives: Students are able to understand the transport phenomenon of momentum, mass and heat simultaneously and able to apply it at the unit processes that involve the flow of single phase or multiple phase
Syllabus: Review of the theory of transfer of momentum, mass and heat simultaneously; analysis and application of single-phase system: mixing and dispersion, mixer; analysis and application of a combination system of gas-liquid phase, gas-solid, liquid-liquid, liquid-solid, gas -liquid-solid
Prerequisite: Peristiwa Perpindahan.

Textbook:

1. Bird R.B., Stewart, W.E. dan Lightfoot, E.N., Transport Phenomena, John Wiley & Sons, 2002.
2. Tosun, I., Modellling in Transport Phenomena, Elsevier, 2002.
3. Griskey, R.G., Transport Phenomena and Unit Operation: A Combined Approach, John Wiley & Sons, 2002.
4. Brodkey, R.S. dan Hershey, H.C., Transport Phenomena: A Unified Approach, McGraw-Hill, 1988.

ENCE802002
ADVANCED CHEMICAL REACTION EGINEEERING
3 CREDITS

Learning objectives: Students are able to analyze the phenomenon of chemical kinetics, the kinetics reaction data to determine the equation mechanistic reaction rate; able to design and analyze the performance of non ideal homogeneous and multi phase chemical reactors.
Syllabus: Thermodynamics of the reaction; definitions and basic concepts: the rate of reaction, the reaction rate equation, the Arrhenius equation: reaction modeling and data analysis for the determination of reaction rate equations; the introduction of gas-solid heterogeneous catalysts: a reduction in reaction rate equations and data of heterogeneous catalytic reactions of solid-gas; effects of diffusion and heat transfer in the catalytic reaction data interpretation. design of batch reactor and CSTR (isothermal, non-isothermal) reactor design PFR and PBR (isothermal, non-isothermal) sphere and the membrane reactor design; design-solid heterogeneous catalytic reactors with interstage gas cooler / heater; design of reactors for multiple reactions and mss (multiple steady state). design of non-ideal reactor (residence time distribution).
Prerequisite: Chemical Reaction Engineering 2

Textbook:

4. Fogler, H.S., Elements of Chemical Reaction Engineering, Prentice-Hall, 4th Ed., 2006.

5. Smith, J.M., Chemical Engineering Kinetics, 3rd ed., 1981, McGraw-Hill.

6. Thomas, JM, and Thomas WJ., Principles and Practice of Heterogeneous Catalysis, VCH Weinheim, 1997.

ENCE801001
ADVANCED CHEMICAL ENGINEERING MODELLING
3 CREDITS

Learning Objectives: Students are able to develop physicochemical model systems in chemical processes and solve it by using numerical methods with assistance of software programme

Syllabus: Emphirical modelling and physicochemical system in Chemical process ; linear and non linear algebra equation system, simple differential equation, initial problem value and limits problem value, partial differential equation.

Prerequisite: Numerical Computation

Textbook:

1. Bismo, S. dan Muharam, Y., Metode Numerik & Komputasi dengan FORTRAN dan Pascal, 2011.

2. Constantinides, A. dan Mostouvi, N., Numerical Methods for Chemical Engineers with MATLAB Applications, Prentice Hall, 1999.

3. Davis, M.E., Numerical Methods and Modeling for Chemical Engineer, JohnWilley & Sons, New York, 1984.

4. Rice, G.R. dan Duong D.D., Applied Mathematics and Modeling for Chemical Engineers, John Willey & Sons, New York,1995.

5. Tosun, I., Modeling in Transport Phenomena: A Conceptual Approach, Elsevier, 2002.

ENCE801002
ADVANCED CHEMICAL ENGINEERING THERMODYNAMICS
3 CREDITS

Learning Objectives: Students are able to understand the basics of thermodynamics, fluid properties, phase equilibrium and reaction and be able to apply it to solve problems of chemical engineering.
Syllabus: Analysis the system using the several form of the first and second laws, the equation network of thermodynamic for thermodynamic properties, condition equation, fluid phase equilibrium, chemical reaction equilibrium
Prerequisite: Chemical Engineering Thermodynamics

Textbook:

1. Kyle, B.G., Chemical and Process Thermodynamics, 2nd ed., Pretice Hall, 1992.

2. Hand-out Kuliah.

3. Smith J.M. dan van Ness, H.C., Introduction to Chemical Engineering Thermodynamics, 4th ed., McGraw-Hill, 1985.

4. Callen, H.B., Thermodynamics and An Introduction to Thermostatics, 2nd ed., John Wiley and Sons, 1985.

ENCE800001
RESEARCH METHODOLOGY
3 CREDITS

Learning Objectives : Students are able to determine the appropriate method for research activities and produce the ideas, processes, and scientific research in writing and oral.
Syllabus: Introduction, techniques to identify problems and arrange hypotheses, think logically, the techniques of scientific writing, technical writing research proposals, designing research techniques, presentation techniques, techniques to collect data, analyze it and present it.
Prerequisites: Students have to take a minimum of 12 credits (minimum value of D) with a GPA of 2.0
Textbook

1. Handout.
2. Research Proposal Format The preparation of various agencies

ENCE800002
SEMINAR
3 CREDITS

Learning Objectives : Students are able to produce the ideas, processes, and scientific research in writing and oral.
Syllabus: Introduction, techniques to identify problems and arrange hypotheses, think logically, the techniques of scientific writing, technical writing research proposals, designing research techniques, presentation techniques, techniques to collect data, analyze it and present it.
Prasyarat: -

Buku ajar: -

TERM 4

ENCE800003
THESIS
7 CREDITS

Learning Objectives : Students are able to design, conduct, and analyze research in Chemical fields ; present reserch result in oral andwriting

Syllabus : Thesis material based on research topic

Prerequisite: Based on regulation

Textbook :

Buku petunjuk praktis pelaksanaan MK Tesis, Depok, 1999.

ENCE800004
SCIENTIFIC PUBLICATIONS
2 CREDITS
Learning Objective :
Syllabus
Prerequisite
Textbook

C. GAS MANAGEMENT

TERM 1
ENGM801003
HYDROCARBON EXPLORATION AND PROCESSING
3 CREDITS
Learning Objectives: Students are able to explain the economic concept of natural gas as well as analyze the economic of exploration oil and natural gas production
Syllabus: Introduction of hydrocarbon, life cycle of field development, hydrocarbon form and hydrocarbon property and reservoir, hydrocarbon exploration: geology, geophysics, and drilling, field appraisal, reservoir development, drilling development, hydrocarbon production, HSE, hydrocarbon economy and lease, coal and hydrocarbon unconventional (CBM, Shale gas, and HYDRAT GAS)
Prerequisite: -

Textbook:

1. Frank Jahn et all, 2008, Hydrocarbon Exploration and Production, Developments in Petroleum Science, second edition.

2. Babusiauz et al, 2004, Oil and Gas Exploration and Production. Reserves, Cost and Contracts, IFP-Technip.

3. M. Kelkar, 2008, Natural Gas Production Engineering, Pennwell Publications.

4. Norman J. Hyne, 2001, Nontechnical Guide to Petroleum Geology, Exploration, Drilling and Production, Pennwell Books, 2 edition.

ENGM801002
NATURAL GAS PROCESSING
3 CREDITS
Learning Objectives : Students are able to synthesing natural gas processing, simulating as well as analyzing.

Syllabus: natural gas processing technology, gas-condensate separation, acid gas removal, gas dehydration, mercury removal, sulfur recovery.

Prerequisite -

Textbook :

1. Maddox, R.N. and Morgan, D.J., Gas conditioning and processing, Vol 4: Gas treating and sulfur recovery, Campbell Petroleum Series, 1998.

2. Kohl, A. and Nielsen, R., Gas purification, 5th Ed, Gulf Publishing Company, 1997.

3. Kidnay, A.J. and Parrish, W.R., Fundamentals of natural gas processing, Taylor & Francis, 2006.

ENGM801004
NATURAL GAS PROJECT MANAGEMENT
3 CREDITS
Learning Objectives: Students are able to apply project management in their fields with appropriate as well as apply it in out main fields.
Syllabus: Concept Project - Production, Project Life Cycle, Project Selection, Project Planning, Project Implementation, Project Completion & Evaluation.
Prerequisite -

Textbook :

Suharto, Imam, Manajemen Proyek,1990

ENGM801001
ADVANCED CHEMICAL ENGINEERING THERMODYNAMICS
3 CREDITS
Learning Objectives: Students are able to understand the basics of thermodynamics, fluid properties, phase equilibrium and reaction and be able to apply it to solve problems of chemical engineering.
Syllabus: Analysis the system using the several form of the first and second laws, the equation network of thermodynamic for thermodynamic properties, condition equation, fluid phase equilibrium, chemical reaction equilibrium
Prerequisite: Chemical Engineering Thermodynamics

Textbook:

1. Kyle, B.G., Chemical and Process Thermodynamics, 2nd ed., Pretice Hall, 1992.

2. Hand-out Kuliah.

3. Smith J.M. dan van Ness, H.C., Introduction to Chemical Engineering Thermodynamics, 4th ed., McGraw-Hill, 1985.

4. Callen, H.B., Thermodynamics and An Introduction to Thermostatics, 2nd ed., John Wiley and Sons, 1985.

TERM 2
ENGM802002
NATURAL GAS ECONOMICS
3 CREDITS
Learning Objective :
Syllabus
Prerequisite
Textbook

ENGM802001

NATURAL GAS TRANSPORTATION AND UTILIZATION
3 CREDITS
Learning Objective :
Syllabus
Prerequisite
Textbook

ENGM802003
RISK MANAGEMENT
3 CREDITS
Learning Objectives: Students can explain and apply risk management in a risk assessment.
Syllabus: Introduction to the risk, the basic principles and guidelines concerning risk, risk management standards, risk assessment, risk analysis, risk analysis and simulation, simulation of the risk with Montecarlo method, the risk of using software simulation crystal ball.
Prerequisites:
Textbook: J. F. A. Stoner, Management, 1986

ENGM802004
ENGINEERING SYSTEM MANAGEMENT
3 CREDITS
Learning Objectives: Students are able to describe analysis system, simulation, and related processes until become an engineering product which is apropriate with consumer needs

syllabus: design, manufacture, and complex system operatin that is a main challenge from manager nowadays. This system have strict schedule as well as financial limitation by pressure in technological development, requires new tools for project planning, organizing, and controlling. This course gives esential knowledge for new management system development as well as modified complex system. This course also gives brief understanding about marketing strategy , determining the relation between superior value versus price. These strategies based on marketing as well as how this activity is connected to basic marketing functions such as sales and promotions.

Prerequisite -

Textbook: -

TERM 3
ENGM803001
SUSTAINABLE ENERGY
3 CREDITS
Learning Objectives: Students are able to explain the relationship of energy with social aspect, economic and environmental and sustainability concepts, and able to analyze the performance of techno-economy and the continuity especially fossil energy system, new, and renewable.
Syllabus: Concept of sustainability and sustainable energy, energy hierarchy, energy linkages with economic, environmental and social, fossil energy / fuels and Impacts, global climate change and its mitigation, conversion, transportation / distribution and storage, analysis method of energy sustainability: LCA , sustainability index, hydrogen and fuel cells and nuclear energy, solar energy (PV and thermal), wind and ocean, hydropower, bioenergy, geothermal energy, energy efficiency and conservation, carbon capture and storage
Prerequisites: Chemical Engineering Thermodynamics or Biochemical Engineering
Textbook:
1. Jefferson W. Tester, et al., Sustainable Energy: Choosing Among Options, MIT Press, 2005.
2. Godfrey Boyle, et al., Energy Systems and Sustainability: Power for a Sustainable Future, Oxford University Press, 2003.
3. E. Cassedy S, Prospects for Sustainable Energy: A critical assessment, Cambridge University Press, 2000.
4. DeSimone et al, Eco-Efficiency. The Business Link to Sustainable Development, MIT Press, 1997.
5. D. Elliot, enerfy, Society, and Environment, Technology for a sustainable future, Rouledge, 1997
6. Miller, G. T., Environment Science. Sustaining Earth, Wardworld Publish Co. 1993

ENGM800001
RESEARCH METHODOLOGY AND SEMINAR
3 CREDITS
Learning Objectives : Students are able to determine the appropriate method for research activities and produce the ideas, processes, and scientific research in writing and oral.
Syllabus: Introduction, techniques to identify problems and arrange hypotheses, think logically, the techniques of scientific writing, technical writing research proposals, designing research techniques, presentation techniques, techniques to collect data, analyze it and present it.
Prerequisites: Students have to take a minimum of 12 credits (minimum value of D) with a GPA of 2.0
Textbook

1. Handout.

2. Research Proposal Format The preparation of various agencies

ENGM803002
HEALTH AND SAFETY IN NATURAL GAS INDUSTRY

3 CREDITS
Learning Objectives: Students are able to identify the condition of health and safety in the geothermal industry and propose the ways of overcoming problems of health and safety with observe to safety laws and regulations relating to the work environment.
Syllabus: The law and regulations relating to safety, national standards and international standards related to safety analysis work, Dual-function chemicals, Hazard Identification and Risk Assessment (HIRA), Hazard Identification (HAZID) and Hazard Operability Study (HAZOPS).
Prerequisites: -
Textbook:
1. Safety Act of 1970 1
2. Regulation of the Minister of Labor, Technical Guidelines for Safety Audit management system and Occupational Health, 1996.
3. International Labor Office, Prevention of Major Industrial Accidents, 1991.
4. Chemical Process Safety Modules

TERM 4
ENGM800002
THESIS
7 CREDITS
Learning Objectives : Students are able to design, conduct, and analyze research in Chemical fields ; present reserch result in oral andwriting

Syllabus : Thesis material based on research topic

Prerequisite: Based on regulation

Textbook :

Buku petunjuk praktis pelaksanaan MK Tesis, Depok, 1999.

ENGM800003
SCIENTIFIC PUBLICATIONS
2 CREDITS
Learning Objective :
Syllabus
Prerequisite
Textbook

ELECTIVE COURSES

ELECTIVE COURSE FOR ODD SEMESTER

ENCE803101
OLEOCHEMICAL INDUSTRY
3 CREDITS

Learning Objectives: Students are able to know the various processes that are commonly used in the oleochemical industry, and able to make a plan to develop the manufacture of oleochemicals from vegetable oils.
Syllabus: Fatty acids, biodiesel, paints and polymers, detergents, soaps, fatty alcohol, glycerin, oils and fats, oil and greese, the development of oleochemicals, vegetable oil processing, vegetable oil technology in the process.
Prerequisites: Organic Chemistry
Textbook: Oleochemical Manufacture and Applications by Frank D. Gunstone, Richard J. Hamilton. Blackwell

ENCE801101
FOOD TECHNOLOGY
3 CREDITS

Learning Objectives: Students are able to understand the processes of making food in the food industry which includes the selection, handling and processing of raw materials, the operating unit of food production, packaging, storage and control the process from beginning stage to the end.
Syllabus: Introduction, physical properties of raw materials, the basic concepts of energy and mass transfer, reaction kinetics, process control. mixing, filtration, centrifugation, extraction and membrane processes, adsorption and ion exchange column, with the temperature settings, drying, preservation, packaging, food storage, and hygiene.
Prerequisites: -
Textbook:
1. Zeki Berk, Food Process Engineering and Technology, Academic Press, Elsevier 2009
2. Food Technology: an introduction by Anita Tull. Oxford University Press, 2002
3. Introduction to Food Engineering by R. Paul Singh, R. Paul Singh and Dennis R. Heldman. Academic Press
4. Introduction to Food Process Engineering by P. G. Smith. Springer

5. Fundamentals of Food Process Engineering by Romeo T. Toledo. Springer

ENCE803102
PROTEIN ENGINEERING
3 CREDITS

Learning Objectives: Students are able to determine protein engineering strategies for the benefit of separation, biocatalysts and medic.
Syllabus: Introduction, Protein docking methods, Protein tagging strategies, Gen synthesis design, Enzyme stabilization, Molecular exploration, Protein engineering, Case study.
Prerequisite: Organic Chemistry
Textbook:
1. Protein Engineering in Industrial Biotechnology, Lilia Alberghina, Harwood academic publishers, 2005
2. Proteins: Biotechnology and Biochemistry by Dr. Gary Walsh. Wiley
3. Protein engineering and design by Sheldon J. Park, Jennifer R. Cochran. CRC Press
4. Protein Engineering and Design by Paul R. Carey. Academic Press
5. Protein Engineering: Principles and Practice. Wiley-Liss

ENCE801102
HERBAL TECHNOLOGY
3 CREDITS

Learning Objectives: Students are able to explain the development of herbal technology, herbal separation technology, herbal formulatioin basis, herbal regulation, and distinguish with other pharmaceutical products
Syllabus: Definition and basic concepts of herbs, herbal materials, herbal separation technology, herbal formulations, herbal regulation.
Prerequisites: Organic Chemistry
Textbook: The Complete Technology Book on Herbal Perfumes & Cosmetics by H. Panda. National Institute of Industrial Research 2003
ENCE801103
COMPOSITE MATERIAL
3 CREDITS

Learning Objectives: Students are able to:
1. Explain the characteristics of composite materials and compare it with conventional materials.
2. Explain the manufacturing process, and research development of composite materials.

Syllabus: The position of composite materials in materials science in general, common characteristics of composite materials, the type of composite based on the composition, the types of polymer matrix and reinforcement, the role of surface treatment in the strength of composite materials, manufacturing processes, durability, the process of splicing and repair of composite materials, code and standards for application of composite materials, the development of composite materials research.
Prerequisites: Organic Chemistry
Textbook:
1. Fiber-reinforced Composites (Materials Engineering, Manufacturing and Design), P. K. Mallick, Marcel Dekker, Inc., 1993.
2. Handbook of Plastics, Elastomers, and Composites, 3rd ed., Charles A. Harper, McGraw-Hill, 1996.
3. Reinforced Plastics - Theory and Practice, 2nd ed., M. W. Gaylord, Chaners Books, 1974.

ENCE813103
APPLIED THERMODYNAMICS
3 CREDITS

Learning Objectives: Students are able to analyze problems of thermodynamics based on a thorough review including fundamental aspects of thermodynamics, experimental, and green chemistry, based on current information from scientific journals
Syllabus: The case study of industrial thermodynamic, example cycle processes, phase equilibrium, and chemical reaction equilibrium to process and product engineer; friendly solvents such as supercritical CO_2 and ionic liquid
Prerequisites: Chemical Engineering Thermodynamics
Textbook:
1. References relevant to a given problem.
2. Mulia, K and Wulan, PPDK, Textbook of Chemical Thermodynamics

ENCE803104
DINAMIC SYSTEM
3 CREDITS

Learning Objectives: Students are able to build dynamic models of process systems, biological, industrial, social and economic.
Syllabus: Introduction to dynamical systems, causal loops, model and validation, analysis, case study.
Prerequisites: Numerical Computation
Textbook:
1. Forrester, J. W., 2002, Principles of Systems, Productivity Press

2. Goodman, Michael R., 1998, Study Notes in System Dynamics, Productivity Press
3. Richardson, George P. and Pugh III, Alexander L., 1999, Introduction to System Dynamics Modeling, Pegasus Communications
4. Andersen, David, etc., Introduction to Computer Simulation - A System Dynamics: Systems Thinking and Modeling for a Complex World, McGraw-Hill

ENCE811104
THERMODYNAMIC SYSTEM OF HYDROCARBON
3 CREDITS

Learning Objectives: Students are able to predict the magnitude of thermodynamic properties of hydrocarbons and the phase condition, either manually or using software calculations.

Syllabus: introduction to hydrocarbon thermodynamics properties, basic thermodynamic concepts, P-V-T data correlations, physical properties of hydrocarbon fluids, computing aided thermodynamics properties, the vapor-liquid behavior of two-phase systems, water-hydrocarbon system behavior, product specifications in the disposal lease of hydrocarbon

Prerequisites: Chemical Engineering Thermodynamics
Textbook:

1. Wayne C. Edmister, Byung Ik Lee, Applied hydrocarbon thermodynamics, Volume 1, Gulf Publishing Company (1988), Houston, Texas.
2. John M. Campbell, Gas Conditioning and Processing, Vol. 1, 8th Edition Campbell Petroleum Series 2001.

ENCE801105
LUBRICANT ENGINEERING
3 CREDITS

Learning Objectives: Students are able to explain the working principles of lubrication, lubricant function and several parameter of the quality and lubricant classification, lubricant chemical, and its production technology either mineral lubricant, synthesis, and vegetal.
Syllabus: Principles of lubrication on friction and wear phenomena on the two surfaces of solid objects are moving together; mode lubrication: hydrodynamic and elastohydrodynamic; lubricants: mineral, synthetic, and vegetable; additives, formulations, degradation, contamination, and maintenance of lubricants; latest development of lubricant technology .
Prerequisites: Organic Chemistry
Textbook:

1. E. Richard Booster, Handbook of Lubricant: Theory and Practice of Tribology, Vol. I, Vol. II, Vol. III, CRC Press (1984), Inc., Boca Raton, Florida
2. Mervin H. Jones, Industrial Tribology: The Practical Aspect of Friction, Lubricant, and Wear., Elsevier Scientific Publishing Co., New York, 1983.
3. J. Halling, Principle of Tribology, Macmillan Press Ltd., London, 1978
4. Handout

ENCE803105
CRYOGENIC ENGINEERING
3 CREDITS

Learning Objectives: Students are able to explain the various processes to liquefy gas in cryogenic technology
Syllabus: History and development of cryogenic, cryogenic scope of work. Refrigeration and liquefaction of natural gas, air, oxygen, nitrogen, helium, neon and argon.
Prerequisites: Chemical engineering thermodynamics
Textbook:

1. Timmerhaus, K.D., Cryogenic Process Engineering, Plenum Press 1989, New York.

ENCE801106
COMBUSTION ENGINEERING
3 CREDITS

Learning Objectives: Students are able to explain the phenomenon of combustion and resolve the problems that rendered correctly.
Syllabus: chemical kinetics and combustion, the flame, premix flame, diffusion flame, the combustion process applications.
Prerequisite: Transport Phenomena, Chemical Reaction Engineering 1, Chemical Engineering Thermodynamics
Textbook:

1. Warnatz, J., Maas, U. dan Dibble, R.W., Combustion: Physical and Chemical Fundamentals, Modeling and Simulation, Experiments, Pollutant Formation, 2nd ed., Springer, Heidelberg, 1999.
2. Turns, S.R., An Introduction to Combustion: Concepts and Applications, 2nd ed, McGraw-Hill, 2000.
3. Glassman, I., Combustion, Academic Press, 1997.
4. El-Mahallawy dan el-Din Habik, S., Fundamental and Technology of Combustion, Elsevier, 2002.
5. Combustion, T. J. Poinsot and D. P. Veynante, in Encyclopedia of Computational Mechanics, edited by Erwin Stein, Ren´e de Borst and Thomas J.R. Hughes, 2004 John Wiley & Sons, Ltd.
6. Introduction to Combustion, Concepts and Applications, Stephen R. Turns, 2nd edition, McGraw Hill, 2000
7. Introduction to Combustion Phenomena, A. Murty Kanury, Gordon and Breach Science Publish-

ers, 1975
8. Heat Transfer from Burners, Charles E. Baukal, in Industrial Burners Handbook, edited by Charles E. Baukal, CRC Press, 2004.

ENCE803106
PLASMA AND OZONE ENGINEERING
3 CREDITS

Learning Objectives: Students are able to explain the physics and chemistry phenomena of plasma formation and release of electromagnetic energy and the use of plasma and ozone technology.
Syllabus: basic phenomena and physical-chemical processes of gases that are given an electrical charge (corona discharge), the generation process or formation of ozone, role and use of plasma technology and ozone in chemical engineering processes, the potential of ozone technology in control technology environmental pollution, the ozone generator module manufacturing equipment.
Prerequisite: Physics Electricity Magnetism
Textbook:
1. E. T. Protasevich: “Cold Non-Equilibrium Plasma”, Cambridge International science Publishing, Cambridge, 1999.
2. Rice, R. G., and M. E. Browning: “Ozone Treatment of Industrial Water wate”, Notes Data Corroraion, Park Ridyl, 1981.
3. Metcalf & Eddy, Inc. (Tchobano-glous, G., and FL Burton): “Wastewater Engineering: Treatment, Disposal, and Reuse”, McGraw-Hill Book. Co., Singapore, 1991.

ENCE801107
HETEROGENEOUS CATALYST
3 CREDITS

Learning Objectives: Students are able to explain the phenomenon of basic concepts heterogeneous catalysts and its application
Syllabus: The general property of catalyst, thermodynamic of the reaction with catalyst, the distribution of the catalyst based on the type of reaction, the core function is active, the method of selecting catalysts for certain reactions, characterization of the corresponding want to know the nature of the target, the catalyst test methods, methods of development of the catalyst, and reaction products.
Prerequisites: Chemical Reaction Engineering 1
Textbook:
1. Satterfield, C. N., heterogeneous Catalysis in Industrial Practice, McGraw-Hill Inc., New York, 1991.
2. Rase, F. R., Commercial Catalyst, CRC Press, New York, 1991
3. Richardson, T, J., Principles of Catalyst Development, Plenum Press, New York, 1989
4. Thomas J.M. And WJ Thomas, Principles and Practice of Heterogenous Catalysis, VCH, Weinhem, Germany, 1997
5. Emmet, R. H., Catalysis, Reinhold Publishing Corporation, New York, 1961

ENCE801108
SUSTAINABLE ENERGY
3 CREDITS

Learning Objectives: Students are able to explain the relationship of energy with social aspect, economic and environmental and sustainability concepts, and able to analyze the performance of techno-economy and the continuity especially fossil energy system, new, and renewable.
Syllabus: Concept of sustainability and sustainable energy, energy hierarchy, energy linkages with economic, environmental and social, fossil energy / fuels and Impacts, global climate change and its mitigation, conversion, transportation / distribution and storage, analysis method of energy sustainability: LCA , sustainability index, hydrogen and fuel cells and nuclear energy, solar energy (PV and thermal), wind and ocean, hydropower, bioenergy, geothermal energy, energy efficiency and conservation, carbon capture and storage
Prerequisites: Chemical Engineering Thermodynamics or Biochemical Engineering
Textbook:
1. Jefferson W. Tester, et al., Sustainable Energy: Choosing Among Options, MIT Press, 2005.
2. Godfrey Boyle, et al., Energy Systems and Sustainability: Power for a Sustainable Future, Oxford University Press, 2003.
3. E. Cassedy S, Prospects for Sustainable Energy: A critical assessment, Cambridge University Press, 2000.
4. DeSimone et al, Eco-Efficiency. The Business Link to Sustainable Development, MIT Press, 1997.
5. D. Elliot, enerfy, Society, and Environment, Technology for a sustainable future, Rouledge, 1997
6. Miller, G. T., Environment Science. Sustaining Earth, Wardworld Publish Co. 1993

ENCE803107
RISK MANAGEMENT
3 CREDITS

Learning Objectives: Students can explain and apply risk management in a risk assessment.
Syllabus: Introduction to the risk, the basic principles and guidelines concerning risk, risk manage-

ment standards, risk assessment, risk analysis, risk analysis and simulation, simulation of the risk with Montecarlo method, the risk of using software simulation crystal ball.
Prerequisites:
Textbook: J. F. A. Stoner, Management, 1986

ENCE803108
SPECIAL TOPIC 1
3 CREDITS

ELECTIVE COURSE FOR EVEN SEMESTER

ENCE802101
PACKAGING AND STORAGE TECHNOLOGY
3 CREDITS

Learning Objective : Students are able to describe characteristics, packaging and storage food technology, the relation between storage and packaging with quality of food, describe factors affecting deviation of food qualities as well as able to choose storage methods and packaging types which is appropriate to food materials.
Syllabus : hidratasi, material storage technology and food products, deviation of food material qualities, microbial contaminant, purpose and function of food packaging, interaction between food packaging and packaging material types
Prerequisite : -
Textboox : Examining Food Technology by Anne Barnett. Heinemann Secondary,1996

ENCE802102
BIOINFORMATICS
3 CREDITS

Learning Objective : Students are able to explore database and programs to be applied in genetic engineering sectors, proteomic etc
Syllabus : Database, genomics, genetic molecular, philogeny, protein structure, metabolism and tissues
Textbook :
1. Bioinformatics by Shalini Suri. APH Publishing, 2006
2. Bioinformatics: A Primer by Charles Staben and Staben. Jones & Bartlett Publishers, 2005

ENCE802103
DRUGS AND COSMETICS TECHNOLOGY
3 CREDITS

Syllabus :
Definition of drugs and cosmetics, types of skins and characteristics, cosmetic types, ethics and regulation of drugs and cosmetics, new drug development technology, process technology in drug and cosmetics industries, packaging technology of drugs and cosmetics technology.
Prerequisite : Organic Chemistry
Textbook :
1. Handbook of Cosmetic Science and Technology by Andre O. Barel, Marc Paye, Howard I. Maibach. INFRMA-HC 2009
2. Biodesign: The Process of Innovating Medical Technologies by Stefanos Zenios, Josh Makower , Paul Yock , Todd J. Brinton, Uday N. Kumar, Lyn Denend, Thomas M. Krummel. Cambridge University Press 2009

ENCE802104
BIOMATERIAL
3 CREDITS

Learning Objective : Students are able to describe the principle and concept of material technologies through biological as well as life cycle assesment (LCA), organic and inorganic materials for biomaterial, apply and develop knowledge about biomaterial for life
Syllabus: Introduction, solids structure, characteristics of materials, metal material for implant, bioceramic materials, structural properties of biomaterial, the respons of tissues to biomaterial implant, the replacement of soft tissues , the replacement of hard tissues, transplantation, and biological tissues engineering
Prerequisite :-
Textbook :
1. Joon Park, R.S. Lakes. Biomaterials an Introduction, springer
2. Biomaterials: Principles and Applications by Joon B. Park, Joseph D. Bronzino. CRC Press

ENCE802105
PETROLEUM PROCESSING
3 CREDITS

Learning Objectives: Students are able to explain petroleum characteristic and its refine product and the stages of the process from various petroleum processing technologies.
Syllabus: Introduction terminology, oil composition, thermal properties of petroleum, chemical

processing of petroleum processing, distillation, hydrogenation and dehydrogenation, cracking processes, the processes of reforming, gas processing and petroleum light products, product improvement.
Prerequisites: Fluid and Particle Mechanics, Thermodynamics, Mass Transfer.

Textbook:
1. James G. Speight, The Chemistry and Technology of Petroleum, Marcel Dekker, 1991.
2. James H. Gary and Glenn E. Handwerk, Petroleum Refining, Marcel Dekker, 1974.
3. D. S. J. Jones, Elements of Petroleum Processing, John & Sons Woley

ENCE802106
PETROCHEMICAL PROCESSING
3 CREDITS

Learning Objectives: Students are able to explain the development of petrochemical products and raw material potential, upstream / downstream petrochemical production lines (olefin center, aromatic center, and the pathways of methane) and the major production processes of several petrochemical industry through methane, olefins and aromatics; able to analyze impact of industrial processes and petrochemical products to the environment.
Syllabus: History of the general petrochemical products development and raw material potential, the scope of the petrochemical industry, petrochemical classification process, the type and processing raw materials into petrochemical products, the details of various petrochemical industry: olefins center, aromatics and the center line of methane, industrial and environmental impact of products petrochemicals.
Prerequisites: Organic Chemistry
Textbook:
1. Martyn V. Twigg, “Catalyst Handbook”, 2nd Ed., Wolfe Pub. Ltd..
2. Lewis T. Hatch, Sami Matar, “From Hydrocarbon to Petrochemical”.
3. Wells, Margaret G., “Handbook of Petrochemicals and Processes”, Gower Publishing Company Ltd., 1991.
4. Pandjaitan Maraudin, Petrochemical Industry and The effect of environment, Gadjah Mada University Press, 2002.

ENCE802107
PHOTOCATALYSIS TECHNOLOGY
3 CREDITS

Learning Objectives: Students are able to understand the basic concepts and photocatalysis and apply it in the various the simple daily problem, especially related with environment, health, and energy.
Syllabus: The basic concept photocatalysis processes, thermodynamics and kinetics of photocatlytic process, semiconductor photocatalyst materials, the basic parameters of photocatlytic process, Photocatalyst Nanomaterial Engineering, photocatlytic applications for degradation of organic pollutants and heavy metals, photocatalysis c applications for self-cleaning and anti fogging, photocatalysis applications for anti-bacterial and cancer therapy, photocatalysis applications for engineering ‘daily life tools’, photocatalysis applications in renewable energy sector, solar detoxification engineering with photocatalysis, intensification of photocatalysis process.
Prerequisites: Chemical Reaction Engineering 1
Textbook:
1. M. Schiavello, Heterogeneous Photocatalysis, John Wiley & Sons, 1997.
2. A. Fujishima, K. Hashimoto, and T. Watanabe, TiO_2 Photocatalysis: Fundamentals and Applications, BKC Inc. Japan, 1999.
3. J.B. Galvez, et.al., Solar Detoxification, Natural Sciences, Basic and Engineering Sciences, UNESCO.
4. M. Kaneko, I. Okura, Photacatalysis Science and Technology, Springer USA, 2002.
5. C.A. Grimes, G.K. Mor, TiO_2 Nanotube Arrays: Synthesis, Properties, and Applications, Springer, New York, 2009.
6. Paper-paper dan bahan lain dari berbagai Jurnal Ilmiah dan website.

ENCE812108
POLYMER ENGINEERING
3 CREDITS
Learning Objectives: Students are able to explain the basic principles and characteristics of polymer manufacturing until being able to keep abreast of the latest technology.
Syllabus: The concept of polymer and polymer characteristics, synthesis / polymerization, kinetics of polymerization, the polymer solution, characterization, process of making plastics.
Prerequisites: Organic Chemistry
Textbook:
1. R. J. Lovell, Introduction to Polymers, P. A. Lovell, Chapman & Hall.
2. R. B., Seymour, Polymers for Engineering Applications, ASM International.
3. F. W. Billmeyer, Textbook of Polymer Science, Wiley.
4. R. J. Crawford, Plastic Engineering, Pergamon Press.
5. Donald R. Woods, Problem Based Learning: How to gain the most PBL, 1994, Mc-Master University, Hamilton, ON L8S 4L8.

ENCE802109
POLLUTION PREVENTION

3 CREDITS
Learning Objectives: Students are able to explain the concepts of pollution prevention and able to design the waste treatment system.
Syllabus: Introduction to the concept of pollution prevention, waste water treatment outline and preparation, waste water treatment in physical, biological, and chemical as well as the operating unit, bioremediation, bioseparation and biodegradation, advanced oxidation processes, the handling of waste gas, waste handling B3, solid waste handling , effluent treatment, gas, is unconventional.
Prerequisites: Chemical Reaction Engineering 1.
Textbook:
1. Freeman, H. M., Industrial Pollution Prevention Handbook, McGraw-Hill, New York, 1995.
2. Eckenfelder, W. W., Jr.., Industrial Water Pollution Control. 3rd ed. McGraw-Hill International Editions, New York, 2000.
3. Metcalf & Eddy. (Revised by Tchobanoglous, G. & F. L. Burton). Waste Water Engineering: Treatment, Disposal, Reuse, 3rd ed., McGraw-Hill, Singapore, 1991.
4. Heinson R. J. & R. L. Cable. Source and Control of Air Pollution. Prentice Hall. New Jersey. Of 1999.
5. Legislation on the prevention of pollution and waste management.
6. Journals, the Internet.

ENCE802110
EXPLORATION AND PRODUCTION OF HYDROCARBON
3 CREDITS

Learning Objectives: Students are able to explain the economic concept of natural gas and analyze the 4e economy.
Syllabus: Introduction of hydrocarbon, life cycle of field development, hydrocarbon form and hydrocarbon property and reservoir, hydrocarbon exploration: geology, geophysics, and drilling, field appraisal, reservoir development, drilling development, hydrocarbon production, HSE, hydrocarbon economy and lease, coal and hydrocarbon unconventional (CBM, Shale gas, and HYDRAT GAS)
Prerequisites:-
Textbook:
1. Frank Jahn et all, 2008, Hydrocarbon Exploration and Production, Developments in Petroleum Science, second edition
2. Babusiauz et al, 2004, Oil and Gas Exploration and Production. Reserves, Cost and Contracts, IFP-Technip,
3. M. Kelkar, 2008, Natural Gas Production Engineering, PennWell Publications
4. Norman J. Hyne, 2001, Nontechnical Guide to Petroleum Geology, Exploration, Drilling and Production, Pennwell Books, 2 edition.

ENCE802111
UTILITIES AND PLANT MAINTENANCE
3 CREDITS

Learning Objectives: Students are able to explain the strategy of plant and utility maintenance.
Syllabus: Plant maintenance strategy: maintenance program, maintainability, reliability, planning and scheduling
Prerequisite: Chemical Engineering Thermodynamics
Handbook:
1. 1 Dhillon, B.S., Engineering Maintenance: A Modern Approach, CRC Press, 2002.
2. Higgins, L.R., Mobley, R.K. dan Smith, R., Maintenance Engineering Handbook, McGraw-Hill, 2002.
3. Sanders, R.E., Chemical Process Safety, Elsevier, 2005.
4. Palmer, D., Maintenance Planning and Scheduling Handbook, McGraw-Hill, 1999.

ENCE802112
NATURAL GAS TRANSPORTATION AND UTILIZATION
3 CREDITS

ENCE812113
DRUG CONTROLLED RELEASED TECHNOLOGY
3 CREDITS
Learning objective : Students are able to describe the principle of control drug releasedor bioactive compound for medical purposes and utilize the principle to apply control drug released technology
Syllabus : polymeric biomaterial that is easily degradable , various methods to drug encapsulation and bioactive compounds in nano/microsfer, diffusion and permeasi, strategy of control released, case study
Prerequisite : Organic Chemistry
Textbook :
1. Saltzman, W.M., Drug Delivery: Engineering Principles for Drug Therapy, Oxford University Press, 2001.
2. Wen, H. and Park, K, ed., Oral Controlled Release Formulation Design and Drug Delivery, Wiley, 2010.

ENCE802114
ANALYSIS AND SYNTHESIS OF CHEMICAL PROCESSES
3 CREDITS

Learning Objectives: Students are able to analyze and synthesize the chemical processes in an integrated system of technical and economic aspects
Syllabus: The strategy of synthesis and analysis process, design concepts development and the determination of the best flow sheet, a preliminary optimization process, the retrofit process, the use of computer aided design system for simulation and analysis process.
Prerequisites: Simulation of Chemical Processes
Textbook:

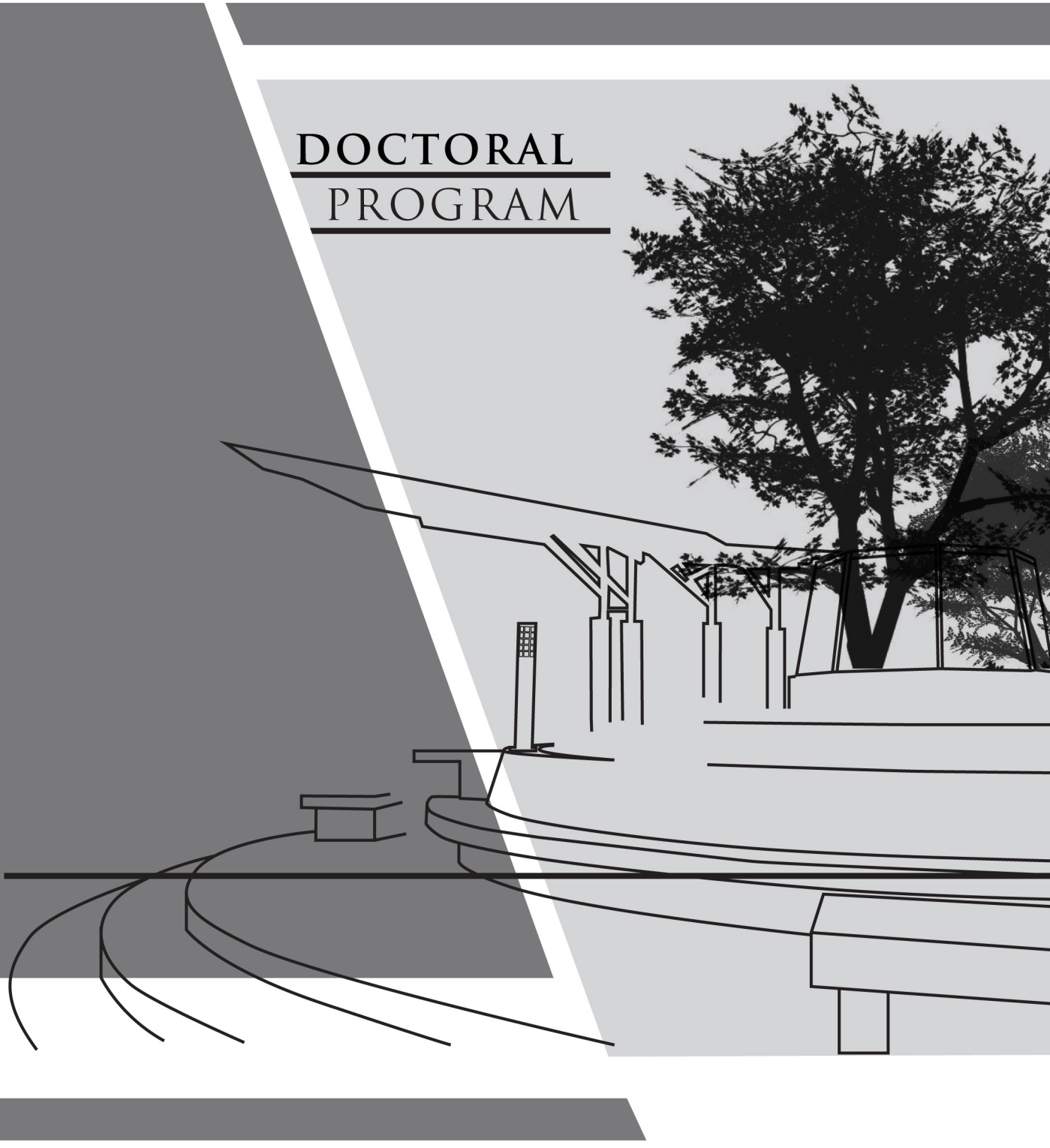
1. James M Douglas, Conceptual Design of Chemical Process, McGraw-Hill International Edition, 1988.
2. Hartman, Klaus, and Kaplick, Klaus, Analysis and Synthesis of Chemical Process Systems
3. Lorenz T Biegler, Systematic Methods of Chemical Process Design, Prentice Hall Inc., 1997.

ENCE802115
GEOTHERMAL TECHNOLOGY
3 CREDITS

ENCE802116
PROBLEM-SOLVING SKILLS
3 CREDITS

ENCE802117
SPECIAL TOPIC 2
3 CREDITS

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
ENCH900001	Kekhususan 1	Special Subject 1	4
		Sub Total	**10**
	Semester 2	**2nd Semester**	
ENGE900002	Analisis Kualitatif & Kuantitatif	Qualitative & Quantitative Analysis	4
ENCH900002	Kekhususan 2	Special Subject 2	4
ENCH900004	Proposal Riset	Research Proposal	6
		Sub Total	**14**
	Semester 3	**3rd Semester**	
ENCH900006	Publikasi – Konferensi Internasional	Publication – International Conference	4
		Sub Total	**4**
	Semester 4	**4th Semester**	
ENCH900007	Ujian Hasil Riset	Research Result Examination	10
		Sub Total	**10**
	Semester 5	**5th Semester**	
ENCH900008	Publikasi II – Jurnal Internasional	Publication II – International Journal	8
		Sub Total	**8**
	Semester 6	**6th Semester**	
ENCH900010	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**	
ENCH900003	Seminar Berkala Kelompok Ilmu	Research Group Periodic Seminar	8
		Sub Total	**8**
	Semester 2	**2nd Semester**	
ENCH900004	Proposal Riset	Research Proposal	6
		Sub Total	**6**
	Semester 3	**3rd Semester**	
ENCH900005	Publikasi I – Konferensi Internasional	Publication I – International Conference	4
		Sub Total	**4**
	Semester 4	**4th Semester**	
ENCH900007	Ujian Hasil Riset	Research Result Examination	10
		Sub Total	**10**
	Semester 5	**5th Semester**	
ENCH900008	Publikasi II – Jurnal Internasional	Publication II – International Journal	8
		Sub Total	**8**
	Semester 6	**6th Semester**	
ENCH900009	Publikasi III – Jurnal Internasional	Publication III – International Conference	8
ENCH900010	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)

ENCH900001
Special Subject 1
4 SKS

ENCH900002
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.

ENCH900003
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.

ENCH900004
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.

ENCH900007
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.

ENCH900006
Publication - International Conference
4 SKS

ENCH900005
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.

ENCH900008
Publication II - International Journal
8 SKS

ENCH900009
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.

ENCH900008
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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