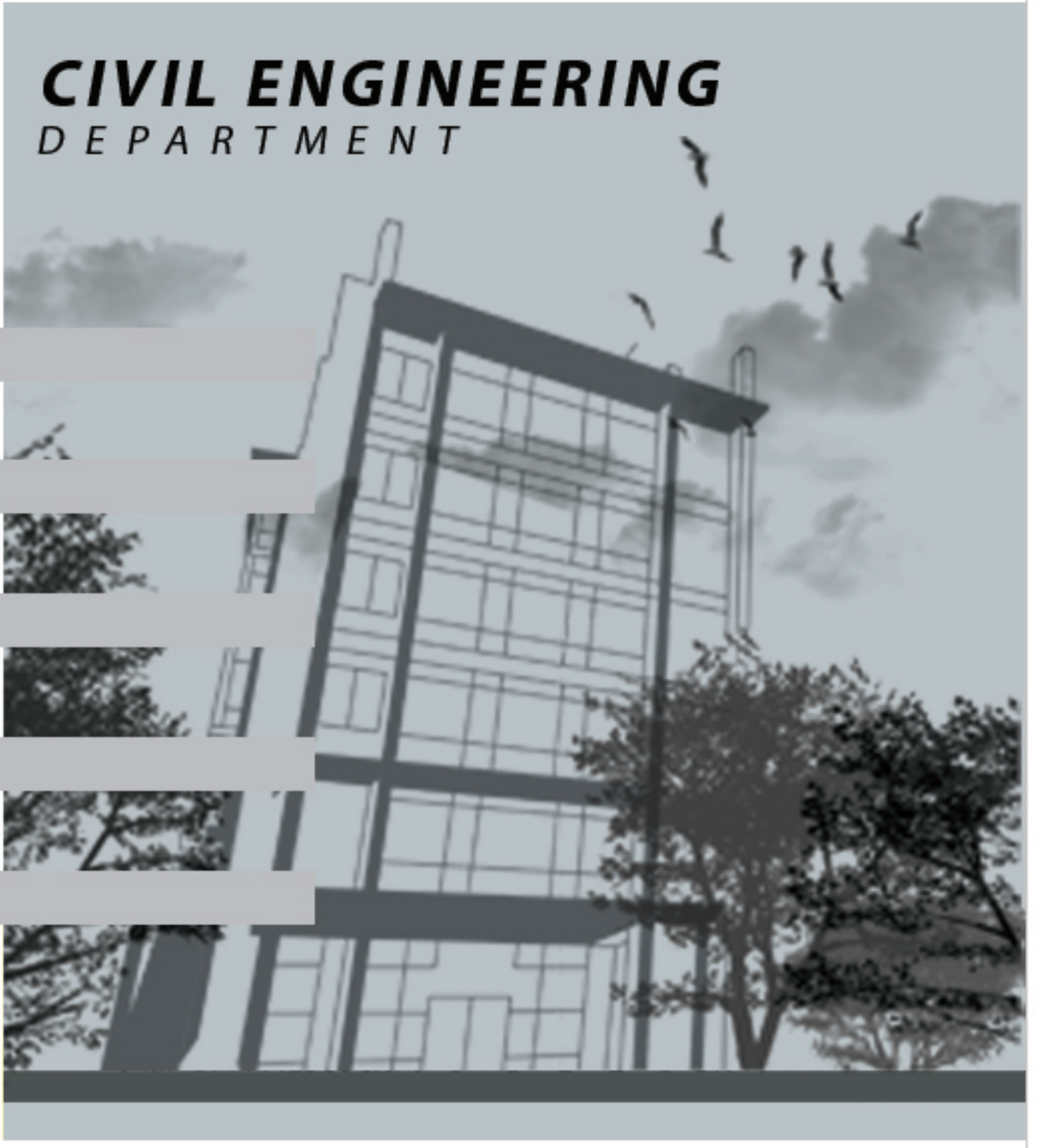
UNIVERSITAS INDONESIA

FACULTY OF ENGINEERING

ACADEMIC GUIDEBOOK

2017 edition

CIVIL 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.

Prof. Masaaki Nagatsu, tmnagat@ipc.shizuoka.ac.jp, (Plasma Science and Technology) Research Institute of Electronics,Shizuoka University

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	Chemical Engineering : A
Electrical Engineering : A	Mechanical Engineering : A
Metallurgy and Materials 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 CIVIL ENGINEERING

GENERAL

The Civil Engineering Department previously known as Civil Engineering Study Program was established together with the Faculty of Engineering Universitas Indonesia (FTUI) at 17 July 1964. In the initial stage of development, Civil Engineering Department – FTUI offered one study program, Civil Engineering, with two majors, structural engineering and water resources engineering. Following the demand and development of science and technology, it was then expanded with four additional majors, i.e. transportation engineering, geotechnical engineering, sanitary engineering and construction management. With the improvement of human resources and facilities, Postgraduate Program for master degree (S2) and doctoral Degree (S3) were established in 1992 and 2001, respectively. In 2006, the Department established the undergraduate program on Environmental Engineering. Previously, Environmental Engineering is one of the majors in Civil Engineering. There are eight specializations for Master and Doctoral Program in Civil Engineering, structural engineering, geotechnical engineering, water resources management, transportation system & engineering, construction management, environmental engineering, project management and infrastructure management.

To ensure the quality, the Department is regularly accredited by the national accreditation board, BAN-PT (Badan Akreditasi Nasional Pendidikan Tinggi) since 1998. All study programs of Civil Engineering, undergraduate, master and doctor reach the highest grade of "A". The Environmental Engineering Study Program of was nationally accredited in 2010. The under graduate program of Civil Engineering was accredited internationally in 2001 by The Joint Board of Moderators of the Engineering Council consisting of Institution of Structural Engineers (ISE), Institution of Civil Engineers (ICE), and Chartered Institution of Building Service Engineers of the United Kingdom. However, due to changes in their policy, reaccreditation was discontinued. In 2008, undergraduate program of Civil Engineering was assessed by ASEAN University Network – Quality Assurance Program (AUN-QA). In order to maintain the quality in education, AUN-QA reassessment was conducted in 2015.

Civil Engineering is the oldest engineering discipline and encompasses many specialties. Civil engineering can be described as the application of engineering to civil society. It applies the principles of engineering to meet society's fundamental needs for housing, transportation, sanitation, and the other necessities of a modern society. The engineers deal with the design, construction, and maintenance of the physical and naturally built environment, including works like roads, bridges, canals, dams, and buildings, as well as other challenges such as deteriorating infrastructures, complex environmental issues, outdated transportation systems, and natural disasters. Civil engineering education is to prepare students to be master planners, designers, constructors, and managers of various civil engineering works. The graduates can work in all levels: in the public sector from municipal through to national governments, and in the private sector from individual homeowners through to international companies.

Environmental engineering is defined as branch of engineering concerned with the application of scientific and engineering principles for protection of human populations from the effects of adverse environmental factors; protection of environments both local and global from the potentially deleterious effects of natural and human activities; and improvement of environmental quality. Tasks of environmental engineers include evaluation of environmental quality of water, air and soils by developing strategies and methods, design of facilities or programs, evaluation of results and assessment of the economics and efficiency of processes. The Environmental Engineering Study Program provide graduates with professional and competence in planning, designing, constructing and managing environmental infrastructure for: drinking water treatment, liquid and solid waste management, drainage, environmental sanitation, water resources, air pollution, pollution prevention & environmental impact assessment.

Corresponding Address

Departemen Teknik Sipil
Fakultas Teknik Universitas Indonesia
Kampus UI Depok 16424, Indonesia
Telp: +62-21-7270029
Fax: +62-21-7270028
Email: sipil@eng.ui.ac.id
http ://www.civil.ui.ac.id

VISION and MISSIONS

VISION

"To become a center of knowledge and technology in Civil Engineering and Environmental Engineering and to play an important role in global market"

MISSIONS

- To produce graduates who have a mastery of fundamental knowledge and meet the international standard and have environmental conscious.
- To contribute to betterment of society through quality research and professional community services in civil engineering & environmental engineering with sustainability considerations.
- To prepare graduates for leadership roles, having effective communication skills and professional ethics.

STAFFS OF THE DEPARTMENT OF CIVIL ENGINEERING

Head of Department:
Prof. Ir. Widjojo Adi Prakoso, M.Sc., Ph.D
Vice Head of Department:
Mulia Orientilize, ST, MEng
Head of Civil Engineering Study Program:
Prof. Ir. Widjojo Adi Prakoso, M.Sc., Ph.D
Head of Environmental Engineering Study Program:
Dr. Ir. Setyo Sarwanto Moersidik, DEA

Head of Laboratory

Head of Structure and Materials Laboratory:
Dr. Ir. Elly Tjahjono S, DEA
Head of Soil Mechanics Laboratory:
Erly Bahsan, ST, Mkomp
Head of Hydraulics, Hydrology and River Laboratory:
Ir. Siti Murniningsih, MS
Head of Transportation Laboratory:
Dr. Ir. Tri Tjahjono
Head of Mapping and Surveying Laboratory:
Ir. Alan Marino, MSc
Head of Sanitation & Environment Laboratory:
Ir. Gabriel S. Boedi Andari, M.Eng., Ph.D

BOARD OF PROFESSORS

Prof. Dr. Ir. Budi Susilo Soepandji, DEA, budisus@eng.ui.ac.id (Ir, UI; DEA, Dr, Ecole Centrale Paris; Prof, UI) Geotechnic

Prof. Dr. Ir.Tommy Ilyas, M.Eng., t.ilyas@eng.ui.ac.id (Ir, UI; M.Eng, Sheffield University; Dr, UI; Prof. UI) Geotechnic

Prof. Dr. Ir. Irwan Katili, DEA, irwan.katili@gmail.com (Ir, UI; DEA, Dr, Universite Technique de Compiegne; Prof. UI) Structure

Prof. Dr. Ir. Sutanto Soehodho, M.Eng., tanto@eng.ui.ac.id (Ir, UI, M.Eng, Dr, Tokyo University; Prof. UI) Transportation

Prof. Dr. Ir. Yusuf Latief, MT., latief73@eng.ui.ac.id (Ir, UI; MT, Dr, UI; Prof. UI) Project Management

Prof. Dr. Ir. Djoko M. Hartono, SE., M.Eng., djokomh@eng.ui.ac.id (Ir, ITB; M.Eng, Asian Institute of Technology; Dr, UI; Prof, UI) Environmental

Prof. Dr. Ir. Sigit Pranowo Hadiwardoyo, DEA., sigit@eng.ui.ac.id (Ir, UI; DEA, Ecole Centrale de Lyon; Dr, Ecole Centrale Paris; Prof. UI) Transportation

Prof. Ir. Widjojo Adi Prakoso, M.Sc., PhD. wprakoso@eng.ui.ac.id (Ir, UI; MSc, PhD, Cornell University; Prof. UI) Geotechnic

Prof. Dr.-Ing. Ir. Dwita Sutjiningsih, dipl. HE, dwita@eng.ui.ac.id (Ir, UI; Dipl.HE, Institute of Hydraulics Engineering (IHE); Dr.-Ing, Institut fur Wasserwirtshaft, Univ. Hannover) Water Resources Management

FULL-TIME FACULTY

Alan Marino, alanmarino@eng.ui.ac.id (Ir, UI; M.Sc., Wisconsin Madison Univ., USA) Transportation

Alvinsyah, alvinsyah_2004@yahoo.com (Ir, UI; M.S.E., University of Michigan, Ann Arbor, USA) Transportation

Andyka Kusuma, andyka.k@eng.ui.ac.id (ST, UI; MSc, Kungliga Tekniska Hogskolan, Swedia; PhD, University of Leeds) Transportation

Ayomi Dita Rarasati, ayomi@eng.ui.ac.id (ST, MT, UI; Ph.D, QUT Australia) Construction Management; Project Management

Budi Susilo Soepandji, budisus@eng.ui.ac.id (Ir, UI; DEA, Dr, Ecole Centrale Paris; Prof, UI) Geotechnic

Cindy Rianti Priadi, cindy.priadi@eng.ui.ac.id (ST, ITB; MSc, University Paris-7-Paris12-ENPC; Dr, Univ. Paris Sud, 2010) Environmental

Djoko M. Hartono, djokomh@eng.ui.ac.id (Ir, ITB; M.Eng, Asian Institute of Technology; Dr, UI; Prof, UI) Environmental

Ellen SW Tangkudung, ellen@eng.ui.ac.id (Ir, UI; M.Sc, ITB) Transportation

Elly Tjahjono, elly@eng.ui.ac.id (Ir, UI; DEA, Insa de Lyon, Perancis; Dr, UI) Structure

Erly Bahsan, erlybahsan@eng.ui.ac.id (ST, M.Kom, UI; Kandidat Dr, NTUST) Geotechnic

Firdaus Ali, firdausali@ymail.com (Ir, ITB; MSc, PhD, University of Wisconsin) Environmental

Gabriel Sudarmini Boedi Andari, andari@eng.ui.ac.id (Ir, ITB; M.Eng, RMIT; PhD, Texas Southern University) Environmental

Henki Wibowo Ashadi, henki@eng.ui.ac.id (Ir, UI; Technische Hochschehule Darmstadt; Dr-Ing, TH Darmstadt) Structure

Herr Soeryantono, herr@eng.ui.ac.id (Ir, UI; MSc, PhD, Michigan State University) Water Resources Management

Heru Purnomo, herupur@eng.ui.ac.id (Ir, UI; DEA, Universite' Blaise Pascal; Dr, Universite'd"Orle'ans) Structure

Irma Gusniani, irma@eng.ui.ac.id (Ir, ITB; MSc, University of Colorado) Environmental

Irwan Katili, irwan.katili@gmail.com (Ir, UI; DEA, Dr, Universite Technique de Compiegne; Prof. UI) Structure

Jessica Sjah, jessicasjah@eng.ui.ac.id (ST, UI; MT, UI; MSc, Ecole Centrale de Lyon; Dr, Ecole Centrale de Lyon) Structure

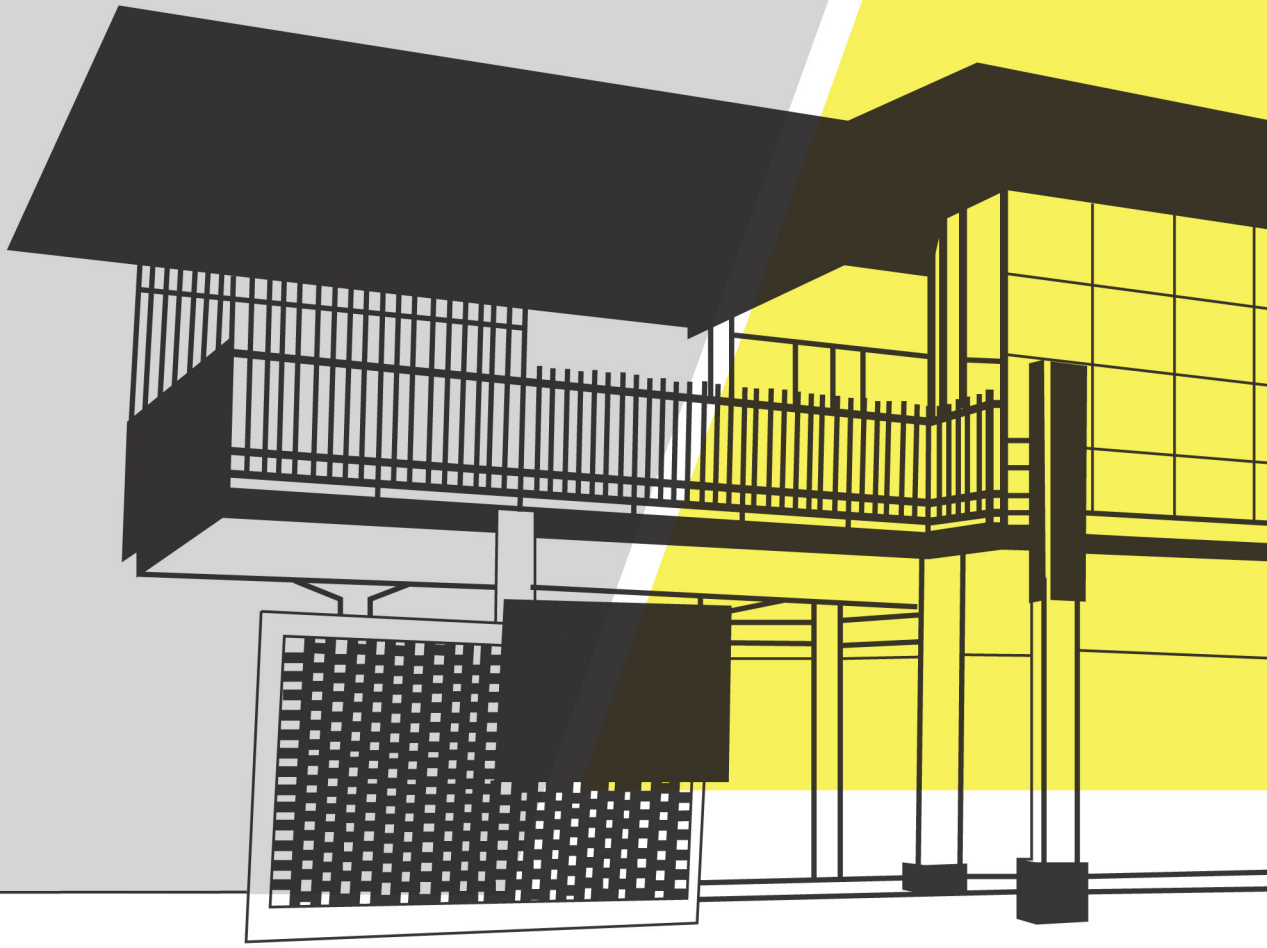
Josia Irwan Rastandi, jrastandi@eng.ui.ac.id (ST, MT, UI; Dr-Ing, Technische Universtat Munchen) Structure

Leni Sagita, lsagita@eng.ui.ac.id (ST, MT, UI; Ph.D., NUS, Singapore) Construction Management: Project Management
Martha Leni Siregar, leni@eng.ui.ac.id (Ir, UI; MSc, Univ.of Southampton) Transportation
Mohammed Ali Berawi, maberawi@eng.ui.ac.id (ST, Unsri; M.Eng.Sc, University of Malaya; PhD, Oxford Brookes University) Construction Management: Project Management
Mulia Orientilize, mulia@eng.ui.ac.id (ST, UI; M.Eng, Nanyang Technological University) Structure
Nahry, nahry@eng.ui.ac.id (Ir, MT, Dr, UI) Transportation
Nyoman Suwartha, nsuwartha@eng.ui.ac.id (ST, MT, UGM; M.Agr, Dr, Hokkaido University) Environmental
R. Jachrizal Soemabrata, rjs@eng.ui.ac.id (Ir, UI; MSc, Leeds Univ; Dr, Melbourne University) Sustainable Urban Transport
RR. Dwinanti Rika Marthanty, dwinanti@eng.ui.ac.id (ST, MT, UI; Dr, UI, Université Lille 1) Water Resources Management
Setyo Sarwanto Moersidik, ssarwanto@eng.ui.ac.id (Ir, ITB; DEA, Dr, Universite'de Montpellier II) Environmental
Sigit Pranowo Hadiwardoyo, sigit@eng.ui.ac.id (Ir, UI; DEA, Ecole Centrale de Lyon; Dr, Ecole Centrale Paris; Prof. UI) Transportation
Siti Murniningsih, titik_winarno@yahoo.com (Ir, Undip; MS, ITB) Water Resources Management
Sutanto Soehodho, tanto@eng.ui.ac.id (Ir, UI, M.Eng, Dr, Tokyo University; Prof. UI) Transportation
Toha Saleh, toha@eng.ui.ac.id (ST, UI; MSc, University of Surrey) Water Resources Management
Tommy Ilyas, t.ilyas@eng.ui.ac.id (Ir, UI; M.Eng, Sheffield University; Dr, UI; Prof. UI) Geotechnic
Tri Tjahjono, tjahjono@eng.ui.ac.id (Ir, UI; MSc, Ph.D, Leeds University) Transportation
Widjojo Adi Prakoso, wprakoso@eng.ui.ac.id (Ir, UI; MSc, PhD, Cornell University) Geotechnic
Wiwik Rahayu, wrahayu@eng.ui.ac.id (Ir, UI; DEA, Dr, Ecole Centrale de Paris) Geotechnic
Yuskar Lase, yuskar@eng.ui.ac.id (Ir, UI; DEA, Dr, Ecole Centrale de Lyon) Structure
Yusuf Latief, latief73@eng.ui.ac.id (Ir, UI; MT, Dr, UI; Prof. UI) Project Management

PART-TIME FACULTY

Prof. Ir. Suyono Dikun, M.Sc., Ph.D, suyonodikun@gmail.com (Ir, UI; MSc, PhD, University of Wisconsin; Prof.UI) Infrastructure Management
Ir. Sjahril A. Rahim, M.Eng, syahril@eng.ui.ac.id (Ir, UI; M.Eng, Asian Institute of Technology) Structure
Dr. Ir. Damrizal Damoerin, damrizal@eng.ui.ac.id (Ir,UI; MSc, ITB; Dr, UI) Geotechnic
Ir. El Khobar Muhaemin Nazech, M.Eng, elkhobar@eng.ui.ac.id (Ir, UI; M. Eng, Asian Institute of Technology) Environmental
Ir. Essy Ariyuni, PhD, essy@eng.ui.ac.id (Ir, ITS; MSc, University of Wisconsin; Dr, Quensland University of Technology) Structure
Ir. Iwan Renadi Soedigdo,PhD, irs1210@yahoo.com (Ir, UI; MSCE, The George Washington University; Ph.D, Texas A&M University) Structure
Ir. Heddy Rohandi Agah,M.Eng, agah@eng.ui.ac.id (Ir, UI; M.Eng, Asian Institute of Technology) Transportation
Ir. Madsuri,MT, madsuri@eng.ui.ac.id (Ir, MT, UI) Structure
Ir. Setyo Supriyadi, M.Si, setyosuprijadi@yahoo.com (Ir, Msi, UI) Structure

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.

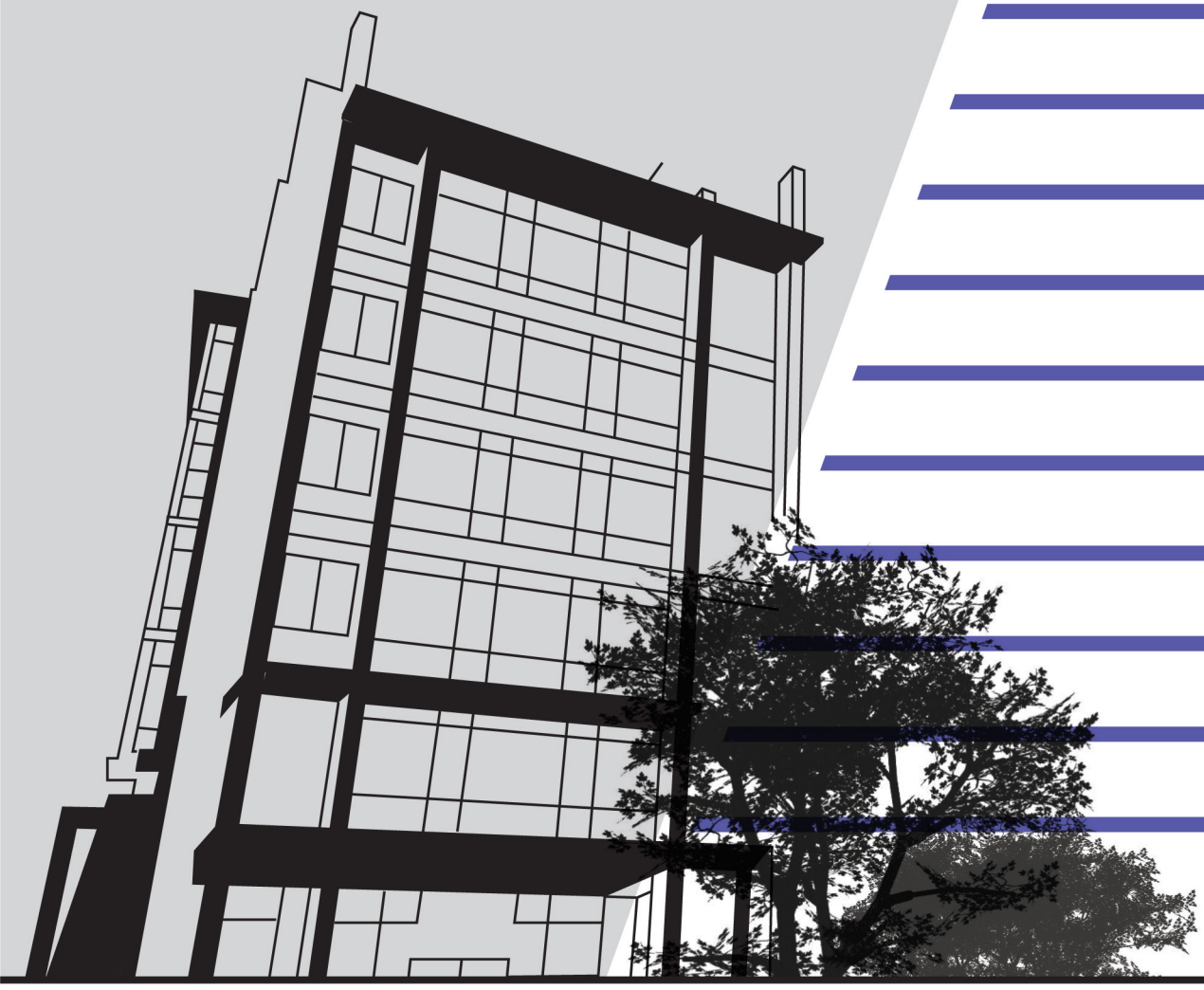
RESEARCH

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

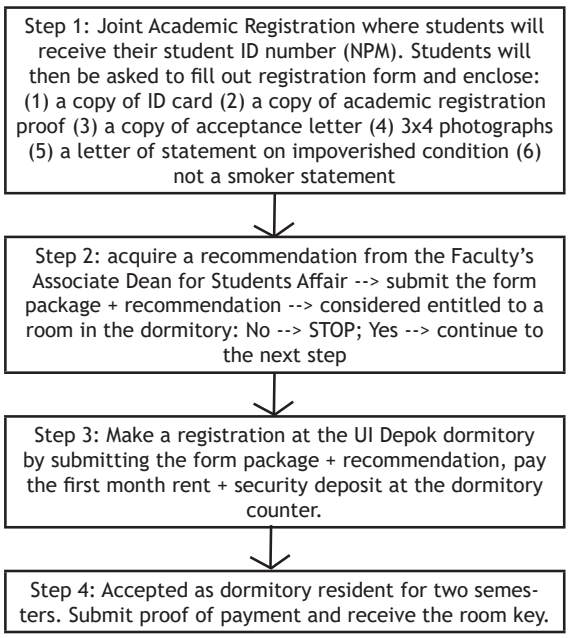
Room Specification
- Standard room: Standard bed, table, chair, bookcase, wardrobe, shoe rack, lamp, outdoor bathroom, non AC.
- Standard plus room: Standard bed, table, chair, book case, wardrobe, shoe rack, lamp, outdoor bathroom, air conditioned.
- Bungur and Melati room: Spring bed mattress, table,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

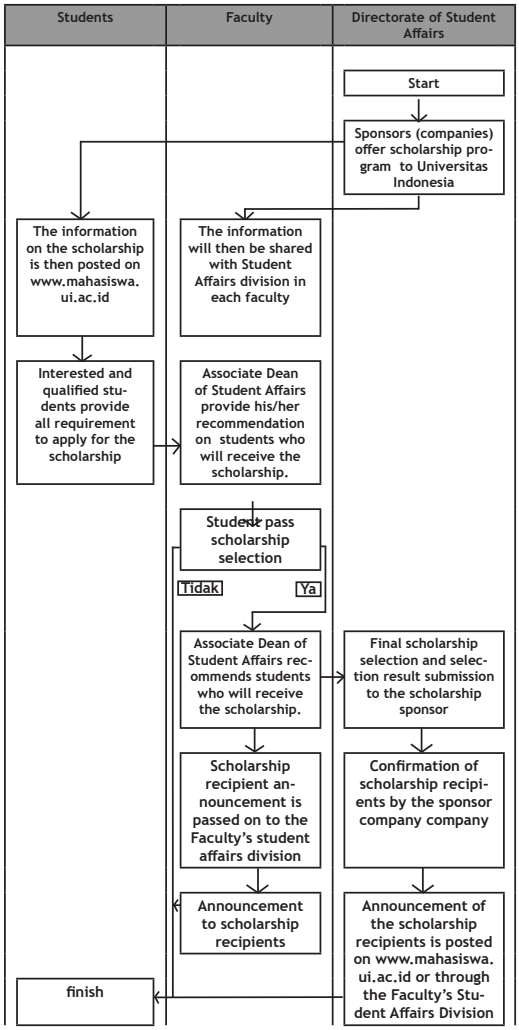
General requirement procedure for scholarship application from Donor/Sponsor:
- Submit application through the Faculty Head with a recommendation from the Associate Dean of Student Affairs.
- Submit a photocopy of academic transcript stating a GPA corresponding with the requirement given by the donor/sponsor.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

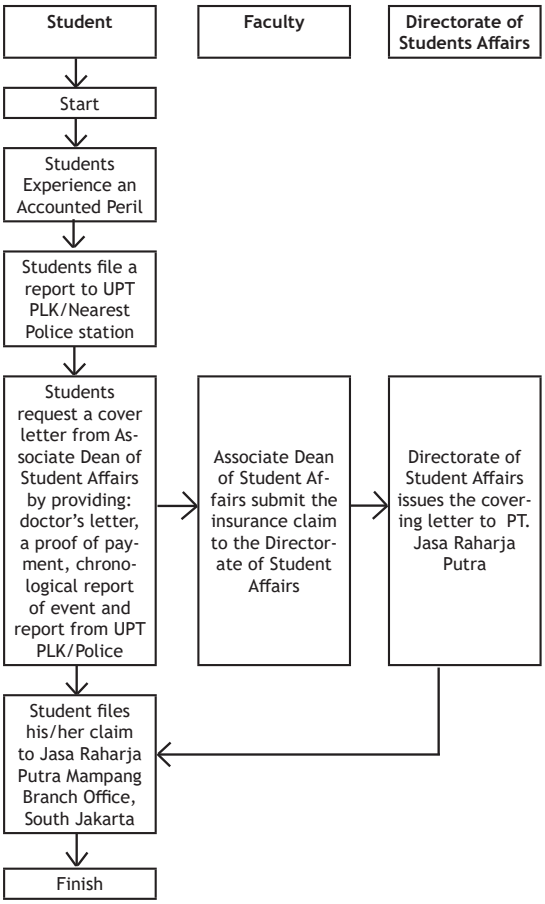
    Thesis
28. Indosat
29. Karya Salemba 4 (KS 4)
30. KORINDO
31. LGE
32. MARUBENI
33. MC.DERMONT
34. Part Time Job

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. UNDERGRADUATE PROGRAM (REGULAR/PARALLEL/INTERNATIONAL)

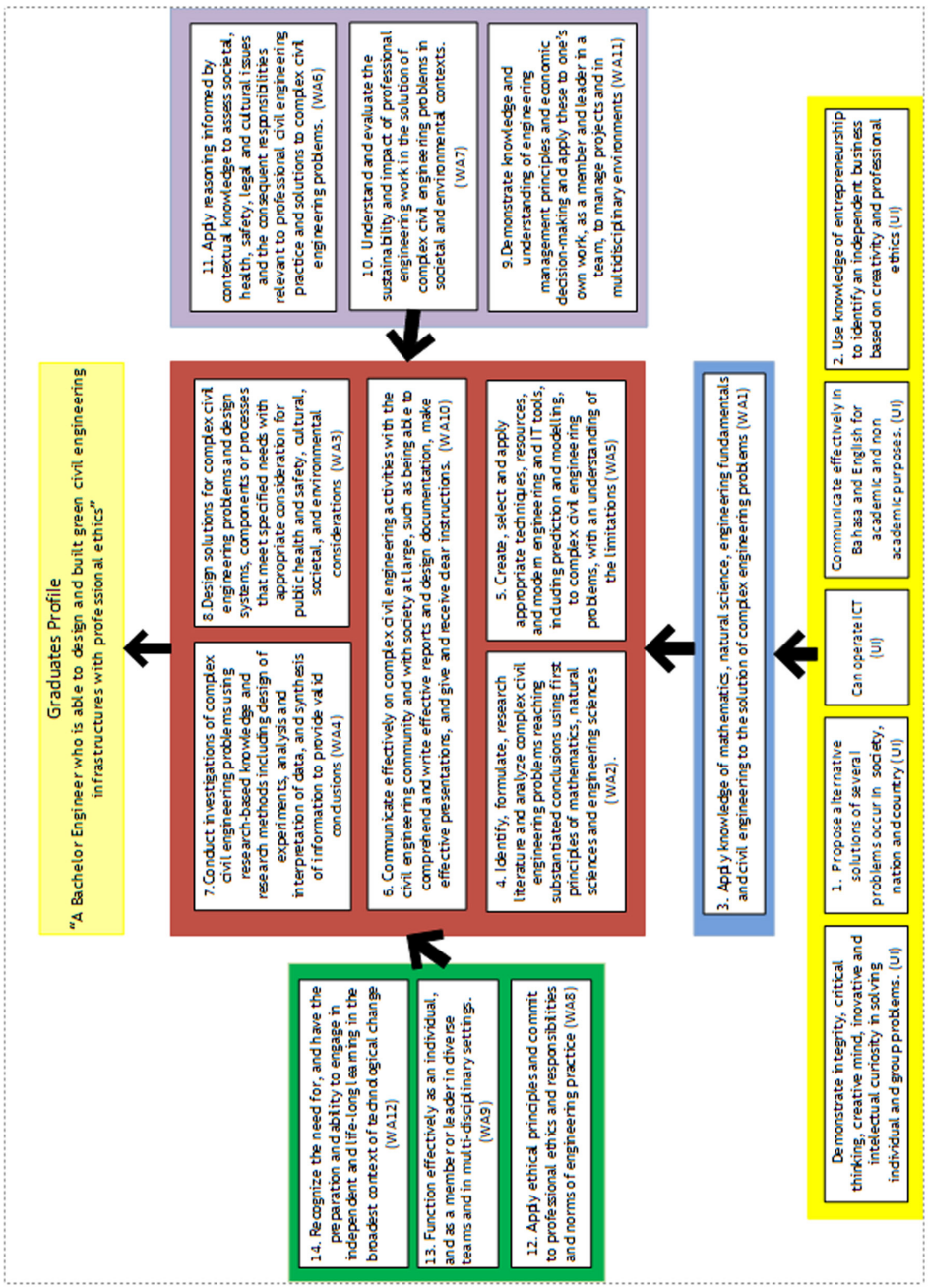
4.1. UNDERGRADUATE PROGRAM IN CIVIL ENGINEERING

Program Specification

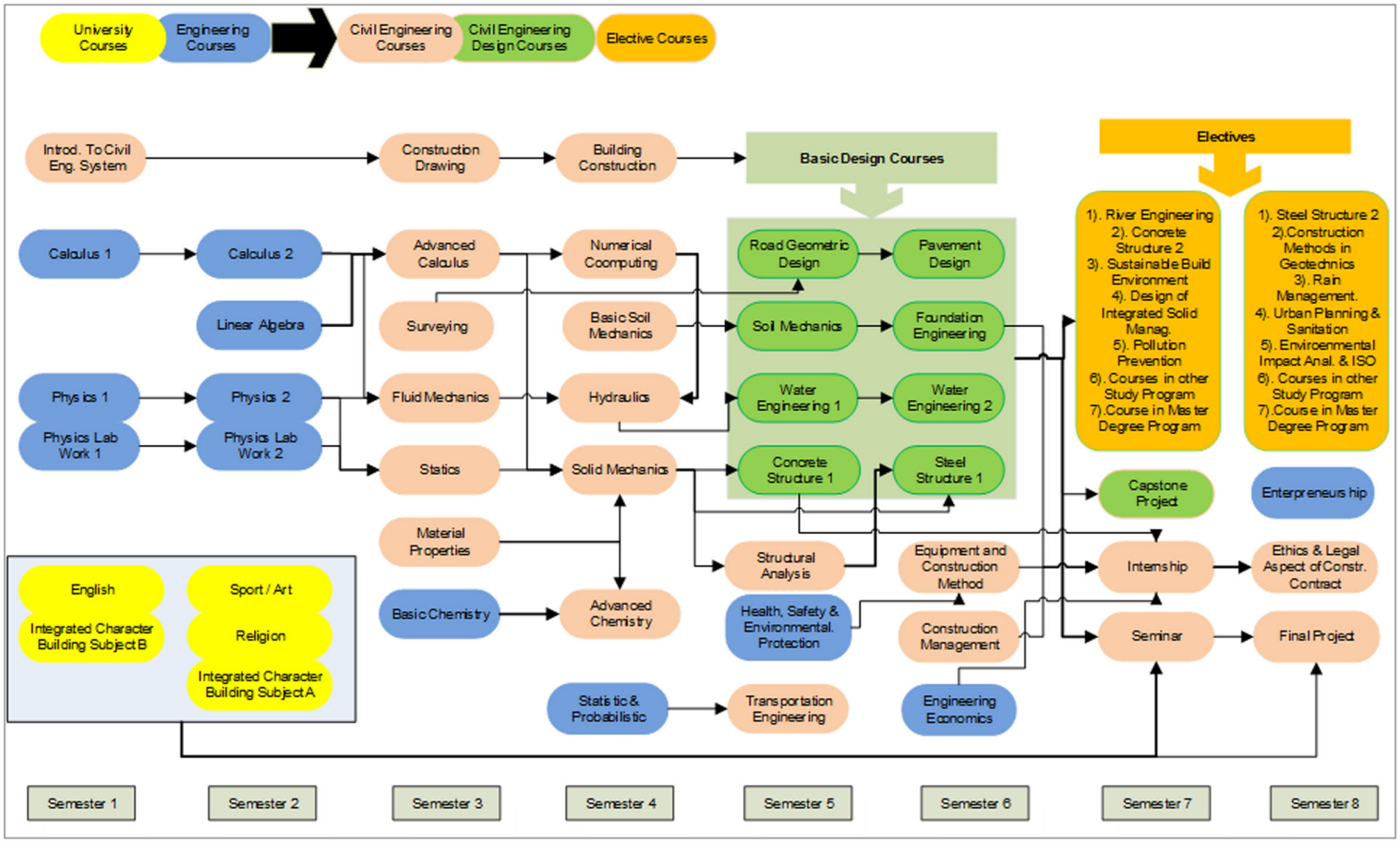
1.	**Awarding Institution**	Universitas Indonesia Double Degree: Universitas Indonesia and partner university	
2.	**Teaching Institution**	Universitas Indonesia Double Degree: Universitas Indonesia and partner university	
3.	**Programme Tittle**	Undergraduate Program in Civil Engineering	
4.	**Class**	Regular, Parallel, and International	
5.	**Final Award**	Sarjana Teknik (S.T) Double Degree: Sarjana Teknik (S.T) and Bachelor of Engineering (B.Eng)	
6.	**Accreditation / Recognition**	BAN-PT: A - Accredited, AUN-QA	
7.	**Language(s) of Instruction**	Bahasa Indonesia and English	
8.	**Study Scheme (Full Time / Part Time)**	Full Time	
9.	**Entry Requirements**	High school /equivalent, or D3 / Polytechnique / equivalent, AND pass the entrance exam.	
10.	**Study Duration**	Designed for 4 years	
	Type of Semester	Number of Semester	Number of weeks / semester
	Regular	8	17
	Short (optional)	3	8
11.	**Graduate Profiles:** A Bachelor Engineer who is able to design and built green civil engineering infrastructures with professional ethics		
12.	**Expected Learning Outcomes:** 1. Apply knowledge of mathematics, natural science, engineering fundamentals and civil engineering to the solution of complex engineering problems. 2. Identify, formulate, research literature and analyze complex civil engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences 3. Design solutions for complex civil engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations 4. Conduct investigations of complex civil engineering problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions. 5. Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex civil engineering problems, with an understanding of the limitations. 6. Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional civil engineering practice and solutions to complex civil engineering problems. 7. Understand and evaluate the sustainability and impact of professional engineering work in the solution of complex civil engineering problems in societal and environmental contexts.		

12.	8. Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. 9. Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings. 10. Communicate effectively on complex civil engineering activities with the civil engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. 11. Demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. 12. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. 13. Propose alternative solutions of several problems occur in society, nation and country. 14. Use knowledge of entrepreneurship to identify an independent business based on creativity and professional ethics.		
13	**Classification of Subjects**		
No.	**Classification**	**Credit Hours (SKS)**	**Percentage**
i	**University General Subjects**	**18**	**13 %**
ii	**Basic Engineering Subjects**	**27**	**19 %**
iii	**Core Subjects**	**79**	**55 %**
iv	**Elective Subjects**	**12**	**8 %**
v	**Internship, Seminar, ndergraduate Thesis, Project**	**8**	**6 %**
	Total	**144**	**100 %**
14.	**Total Credit Hours to Graduate**		**144 SKS**

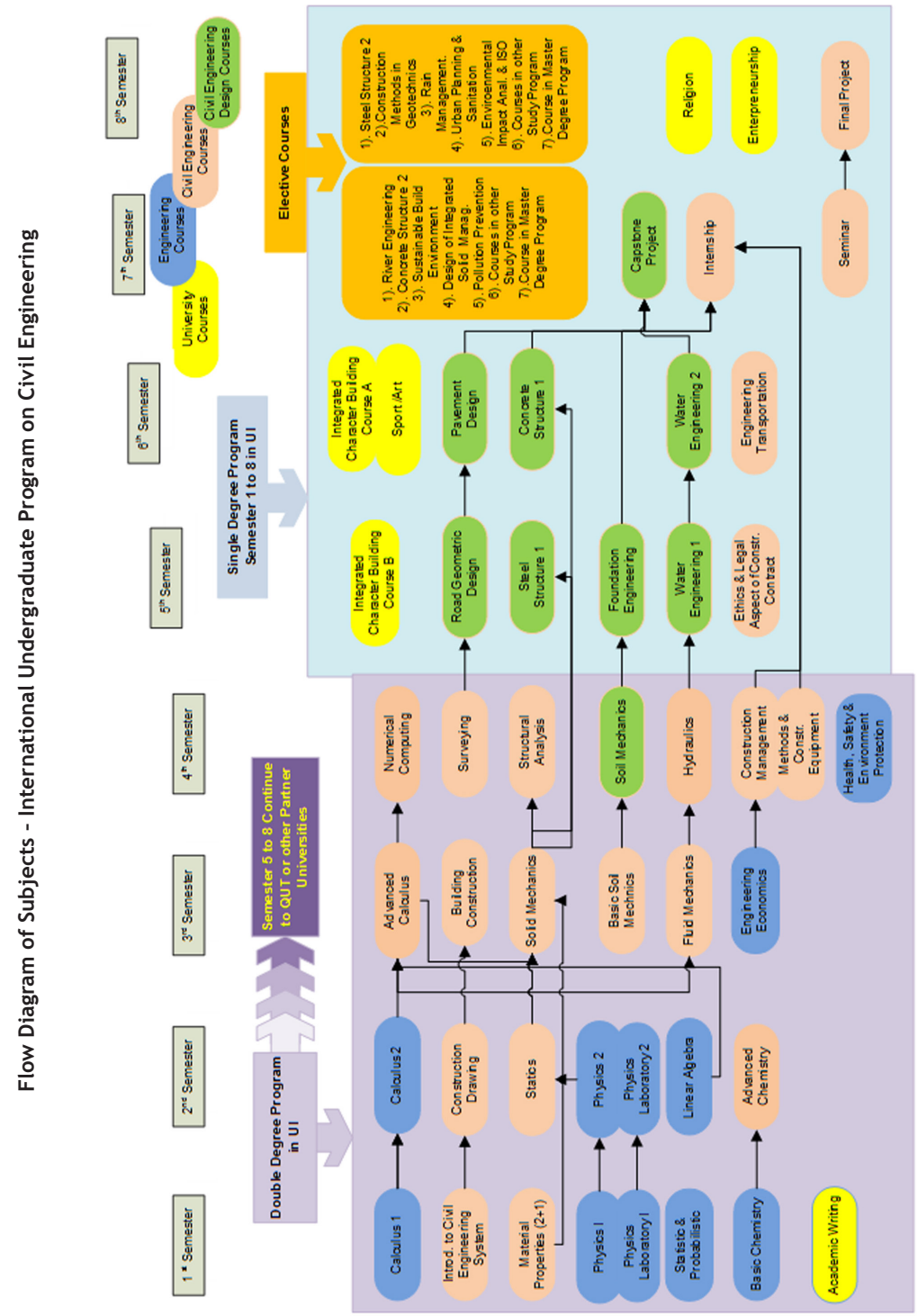
Learning Outcomes Flow Diagram



Flow Diagram of Subjects at Regular and Parallel Program



Flow Diagram of Subjects - International Undergraduate Program on Civil Engineering



Course Structure of Undergraduate Program in Civil Engineering (Regular/Parallel)

Code	Subject	SKS
	1st Semester	
UIGE610002	Integrated Character Building B	6
UIGE610003	English	3
ENGE600001	Calculus 1	3
ENGE600005	Physics (Mechanics and Thermal)	3
ENGE600006	Physics (Mechanics and Thermal) Lab	1
ENCV601001	Intro to Civil Engineering System	3
	Sub Total	**19**
	2nd Semester	
UIGE610001	Integrated Character Building A	6
UIGE610020 - UIGE610048	Sport/Art	1
UIGE610010 - UIGE610015	Religion	2
ENGE600002	Calculus 2	3
ENGE600004	Linear Algebra	4
ENGE600007	Physics (Electricity, MWO)	3
ENGE600008	Physics (Electricity, MWO) Lab	1
	Sub Total	**20**
	3rd Semester	
ENGE600009	Basic Chemistry	2
ENCV 603 001	Advanced Calculus	3
ENCV 603 002	Material Properties	3
ENCV 603 003	Construction Drawing	2
ENCV 603 004	Surveying	3
ENCV 603 005	Statics	4
ENCV 603 006	Fluid Mechanics	3
	Sub Total	**20**
	4th Semester	
ENGE600010	Statistic and Probability	2
ENCV 604 001	Advanced Chemistry	2
ENCV 604 002	Numerical Computing	2
ENCV 604 003	Building Construction	3
ENCV 604 004	Solid Mechanics	4
ENCV 604 005	Basic Soil Mechanics	3
ENCV 604 006	Hydraulics	3
	Sub Total	**19**
	5th Semester	
ENGE600012	HSE Protection	2
ENCV 605 011	Structural Analyses	3
ENCV 605 012	Concrete Structure 1	3

ENCV 605 013	Soil Mechanics	3
ENCV 605 014	Road Geometric Design	3
ENCV 605 015	Transportation Engineering	3
ENCV 605 016	Water Engineering 1	3
	Sub Total	**20**
	6th Semester	
ENGE600011	Engineering Economics	3
ENCV 606 001	Steel Structure 1	3
ENCV 606 002	Foundation Engineering	3
ENCV 606 003	Pavement Design	3
ENCV 606 004	Water Engineering 2	3
ENCV 606 005	Construction Management	2
ENCV 606 006	Construct Method & Equipments	2
	Sub Total	**19**
	7th Semester	
ENCV 607 001	Capstone Project	3
ENCV 600 001	Internship	3
ENCV 600 002	Seminar	1
	Electives *)	3
	Electives *)	3
	Sub Total	**13**
	8th Semester	
ENCV 608 001	Etics & Legal of Construction Law	2
ENCV 608 002	Enterpreneurship	2
ENCV 600 003	Final Project	4
	Electives *)	3
	Electives *)	3
	Sub Total	**14**
	TOTAL	**144**

Resume

Wajib Universitas	**18**
Wajib Fakultas	**27**
Wajib Program Studi	**87**
Jumlah	**132**
Pilihan	**12**
Total Beban Studi	**144**

ELECTIVES

	Electives Odd Semester	
ENCV 607 002	Civil Engineering System	3
ENCV 607 003	Sustainable Built Environemnt	3
ENCV 607 004	Steel Structure 2	3
ENCV 607 005	River Engineering	3
ENCV 607 006	Sistim Kota dan Utilitas	3
ENCV 607 007	Transportasi Jalan Rel	3
ENCV 801 101	Prestressed Concrete Structure	3
ENCV 801 102	Structural Dynamics	3
ENCV 803 101	Offshore Structure	P
ENCV 803 102	Bridge Structure	P
ENCV 803 103	Highrise Structural Building	P
ENCV 801 201	Advanced Soil Mechanics	3
ENCV 801 202	Geotechnic Investigation	3
ENCV 803 201	Advanced Foundation & Deep Excavation	3
ENCV 803 202	Diynamics & Earthquake in Geotechnic	3
ENCV 803 203	Special Topics in Geotechnics	3
ENCV 801 401	Engineering Hydrology	3
ENCV 801 402	Ground Water Hydraulics	3
ENCV 801 301	Traffic Control Engineering	3
ENCV 801 302	Transportation System	3
ENCV 803 302	Public Tranport Manag. & Planning	3
ENCV 803 305	Advanced Road Geometric Design	3
ENCV 801 601	Project Investment & Finance	3
ENCV 803 601	HR & Project Communication Management	3
ENCV 803 605	Management System of HSE	3
	Electives Even Semester	
ENCV 608 003	Concrete Structure 2	3
ENCV 608 004	Construction Methods in Geotechnic	3
ENCV 608 005	Stormwater Management	3
ENCV 608 006	Perancangan Pelabuhan	3
ENCV 608 007	Perancangan Lapangan Terbang	3
ENCV 608 008	Transportasi dan Lingkungan	3
ENCV 608 009	Struktur Baja Canai Dingin	3
ENCV 802 101	Earthquake Resistance Building	3
ENCV 802 102	Finite Element Method	3
ENCV 802 103	Advanced Mechanics of Material	3
ENCV 802 104	Advanced Steel Structure	3
ENCV 802 105	Concrete Techno & Adv. Reinforced Concrete	3
ENCV 802 201	Slope Stabilization & Soil Improvement	3
ENCV 802 202	Environmental Geotechnics	3
ENCV 802 203	Numerical Methods in Geotech Engineering	3

ENCV 802 401	Environmental Fluid Mechanics	3
ENCV 802 402	Water Resources Management	3
ENCV 802 403	Hydraulics Structures	3
ENCV 802 301	Transportation Economics	3
ENCV 802 302	Transportation Policy	3
ENCV 802 303	Transportation Safety	3
ENCV 802 601	Time & Cost Management	3
ENCV 802 602	Quality & Risk Management	3
ENCV 802 603	Procurement Manag. Contract & Claim Admin	3
ENCV 802 604	Advanced Construction Methods & Equipments	3

Course Structure International Undergraduate Civil Engineering

Code	Subject	CP
	1st Semester	
UIGE610002	Academic Writing	3
ENGE610001	Calculus 1	3
ENGE610005	Physics (Mechanics and Thermal)	3
ENGE610006	Physics(Mechanics and Thermal) Laboratory	1
ENGE 610009	Basic Chemistry	2
ENGE610010	Statistic and Probability	2
ENCV611001	Intro to Civil Engineering System	3
ENCV611002	Material Properties	3
	Sub Total	**20**
	2nd Semester	
ENGE610002	Calculus 2	3
ENGE610004	Linear Algebra	4
ENGE610007	Physics (Electricity, MWO)	3
ENGE610008	Physics (Electricity, MWO) Lab	1
ENCV 612 001	Advanced Chemistry	2
ENCV 612 002	Construction Drawing	2
ENCV 612 003	Statics	4
	Sub Total	**19**
	3rd Semester	
ENGE610011	Engineering Economics	3
ENCV 613 001	Advanced Calculus	3
ENCV 613 002	Building Construction	3
ENCV 613 003	Solid Mechanics	4
ENCV 613 004	Basic Soil Mechanics	3
ENCV 613 005	Fluid Mechanics	3
	Sub Total	**19**
	4th Semester	
ENGE610012	HSE Protection	2
ENCV 614 001	Numerical Method	2
ENCV 614 002	Surveying	3
ENCV 614 003	Structural Analysis	3
ENCV 614 004	Soil Mechanics	3
ENCV 614 005	Transportation Engineering	3
ENCV 614 006	Hydraulics	3
	Sub Total	**19**

	5th Semester	
UIGE610004	Integrated Charater Building B	6
ENCV 615 001	Steel Structure 1	3
ENCV 615 002	Foundation Engineering	3
ENCV 615 003	Road Geometric Design	3
ENCV 615 004	Water Engineering 1	3
ENCV 615 005	Ethics and Legal Aspect of Construction Contract	2
	Sub Total	**20**
	6th Semester	
UIGE610001	Integrated Charater Building A	6
UIGE610003	Sports / Arts	1
ENCV 616 001	Concrete Structure 1	3
ENCV 616 002	Pavement Design	3
ENCV 616 003	Water Engineering 2	3
ENCV 616 004	Construction Management	2
ENCV 616 005	Construction Methods & Equipments	2
	Sub Total	**20**
	7th Semester	
ENCV 617 001	Capstone Project	3
ENCV 610 001	Internship	3
ENCV 610 002	Seminar	1
	Elective *)	3
	Elective *)	3
	Sub Total	**13**
	8th Semester	
UIGE610005-9	Religion	2
ENCV 618 001	Enterpreneurship	2
ENCV 610 003	Final Project	4
	Elective *)	3
	Elective *)	3
	Sub Total	**14**

Resume

Wajib Universitas	18
Wajib Fakultas	27
Wajib Program Studi	87
Jumlah	132
Pilihan	12
Total Beban Studi	144

Electives

Code	Electives Odd Semester (Semester 7)	Credit
ENCV 617 002	Cold Formed Steel Structures	3
ENCV 617 003	Sustainable Built Environment	3
ENCV 617 004	Concrete Structure 2	3
ENCV 617 005	River Engineering	3
ENCV 617 006	Harbor Design	3
ENCV 617 007	Airport Design	3
ENCV 617 008	Transportation and Environment	3
Code	**Electives Even Semester (Semester 8)**	**Credit**
ENCV 618 002	Steel Structure 2	3
ENCV 618 003	Construction Methods in Geotechnic	3
ENCV 618 004	Stormwater Management	3
ENCV 618 005	City System and Utility	3
ENCV 618 006	Railway Transportation	3
ENCV 618 007	Civil Engineering System	3

*) Students may choose Elective courses offered by other Departemen/Faculty or offered by Master Program

COURSE SYLLABUS OF UNDERGRADUATE PROGRAM ON CIVIL ENGINEERING

ENCV 601 001 / ENCV611001
Introduction to Civil Engineering System
3 Credits
Learning Outcomes :

1. Students will be able to elaborate the working scope of Civil Engineering with its sub-expertise for a system related to Civil Engineering work;
2. Be able to work in a team;
3. Be able to deliver the ideas in oral or written form.

Competencies in Curriculum: WA 6 (engineer's role in society), WA7 (environment and sustainability), WA 9 (Team work), WA 10 (communication skill)
Syllabus : Introducing the system and working scope of Civil Engineering: General description of the system and work scope of Civil Engineering, General Description about the sub-expertise of Transportation Engineering, Geotechnical Engineering, Water Resources Management, Environmental Engineering, Structural Engineering and Construction Management; Components and Functions of buildings/infrastructures in Civil Engineering: Physical and non-physical components of buildings/infrastructures in Civil Engineering, Functions of physical and non-physical of buildings/infrastructures in Civil Engineering; Role of Civil Engineering Bachelors: Roles of Civil Engineering Bachelors in areas of expertise of Transportation Engineering, Geotechnical Engineering, Water Resources Management, Environmental Engineering, Structural Engineering and Construction Management, Relationship between scope of work between areas of expertise.
Prerequisites : -
Text Book References : -

ENCV 603 002 / ENCV611002
Material Properties
3 Credits
Learning Outcomes :

1. Students will be able to explain comprehensively the definition of practical and elementary aspects of materials in the Civil Engineering field related to the tension-strain relationship, elasticity, behavior through time, damping property, atom structures, plasticity, yielding criteria, fatigue, ductility, and corrosion process;
2. Be able to design concrete mix design materials according to the desired concrete compressive strength; able to explain the compression test process of a cylinder concrete sample and the tensile test of steel reinforcement in the laboratory and able to explain the meaning of the test results;
3. Be able to work in a team.

Competencies in Curriculum : *prior knowledge* for WA 1 (Engineering knowledge), WA 4 (experiment), WA9 (team work)
Syllabus : Particulate Material, aggregate, Portland Cement and Portland Cement Concrete, Structural Steel, Asphalt Cement and asphalt concrete, wood, plastic and polymer, Concrete Fibers, basis of materials and solids, microstructure and surface properties, material responses to stresses, yielding and facture, rheology of fluid and solid; fatigue
Prerequisites: -
Text Book References :

1. S. Young, Sidney, The Science and Technology of Civil Engineering Materials, Prentice-Hall International Inc., 1998
2. Shan Somayaji, 2001, Civil Engineering Materials, Prentice Hall.
3. Robert D Kerbs, Richad D Walker, (1971) Highway Materials, McGraw-Hill

ENCV 604 001 / ENCV612001

Advanced Chemistry

2 Credits

Learning Outcomes : Students will be able to apply and report their knowledge about basic chemistry and environment to investigate the two-way interaction between materials and civil engineering structure's life cycle with its environment (C3. A2).

Competencies in Curriculum : In order to achieve competencies of WA1 (Engineering knowledge) and WA7 (environment and sustainability)

Syllabus : Spontaneity reaction (Irregularities concept, enthalpy, entropy, Gibbs free energy, Arrhenius Equation), spontaneous and non- spontaneous reaction (Temperature effect, concentration and energy effect to spontaneity, cement production process), Steel production process (Mining and Purification of minerals, iron extraction from mineral, steel production), Chemical weathering of building's material (Causes and mechanisms of acid rain formation, ettringite formation and characteristic, ettringite impact to building's strength, metal reaction to acid, acid rain's effect to metal, aggressive and corrosive environment, examples of material protection methods), civil engineering building's life cycle concept (life cycle concept, production process, transportation, construction, operation, and end of life of the building), cement and steel production effect to air pollution escalation (by-product of cement production process, by-product of steel production process, cement and steel industry contribution to CO2 and particulate level in the air), Pollution caused by civil building's life cycle (Pollution of air, water and soil from construction and operation process of civil engineering building's)

Prerequisites : Basic Chemistry

Text Book References :

1. Brown and Holme, 2011, Chemistry for Engineering Students 2nd edition
2. Rainer Remus, Miguel A. Aguado-Monsonet, Serge Roudier and Luis Delgado Sanch, 2013, Best Available Techniques (BAT) Reference Document for Iron and Steel Production, EU Commission
3. Colin Baird, Michael Cann, 2008, Environmental Chemistry 4th edition, W. H. Freeman
4. A. Moncmanová, 2007, Environmental Deterioration of Materials, WIT Press
5. Frauke Schorcht, Ioanna Kourti, Bianca Maria Scalet, Serge Roudier, Luis Delgano Sancho, 2013, Best Available Techniques (BAT) Reference Document for Cement, Lime and Magnesium Oxide, EU Commission
6. Building and Environment, Elsevier
7. Georgia Institute of Technology, 2010, AIA Guide to Building Life Cycle Assessment in Practice, The American Institute of Architects
8. Georgia Institute of Technology, 2010, AIA Guide to Building Life Cycle Assessment in Practice, The American Institute of Architects

ENCV 603 003 / ENCV612002

Construction Drawing

2 Credits

Learning Outcomes :

1. Students will be able to explain engineering drawing symbols in Civil Engineering field and draw it manually or using a software (AutoCAD);
2. Be able to design a one-floor simple healthy house building;
3. Be able to draw the one-floor simple healthy house building according to rules and procedures of engineering drawing such as aperture drawing (plans and appearance) and section view; covering dimension/sizes; foundation drawing, structural beam and column drawing, trestlework drawing, electrical installation and plumbing.

Competencies in Curriculum: *Prior knowledge* for WA5 (*modern tool usage*) and achieving competency WA10 (communication skill)

Syllabus : introduction to Civil Engineering knowledge discipline scope and Civil Engineering

building construction, introduction to engineering drawing, benefit and purpose of drawing in design process; introduction to drawing tools, drawing paper format, drawing head, standards, lettering, leader, and scale; geometric construction; pictorial projection; orthogonal projection; section view drawing; details of the building drawing, construction drawing of wooden and light steel rooftop; beam construction drawing, column and river stone foundation; electrical installation drawing and plumbing drawing

Prerequisites:

Text Book References:

1. Neufret, Ernst, *Data Arsitek Jilid 1 dan 2*, Penerbit Erlangga, Jakarta, 1989
2. Subarkah, Imam, *Konstruksi Bangunan Gedung*, Penerbit Idea Dharma, Bandung, 1988
3. Sugiharjo, R., *Gambar-Gambar Dasar Ilmu Bangunan*, Penerbit R. Sugihardjo
4. Giesecke, F. E., et al. (1997). Technical Drawing, Tenth Edition, Prentice Hall Publishing,

ENCV 603 005 / ENCV612003

Statics

4 Credits

Learning Outcomes :

1. Students will be able to apply the mechanics physics concept in calculating responds from rigid body as results of working forces (C3);
2. Be able to apply the mechanics physics concept in analyzing simple structure of beam, trusses, and three joints arch (C3).

Competencies in Curriculum : WA 1 (Engineering knowledge)

Syllabus : Statics of particle; rigid body; equilibrium of rigid body; structural analysis of trusses with point equilibrium method; influential lines for statically determinate structure caused by moving loads

Prerequisites : Heat and Mechanics Physics

Text Book References :

1. Aslam Kassimali, Structural Analysis, 4th edition, 2011
2. R.C. Hibbeler, Structural Analysis, Prentice Hall, 1998
3. Lecture Notes "*Mekanika Teknik*", Elly Tjahjono
4. Lecture Notes "*Garis Pengaruh*", Elly Tjahjono

ENCV 603 001 / ENCV613001

Advanced Calculus

3 Credits

Learning Outcomes : Students will be able to derive and use the concept of: ordinary differential equation and calculus vector in order to solve its applied problems. (C2)

Competencies in Curriculum: *Prior knowledge* for WA1 (basic math)

Syllabus : Introduction to Differential Equations, Definitions and Terminology, Initial-Value Problems, Differential Equations as Mathematical Models, First-Order Differential Equations, Solution Curves without a Solution, Direction Fields, Autonomous First-Order Differential Equations, Separable Equations, Linear Equations, Exact Equations, Solution by Substitutions, A Numerical Method, Linear Models, Nonlinear Models, Modeling with Systems of First-Order Differential Equations.
Higher-Order Differential Equations, Theory of Linear Equations, Initial-Value and Boundary-Value Problems, Homogeneous Equations, Nonhomogeneous Equations, Reduction of Order, Homogeneous Linear Equations with Constant Coefficients, Undetermined Coefficients, Variation of Parameters, Cauchy-Euler Equations, Nonlinear Equations, Linear Models; Initial-Value Problems, Spring/ Mass Systems: Free Undamped Motion, Spring/Mass Systems: Free Damped Motion, Spring/Mass Systems: Driven Motion, Series Circuit Analogue, Linear Models : Boundary-Value Problems, Green's Function (Initial-Value and Boundary-Value Problems), Nonlinear Models, Solving Systems of Linear Equations. Vector Functions, Motion on a Curve, Curvature and Components of Acceleration, Partial

Derivatives, Directional Derivative, Tangent Planes and Normal Lines, Curl and Divergence, Line Integrals, Independence of the Path, Double Integrals, Double Integrals in Polar Coordinates, Green's Theorem, Surface Integrals, Stokes' Theorem, Triple Integrals, Divergence Theorem, Change of Variables in Multiple Integrals.

Prerequisites : Calculus 1 and Calculus 2

Text Book References :

1. D.G Zill and W.S Wright, Advanced Engineering Mathematics, 5th ed., Jones & Barlett Learning, 2014
2. E. Kreyzig, Advanced Mathematical Engineering, John Wiley & Son, 5th ed., 2011

ENCV 604 003 /ENCV613002

Building Construction

3 Credits

Learning Outcomes:

1. Students will be able to apply the knowledge of engineering drawing symbols in Civil Engineering field for describing a two-story building according to the rules and procedures of engineering drawing such as aperture drawing (plans and appearance) and section view; covering dimension/ sizes; foundation drawing, structural beam and column drawing, trestlework drawing, electrical installation and plumbing;
2. Be able to read the construction drawing and explain the parts of water structure (dam), waste treatment building, geotechnical building (foundation, retaining wall), roads, and bridges according to the construction drawing;
3. Be able to calculate the volume of the building, unit price, and cost estimation.

Competencies in Curriculum: WA1 (engineering knowledge); WA 10 (communication skill), and *Prior knowledge* for WA 5 (modern tool usage)

Syllabus : Introduction of the course syllabus, introduction of standards of every building element and room function, plan and appearance drawing of a building, section-view drawing, foundation plan drawing, column and beam construction drawing, rooftop and trestlework plan drawing, platform drawing, stairs drawing, plafond and floor pattern drawing, window and door frames drawing, lighting installation drawing; plumbing system drawing, fire prevention installation drawing; lightning rod installation drawing, solid waste/trash drawing and septic tank drawing. Calculation of the building's volume and cost estimation. Unit Price. Journals.

Prerequisites : Construction Drawing

Text Book References:

1. Neufret, Ernst, *Data Arsitek Jilid 1 dan 2*, Penerbit Erlangga, Jakarta, 1989
2. Subarkah, Imam, *Konstruksi Bangunan Gedung*, Penerbit Idea Dharma, Bandung, 1988
3. Sugiharjo, R., *Gambar-Gambar Dasar Ilmu Bangunan*, Penerbit R. Sugihardjo
4. Tanggoro, Dwi, *Utilitas Bangunan*, Penerbit Universitas Indonesia, 2000

ENCV 604 004 /ENCV613003

Solid Mechanics (3+1)

4 Credits

Learning Outcomes :

1. Students will be able to analyze tension and shape changes as a result of working forces for various shape of statically determined structure and various shape of sections and type of materials;
2. Be able to calculate the deflection of beam, portal, and trusses structure using the beam, moment area, and energy theory and use the knowledge to analyze a simple statically undetermined structure using the principals of consistent deformation.

Competencies in Curriculum : WA1 (engineering knowledge)

Syllabus : The meaning of loads and forces working on a solid object, effect of forces to a solid

object, stresses on a solid object, shape deformation of a solid object, characteristics of shape deformation of a solid object, elastic and inelastic phases, axial strain, Modulus of Elasticity, Poisson Ratio. Section Properties, area, center of gravity, cross-axis system, maximum moment of inertia of a section, minimum moment of inertia of a section, radius of gyration, symmetric section, asymmetric section. Normal stress due to axial internal forces, normal stress due to flexure, combination of normal stress and flexure, one way and two-way flexural stress, core area (Kern), shear stress due to transversal internal forces, shear stress due to torsion internal forces. Combination of normal and shear stresses. Stresses on inclined plane and primary stresses.
Deflection of beam, portal, and trusses of statically determined structure caused by external forces using elastic deformation line differential equation method, moment area of an equivalent beam method, energy/unit load method. Simple analysis of statically undetermined structure with the principals of consistent deformation

Prerequisites : Statics

Text Book References :

1. Hibbeler, R.C., Mechanics of Materials, 8/e, Pearson, 2011
2. Beer, F. and Johnston, P., Mechanics of Materials, 6/e. McGraw Hill, 2011
3. Egor P. Popov (Author), Engineering Mechanics of Solids (2nd Edition), Prentice Hall, 1998
4. Gere, J.M. and Timoshenko, S.P. (1997). Mechanics of Materials, 4th ed., PWS Publishing Co., Boston, Mass.
5. Vable, M., Mechanics of Materials, http://www.me.mtu.edu/~mavable/MoM2nd.htm
6. James M. Gere, *Mekanika Bahan* 1 ed.4, Penerbit Erlangga, Kode Buku: 37-01-010-6 Tahun: 2000
7. James M. Gere, *Mekanika Bahan* 2 ed.4, Penerbit Erlangga, Kode Buku: 37-01-010-7 Tahun: 2002

ENCV 604 005 /ENCV613004

Basic Soil Mechanics (2+1)

3 Credits

Learning Outcomes : Students will be able to explain the basic understanding of geology and able to explain the physical properties of soil and its parameters which covers its application in civil engineering.

Competencies in Curriculum : WA1 (engineering knowledge) and WA2 (problem analysis) also *Prior knowledge* for WA 4 (experiment) and WA 9 (team work)

Syllabus : Geological Engineering and Soil Properties; Definitions of geological knowledge, geotechnics with other disciplines/civil; topography and geomorphology map; definition and meaning of units in topography and its tools; how to read and analyze mineralogy, stone types, and stratigraphy, introduction to type of minerals forming igneous rock, geological structure and its types; how to identify and understand the effect of coating, stocky, fault, and unconformity for construction; weathering and movement of soil; introduction of types, processes, and identification of weathering; Explanation of classification process; Geological and Geotechnical maps; analyzing basic topography maps; Criteria of geotechnics geological maps; soil properties: soil in three phases; physical characteristics of soil; soil classification, Atterberg Limit; soil compaction theory and CBR test; one flow dimension in soil, permeability and introduction to groundwater seepage, flow diagram stress theory and the effective stress principal; effective stress reaction because of the change of total stress in a fully saturated soil; soil shear strength theory; laboratory soil shear strength test for clay and sand; consolidation theory and test;

Prerequisites : Material Properties

Text Book References :

1. Burchfiel BC & Foster RJ et .al., “Physical Geology”, Charles E Merril Publishing Co., Colombus Toronto London Sydney, 1986.

2. Blyth, F.G.H. & de Freitas, M.H., "A Geology for Engineers, 7th Ed.". Elsevier. 2005.
3. Craig, R.F., " Soil Mechanics, 7th Ed.", 2007
4. Bowles, J.E., "Physical and Geotechnical Properties of Soils", McGraw-Hill Kogagusha Ltd., 1998.
5. Das, B.M., "Principles of Geotechnical Engineering", Fifth edition, 2005, PWS Publishing Company, Boston
6. Budu M., "Soil Mechanics and Foundations", Second Edition, 2007, John Wiley& Sons, New York

ENCV 603 006 /ENCV613005

Fluid Mechanics

3 Credits

Learning Outcomes :

1. Students will be able to analyze fluid pressure distribution at a given static situation to be applied for load calculation of structure stability of civil building;
2. Be able to analyzed fluid in motion to be applied for calculation of total flow and the induced dynamic forces;

Competencies in Curriculum : WA 1 (Engineering knowledge).

Syllabus : The most important basic science in civil engineering is mechanics knowledge. This knowledge can be separated into material mechanics and fluid mechanics. The mechanics of fluid discuss about the basic formulation of motion and forces of an object that cannot be perceived as completely integrated fluid, such as wind and water. This knowledge is the basis for all of the water resources engineering subjects, such as Hydraulics, Hydrology, Design of Water Infrastructure, Ground Water Resources, Water Surface Management and Development, etc. Until midterms, the materials that will be discussed is static fluid which covers the definition of pressure, pressure distribution formulation, and the application of the formula to determine the force as an effect from the pressure for various civil engineering buildings. The other half of the semester, the materials that will be discussed is flowing fluid, starting from the Eulerian movement conceptualization and its application in the law of mass, momentum, and energy conservation to calculate the total flow and dynamic force induced by the law. The total flow and force obtained will be the basis of particularly hydraulic building design or civil engineering buildings in general.

Prerequisites : Calculus I, Calculus II, Basic Physics I, Basic Physics II, Basic Physics Laboratory I, Basic Physics Laboratory II

Text Book References :

1. Merle C. Potter, David C. Wiggert, Bassem H. Ramadan, Mechanics of Fluids, Fourth Edition, Cengage Learning, 2011
2. Frank M. White, Fluid Mechanics, Fourth Edition, McGraw-Hill, 1998

ENCV 604 002 /ENCV614001

Numerical Method

2 Credits

Learning Objective : Students will be able to solve mathematics equation on linear algebra and differential equation with numerical method using MatLab software.

Competencies in Curriculum : *Prior knowledge* for WA 1 (Engineering knowledge) and WA5 (modern tool usage)

Syllabus : Introduction to MATLAB (programming basics with MATLAB), Searching for root equation (Bracketing Method & Open Method); Linear System (Solving Simultaneous Linear Algebraic Equation, Gauss Elimination, LU-Factorization, Matrix Inversion, Solution by Iteration, Eigenvalues). Numerical Method in Curve Fitting (Linear Regression & Least Square), Numerical Method in solving: Ordinary Differential Equations (Initial Value Problems, Adaptive Method and Stiff System, Boundary Value Problems)

Prerequisites : Calculus 1, Calculus 2, Advanced Calculus, Linear Algebra

Text Book References:

1. Numerical Methods for Engineers, Steven C. Chapra & Raymond P Canale, 7th edition, 2013
2. Applied Numerical Methods with MATLAB for Engineers and Scientist, 3rd edition, Steven C. Chapra, McGraw Hill, 2012

ENCV 603 004 /ENCV614002

Surveying (2+1)

3 Credits

Learning Outcomes :

1. Students will be able to use various measuring instruments to solve mapping problems and pegs in civil engineering and environmental engineering works, surveying and displaying the results in a form of drawing with integrating various measuring methods and able to read and draw the data from the surveying results done by someone else;
2. Be able to work in team.

Competencies in Curriculum : *prior knowledge* for WA 4 (experiment) and WA9 (team work)

Syllabus : Explanation of surveying concept in civil engineering and environmental engineering works; introduction to distance measuring equipment, angles and other measuring equipment usually used in mapping and pegging; Operating levelling equipment and Theodolite in order to take field's data and integrating the data into a map or transferring design coordinates into the field coordinates in civil engineering and environmental engineering activities; carrying out field measuring with measuring methods of horizontal, vertical distance, and angle measurement; Error theory; planning of basic concept of mapping and pegging; calculation of area and volume; displaying the field measuring results in a corresponding map for the needs of civil engineering and environmental engineering

Prerequisites : Calculus 1, Calculus 2, and Construction Drawing

Text Book References :

1. Kavanagh, B. and Slattery, D., 2014. Surveying with Construction Applications 8th ed., Prentice-Hall, Inc.

2. Irvine, W., 2005. Surveying for Construction 8th ed., McGraw-Hill Higher Education.

3. Uren, J. and Prince, W., 2010. Surveying for Engineers 5th ed., Palgrave MacMillan.

4. Schofield, W. and Breach, M., 2007. Engineering Surveying 6th ed., CRC Press.

ENCV 605 011 / ENCV614003

Structural Analysis

3 Credits

Learning Outcomes :

1. Students will be able to analyze statically undetermined structural responses of truss, beams, frames and arches affected by external loads and degradation of placement using methods such as slope deflection method and moment distribution (cross-method);
2. Be able to analyze 2D spatial structure using direct stiffness method with computer aid (matrix method);
3. Be able to apply moment distribution principal in analyzing influence line in continuous beam structure.

Competencies in curriculum : WA2 (problem analysis)

Syllabus : Definition of statically undetermined vs. determined structure, external statically undetermined structure, *Slope deflection* and moment distribution for continuous beam with various condition of placement, fixed portal and portal that have single/double swinging factors, *gable frame*, symmetrical and asymmetrical structure; Influential lines of placement reactions,

influential lines of transversal force and flexural moment for continuous beam. Virtual working principals and energies used in structural analysis;
Superposition matrix method in structural analysis; Implementation of superposition matrix method for 2D spatial Structure
Prerequisites : Statics, Material Property and Solid Mechanics
Text Books References :
1. Hibbeler,R.C., Structural Analysis, Prentice Hall, 2016
2. Aslam Kassimali, Structural Analysis, 4th edition, 2011
3. Ghali A., A.M. Neville, Structural Analysis : A unified Classical and Matrix Approach, 4th ed., Thompson pub., 1997
4. Marc Hoit, Computer-Assisted Structural Analysis and Modelling, Prentice Hall, Englewood Cliffs, New Jersey, 1995
5. Katili, Irwan, *Metode Elemen Hingga untuk Skeletal*, Rajawali Pers, 2008

ENCV 605 013 / ENCV614004
Soil Mechanics (2+1)
3 Credits
Learning Outcomes :

1. Students will be able to apply basic soil parameter knowledge on calculating soil strength and stability for simple buildings/civil engineering construction;
2. Be able to design soil retaining wall and draw it according to the rules and regulations of engineering drawing;
3. Be able to use SLOPE/W software to analyze slope stability.

Competencies in curriculum : WA 2 (problem analysis), WA3 (design), WA5 (modern tool usage) and prior knowledge for WA 4 (experiment) and WA 9 (team work)
Syllabus : Bearing capacity of the soil: Allowable bearing capacity and Ultimate bearing capacity due to inclination and eccentricity of load; One dimensional elastic settlement and consolidation settlement; Drawing shallow foundation design; Seepage through dam; Stress distribution in the soil: A point load, strip, circle, and square area of footing using Fadum and Newmark theories; Lateral earth pressure: Rankine and Coulomb theories; Structure design of earth retaining wall, gravity wall, cantilever wall, earth retaining cantilever wall, sheet pile; Slope stability: concept of slope stability, undrained analysis, slice method, introduction of Fellenius method, Bishop method, Soil stability method
Prerequisites : Basic Soil Mechanics
Text Books References:
1. Craig, R.F., "Soil Mechanics, 7th Ed.", 2007
2. Bowles, J.E., "Physical and Geotechnical Properties of Soils", McGraw-Hill Kogagusha Ltd., 1998.
3. Das, B.M., "Principles of Geotechnical Engineering", Fifth edition, 2005, PWS Publishing Company, Boston
4. Budhu M., "Soil Mechanics and Foundations", Second Edition, 2007, John Wiley& Sons, New York

ENCV 605 015 / ENCV614005
Transportation Engineering
3 Credits
Learning Outcomes : Students will be able to design road segment and intersection using traffic variables, decipher the characteristics of modes of transportations and designing steps of urban transportation.
Competencies in Curriculum : WA1 (engineering knowledge), WA2 (problem analysis) and WA 5 (modern tool usage)
Syllabus : Types, characteristics, and facilities for a single mode and multi-modes of transportations (e.g. transportation modes, parking, and terminal); variables related to the characteristic of

traffic and parking flows; measuring and analyzing variables of traffic characteristics; calculating the segment capacity and simple intersection with the rules of *Manual Kapasitas Jalan Indonesia* (MKJI) and Highway Capacity Manual (HCM); Measuring the variables mentioned in the filed with a traffic control equipment for intersection; Introduction to *Four step model (link, nodes, zone).*
Prerequisites: Calculus 1, and Statistic and Probabilistic
Text Book References :

1. Papacostas, C. and Prevedouros, P., 2000. Transportation Engineering and Planning 3rd ed., Prentice-Hall, Inc.
2. Banks, J., 2002. Introduction to Transportation Engineering 2nd ed., McGraw-Hill.
3. Fricker, J. and Whitford, R., 2004. Fundamentals of Transportation Engineering: A Multimodal System Approach. In Prentice Hall.

ENCV 604 006 / ENCV614006
Hydraulics
3 Credits
Learning Outcomes: Students will be able to apply the mass and momentum conservation law to be applied as the fundamental design of water flow under pressure, and water flow in open drainage system.
Competencies in Curriculum : WA1 (engineering knowledge) and WA2 (problem analysis)
Syllabus : Hydraulic is an application of the law of mass, energy, and momentum conservation which is applied theoretically in drainage medias generally found in civil engineering world. These drainage media cover flows in pipes (under pressure), and flows in open drainage system (the water surface has atmospheric pressure). Until midterms, awareness is built to obtain the formulation that can be used in designing dimension which basically needed in formulating energy lost. This concept is introduced in designing a piping system. After the midterm, the energy lost concept is continued by applying it to an open drainage system. Due to the incapability of obtaining accuracy just by using the theoretical formulation for energy loss, it is introduced that the application for some of the water structures will be forced to use empirical coefficient.
Prerequisites : Fluid Mechanics
Text Book References :

1. Merle C. Potter, David C. Wiggert, Bassem H. Ramadan, Mechanics of Fluids, Fourth Edition, Cengage Learning, 2011.
2. Frank M. White, Fluid Mechanics, Fourth Edition, McGraw-Hill, 1998.

ENCV 606 001 / ENCV615001
Steel Structure 1
3 Credits
Learning Outcomes :

1. Students will be able to analyze the strength of a simple steel structure;
2. Be able to proportionate the simple steel structure building such as steel trestlework or pedestrians bridge with steel trusses structures according to the regulations and standards applied and present the designed structure with a design engineering drawing;
3. Be able to work together in a team.

Competencies in curriculum : WA2 (problem analysis), WA3 (design), WA9, (team work) and WA10 (communication skill)
Syllabus : Basic steel structural system; Types of steel structure; Mechanical properties; factors which influences the steel's quality, Stress strain steel curve, Steel material property; Proportion of structural member with LRFD against tensile strength, compressive force, bending strength, and shear force according to the standards; Steel structure element analysis and design: tension

rod, compression rod, elastic buckling, inelastic buckling, two-way flexure, shear, lateral-torsion buckling; Design and analysis of steel structural joints; Bolt joints; HTB; Welded joints; Pedestrian bridge/trestle roof design

Prerequisites : Statics, Solid Mechanics, Material Properties

Text Books References :

1. Spesifikasi untuk Bangunan Gedung Baja Struktural; SNI 1729: 2015
2. Segui, William T., Steel Design,5th edition, 2013
3. Manual of Steel Construction, Load Resistance Factor Design, Structural Members, Specification & Codes Volume 1
4. Manual of Steel Construction, Load Resistance Factor Design, Structural Members, Specification & Codes Volume 2
5. Structural Steel Design, Prentice Hall, 2012

ENCV 606 002 / ENCV615002

Foundation Engineering

3 Credits

Learning Outcomes :

1. Students will be able to explain the soil parameters needed for analysis and design process of deep foundation and deep retaining wall system;
2. Be able to explain the basic of deep foundation from analytical, design and construction aspect;
3. Be able to explain the basic of deep foundation load test;
4. Be able to explain the basic of deep retaining wall system from analytical, design and construction aspect.

Competencies in curriculum : WA2 (problem analysis), WA3 (design), and WA10 (communication skill)

Syllabus : Introduction to types and system of deep foundation, methods to determine the axial bearing capacity of deep foundation; Methods to determine the lateral bearing capacity of deep foundation; Methods to determine vertical and lateral deformation of deep foundation; Pile test method and introduction to types and systems of deep soil retaining structures; Soil retaining system calculation methods, as well as understanding the soil parameters needed; Drawing a deep foundation design

Prerequisites : Soil Mechanics

Text Books References:

1. Bowles, J.E., “Foundation Analysis and Design”, International Student Edition, McGraw-Hill, Kogakusha, Ltd., Japan, 1988
2. Coduto D.P., “Foundation Design”, Prentice Hall, Inc.,1994
3. Poulos, H.G & Davis, E.H., “Pile Foundation Analysis and Design”, John Wiley & Sons, Inc., 1980.
4. Prakash S & Sharma HD., Pile foundation in Engineering Practice, John Wiley $ Sons, 1990
5. Tomlinson M. and Woodward J., “Pile Design and Construction Practice, 5th Ed.”, Taylor & Francis, Oxon, UK., 2007
6. Reese L.C., Isenhower W.M. and Wang S.-T., “Analysis and Design of Shallow and Deep Foundations”, John Wiley & Sons, Inc., Hoboken, USA., 2006.
7. Fleming K., Weltman A., Randolph M., and Elson K.,” Piling Engineering, 3rd Ed.”, Taylor & Francis, Oxon, UK., 2009

Journal References:

1) ASCE, journals in geotechnics and geomechanics
2) Canadian Geotechnical Journal

ENCV 605 014 / ENCV615003

Road Geometric Design

3 Credits

Learning Outcomes :

1. Students will be able to design simple highway geometric by considering economic, environmental issues, comfort and safety principles;
2. Be able to present the results of the design in a shop drawing according to the rules and regulations of engineering drawing.

Competencies in curriculum : WA 1 (engineering knowledge), WA2 (problem analysis), WA3 (design), WA10 (communication skill)

Syllabus : Introduction to Indonesia's norms, standards, codes and manuals for geometric design; Highway classification and functions; Design criteria and control: vehicles, drives, capacity, safety, environmental and economic factors; Design elements: sight distance, horizontal and vertical alignment; Cut and fill analysis; Elements of road cross section: right of way, lanes, curb, median, pedestrian and bicycle facilities; Drainage design for road; Stacking; Road lighting; Project work: A complete set of road geometric design and other complementary road structures.

Prerequisites : -

Text Books References :

1. J.G. Schoon (1993): Geometric Design Project for Highway, ASCE
2. Direktorat Jendral Bina Marga (1997): *Standar Perencanaan Geometrik Jalan Luar Kota*
3. Direktorat Jendral Bina Marga (1990): *Petunjuk Desain Drainase Permukaan Jalan*
4. Sudarsono DU, *Konstruksi Jalan Raya*, Penerbit PU
5. Guide for Design of Pavement Structures, AASHTO, 1986
6. *Standar Perencanaan Tebal Perkerasan Lentur*, Bina Marga, Penerbit Departemen PU, 1983
7. AASHTO Maintenance Manual, AASHTO 1987
8. Krebs RD, Walker Richard D, Highway Material, McGraw-Hill, 1974

ENCV 605 016 /ENCV615004

Water Engineering 1

3 Credits

Learning Outcomes :

1. Students will be able to set the dimension of a channel, culverts, spillway and storage of reservoir/retention pond, in a catchment area with an area not exceeding 50 Km2, based on topographical map with 1:25.000 scale, rain data at the rain station in and/or around the catchment area, domestic water needs survey result and social-economy data in the related district. (C4);
2. Be able to self-organize when working independently or in a group, hence the students can demonstrate the ability to master the course in the form of systematic written documents and an effective and efficient oral presentation (A4).

Competencies in curriculum : WA 1 (engineering knowledge), WA2 (problem analysis), WA3 (design), WA9, (team work) and WA10 (communication skill)

Syllabus : Determining the dimension of a channel, culverts, and reservoir/retention pond spillway based on the calculation of planned flood debit and open channel hydraulics, and determining the dimension of reservoir/retention pond based on water balance calculation. The learning method consists of introductory lecture, individual/group exercises in and out of the class, as well as presentation and writing paper as a group final project. The final project consists of a task to design channel, culvert, spillway and storage of reservoir/retention pond, in a catchment area with an area not exceeding 50 Km2, based on topographical map with 1:25.000 scale, rain data at the rain station in and/or around the catchment area, domestic water needs survey result and social-economy data in the related district/city.

Prerequisites : Hydraulics

Text Books References:

1. Bedient, Philip B. and Huber, Wayne C., 1992. Hydrology and Floodplain Analysis. Second

Edition. Addison-Wesley Publishing Company, USA.
2. Chow, Ven Te, 1959. Open-Channel Hydraulics. International Student Edition. McGraw-Hill Kogakusha, Ltd., Tokyo.
3. Chow, Ven Te, Maidment, David R. and Mays, Larry W., 1988. Applied Hydrology. McGraw-Hill Book Company, Singapore.
4. Dewberry, Sidney O. and Rauenzahn, Lisa N., 2008. Land Development Handbook: Planning, Engineering, And Surveying / Dewberry. Third edition. McGraw-Hill, USA. E-Book
5. Mays, Larry W., 1996. Water Resources Handbook. McGraw-Hill, USA.
6. Wanielista, M., Kersten, R. and Eaglin, R., 1997. Hydrology: Water Quantity and Quality Control. Second Edition. John Wiley & Sons, Inc., Canada.
7. Internet:
8. http://www.powershow.com/view1/10412d-ZDc1Z/Watershed_Delineation_powerpoint_ppt_presentation#5
9. Maine Stream Team Program of the Maine Department of Environmental Protection Stream, 2009. Survey Manual. A CITIZEN'S GUIDE to Basic Watershed, Habitat, and Geomorphology Surveys in Stream and River Watersheds — Volume I. http://www.geo.brown.edu/research/Hydrology/FTP_site_5099-05/Maine_water_survey-manual_appendix.pdf
10. The USDA Natural Resources Conservation Service. How to Read a Topographic Map and Delineate a Watershed. http://www.geo.brown.edu/research/Hydrology/FTP_site_5099-05/Delineate_watersheds_NH_NRCS.pdf

ENCV 608 001 / ENCV615005

Ethics and Legal Aspect of Construction Contract

2 Credits

Learning Outcomes :

1. Students will be able to explain ethics and morality in civil engineering profession and able to apply the knowledge in analyzing the impact when ethics is not applied;
2. Be able to explain the legal aspect and contracts in a construction project.

Competencies in curriculum : WA6 (engineer in society), WA8 (ethics)

Syllabus : Ethics and morals definition; Ethics theory; Work Ethics; Construction business ethics; Ethics towards environment; Law and regulation in construction works; Legal aspect of the dispute in construction works; Construction contracts

Prerequisites : Construction Management

Text Books References:

1. Mike W. Martin & Roland Schinzinger, Ethics in Engineering, McGraw Hill, 2005
2. Chow Kok Fong, Law and Practice of Construction Contracts, Sweet & Maxwell Asia, 2012
3. Nazarkhan Yasin, Kontrak Konstruksi di Indonesia, Gramedia Pustaka Utama, 2014

ENCV 605 012 / ENCV616001

Concrete Structure 1

3 Credits

Learning Outcomes :

1. Students will be able to explain design concept of structures, load applied on structures, structural systems;
2. Be able to design structural members from reinforced concrete according to procedures and design standards including beams, T beams, one way and two-way plate, short column and shallow foundation;
3. Be able to describe design results in engineering drawing in accordance to the rules and regulations of engineering drawing.

Competencies in curriculum : WA2 (problem analysis), WA3 (design), WA10 (communication skill)

Syllabus : Introduction to structural system analysis and design; structural systems: purposes, design step; LRFD, reduction factor and allowable stress; loads and loading: Load forms, load types; location of loads, load distribution, load factor and load combination; basic concept of reinforced concrete; Steel and concrete stress-strain properties; Concrete compressive strength characteristic; Concrete compressive strength evolution; Ultimate strength concept, Whitney tensile block simplification, impartial collapse; Reinforcement analysis of single and double reinforcement on a regular beam; analysis of reinforcement for a T-beam section due to internal flexural moment forces; analysis of shear reinforcement for beam and torque reinforcement; analysis of one-way plate reinforcement, two-way plate with method coefficient method, analysis for short column reinforcement; foundation types and local shallow foundation designs with its drawing; able to calculate the deflection of a reinforced concrete structure.

Prerequisites : Construction Drawing, Building Construction, Solid Mechanics and Material Properties

Text Books References :

1. *Persyaratan Beton Struktural Untuk Bangunan Gedung*, SNI 2847 : 2013
2. *Beban Minimum Untuk Perancangan Bangunan Gedung Dan Struktur Lain*, SNI 1727 : 2013
3. MacGregor, J.G., Reinforced Concrete: Mechanics and design, 6th edition, Pearson, 2012
4. Wahyudi, Syahril A.Rahim, *Struktur Beton Bertulang*, Penerbit Gramedia, 1997

ENCV 606 003 / ENCV616002

Pavement Design

3 Credits

Learning Outcomes :

1. Students will be able to create a pavement design by recognizing the type of pavement and pavement damage with the ways of handling it, road pavement structure with mixture of asphalt concrete and cement concrete with tests in laboratory;
2. Be able to use HDM (highway design manual) software as a tool in the designing process.

Competencies in curriculum : WA 1 (engineering knowledge), WA2 (problem analysis), WA3 (design) and WA5 (modern tool usage)

Syllabus : Introduction to the history and development of highway design technology; Highway construction Norm, Standards, Rules and Manual; Type of pavement construction, Function of each layer of pavement; Basic soil road stabilization, type of material and test method as well as its use; Road pavement material test and quality test method; Mix Design and Mix test plan, paired with test activity in the laboratories; Introduction to asphalt mixing plant (AMP) – Types of and operating procedures; Design criteria and several analytical and empirical design method; Flexible pavement thickness design using AASHTO methods and component analysis (Bina Marga), staged construction and recoating construction; Rigid pavement design, joints method; Highway maintenance strategy, Type of road damages and how to detect it, as well as on how to repair it.

Prerequisites : Material Properties

Text Books References :

1. Direktorat Jenderal Bina MArga, (2013), *Manual Desain Perkerasan Jalan no 02/M/BM/2013,* Kementerian Pekerjaan Umum.
2. Huang, Y., 2004. Pavement Analysis and Design 2nd ed., Prentice-Hall, Inc.
3. *Petunjuk Desain Drainase Permukaan Jalan* (1990) Direktorat Jendral Bina Marga
4. AASHTO, 2007. Maintenance Manual for Roadways and Bridges. 4th Ed., American Association of State and Highway Transportation Officials

ENCV 606 004 / ENCV616003

Water Engineering 2

3 Credits

Learning Outcomes :

1. Students will be able to evaluate the implication of changes in spatial hypothetic of Case-DTA, to the planned flood debit value and the dimension of a related water infrastructure, by using hydrology model of WinTR-20 (C5);
2. Be able to self-organize when work independently or in a group, so the students can demonstrate the ability to master the course in the form of systematic written documents and an effective and efficient oral presentation (A4);
3. Be able to operate ArcGIS geospatial model to prepare data for hydrology model WinTR-20 (P3).

Competencies in curriculum : WA2 (problem analysis), WA3 (design), WA5 (modern tool usage), WA6 (engineer in society), WA7 (environment & sustainability), WA9, (team work) and WA10 (communication skill)

Syllabus : Using hydrology model assisted with geospatial model to evaluate the impact of spatial changes on a water catchment area with area not exceeding 50 Km^2, and present the result in a form of a systematically written paper and effective oral presentation. The learning method consists of introductory lecture, individual/group exercises in and out of the class, as well as presentation and writing paper as a group final project. The final project consists of a task to use the ArcGIS geospatial model to prepare hydrological model input data for WinTR-20 that used to simulate the connection between rain and flow of water influenced by the changes of the spatial changes on a water catchment area. The Evaluation is focused on the impact of the changes on water catchment area towards the amount of planned flooding debit value which will impact the dimension of related water structure.

Prerequisites : Water Engineering 1

Text Books References:

1. John E. Gribbin, 2014, Introduction to Hydraulics and Hydrology with Applications for Storm Water Management, Fourth Edition
2. Bedient, Philip B. and Huber, Wayne C., 1992. Hydrology and Floodplain Analysis. Second Edition. Addison-Wesley Publishing Company, USA.
3. Chow, Ven Te, 1959. Open-Channel Hydraulics. International Student Edition. McGraw-Hill Kogakusha, Ltd., Tokyo.
4. Chow, Ven Te, Maidment, David R. and Mays, Larry W., 1988. Applied Hydrology. McGraw-Hill Book Company, Singapore.
5. Dewberry, Sidney O. and Rauenzahn, Lisa N., 2008. Land Development Handbook: Planning, Engineering, And Surveying / Dewberry. Third edition. McGraw-Hill, USA. E-Book
6. Mays, Larry W., 1996. Water Resources Handbook. McGraw-Hill, USA.
7. Wanielista, M., Kersten, R. and Eaglin, R., 1997. Hydrology: Water Quantity and Quality Control. Second Edition. John Wiley & Sons, Inc., Canada.
8. http://www.powershow.com/view1/10412d-ZDc1Z/Watershed_Delineation_powerpoint_ppt_presentation#5
9. Maine Stream Team Program of the Maine Department of Environmental Protection Stream, 2009. Survey Manual. A CITIZEN'S GUIDE to Basic Watershed, Habitat, and Geomorphology Surveys in Stream and River Watersheds — Volume I. http://www.geo.brown.edu/research/Hydrology/FTP_site_5099-05/Maine_water_survey-manual_appendix.pdf
10. The USDA Natural Resources Conservation Service. How to Read a Topographic Map and Delineate a Watershed. http://www.geo.brown.edu/research/Hydrology/FTP_site_5099-05/Delineate_watersheds_NH_NRCS.pdf

ENCV 606 005 / ENCV616004

Construction Management

2 Credits

Learning Outcomes :

1. Students will be able to apply process and concept of construction management in analyzing the step of planning, executing and handover stage of a construction project;
2. Be able to apply process and concept of construction management in planning and executing project by considering cost, time and quality aspect of the project;
3. Be able to explain administration of contracts related to a construction project;
4. Be able to use MS Project software as a tool in project planning.

Competencies in curriculum : WA5 (modern tool usage), WA11 (project management & finance)

Syllabus : Construction project knowledge including: Project Planning; Bidding documents preparation; Contract administration; Construction planning; Construction execution methods; Monitoring and Controlling; Material Management; Quality Management; Project Cost Management; Time Management; Safety, Health and Environment; Resource and Stakeholder Management.

Prerequisites :

- Pass these following courses: Construction Drawing; Building Construction; Material Properties
- This course is taken in conjunction with Methods and Equipment Construction Course

Text Books References :

1. Kerzner, Harold, Project Management, John Wiley & Sons, Inc., 2006
2. Project Management Institute, A Guide to Project Management Body of Knowledge, 2013
3. European Construction Institute, Total Project Management of Construction Safety, Health and Environment, Thomas Telford, London,1995
4. Clough, R. H., Sears, G. A. and Sears, S. K., Construction Contracting, 7th ed., John Wiley & Sons Inc., New York, 2005
5. Holroyd, T. M., Site Management for Engineers, Thomas Telford, London, 1999
6. Michael T. Callahan, Daniel G. Quakenbush, and James E. Rowing, Construction Planning and Scheduling, McGraw-Hill Inc., New York, 1992.
7. Gould, F. E. Managing the Construction Process (Estimating, Scheduling and Project Control)., Prentice Hall., New Jersey, 1997
8. Halpin, D., W., Construction Management. USA, John Wiley and Sons, Inc., New York, 1998
9. Hendrickson, C., Project Management for Construction. Fundamental Concepts for Owners, Engineer, Architects, and Builders., Prentice Hall, Singapore, 2008
10. Barrie, D. and Paulson B., Professional Construction Management, McGraw Hill, New York, 1992

ENCV 606 006 / ENCV616005

Construction Methods and Equipment

2 Credits

Learning Outcomes :

1. Students will be able to calculate the capacity and cost of a heavy construction equipment, able to analyze the character, type and volume of the works;
2. Be able to calculate and plan an execution process of soil displacement using heavy construction equipment by considering the principal of construction management in calculating the cost aspect;
3. Be able to work together in a team.

Competencies in curriculum : WA3 (design), WA9, (team work) and WA11 (Project management & finance)

Syllabus : Definition of mechanical earth moving, characteristic, type of soil and soil volume, operation of heavy equipment, capacity and production cost of heavy equipment, calculate work volume, determine the equipment needs, designing to combining equipment for optimization times and cost; Calculate production of heavy equipment, the way to work of each heavy equipment, the way to planning project. Several ways to calculate volume of cut and fill, construction method, calculation of the work schedule and related cost.

Prerequisites : Surveying and Basic Soil Mechanics

Text Books References :

1. Imam Sugoto. 1980. *Mempersiapkan Lapisan Dasar Konstruksi Jilid 1.* Jakarta: Departemen Pekerjaan Umum.
2. Imam Sugoto. 1980. *Mempersiapkan Lapisan Dasar Konstruksi Jilid 2.* Jakarta: Departemen Pekerjaan Umum

ENCV 607 001 / ENCV617001
Capstone Project
3 Credits
Learning Outcomes : The students will be able to produce civil engineering building design with detailed engineering design, simulated as a work ready to be executed using basic civil engineering combined with economic analysis and tender documents complete with shop drawing.
Competencies in curriculum : WA2 (problem analysis), WA3 (design), WA5 (modern tool usage), WA6 (engineer in society), WA7 (environment & sustainability), WA8 (ethics), WA9 (team work) and WA10 (communication skill)
Syllabus : Identification of problems in accordance with the work terms of reference; Planning component negotiations associated with the scope of work and execution time; Formulation of the main and secondary civil engineering structural component as an analysis material; Arranging analysis report consist of design concept, calculating and execution methods, by applying rules, manuals and standards. ; Arranging civil engineering construction component specification according to the rules and technical specification, Calculation of unit price and bill of quantity, details of the overall cost of the job, and detail drawing for main components according to the standard and technical provisions.

Creating a Blue Print as a results of structure calculation in the form of a shop drawings that are ready to be executed by contractors.

Prerequisites : -
Text Books References :
1) SNI (*standar tata cara perhitungan struktur beton untuk bangunan gedung; standar tata cara perencanaan struktur baja untuk bangunan gedung; standar tata cara perencanaan ketahanan gempa bangunan gedung, dan standar yang dikeluarkan oleh Kementerian PU*)
2) ASTM (American Standard for Testing Material)
3) AISC (American Institute of Steel Construction*)*
4) The American Concrete Institute' (ACI)
5) ASCE 07-2010 – Minimum Design Load for Building and other structures
6) British Standards
7) Technical Standards for Port and Harbor in Japan
8) FAA (Federal Aviation Administration)

ENCV 600 001 / ENCV610001
Internship
3 Credits
Learning Outcomes :
1. Students will be able to observe the application of theoretical civil engineering knowledge in an execution process of a construction project;
2. Be able to observe the application of professional ethics during the execution of a construction project;
3. Be able to apply a part of engineering economics principal and construction management in analyzing the execution of a construction projects;
4. Be able to identify problems that emerge during the execution of the construction project and solution decision process, able to analyze solution options according to the existing theory and able to criticize if there is an incompatibility as well as able to give solution

that should be taken according to the existing theory;

5. Be able to read engineering drawing and see the similarities between the engineering drawing and the realization in the construction projects;
6. Be able to write field observation result in a form of an internship report and able to present it in front of the examiner team.

Competencies in curriculum : WA6 (engineer in society), WA7 (environment & sustainability), WA8 (ethics), (WA9, (team work), WA10 (communication skill) and WA11 (project management & finance)
Syllabus : Implement an internship in a construction project, field observation; interpret a construction drawing, writing an observation report, describing a technical work process, quality control, project management, project specification, engineering drawing and other aspect; problem solving on the fields, presenting an internship reports
Prerequisites :

1. Already pass 6th semesters and pass ≥ 75 credits according to the determined conditions applied by the Civil Engineering Department, Faculty of Engineering, Universitas Indonesia and/or the conditions from Faculty of Engineering, Universitas Indonesia
2. Registered and fill out IRS for internship special course, and expresses him/herself to the Internship Coordinator in the Department of Civil Engineering
3. Student choose a project and / or object of selected activities at the internship site and location that has been contracted previously
4. Students must complete and submit the registration form at the Secretariat of Civil Engineering Department

Text Books References : -

ENCV 600 002 / ENCV610002
Seminar
1 Credit
Learning Outcomes :

1. Students will be able to implement the civil engineering knowledge on formulating a problem in the field of civil engineering, conducting a literature studies and formulate a research hypothesis and methodology to solve the problem;
2. Be able to write a study proposal in a scientific writing using a proper Indonesian/English language and following the standard of seminar and undergraduate thesis format and present it to the examiner team;
3. Be able to work independently and complete the work within the time limit.

Competencies in curriculum : WA2 (problem analysis), WA3 (design), WA5 (modern tool usage), WA6 (engineer in society), WA7 (environment & sustainability), WA9, (team work) and WA10 (communication skill), WA12 (lifelong learning)
Syllabus : Developing problem description, Literature study, constructing research methodology, conducting an initial study, preparing and presenting a well-structured and well-written final report
Prerequisites : Passing 110 credits with GPA >=2.00 and without grade of E
Text Books References: -

ENCV 608 002 / ENCV 618 001
Entrepreneurship
2 Credits
Learning Outcomes : The students will be able to explain the comparison among wide types of civil engineering entrepreneurship characterized by innovation and independency which based on ethics as well as able to communicate it both visually and orally.
Competencies in curriculum : Ule (entrepreneurship), WA6 (engineer in society), WA9, (team work), and WA10 (communication skill)
Syllabus : Problems and needs from the various stakeholders in the field of civil engineering, General

options for entrepreneurship to solve civil engineering problems, Entrepreneurship definition, Businessman Action, Plan and Challenges; Action, Academics and observer challenge and plan, Canvas model Business Concept, General Company Profile, General customer profile, Cost and Turnover, Differences and similarities identification between BMC components, Advantages and disadvantages assessment from each of the BMC components, Various environmental engineering product and services, Definition of product value, Human Needs, Customer segments, Various customer profiles, Knowing the customer profile method, Knowing the customer profile, Differences and similarities identification between VPC components, Advantages and disadvantages assessment from each of the VPC components

Prerequisites : MPKT A, Introduction to Civil Engineering System

Text Books References: -

ENCV 600 003 / ENCV610003

Final Project

4 Credits

Learning Outcomes:

1. Students will be able to apply civil engineering knowledge to solve a complex civil engineering problem through a study that follows the research rules such as: Conducting a literature study, choosing the research methodology, analyze and interpret the data and draw a valid conclusion;
2. Be able to write the result of the research in a scientific writing using the correct Indonesian/English language and following the standard final project format;
3. Be able to present the study result to the examiner team;
4. Be able to work independently and complete the work within the time limit.

Competencies in curriculum : WA2 (problem analysis), WA3 (design), WA5 (modern tool usage), WA6 (engineer in society), WA7 (environment & sustainability), WA9, (team work) and WA10 (communication skill), WA12 (lifelong learning)

Syllabus : Problem formulation, Literature study, conducting research, data analysis, result interpretation, preparing a written report of the synthesis and present the study results

Prerequisites : Passing 110 credits with GPA >=2.00 and without grade of E

Text Books References: -

Elective Courses Syllabi

ENCV 607 002

Civil Engineering System

3 Credits

Learning Outcomes:

1. Students will be able to create basic design and proposal for alternative plans or solutions to the problems of civil engineering based on formulation of problems encountered with literature review and field surveys;
2. Students will be able to find the optimal solution for a simple problem in Civil Engineering with a systematic approach through the stages of problem solving techniques (engineering). (C4) /(A3).

Competencies in Curriculum: WA2 (problem analysis), WA9 (team work) and WA10 (communication skills)

Syllabus: The role and function of professional undergraduate Civil Engineering, Process for solving engineering problem, System approach, Systems characteristic in engineering problem, Understanding the characteristics of the problem, Statement of Needs, System hierarchy, Scope and limitation, Systems Analysis, Solutions approach, The role of modeling, Type of modelling,

Linear Graph modeling concept, Mathematical modeling concept, Process optimization, Motivation and freedom to choose, Purpose, Objectives and Criteria for optimization, Optimization Methods, Feasibility studies, Planning horizon. Time Value of Money, method of Economic Analysis, Financial Analysis, Element of decision problems, Decision models, Basic Probability, Decision Analysis by Value Utilities.

Prerequisites: Introduction to Civil Engineering System

Text Book References:

1. Dale D Meredith, Kam W Wong, Ronald W Woodhead, Robert H Worthman (1975), Design & Planning of Engineering Systems, Prentice Hall
2. C Jotin Khisty, Jamshid Mohammadi, (2001), Fundamental of System Engineering with Economics, Probability, and Statistics, Prentice Hall
3. M David Burghardt, (1999), Introduction to Engineering Design and Problem Solving, McGraw Hills.

ENCV 617 003

Sustainable Build Environment

3 Credits

Learning Outcomes: Students will be able to apply the basic principles of natural and manmade environmental system and the meaning of sustainable development in engineering activities to be able to design civil engineering buildings with the concept of green building and environmental friendly.

Competencies in Curriculum: WA2 (problem analysis), WA7 (environment and sustainability)

Syllabus: Basic Principles of natural environmental systems and life cycle (cycle of matter and energy, hydrological cycle, food chain); Basic Principles of manmade environment and the impact on the natural environment system and life cycle (social system, ecosystem, build environment; niche concept, carrying capacity and resilience); Construction and infrastructure sector impact on the natural environment; 21 Agenda and Environmental Based Construction (Global agenda / national / local, social-economic, and the environment pillar in construction); The concept of Civil Engineering environment (zero waste, efficiency, waste management hierarchy, waste-pollution and carrying capacity of the environment, sustainable consumption and production); The concept of Green Building (LEED); Criteria for Green Building; Sustainable sites (EIA); Water efficiency; Energy and atmosphere; Materials and natural resources; Innovation and design process; Strategy Conception for Green Building; Examples of Green Building concept in Indonesia and other States; Laws and other regulations in Environmental Affairs, ISO 14001.

Prerequisites: -

Text Book References: -

ENCV 617 004

Concrete Structure 2

3 Credits

Learning Outcomes:

1. Students will be able to design structural component: columns, portals, with the ultimate strength method due to force from latitude bending moment, normal moment, torque and its combination in accordance to the aspect of service life according to SNI 2847: 2013; able to design a two-way slab without beams, short consoles, as well as understand the application of strut and tie models;
2. Students will be expected to plan a simple pre-stressed concrete structures, according to SNI 2847: 2013.

Competencies in Curriculum: WA2 (problem analysis), WA3 (design), WA10 (communication skills)

Syllabus: Analysis of shear and torsion; Meaning of bond stress, Termination/cutting of reinforcement steel and length of reinforcement distribution; Serviceability: Analysis of deflection on reinforced

concrete structures; Analysis of crack width; Analysis of reinforcement in reinforced concrete slender columns; Biaxial bending; Analysis of P-d effect; Analysis of shear reinforcement in columns; Planning of continuous foundation and deep foundations in reinforced concrete; Floor system analysis: two-way slab with and without beam, direct design and the equivalent frame; Understanding the basis for planning and application of reinforced concrete portals; Examination of the relationship between the beams and columns; Corbel and placement; Analysis of Strut and Tie modeling; The basic concept of pre-stressed concrete structures, All kinds of pre-stressed concrete structures, Stage for pre-stress force, Material characteristics, Pre-stressed and anchorage system, Loss of pre-stressed force; Cross-section analysis with elastic method and strength limits for monoliths and composites cross section; Planning of pre-stressed cable cross section due to bending; Analysis of shear stress, Deflection analysis on pre-stressed concrete structures.

Prerequisites: Concrete Structure 1

Text Book References:

1. *Persyaratan Beton Struktural Untuk Bangunan Gedung*, SNI 2847: 2013
2. *Beban Minimum Untuk Perancangan Bangunan Gedung Dan Struktur Lain*, SNI 1727: 2013
3. MacGregor, J.G., Reinforced Concrete: Mechanics and Design, 6th. Edition, Pearson, 2012
4. Nawi, E.G. Reinforced Concrete: A Fundamental Approach, 6th. edition, Pearson, 2009
5. Wang C.K. and Salmon C.G., Reinforced Concrete Design, Harper Collins, 1992

Lin, T.Y & Burns, N.H., Design of Pre-Stressed Concrete Structures, Third Edition, John Wiley & Sons, 1981

ENCV 617 005

River Engineering

3 Credits

Learning Outcomes: Students will be able to predict and describe (C5) systematically both in oral and in writing, the influence of interactions among various factors of hydrological, hydraulic and river morphology to the behavior of river and if there are problems may propose solutions (A5) with taking into account the technical and environmental aspects.

Competencies in Curriculum: WA2 (problem analysis)

Syllabus: Knowledge on how the flow of the river is formed from the river hydrology point of view, River hydraulics and morphology of the river, as well as what problems are caused by changes in river flow due to the nature of the flow and sediment transport, so as too able to predict, analyze and criticize the influence of the local system flow in relation to construction of buildings along the river and river controlling structure.

Prerequisites: Water Engineering 1

Text Book References:

1. Jansen, P.Ph. · Van Bendegom, L. · Van den Berg, J. · De Vries, M. · Zanen, A., 1994, Principles of river engineering: the non-tidal alluvial river, Delftse Uitgevers Maatschappij, Netherland
2. Prins A., 1979. Rivers. Lecture Notes (Unpublished). International Institute for Hydraulics Engineering, Delft, The Netherland
3. Chow, Ven. Te et.al., 1988: Applied Hydrology. McGraw-Hill Book Company
4. Chow, Ven. Te et.al., 1959. Open-Channel Hydraulics. McGraw-Hill Kogakusha.
5. Henderson, F.M., 1966: Open Channel Flow. MacMillan, New York
6. French R.H., 1985: Open-Channel Hydraulics. McGraw-Hill Book Company
7. Bedient P. B. and Huber W.C., 1992: Hydrology and Floodplain Analysis. 2nd ed. Ch.3-5. Addison-Wesley Publishing Company, USA
8. Doelhomid Srimoerni W.S., 1977: Sungai. Diktat Kuliah (tidak dipublikasikan). IMS FTUI, Jakarta
9. R. J. Garde, 2006, River Morphology, New Age International (P) Limited, Publisher

ENCV 618 002
Steel Structure 2
3 Credits
Learning Outcomes:

1. Students will be able to calculate the connection strength in steel structure and proportioning the connection using plastic and elastic method;
2. Be able to calculate and proportioning girder plate structure, portals and composite structure in a simple multi-stories building using elastic and plastic method.

Competencies in Curriculum: WA2 (problem analysis), WA3 (design)
Syllabus: Calculation of continuous beam by plastic method; Beam-columns; Theory and Analysis of girder plate on building; Advance connection techniques; The design of the portal and gable frame; Structural Analysis; Steel-steel and steel-concrete composite structures in simple multi-stories buildings; Concrete pre-stressed steel composite structure and implementation of Perplex systems in buildings; Cold form section / Light Gage Member.
Prerequisites: Steel Structure 1
Text Book References:

1. Spesifikasi untuk Bangunan Gedung Baja Struktural; SNI 1729: 2015
2. Segui, William T., Steel Design,5th edition, 2013
3. Manual of Steel Construction, Load Resistance Factor Design, Structural Members, Specification & Codes Volume 1
4. Manual of Steel Construction, Load Resistance Factor Design, Structural Members, Specification & Codes Volume 2
5. Structural Steel Design, Prentice Hall, 2012

ENCV 618 003
Construction Methods in Geotechnics
3 Credits
Learning Outcomes: Students will be able to design construction method of a geotechnical construction component with considering the economic, environmental, social, ethical, health, safety, constructability, and sustainability factor.
Competencies in Curriculum: WA2 (problem analysis), WA3 (design), WA7 (environment and sustainability)
Syllabus: Construction method of deep foundation and retaining wall, and factors that influence the method of selection, Method of testing the integrity of deep foundations; Method of basement construction, Excavation strengthening, dewatering, and factors that influence the selection of method; Construction method of embankment on soft ground, PVD, Preloading, Vacuum preloading, and the factors that influence the selection of method; Geo-synthetic usage in geotechnical construction.
Prerequisites: Basic Soil Mechanics, Soil Mechanics, Foundation Engineering
Text Book References:

1. Chai, J. and Carter, J.P. (2011). Deformation Analysis in Soft Ground Improvement, Springer.
2. Hertlein, B.H. and Davis, A.G. (2006). Nondestructive Testing of Deep Foundations, John Wiley.
3. Koerner, R.M. (2005). Designing with Geosynthetics, 5th Ed., Prentice Hall.
4. Ou, C.-Y. (2006). Deep Excavation: Theory and Practice, Taylor and Francis, London.
5. Tomlinson, M. J. and Woodward, J. (2008). Pile Design and Construction Practice, 5th ed., Taylor and Francis.

ENCV 618 004

Stormwater Management

3 Credits

Learning Outcomes:

1. Students will be able to assess the effectiveness of the management of rain in an existing Region Case (RC) which is a developed region in urban areas, based on the comparison of the evaluation results from the performance of existing drainage systems in existing RC, and performance evaluation of the proposed rain management model by using Low Impact Development (LID) and Water Balance Model (WBM), using a hydrological model WinTR-55 aided with of ArcGIS geospatial model (C5);
2. Be able to organize every individual to work independently and in groups, so as to demonstrate the mastery of the course competencies in the form of a systematic written document and effective and efficient oral presentations (A4).

Competencies in Curriculum: WA2 (problem analysis), WA3 (design)

Syllabus: Utilizing a deterministic hydrology model aided with geospatial model to evaluate the performance of drainage systems that exist in a developed region in urban areas, and making proposals to the management system of rain by using Low Impact Development (LID) models and Water Balance Model (WBM), as well as evaluating the performance of the proposed design by utilizing the same hydrological and geospatial models. The result is presented in a systematic written document and an effective and efficient oral presentations. Learning method consists of introductory lectures, group discussions inside and outside the classroom, written/oral exam, oral presentation and final papers.

Prerequisites: Water Engineering 1

Text Book References:

1. Bedient, Philip B. and Huber, Wayne C., 1992. Hydrology and Floodplain Analysis. Second Edition. Addison-Wesley Publishing Company, USA.
2. Chow, Ven Te, 1959. Open-Channel Hydraulics. International Student Edition. McGraw-Hill Kogakusha, Ltd., Tokyo.
3. Chow, Ven Te, Maidment, David R. and Mays, Larry W., 1988. Applied Hydrology. McGraw-Hill Book Company, Singapore.
4. Dewberry, Sidney O. and Rauenzahn, Lisa N., 2008. Land Development Handbook: Planning, Engineering, And Surveying / Dewberry. Third edition. McGraw-Hill, USA. E-Book
5. The Douglas College Institute of Urban Ecology, British Columbia. The Water Balance Model: A Tool for Designing with Nature. Douglas College Rain Conference. www.waterbalance.ca
6. Kim A. Stephens, Patrick Graham and David Reid, 2002. Storm water Planning: A Guidebook for British Columbia. Ministry of Water, Land and Air Protection. British Columbia, Canada.
7. Low Impact Development (LID) Urban Design Tools. http://www.lid-stormwater.net/
8. NRCS and ARS, 2003. WinTR-55: User Guide.
9. NRCS and ARS. WinTR-55: Tutorial.
10. Panduan Pelatihan ArcGIS.

ENEV605001

Urban Planning and Sanitation

3 Credits

Learning Outcomes:

1. Students will be able to explain the role of civil engineer in setting up the infrastructure needed in an urban area and be able to apply that knowledge in the process of planning, monitoring and implementation of the regional arrangement;

2. Be able to describe the components of an urban sanitation techniques and applying that knowledge in the planning, monitoring and implementation so as to create environmentally sustainable region.

Competencies in Curriculum: WA2 (problem analysis), WA7 (environment and sustainability)
Syllabus: Definition and function of urban planning, Primary factor in urban planning, Population aspect in urban planning, Social facilities and forms of urban development, Land use, Water management and its relationship with land use. Controlling transmission of infectious and non-infectious diseases in an area, Planning and analyzing impacts of environmental engineering, Clean water supply, Waste water treatment and disposal, Solid waste management, Noise control, Air pollution control.
Prerequisites: -
Text Book References:

1. Hamid Shirvani, Urban Design Process, New York, Van Nostrand Reinhold Co, 1987
2. Ali Madanipour, Design of Urban Space: An Inquiry into a Socio-Spatial Process, John Wiley and Sons, 1996
3. Gideon S. Golany, Ethics and Urban Design: Culture, Form and Environment, Wiley, 1995
4. Environmental Engineering and Sanitation: Joseph A Salvato: John Willey & Son, Inc., Canada
5. Environmental Science and Engineering, J. Glynn Henry and Gary W. Heinke, Prentice Hall International Inc.

ENEV606004
Environmental Impact Analysis and ISO
3 Credits
Learning Outcomes: Students will be able to apply the method of EIA and environmental audits as inputs for safeguards against human and natural resources.
Competencies in Curriculum: WA2 (problem analysis), WA7 (environment and sustainability)
Syllabus: The meaning of EIA, EIA process and benefits, rules, regulations and management of EIA, Environmental settings, Estimation of environmental impacts, Environmental impact to the physical, chemical, biological, socio-economic, and socio-cultural sector. EIA method, Method and techniques of identification, prediction, evaluation and interpretation of the EIA, Environmental Monitoring Plan, Environmental Management Plan, Environmental Audit and Environmental Management System.
Prerequisites: -
Text Book References:

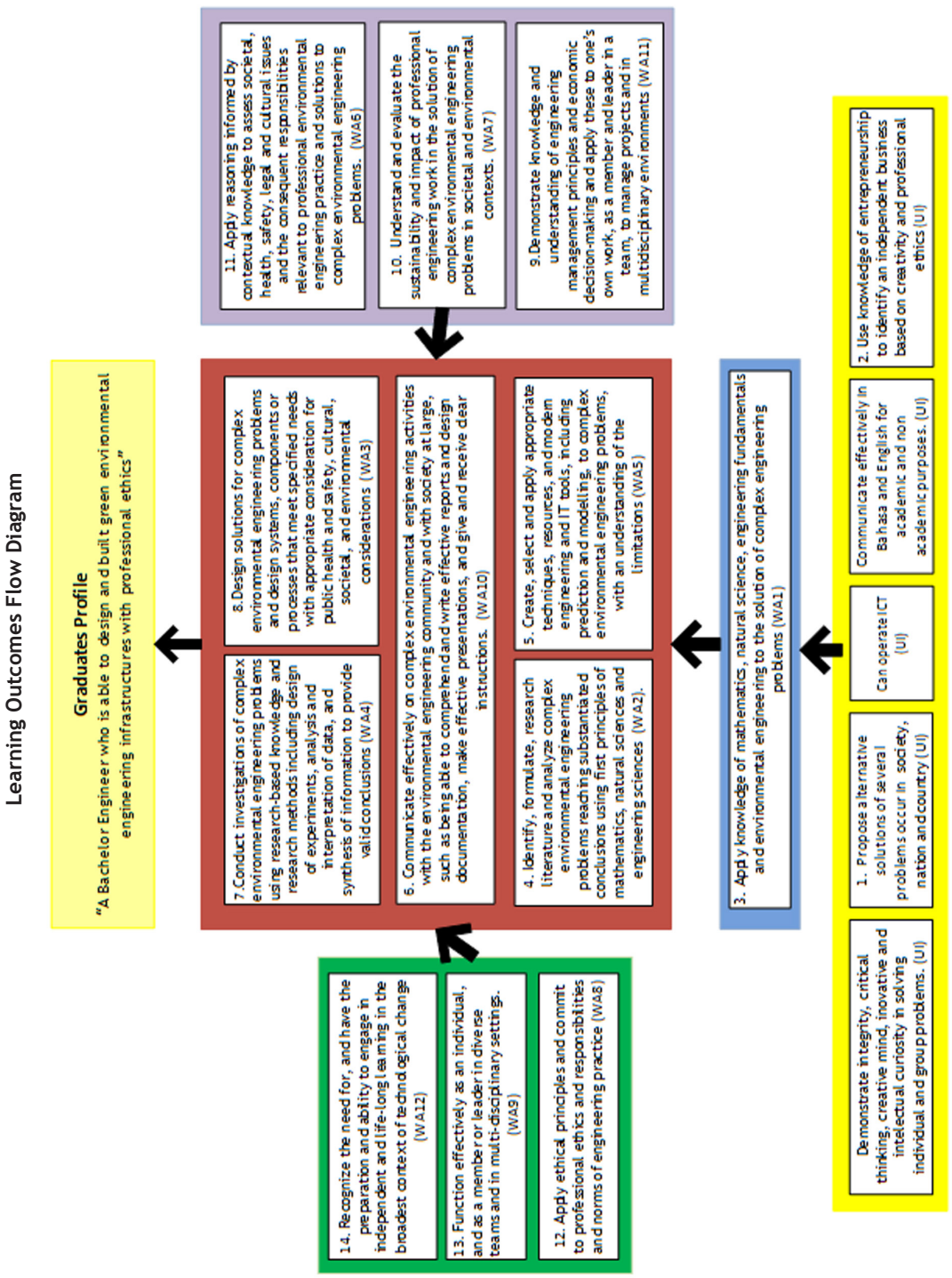
1. Canter, L.W., Environmental Impact Assessment, New York, McGraw-Hill, 1996.
2. Kuhre W. Lee., *Sistem Manajemen Lingkungan*, Jakarta, Prenhallindo, 1996.
3. "ISO 14000 *Sistem Manajemen Lingkungan*" by Brian Rotherry (1996)
4. Soemarwoto, Otto, *Analisis Mengenai Dampak Lingkungan*, Yogyakarta, Gadjah Mada University Press, 2007

4.2. UNDERGRADUATE PROGRAM IN ENVIRONMENTAL ENGINEERING

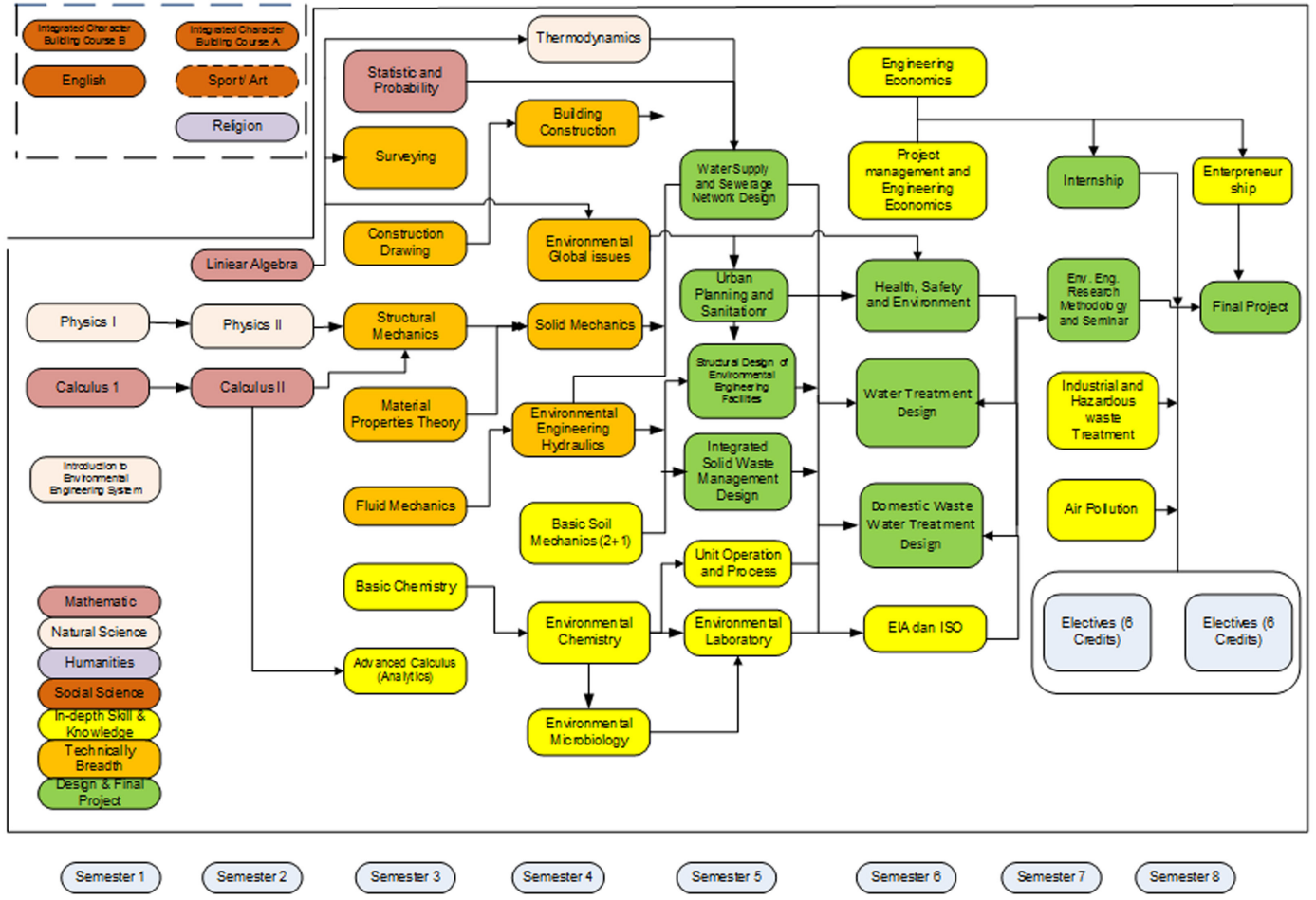
Program Specification

1.	**Awarding Institution**	Universitas Indonesia	
2.	**Teaching Institution**	Universitas Indonesia	
3.	**Programme Tittle**	Undergraduate Program in Environmental Engineering	
4.	**Class**	Regular	
5.	**Final Award**	Sarjana Teknik (S.T)	
6.	**Accreditation / Recognition**	BAN-PT: A Accredited AUN-QA	
7.	**Language(s) of Instruction**	Bahasa Indonesia and English	
8.	**Study Scheme (Full Time / Part Time)**	Full Time	
9.	**Entry Requirements**	High school /equivalent, or D3 / Polytechnique / equivalent, AND pass the entrance exam.	
10.	**Study Duration**	Designed for 4 years	
	Type of Semester	Number of Semester	Number of weeks / semester
	Regular	8	17
	Short (optional)	3	8
11.	**Graduate Profiles:** "A bachelor engineering who is able to design system and infrastructure of environmental engineering in order to improve environmental quality and to protect humans from environmental degradation"		
12.	**Expected Learning Outcomes:** 1. Apply knowledge of mathematics, natural science, engineering fundamentals and environmental engineering to the solution of complex engineering problems. 2. Identify, formulate, research literature and analyze complex environmental engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences 3. Design solutions for complex environmental engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations 4. Conduct investigations of complex environmental engineering problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions. 5. Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex environmental engineering problems, with an understanding of the limitations. 6. Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional environmental engineering practice and solutions to complex environmental engineering problems. 7. Understand and evaluate the sustainability and impact of professional engineering work in the solution of complex environmental engineering problems in societal and environmental contexts. 8. Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. 9. Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings. 10. Communicate effectively on complex environmental engineering activities with the environmental engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.		

12.	11. Demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. 12. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. 13. Propose alternative solutions of several problems occur in society, nation and country 14. Use knowledge of entrepreneurship to identify an independent business based on creativity and professional ethics		
13	**Classification of Subjects**		
No.	**Classification**	**Credit Hours (SKS)**	**Percentage**
i	**University General Subjects**	18	13 %
ii	**Basic Engineering Subjects**	27	19 %
iii	**Core Subjects**	79	55 %
iv	**Elective Subjects**	12	8 %
v	**Internship, Seminar, Undergraduate Thesis, Project**	8	6 %
	Total	144	100 %
14.	**Total Credit Hours to Graduate**		144 SKS


Learning Outcomes Flow Diagram
Graduates Profile
"A Bachelor Engineer who is able to design and built green environmental engineering infrastructures with professional ethics"
7.Conduct investigations of complex environmental engineering problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions (WA4)
8.Design solutions for complex environmental engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations (WA3)
6. Communicate effectively on complex environmental engineering activities with the environmental engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. (WA10)
4. Identify, formulate, research literature and analyze complex environmental engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences (WA2).
5. Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex environmental engineering problems, with an understanding of the limitations (WA5)
11. Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional environmental engineering practice and solutions to complex environmental engineering problems. (WA6)
10. Understand and evaluate the sustainability and impact of professional engineering work in the solution of complex environmental engineering problems in societal and environmental contexts. (WA7)
9.Demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments (WA11)
14. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change (WA12)
13. Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings. (WA9)
12. Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice (WA8)
3. Apply knowledge of mathematics, natural science, engineering fundamentals and environmental engineering to the solution of complex engineering problems (WA1)
Demonstrate integrity, critical thinking, creative mind, inovative and intelectual curiosity in solving individual and group problems. (UI)
1. Propose alternative solutions of several problems occur in society, nation and country (UI)
Can operate ICT (UI)
Communicate effectively in Bahasa and English for academic and non academic purposes. (UI)
2. Use knowledge of entrepreneurship to identify an independent business based on creativity and professional ethics (UI)

Flow Diagram of Subjects



COURSE STRUCTURE UNDERGRADUATE PROGRAM ENVIRONMENTAL ENGINEERING

Code	Subject	Credit
	1st Semester	
UIGE600002	Integrated Character Building B	6
UIGE600003	English	3
ENGE600001	Calculus 1	3
ENGE600005	Physics (Mechanics and Thermal)	3
ENGE600006	Physics (Mechanics and Thermal) Lab	1
ENEV601001	Intro to Environmental Engineering	3
	Sub Total	**19**
	2nd Semester	
UIGE600001	Integrated Character Building A	6
UIGE600020 - 48	Sport/Art	1
UIGE600010-15	Religion	2
ENGE600002	Calculus 2	3
ENGE600004	Linear Algebra	4
ENGE600007	Physics (Electricity, MWO)	3
ENGE600008	Physics (Electricity, MWO) Lab	1
	Sub Total	**20**
	3rd Semester	
ENGE600009	Basic Chemistry	2
ENGE600010	Statistic and Probability	2
ENCV 603 001	Advanced Calculus	3
ENCV 603 003	Construction Drawing	2
ENCV 603 004	Surveying	3
ENEV 603 001	Material Properties	2
ENEV 603 002	Structural Mechanics	3
ENEV 603 003	Fluid Mechanics	3
	Sub Total	**17**
	4th Semester	
ENCV 604 003	Building Construction	2
ENCV 604 005	Basic Soil Mechanics	3
ENEV 604 001	Solid Mechanics	3
ENEV 604 002	Environmental Eng. Hydraulics	3
ENEV 604 003	Environmental Chemistry	3
ENEV 604 004	Environmental Global issues	2
ENEV 604 005	Environmental Microbiology	2
ENEV 604 006	Thermodynamics	2
	Sub Total	**18**

	5th Semester	
ENEV 605 001	Urban Planning and Sanitation	3
ENEV 605 002	Structural Design of Env Facilities	3
ENEV 605 003	Sewerage Network Design	3
ENEV 605 004	Integrated Solid Waste Manag Design	3
ENEV 605 005	Unit Operation and Process	4
ENEV 605 006	Environmental Laboratory	3
	Sub Total	**19**
	6th Semester	
ENGE600011	Engineering Economics	3
ENGE600012	HSE Protection	2
ENEV 606 001	Project Management	3
ENEV 606 002	Water Treatment Design	3
ENEV 606 003	Domestic Waste Water Treatment Design	3
ENEV 606 004	EIA dan ISO	3
	Sub Total	**17**
	7th Semester	
ENEV 607 001	Industrial & Hazardous Waste Treatment	3
ENEV 607 002	Air Pollution	3
ENEV 600 001	Internship	3
ENEV 600 002	Research Methodology & Proposal	2
	Electives *)	3
	Electives *)	3
	Sub Total	**17**
	8th Semester	
ENEV 608 001	Enterpreneurship	2
ENEV 600 003	Final Project	4
	Electives *)	3
	Electives *)	3
	Sub Total	**12**

Resume

Wajib Universitas	18
Wajib Fakultas	27
Wajib Program Studi	87
Jumlah	132
Pilihan	12
Total Beban Studi	144

Electives

Code	Elective Even Semester	Credit
ENCV 801 501	Environmental Risk Management	3
ENCV 801 502	Tech of Solid Waste Treatment: Op & Design	3
ENCV 803 501	Urban water Quality Management	3
ENCV 803 502	Environmental Audit	3
ENCV803503	Advanced Environmental Chemistry	3
	Elective Odd Semester	
ENCV 802 501	Contaminating & Soil Remediation	3
ENCV 802 502	Adv. Waste Water Engineering	3
ENCV 802 503	Limbah Menjadi Energi	3
ENCV 802 504	Emission Control	3
ENCV 802 505	Life Cycle Analysis (LCA)	3
ENCV 802 506	Pollution Prevention	3
ENCV 802 507	Environmental System Dynamics	3

Syllabus of Undergraduate Program on Environmental Engineering
ENEV601001
Introduction to Environmental Engineering System
2 credits
Learning Outcomes: Students are expected to explicate (1) the concept of the environment, (2) natural resources and biodiversity, (3) the source of artificial nature, (4) the balance of nature and carrying capacity, (5) water, (6) liquid waste, (7) solid waste, (8) air pollution, (9) the urban planning in environmental engineering, (10) correlation of sanitation and public health, (11) regulations.
Syllabus: Understanding of ecology, ecosystems, natural resources, vegetation and tropical forests, ecosystem waters, dams, agricultural, land use management, climate change, element, energy, life, life cycle, the hydrologic cycle, water and pollution, management of water resources, water needs, water treatment facility and distribution network, the characteristics of liquid waste, domestic waste water treatment facilities and collecting ducts, solid waste and hazardous waste, air emissions, soil and water contamination by sewage, renewable and nonrenewable natural resources, regulations.
Prerequisites: -
Text Book References:

1. Kevin,T., Jonathan, P., Jeremy C. 2003. *Urban Sanitation: A Guide to Strategic Planning*. GHK International Ltd, London.
2. Gleynn Henry, J & Gary W. Heinke 2007. *Environmental Science & Engineering*, Prentice Hall, Inc, New Jersey 1996
3. Qasim S.R.,Motley E.M., Zhu G., Water Work Engineering : Planning, Design & Operation, Prentice Hall, 2000.
4. Cunningham W.P., Cunningham M. A, Environmental Science : A Global Concern, Mc Graw Hill , NY, 2008
5. Salvato, Joseph A. *Environmental Engineering & Sanitation,* John Wiley & Son Inc. Canada.

ENCV 603 001
Advanced Calculus
3 Credits
Learning Outcomes : Students will be able to derive and use the concept of: ordinary differential equation and calculus vector in order to solve its applied problems. (C2)
Competencies in Curriculum: *Prior knowledge* for WA1 (basic math)
Syllabus : Introduction to Differential Equations, Definitions and Terminology, Initial-Value Problems, Differential Equations as Mathematical Models, First-Order Differential Equations, Solution Curves without a Solution, Direction Fields, Autonomous First-Order Differential Equations, Separable Equations, Linear Equations, Exact Equations, Solution by Substitutions, A Numerical Method, Linear Models, Nonlinear Models, Modeling with Systems of First-Order Differential Equations.
Higher-Order Differential Equations, Theory of Linear Equations, Initial-Value and Boundary-Value Problems, Homogeneous Equations, Nonhomogeneous Equations, Reduction of Order, Homogeneous Linear Equations with Constant Coefficients, Undetermined Coefficients, Variation of Parameters, Cauchy-Euler Equations, Nonlinear Equations, Linear Models; Initial-Value Problems, Spring/Mass Systems: Free Undamped Motion, Spring/Mass Systems: Free Damped Motion, Spring/Mass Systems: Driven Motion, Series Circuit Analogue, Linear Models : Boundary-Value Problems, Green's Function (Initial-Value and Boundary-Value Problems), Nonlinear Models, Solving Systems of Linear Equations. Vector Functions, Motion

on a Curve, Curvature and Components of Acceleration, Partial Derivatives, Directional Derivative, Tangent Planes and Normal Lines, Curl and Divergence, Line Integrals, Independence of the Path, Double Integrals, Double Integrals in Polar Coordinates, Green's Theorem, Surface Integrals, Stokes' Theorem, Triple Integrals, Divergence Theorem, Change of Variables in Multiple Integrals.

Prerequisites : Calculus 1 and Calculus 2

Text Book References :

1. D.G Zill and W.S Wright, Advanced Engineering Mathematics, 5th ed., Jones & Barlett Learning, 2014
2. E. Kreyzig, Advanced Mathematical Engineering, John Wiley & Son, 5th ed., 2011

ENCV 603 003

Construction Drawing

2 Credits

Learning Outcomes :

1. Students will be able to explain engineering drawing symbols in Civil Engineering field and draw it manually or using a software (AutoCAD);
2. Be able to design a one-floor simple healthy house building;
3. Be able to draw the one-floor simple healthy house building according to rules and procedures of engineering drawing such as aperture drawing (plans and appearance) and section view; covering dimension/sizes; foundation drawing, structural beam and column drawing, trestlework drawing, electrical installation and plumbing.

Competencies in Curriculum: *Prior knowledge* for WA5 (*modern tool usage*) and achieving competency WA10 (communication skill)

Syllabus : introduction to Civil Engineering knowledge discipline scope and Civil Engineering building construction, introduction to engineering drawing, benefit and purpose of drawing in design process; introduction to drawing tools, drawing paper format, drawing head, standards, lettering, leader, and scale; geometric construction; pictorial projection; orthogonal projection; section view drawing; details of the building drawing, construction drawing of wooden and light steel rooftop; beam construction drawing, column and river stone foundation; electrical installation drawing and plumbing drawing

Prerequisites:

Text Book References:

1. Neufret, Ernst, *Data Arsitek Jilid 1 dan 2*, Penerbit Erlangga, Jakarta, 1989
2. Subarkah, Imam, *Konstruksi Bangunan Gedung*, Penerbit Idea Dharma, Bandung, 1988
3. Sugiharjo, R., *Gambar-Gambar Dasar Ilmu Bangunan*, Penerbit R. Sugihardjo
4. Giesecke, F. E., et al. (1997). Technical Drawing, Tenth Edition, Prentice Hall Publishing,

ENCV 603 004

Surveying (2+1)

3 Credits

Learning Outcomes :

1. Students will be able to use various measuring instruments to solve mapping problems and pegs in civil engineering and environmental engineering works, surveying and displaying the results in a form of drawing with integrating various measuring methods and able to read and draw the data from the surveying results done by someone else;
2. Be able to work in team.

Syllabus : Explanation of surveying concept in civil engineering and environmental engineering works; introduction to distance measuring equipment, angles and other measuring equipment usually used in mapping and pegging; Operating levelling equipment and Theodolite in order to take field's data and integrating the data into a map or transferring design coordinates into the field coordinates in civil engineering

and environmental engineering activities; carrying out field measuring with measuring methods of horizontal, vertical distance, and angle measurement; Error theory; planning of basic concept of mapping and pegging; calculation of area and volume; displaying the field measuring results in a corresponding map for the needs of civil engineering and environmental engineering

Prerequisites : Calculus 1, Calculus 2, and Construction Drawing

Text Book References :

1. Kavanagh, B. and Slattery, D., 2014. Surveying with Construction Applications 8th ed., Prentice-Hall, Inc.
2. Irvine, W., 2005. Surveying for Construction 8th ed., McGraw-Hill Higher Education.
3. Uren, J. and Prince, W., 2010. Surveying for Engineers 5th ed., Palgrave MacMillan.
4. Schofield, W. and Breach, M., 2007. Engineering Surveying 6th ed., CRC Press.

ENEV603001

Material Properties

2 credits

Learning Outcomes:

1. Understand the practical aspects and the fundamental importance of civil engineering materials comperhensively.
2. Understand and able to apply the practical aspects and the fundamental importance at the laboratory level of the material associated with stress and strain correlation, elasticity, behavior depends on the time, property damping, atomic structure, plasticity, yielding criteria, fatigue, ductility, and process corrosion.

Syllabus: Particulate material, aggregate, Portland Cement and Portland Cement Concrete, Structural Steel, Cement asphalt and asphalt concrete, wood, polymers and plastics, Concrete Fiber, Basic material and solid, micro structure and surface properties; erial response to stresses; Yielding and fracture; Rheology of the fluid and solid; Fatique.

Prerequisites: -

Text Book References:

1. S. Young, Sidney, The Science and Technology of Civil Engineering Materials, Prentice-Hall International Inc., 1998
2. Shan Somayaji, 2001, Civil Engineering Materials, Prentice Hall.
3. Robert D Kerbs, Richad D Walker, (1971) Highway Materials, Mc Graw-Hill

ENEV603002

Structural Mechanics

3 Credits

Learning Outcomes :

1. Students will be able to apply the mechanics physics concept in calculating responds from rigid body as results of working forces (C3);
2. Be able to apply the mechanics physics concept in analyzing simple structure of beam, trusses, and three joints arch (C3).

Syllabus : Statics of particle; rigid body; equilibrium of rigid body; structural analysis of trusses with point equilibrium method

Prerequisites : Heat and Mechanics Physics

Text Book References :

1. Aslam Kassimali, Structural Analysis, 4th edition, 2011
2. R.C. Hibbeler, Structural Analysis, Prentice Hall, 1998
3. Lecture Notes "*Mekanika Teknik*", Elly Tjahjono
4. Lecture Notes "*Garis Pengaruh*", Elly Tjahjono

ENEV 603003
Fluid Mechanics
3 credits
Learning Outcomes: Students are able to understand the fluid characteristics, concept of hydraulic pressure and forces on static and dynamic fluid, and apply the basic equation to calculate the hydraulic pressure and forces on static and dynamic fluid.
Syllabus: a) The characteristics of the fluid, liquid and gaseous fluids, dimensions and units; (b) Types of flow; laminar, transitional, turbulent; (c) Concept of hydraulic pressure and forces on static and dynamic fluid; the pressure at a point, the pressure on a flat plane, the pressure on the curved area, the pressure of fluid in container undertake linear acceleration, and the pressure of fluid in rotating cylinder; (d) The buoyancy and stability of an object, metacentrum of floating objects; (e) The basic equations of the hydraulic pressure and forces on static and dynamic fluid (Bernoulli, Law of Continuity, Energy, and Momentum), to be applied on Environmental Engineering building structure.
Prerequisites: Physics (Mechanics and Thermal), Calculus
Text Book References:
1. Fundamentals of Fluid Mechanics, 7th Edition. Bruce R. Munson, Bruce R. Munson, Alric P. Rothmayer, Alric P. Rothmayer, Theodore H. Okiishi, Theodore H. Okiishi, Wade W. Huebsch, Wade W. Huebsch, ©2013
2. Fluid Mechanics, 7th Edition SI Version. Bruce R. Munson, Theodore H. Okiishi, Wade W. Huebsch, Alric P. Rothmayer. ISBN: 978-1-118-31867-6, 792 pages. January 2013, ©2013
3. Engineering Fluid Mechanics, 10th Edition SI Version. Donald F. Elger, Barbara C. Williams, Clayton T. Crowe, John A. Roberson. ISBN: 978-1-118-31875-1, 696 pages. June 2013, ©2013
4. Fluid Mechanics, 9th Edition SI Version. Robert W. Fox, Alan T. McDonald, Philip J. Pritchard, John W. Mitchell. ISBN: 978-1-118-96127-8, 680 pages. September 2015, ©2015

ENCV 604 003
Building Construction
3 Credits
Learning Outcomes:
1. Students will be able to apply the knowledge of engineering drawing symbols in Civil Engineering field for describing a two-story building according to the rules and procedures of engineering drawing such as aperture drawing (plans and appearance) and section view; covering dimension/sizes; foundation drawing, structural beam and column drawing, trestlework drawing, electrical installation and plumbing;
2. Be able to read the construction drawing and explain the parts of water structure (dam), waste treatment building, geotechnical building (foundation, retaining wall), roads, and bridges according to the construction drawing;
3. Be able to calculate the volume of the building, unit price, and cost estimation.

Syllabus : Introduction of the course syllabus, introduction of standards of every building element and room function, plan and appearance drawing of a building, section-view drawing, foundation plan drawing, column and beam construction drawing, rooftop and trestlework plan drawing, platform drawing, stairs drawing, plafond and floor pattern drawing, window and door frames drawing, lighting installation drawing; plumbing system drawing, fire prevention installation drawing; lightning rod installation drawing, solid waste/trash drawing and septic tank drawing. Calculation of the building's volume and cost estimation. Unit Price. Journals.
Prerequisites : Construction Drawing
Text Book References:
1. Neufret, Ernst, *Data Arsitek Jilid 1 dan 2*, Penerbit Erlangga, Jakarta, 1989
2. Subarkah, Imam, *Konstruksi Bangunan Gedung*, Penerbit Idea Dharma, Bandung, 1988

3. Sugiharjo, R., *Gambar-Gambar Dasar Ilmu Bangunan*, Penerbit R. Sugihardjo
4. Tanggoro, Dwi, *Utilitas Bangunan*, Penerbit Universitas Indonesia, 2000

ENCV 605 013 / ENCV614004
Soil Mechanics (2+1)
3 Credits
Learning Outcomes :

1. Students will be able to apply basic soil parameter knowledge on calculating soil strength and stability for simple buildings/civil engineering construction;
2. Be able to design soil retaining wall and draw it according to the rules and regulations of engineering drawing;
3. Be able to use SLOPE/W software to analyze slope stability.

Syllabus : Bearing capacity of the soil: Allowable bearing capacity and Ultimate bearing capacity due to inclination and eccentricity of load; One dimensional elastic settlement and consolidation settlement; Drawing shallow foundation design; Seepage through dam; Stress distribution in the soil: A point load, strip, circle, and square area of footing using Fadum and Newmark theories; Lateral earth pressure: Rankine and Coulomb theories; Structure design of earth retaining wall, gravity wall, cantilever wall, earth retaining cantilever wall, sheet pile; Slope stability: concept of slope stability, undrained analysis, slice method, introduction of Fellenius method, Bishop method, Soil stability method
Prerequisites : Basic Soil Mechanics
Text Books References:

1. Craig, R.F., "Soil Mechanics, 7th Ed.", 2007
2. Bowles, J.E., "Physical and Geotechnical Properties of Soils", McGraw-Hill Kogagusha Ltd., 1998.
3. Das, B.M., "Principles of Geotechnical Engineering", Fifth edition, 2005, PWS Publishing Company, Boston
4. Budhu M., "Soil Mechanics and Foundations", Second Edition, 2007, John Wiley& Sons, New York

ENEV604001
Solid Mechanics
3 SKS
Learning Outcomes :

1. Students will be able to analyze tension and shape changes as a result of working forces for various shape of statically determined structure and various shape of sections and type of materials;
2. Be able to calculate the deflection of beam, portal, and trusses structure using the beam, moment area, and energy theory and use the knowledge to analyze a simple statically undetermined structure using the principals of consistent deformation.

Syllabus : The meaning of loads and forces working on a solid object, effect of forces to a solid object, stresses on a solid object, shape deformation of a solid object, characteristics of shape deformation of a solid object, elastic and inelastic phases, axial strain, Modulus of Elasticity, Poisson Ratio. Section Properties, area, center of gravity, cross-axis system, maximum moment of inertia of a section, minimum moment of inertia of a section, radius of gyration, symmetric section, asymmetric section. Normal stress due to axial internal forces, normal stress due to flexure, combination of normal stress and flexure, one way and two-way flexural stress, core area (Kern), shear stress due to transversal internal forces, shear stress due to torsion internal forces. Combination of normal and shear stresses. Deflection of beam, portal, and trusses of statically determined structure caused by external forces using energy/unit load method.

Prerequisites : Statics
Text Book References :

1. Hibbeler, R.C., Mechanics of Materials, 8/e, Pearson, 2011
2. Beer, F. and Johnston, P., Mechanics of Materials, 6/e. McGraw Hill, 2011
3. Egor P. Popov (Author), Engineering Mechanics of Solids (2nd Edition), Prentice Hall, 1998
4. Gere, J.M. and Timoshenko, S.P. (1997). Mechanics of Materials, 4th ed., PWS Publishing Co., Boston, Mass.
5. Vable, M., Mechanics of Materials, http://www.me.mtu.edu/~mavable/MoM2nd.htm
6. James M. Gere, *Mekanika Bahan* 1 ed.4, Penerbit Erlangga, Kode Buku: 37-01-010-6 Tahun: 2000
7. James M. Gere, *Mekanika Bahan* 2 ed.4, Penerbit Erlangga, Kode Buku: 37-01-010-7 Tahun: 2002

ENEV604002
Hydraulics in Environmental Engineering
3 credits
Learning Outcomes: Students have the basic ability to understand the basic concepts of the behavior of water flow in open channels and closed conduits, understand the functions of the water buildings and measuring the flow rate, and able to calculate the flow rate in open channels and closed conduits, calculate the energy loss, and mathematically describe the flow and pressure distribution within a pipe network.
Syllabus: (a) the concept of hydraulics in open-channel flow and closed-conduits flow; (b) Flow in open channel; basic equation, minor and major losses; (c) Flow in pipe network; the use of concept of HGL (Hydraulic Grade Line) and EGL (Energy Grade Line), Bernoulli equation, Hardy-cross method for calculating flow distribution in a pipe network: series, parallel, and branching; (d) The concept of energy (specific energy and critical energy), the type of flow; steady, unsteady, uniform, non-uniform; (e) Various primary water buildings; weir, intake building, distribution channel, flow or discharge measuring tools/ gauges; Chipoleti-weir, Parshall-flume, V-notch weir, loggers, etc.
Prerequisites: Fluid Mechanics
Text Book References:

1. *Fundamentals of Hydraulic Engineering Systems* (4th Edition), Houghtalen, Robert J.; Akan, A. Osman; Hwang, Ned H. C., Publisher: Prentice Hall, 2009. ISBN 10: 0136016383 ISBN 13: 9780136016380
2. *Hydraulics in Civil and Environmental Engineering*, 5th edition. Andrew Chadwick, John Morfett, Martin Borthwick. Publisher: CRC Press ISBN: 978-1-118-31875-1, 648 pages. © February 21, 2013
3. *Mechanics of Fluids*, Second Edition. International Edition. Merle C. Potter, David C. Wiggert, Prentice-Hall Inc., 1997

ENEV604003
Environmental Chemistry
3 credits
Learning Outcomes: students are able to analyze various parameters of water and waste water quality, and writing the results in scientific report
Syllabus: The basic principle of environmental chemistry; interactions between environmental factors and various parameters of water quality and waste water; Water resources: the properties and quality of water resources; contamination and water pollution; quality raw water sources and clean water; chemicals and some parameters in water and waste water (turbidity, color, pH, acidity, alkalinity, hardness, dissolved oxygen, BOD, COD, nitrogen, sulfate, Solid, iron, manganese, fluoride, chlorine residual and the chlorine needs), and its source, influence on health and environment; methods

of laboratory examination of various parameters of water and waste water quality
Prerequisites: Basic Chemistry

References:

1. Standard Methods, Examination of Water & Wastewater, 20th Edition
2. Sawyer, McCarty, and Perkin. 2003. Chemistry Environmental Engineering Science. McGraw Hill
3. Manahan, S.E. (2005). Environmental Chemistry. Washington: CRC

ENEV604004
Environmental Global Issues
2 credits

Learning Outcomes: Students are able to relate the (C3) concepts and knowledge of environmental science to investigate (C3), criticized (A3) and demonstrating (P2) causes, effects and solutions of the existig contemporary global environmental problems

Syllabus: abiotic environment problems and decrease of resilience of various spatial and temporal scales, (concept of D-P-S-I-R, climate change, water, air and land pollution, scarcity of Natural Resources, Probability and statistics in environmental science, Resilienc); Ecosystems and living beings (Recycling of energy and water, the food chain, biodiversity, nutrient cycle in nature, the main ecosystems of the earth, Sustainability); The harmful effects of environmental problems on society, the economy, and the environment particularly which is irreversible (System thinking, State shift and irreversibility, health impacts, economic impacts, the impact of welfare); Anthropocene era and the concept of sustainable development (population, changes in land use, consumption, economy and development, Nexus Water-Energy-Food, Three pillars of sustainability); Solutions to environmental problems (L-C-A, Greenwashing, Geo-Engineering, End-of-pipe vs closed loop, Reflexive Engineer, Sustainable Consumption and Production, Resiliency)

Prerequisites: Integrated Character Buliding Course B

Buku Referensi :

a. Berg, Linda R. 2013. Visualizing Environmental Science 4th Edition. Wiley.
b. Easton, Thomas. 2013. Taking Sides: Clashing Views on Environmental Issues 15th Edition. McGraw-Hill/Dushkin.
c. Hardisty, Paul E. 2010. Environmental and Economic Sustainability 1st Edition. CRC Press.
d. Harris, Frances. 2012. Global Environmental Issues 2nd edition. Wiley Blackwell
e. The Worldwatch Institute & Erik Assdourian. 2013. State of The World 2013: Is Sustainable Still Possible? 1st Edition. Island Press.

ENEV604005
Environmental Microbiology
2 credits

Learning Outcomes:

1. Students are able to explain the system in relation to the microbiological transformation and mineralization of organic wastes and factors that control microbiological processes in wastewater treatment;
2. Students are able to check the quality of water and air microbiological

Syllabus: The basic concepts of microbiology (Introduction of environmental microbiology, microorganisms found in the environment, diversity of microorganisms and their interaction at natural ekosistem); Nutrition for microorganisms; Bacterial growth; Environmental microorganism (Earth environments, Aeromicrobiology, Aquatic environments, Extreme environments); Remediation of organic pollutants and metals (microorganisms and organic pollutants, microorganisms and metal pollutants); Basic microbiology for waste water treatment and solid waste (processing aerobic, anaerobic processing); Urban microbiology, microbial emerging global issues in the Anthropocene era and risk assessment.

Practicum
1. Microbial Enumeration for water quality (TPC,MTF)
2. Gram staining
3. *Aeromicrobiology – Bioaerosol sampling*

Prerequisites: Introduction to Environmental Engineering System

Buku Referensi :

1. Ian L.P., Charles P.G., Terry J.G. 2015. Environmental Microbiology, 3rd ed. Elsevier. Amsterdam.
2. Willey, J.M., Sherwood, L.M., Woolverton, C.J. 2008. *Microbiology*. 7th. Edition. Mc Graw Hill, Boston.
3. Johnson, T.R., Case, C.L. 2010. *Laboratory Experiments in Microbiology*. Benjamin Cummings. Pearson. San Fransisco
4. Novita, E., Gusniani, I., Handayani, S.D. 2009. Modul Praktikum Mikrobiologi Lingkungan. Laboratorium Teknik Lingkungan-Departemen Teknik Sipil FT-UI. Depok

ENEV604006
Thermodynamics
2 credits

Learning Outcomes: Students are expected to apply the science of thermodynamics in conceptualizing waste management and environmentally efficient and sustainable

Silabus: The concept of thermodynamics (enthalpy, entropy, free energy, equilibrium, spontaneity), Cycle of energy on earth, energy balance, the concept of conversion and transfer of energy, Equilibrium element on earth, Thermodynamics in sewage treatment in Indonesia, new and renewable energy

Prerequisites: Basic Chemistry, Physics

Buku Referensi :

1. Douce, 2011, Thermodynamics of the Earth and Planets, Cambridge
2. Berg, Linda R. 2013. Visualizing Environmental Science 4th Edition. Wiley.
3. Mihelcic and Zimmerman, 2010, Environmental Engineering, Wiley
4. Brown and Holme, 2011, Chemistry for Engineering Students 2nd edition

ENEV605001
Urban Planning and Sanitation
3 Credits

Learning Outcomes:
1. Students will be able to explain the role of civil engineer in setting up the infrastructure needed in an urban area and be able to apply that knowledge in the process of planning, monitoring and implementation of the regional arrangement;
2. Be able to describe the components of an urban sanitation techniques and applying that knowledge in the planning, monitoring and implementation so as to create environmentally sustainable region.

Competencies in Curriculum: WA2 (problem analysis), WA7 (environment and sustainability)

Syllabus: Definition and function of urban planning, Primary factor in urban planning, Population aspect in urban planning, Social facilities and forms of urban development, Land use, Water management and its relationship with land use. Controlling transmission of infectious and non-infectious diseases in an area, Planning and analyzing impacts of environmental engineering, Clean water supply, Waste water treatment and disposal, Solid waste management, Noise control, Air pollution control.

Prerequisites: -

Text Book References:

1. Hamid Shirvani, Urban Design Process, New York, Van Nostrand Reinhold Co, 1987
2. Ali Madanipour, Design of Urban Space: An Inquiry into a Socio-Spatial Process, John Wiley and Sons, 1996
3. Gideon S. Golany, Ethics and Urban Design: Culture, Form and Environment,

Wiley, 1995
4. Environmental Engineering and Sanitation: Joseph A Salvato: John Willey & Son, Inc., Canada
5. Environmental Science and Engineering, J. Glynn Henry and Gary W. Heinke, Prentice Hall International Inc.

ENEV605002
Structural Design of Environmental Engineering Facilities
3 credits
Learning Outcomes: Students are able to design environmental engineering structures such as sewage treatment facilities and water tanks of reinforced concrete in accordance with the applicable procedures and standards
Syllabus: objections, step and the process of designing the structure and explain the various methods of planning; shape, type, placement, distribution, factors and combinations of load and able to explain a wide range of structural system reinforced concrete; material and mechanical properties of reinforced concrete cross-section, the concept of elastic and strength limits, simplifying the Whitney tension block and impartial failure; square reinforced concrete beam, with single or double bars and the beam cross-section T to bending and shear, and capable to proportion short and slender columns to bending and axial force, and the shallow foundation; building operating conditions to determine the load recovery techniques, water-resistant requirements, joint detail and placement, shrinkage reinforcement, design parameters, strength for restructuring techniques building design; square tank structure and circular tanks of reinforced concrete for the restructuring techniques building.
Prerequisites: Basic Soil Mechanics, Solid Mechanics
Buku Referensi :
1. Persyaratan beton structural untuk bangunan gedung, SNI 2847 : 2013
2. Beban minimum untuk perancangan bangunan gedung dan struktur lain, SNI 1727 : 2013
3. Mac Gregor, J.G., Reinforced Concrete: Mechanics and design, 6th edition, Pearson, 2012
4. Wahyudi , Syahril A.Rahim, Struktur BetonBertulang, Penerbit Gramedia, 1997
5. Wahyudi & Syahril A.R., *Struktur Beton Bertulang*, Gramedia, 1997.
6. JF. Seidensticker and ES Hoffman, Sanitary

ENEV605003
Network Design in Environmental Engineering
3 credits
Learning Outcomes:
1. Students are able to calculate the regional average rainfall, planned rainfall, organize intensity-duration-frequency rainfall curve, calculate the flood discharge plan at various return period
2. Students are expected be able to divide the service zone, identify water needs of each zone, plan the distribution pipe network of primary and secondary, and determining the location of reservoir distribution
3. Students are able to calculate and design a waste water network; the service zone, calculate peak flow of each zone, plan the distribution pipe network of primary and secondary, and determining the location of waste water treatment plant.

Syllabus: (a) the basic concept of the hydrological cycle, catchment area/watershed; (b) the determination of the average rainfall of a region, design rainfall using extreme distribution method; (c) determination of intensity-duration-frequency rainfall curve, and design of flood discharge return period; (d) calculation of flow rate in each segment of the pipe, design velocity, and pipe diameter, calculation of flow distribution in pipe

network using Hardy-Cross method and EPANet software.

Prerequisites: Fluid Mechanics, Hydraulics in Environmental Engineering

Text Book References:

1. *Applied Hydrology*, Ven Te Chow, David R. Maidment, Larry W. Mays., 2003 edition, McGraw-Hill. ISBN 0070108102.
2. *Hydrology and Floodplain Analysis,* 5th Edition. Philip B. Bedient, Wayne C. Huber, Baxter E. Vieux. Publisher: Prentice Hall ISBN-10: 0132567962, 816 pages. © February 25, 2012
3. *Water Works Engineering, Planning, Design & Operation*, Syed R. Qasim, 2000
4. Water and Wastewater Engineering: Design Principles and Practice, Mackenzie L. Davis, 2010. McGraw-Hill Education

ENEV605004

Integrated Solid Waste Management Design

3 credits

Learning Outcomes: students are able to plan a solid waste management system in engineering aspects

Syllabus: Students are expected to explain the properties and problems arising from the solid waste material and developing and selecting alternative management in accordance with local conditions. Understanding of the management of solid waste material, Source, type and composition of the waste material solid, Generation waste material solid, collection, transfer and transport of solid waste materials and disposal, and the processing of solid waste material, aspects of the organization in the management of solid waste material, aspects of financing, aspects of regulation and aspects of community participation management of solid waste and materials. The concept of designing the management of solid waste material. The management system of solid waste material, Regulation of solid waste material management, solid waste material management methods

Prerequisites:

Buku Referensi :

1. Tchobanoglouss, 1993, *Integrated Solid Waste Management*.
2. Tchobanoglous, 1977, Engineering Principles and Management Issues.;
3. Wentz, 1989, *Hazardous Waste Management*
4. Flintoff FF., 1983, *Management of Solid Wastes in Developing Countries*

ENEV605005

Unit Operation and Process

4 credits

Learning Outcomes: students are able to explain unit operations and unit processes used in water treatment and waste water, using the basic principles of engineering calculations for the deterimining processes of physics, chemistry, and biology.

Syllabus: unit operations and processes based on the principle (physical processing, chemical, biology), the level of processing; the concept of balanced mass, flow model, and reactor; unit operations and process of preliminary treatment in the process of water treatment and waste water; process and operation of the coagulation process and Flocculation; an operating unit of the separation of solid particles in the water treatment and waste water (sedimentation); an operating unit of the separation of solid particles through the axis media (filtration);

Students are able to explain the operating unit and the process of separation of ammonia, an operating unit and the adsorption process; unit process of chemical reactions between the ions in the liquid phase and solid phase (Ion Exchange) in water treatment and wastewater; unit operation and process that separate elements of the solution using pemeable membrane (Membrane Process) in water treatment and wastewater; unit operations and process of oxygen transfer and mixing; biological processes at waste

water treatment by the method of suspended growth: Activated Sludge; biological processes at waste water treatment by the method of suspended growth: Stabilization Ponds and aerated Lagoons; biological processes at waste water treatment by the method of suspended growth: Stabilization Ponds and aerated Lagoons; biological processes in wastewater treatment with anaerobic suspended growth method: Anaerobic digestion; biological processes in wastewater treatment with suspended aerobic growth method: Aerobic digestion; sludge treatment process

Prerequisites: Basic Chemistry, Physics (Mechanics and Thermal), Environmental Chemistry

Buku Referensi :

1. Tom D. Reynolds and Paul Richards, Unit Operations and Process in Environmental Engineering Pws Series in Engineering;
2. Rich, Linvil G : " Unit Operation for Sanitary Engineering"Management, McGraw Hill

ENEV605006

Environmental Laboratory

3 credits

Learning Outcomes: Students are able to perform the environmental sampling and water treatment experiment at a laboratory scale by applying the principles of unit operations and processes (C3, P3)

Syllabus: Analysis of water resources, Identification of pollution sources ,; Sampling of surface water and solid waste (representativeness of the sampling and analysis of data, surface water sampling, sampling of solid waste); Analysis of surface water quality (analysis of the characteristics and composition of waste on, quality of surface water), composition and characteristics of solid waste, planning experiment of water treatment at at laboratory scale, solid analysissedimentation type 1, coagulation and flocculation processes, sedimentation type 2 , chlorination

Prerequisites: Environmental Chemistry

References:

1. Standard Methods, Examination of Water & Wastewater, 20th Edition
2. Davis, Mackenzie, Water and Wastewater Engineering, New York, McGraw-Hill, 2012
3. Metcalf and Eddy, Wastewater Engineering: Treatment and Resource Recovery, New York, McGraw-Hill Inc, 2013
4. Sawyer, McCarty, and Perkin. 2003. Chemistry Environmental Engineering Science. McGraw Hill
5. Tchobanoglous, G., Thiessen, H., & Vigil, S. (2003). Integrated Solid Waste Management: engineering principles and management issues. Singapore: McGraw-Hill Inc.
6. Buku Pedoman Praktikum Laboratorium Teknik Lingkungan, 2012

ENEV606001

Project Managements

3 credits

Learning Outcomes: At the end of the course, students are expected to select and plan the project management from project initiation to implementation and delivering the works

Syllabus: Project: environmental infrastructure, project initiation: project selection, Planning project: major activities and supporting activities; Implementation of the project: plan implementation, quality assurance, Healt, safety and environmental management, material procurement processes, equipment and services; Control of the project: project performance reporting, control activities, time, cost and quality; Closure of the project: the introduction of asset management / infrastructure

Prerequisites:

Buku Ajar :

1. Blank, L and Tarquin, A., Engineering Economy, McGrawHill, New York, 2002
2. Halpin, D, W and Woodhead, R.W., Costruction Management, 2nd ed., John Wiley & Sons Inc., New York, 1998
3. Buku Referensi :
4. Duffield, C.F and Trigunarsyah, B., Manajemen Proyek – dari Konsepsi sampai Penyelesaian, Engineering Education Australia, Melbourne, 1999
5. Europen Construction Institute, Total Project Management of Construction Safety, Health and Enviornment, Thoman Telford, London, 1995
6. Slough, R.H., Sears, G.A. and Sears, S.K., Construction Project Management, 4th ed., John Wiley & Sons Inc., New York, 2000
7. Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK®Guide). PMI, USA 2000

ENEV606002
Water Treatment Design
3 credits
Learning Outcomes: students are able to plan water treatment systems and to design dimensions of the unit in the processing unit of the treatment plant
Syllabus: Water supply systems and their components, water needs, raw water sources, water and raw water quality, water catchments and water transmission and equipment, water treatment, physical treatment, chemicals treatment, reservoir, equipments of another installation, layout, hydraulic profile
Prerequisites: Unit Operation and Process, Fluid Mechanics, Water Supply and Sewerage Network Design
Buku Referensi :
1. Water Works Enginering, *Planning, Design & Operation* , Syed R. Qasim, 2000
2. *Water Treatment Principles and design, J. M. Montgomery, 1985*
3. Water and Wastewater Technology, Mark J. Hammer, 1996
4. Cheremisinof. *Handbook of Water and Waste Water Technology*, 1995
5. Water Supply and Sewerage, Terence J. Mc.Ghee, 1991

ENEV606003
Domestic Wastewater Treatment Design
3 credits
Learning Outcomes: the student is able to design the details of domestic waste water treatment facility in a city.
Syllabus: Domestic Wastewater Treatment Design course begins with a study that determining the water needs in its coreelation with the discharge and the characteristics of domestic wastewater generated. Domestic wastewater treatment plant designed including all processing units of physical, chemical processing (if necessary) and biological treatment which is the core domestic wastewater. Pre-processing, primary processing and secondary processing and effluent processing units are required to guarantee the quality of treated water before discharged to the receiving water bodies in accordance to applicable Environmental Quality Standards.
Prerequisites: Unit Operation and Process, Perancangan Jaringan TL, Fluid Mechanics
Buku Referensi :
1. Water and Wastewater Technology, Mark J. Hammer, 1996
2. Cheremisinof. *Handbook of Water and Waste Water Technology*, 1995
3. Water Supply and Sewerage, Terence J. Mc.Ghee, 1991
4. Metcalf and Eddy, *Waste Water Engineering Treatment and Disposal, Reuse*,

Singapour, McGraw-Hill Inc, 2004.
5. Qasim, Syeed, R, Wastewater Treatment Plants, Planning, Design and Operations, New York, CBS Collin Publishing, 2000

ENEV606004
Environmental Impact Analysis and ISO
3 Credits
Learning Outcomes: Students will be able to apply the method of EIA and environmental audits as inputs for safeguards against human and natural resources.
Syllabus: The meaning of EIA, EIA process and benefits, rules, regulations and management of EIA, Environmental settings, Estimation of environmental impacts, Environmental impact to the physical, chemical, biological, socio-economic, and socio-cultural sector. EIA method, Method and techniques of identification, prediction, evaluation and interpretation of the EIA, Environmental Monitoring Plan, Environmental Management Plan, Environmental Audit and Environmental Management System.
Prerequisites: -
Text Book References:

1. Canter, L.W., Environmental Impact Assessment, New York, McGraw-Hill, 1996.
2. Kuhre W. Lee., *Sistem Manajemen Lingkungan*, Jakarta, Prenhallindo, 1996.
3. "ISO 14000 *Sistem Manajemen Lingkungan*" by Brian Rotherry (1996)
4. Soemarwoto, Otto, *Analisis Mengenai Dampak Lingkungan*, Yogyakarta, Gadjah Mada University Press, 2007

ENEV607001
Industrial and Hazardous Waste Treatment
3 credits
Learning Outcomes: Students are expected to implement processes and technology of industrial waste treatment within the framework of environmental pollution control and environmental work
Syllabus: Sustainable Development Goals in the perspective of environmental development, especially in waste management, regulation and legislation in environmental management industry; concept of environmental carrying capacity and environmental components in the industrial waste management; Sources, types and characteristics of the waste industry based on raw materials, processes and products used; The impact of pollution (liquid, solid and gas waste), vibration and noise on humans and the environment; Pollution prevention and waste minimization industry; Process and waste treatment technology of liquid, solid and gas waste; Case of industrial waste management and treatment.
Prerequisites: Unit Operation and Process
Text Book References:

1. La Grega (1994), 'Hazardous Waste Management' ERM, England
2. Nemerow (1992),'Industrial and Hazardous Waste Pollution Control', McGraw-Hill, Singapore
3. W.W. Eckenfelder (2004),'Industrial Water Polluiton Control', McGraw-Hill, Singapore
4. Peraturan Pemerintah 101 Tahun 2014 tentang Pengelolaan Limbah B3

ENEV607002
Air Pollution
3 credits
Learning Outcomes: students are able to identify the problem of air pollution in the solid waste management and waste water treatment setting, determining the source, type, and characteristics of air pollutants and providing advice on control. This course is conducted in Bahasa Indonesia with face to face method, discussions and group assignments.

Syllabus: Sources and types of air pollution, impacts of air pollution, meteorological factors, Detail discussion of the types of air pollution such as sulfur dioxide, nitrogen oxides, particulates, contaminants microbiological, and environmental tobacco smoke, Technology available for air pollution control such as cyclone, bag house filter, and scrubber.

Prerequisites: -

References:

1. Nevers, N.D., *Air Pollution Engineering*, McGraw-Hill, USA, 2000.
2. Spengler, J.d. *et al.*, *Indoor Air Quality Handbook*, McGraw-Hill, USA, 2001.
3. Ross, R.D., *Air Pollution and Industry*, Van Nostrand Reinhold Company, New York, 1972.
4. Metcalf and Eddy, Wastewater Engineering: Treatment and Resource Recovery, New York, McGraw-Hill Inc, 2013
5. Tchobanoglous, G., Thiessen, H., & Vigil, S. (2003). Integrated Solid Waste Management: engineering principles and management issues. Singapore: McGraw-Hill Inc.

ENEV607003

Internship

3 Credits

Learning Outcomes :

1. Students will be able to observe the application of theoretical Environmental engineering knowledge in an execution process of a construction project;
2. Be able to observe the application of professional ethics during the execution of a construction project;
3. Be able to apply a part of engineering economics principal and construction management in analyzing the execution of a construction projects;
4. Be able to identify problems that emerge during the execution of the construction project and solution decision process, able to analyze solution options according to the existing theory and able to criticize if there is an incompatibility as well as able to give solution that should be taken according to the existing theory;
5. Be able to read engineering drawing and see the similarities between the engineering drawing and the realization in the construction projects;
6. Be able to write field observation result in a form of an internship report and able to present it in front of the examiner team.

Syllabus : Implement an internship in a construction project, field observation; interpret a construction drawing, writing an observation report, describing a technical work process, quality control, project management, project specification, engineering drawing and other aspect; problem solving on the fields, presenting an internship reports

Prerequisites :

1. Already pass 6th semesters and pass $\geq$ 75 credits according to the determined conditions applied by the Civil Engineering Department, Faculty of Engineering, Universitas Indonesia and/or the conditions from Faculty of Engineering, Universitas Indonesia
2. Registered and fill out IRS for internship special course, and expresses him/herself to the Internship Coordinator in the Department of Civil Engineering
3. Student choose a project and / or object of selected activities at the internship site and location that has been contracted previously
4. Students must complete and submit the registration form at the Secretariat of Civil Engineering Department

Text Books References : -

ENEV607004

Research Methods and Seminar in Environmental Engineering

2 credits

Learning Outcomes: Students are expected be able to apply knowledge and demonstrate

understanding of research methods in civil and environmental engineering; conduct literature review and design experimental methods to solve basic problems in civil and environmental engineering context, as well as be able to communicate verbally and in writing.

Syllabus: Identification of major issue and problems in environmental engineering, formulating research problem, determining specific aims/objectives of the research, collecting related data, study or previous research, conducting literature review and meta-analysis, designing research methods, writing research proposal (introduction, literature review, methods), presentation of research proposal

Prerequisites: Have completed courses of 110 credits with a GPA ³ 2.00 and without E value

Textbook References:

1. *Research Methods for Engineers*. David V. Thiel, 2014. Cambridge University Press
2. *Research Methodology: A Step-by-Step Guide for Beginners*. 3rd Edition, Ranjit Kumar, 2010. SAGE Publications Ltd

ENEV608001
Enterpreneurship
2 credits

Learning Outcomes: Students are able to explain the comparison of various entrepreneurial activity of civil / environment engineering characterized by innovation and self-reliance based on ethics and able to communicate visually and verbally

Syllabus: Problems and needs of the various stakeholders in the fields of water, waste and sanitation in Indonesia, existing solution for the problems of Environmental Engineering, general opportunity entrepreneurship to solve the problems of Environmental Engineering, Definition of entrepreneurship, Action, plans and challenges for enterpreneur, Action, plans and challenges academics and observers, Business models canvas (BMC) concept, profile the company in general, customer profile in general, fees and turnover, identification of differences and similarities between the components of the BMC, Assessment of the advantages and disadvantages of each component of BMC, variety of products and services environmental engineering, definition of product value, human needs, customer segments, various customer profiles, customer profiles excavation methods, excavation customer profiles, identification of differences and similarities between the components of BMC, Assessment advantages and disadvantages of each component of BMC.

Prerequisites: Integrated Character Building Course A, Introduction to Environmental Engineering System, Urban Planning and Sanitation

Text Book References:

1. Eawag Sandec, Water and Sanitation in Developing Countries, Compendium of Sanitation Systems and Technologies 2nd Edition, 2014
2. WSP, Introductory Guide to Sanitation Marketing, 2011
3. Devine, Jacqueline; Kullmann, Craig. 2011. Introductory guide to sanitation marketing. Water and sanitation program: toolkit. Washington, DC: World Bank.
4. Osterwarlder, Business Model Generation, 2010
5. Osterwarlder, Value Proposition Design: How to Create Products and Services Customers Want, 2014
6. Mattimore, Idea Stormers: How to Lead and Inspire Creative Breakthroughs, 2012

ENEV600003
Final Project
4 Credits

Learning Outcomes:

1. Students will be able to apply civil engineering knowledge to solve a complex

civil engineering problem through a study that follows the research rules such as: Conducting a literature study, choosing the research methodology, analyze and interpret the data and draw a valid conclusion;
2. Be able to write the result of the research in a scientific writing using the correct Indonesian/English language and following the standard final project format;
3. Be able to present the study result to the examiner team;
4. Be able to work independently and complete the work within the time limit.

Syllabus : Problem formulation, Literature study, conducting research, data analysis, result interpretation, preparing a written report of the synthesis and present the study results

Prerequisites : Passing 110 credits with GPA >=2.00 and without grade of E

Text Books References: related to the subject

MASTER PROGRAM

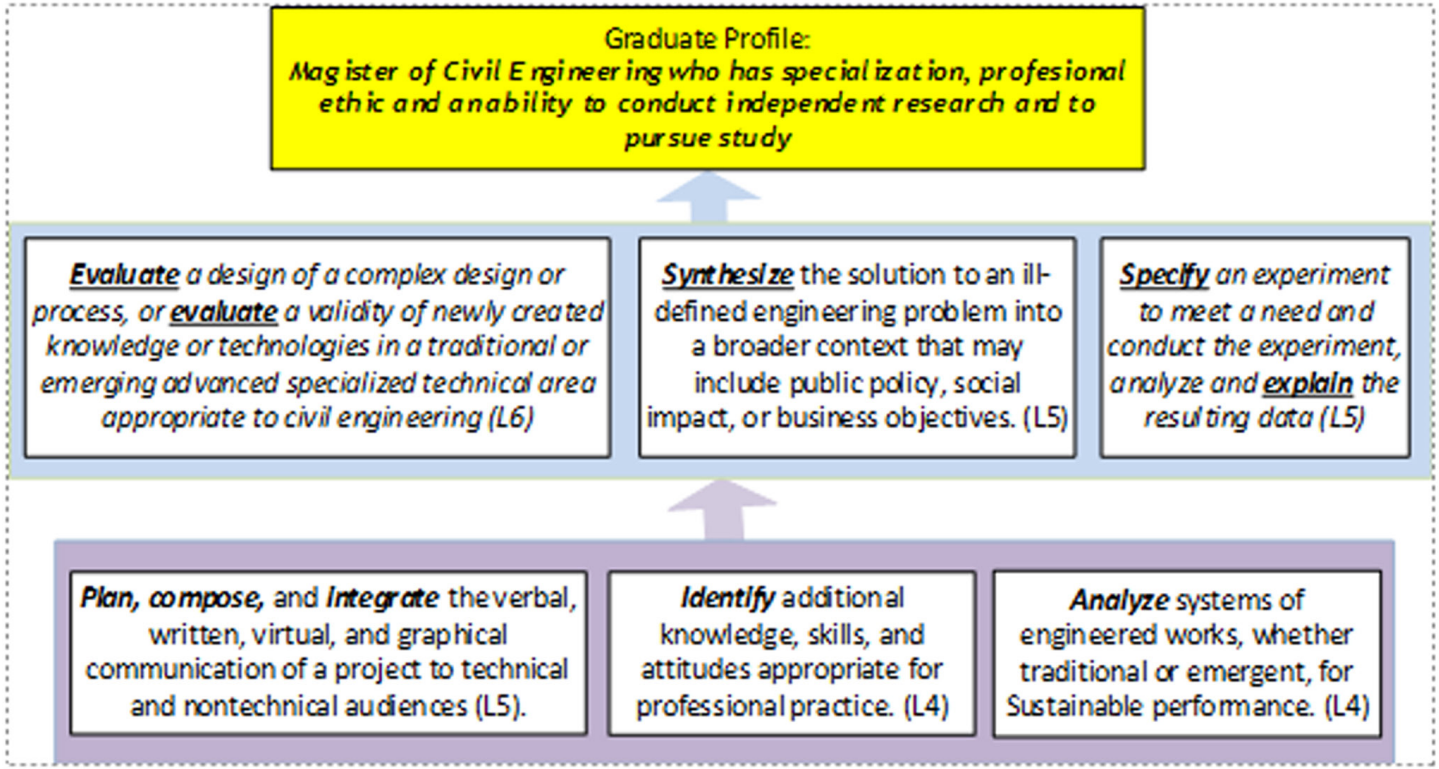
5. MASTER PROGRAM

MASTER IN CIVIL ENGINEERING

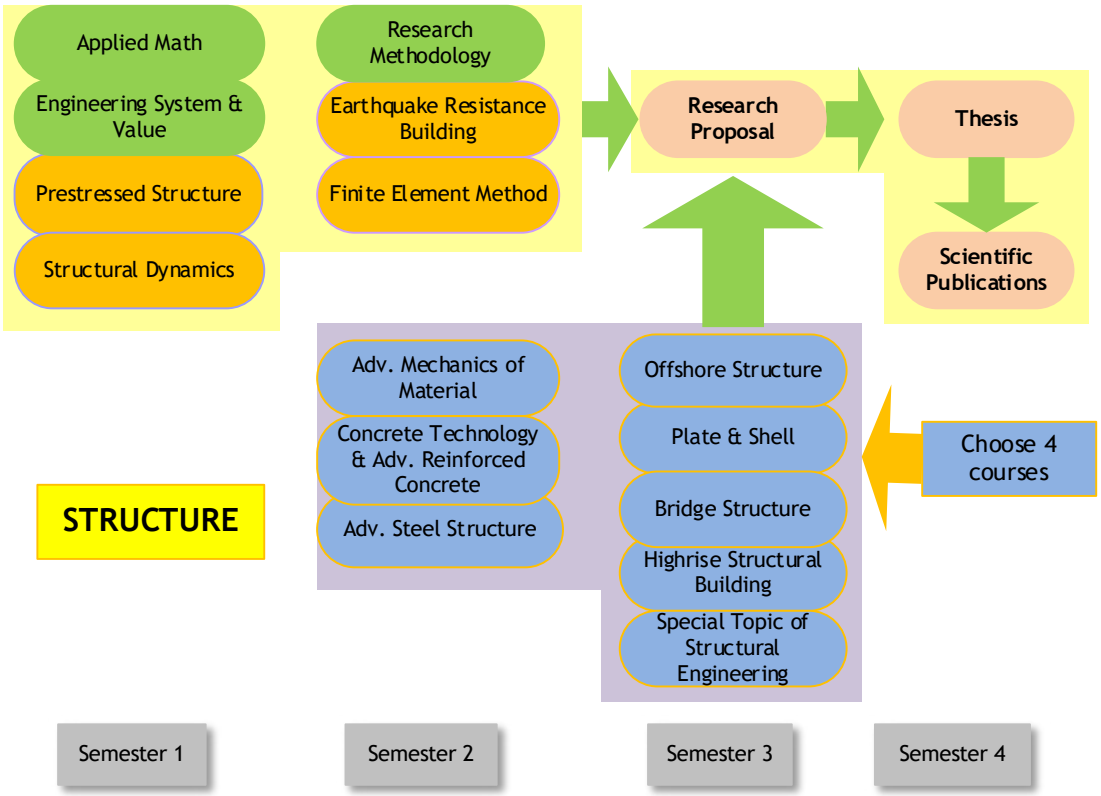
Program Specification

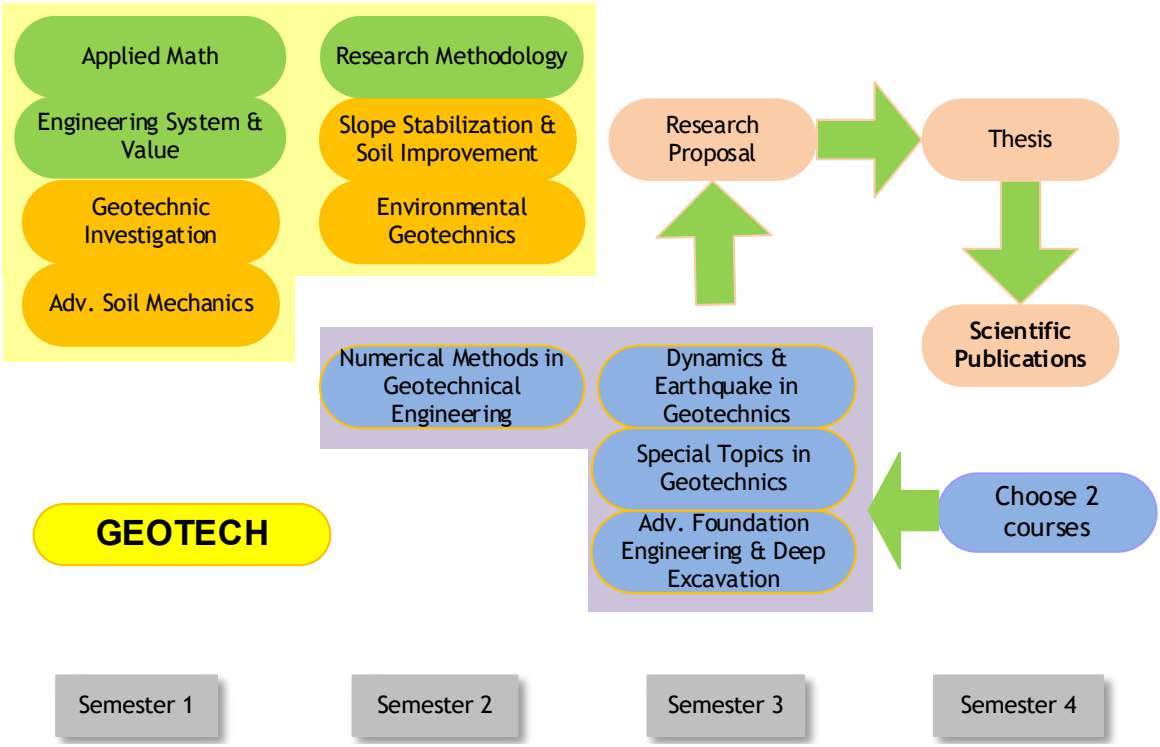
1.	**Awarding Institution**	Universitas Indonesia	
2.	**Teaching Institution**	Universitas Indonesia	
3.	**Programme Title**	Graduate Program in Civil Engineering	
4.	**Class**	Regular	
5.	**Final Award**	Master Teknik (M.T)	
6.	**Accreditation / Recognition**	BAN-PT: A - accredited	
7.	**Language(s) of Instruction**	Bahasa Indonesia and English	
8.	**Study Scheme (Full Time / Part Time)**	Full Time	
9.	**Entry Requirements**	Bachelor Degree (S1)	
10.	**Study Duration**	Designed for 2 years	
	Type of Semester	Number of Semester	Number of weeks / semester
	Regular	4	17
	Short (optional)	3	8
11.	**Graduate Profiles:** Magister of Civil Engineering who has specialization, profesional ethic and an ability to conduct independent research and to pursue study.		
12.	Expected Learning Outcomes: 1. Problem Recognation and Solving: *Synthesize the solution to an ill-defined engineering problem into a broader context that may include public policy, social impact, or business objectives. (L5)* 2. Experiment: *Specify an experiment to meet a need and conduct the experiment, analyze and explain the resulting data (L5)* 3. Technical Specialization *Evaluate a design of a complex design or process, or evaluate a validity of newly created knowledge or technologies in a traditional or emerging advanced specialized* technical area appropriate to civil engineering. *4. Sustainability: Analyze* systems of engineered works, whether traditional or emergent, for sustainable performance. (L4) *5. Communication: Plan, compose, and integrate* the verbal, written, virtual, and graphical communication of a project to technical and nontechnical audiences (L5). *6. Lifelong Learning: Identify* additional knowledge, skills, and attitudes appropriate for professional practice. (L4)		
13	**Classification of Subjects**		
No.	**Classification**	**Credit Hours (SKS)**	**Percentage**
i	**Program Study Subjects**	**9**	**21**
ii	**Specialization Subjects**	**12 - 21**	**28-49**
iii	**Elective Subjects**	**3 - 12**	**7-28**
iv	**Seminar, Thesis, Scientific Publications**	**10**	**23**
	Total	**43**	**100 %**
14.	**Total Credit Hours to Graduate**		**43 Credits**

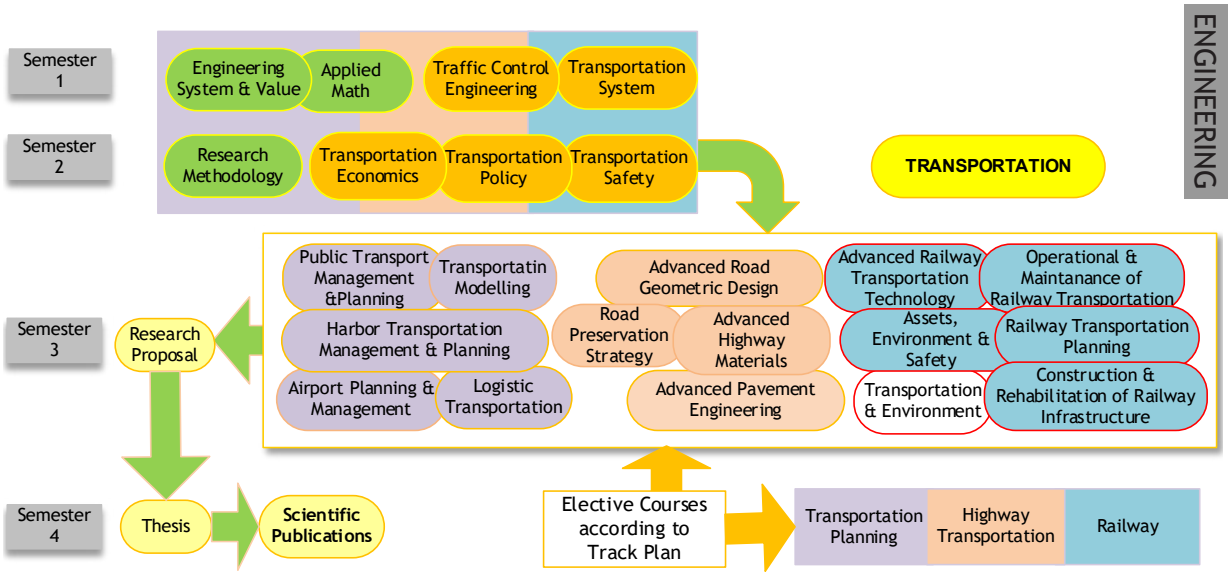
GRADUATE PROFILE

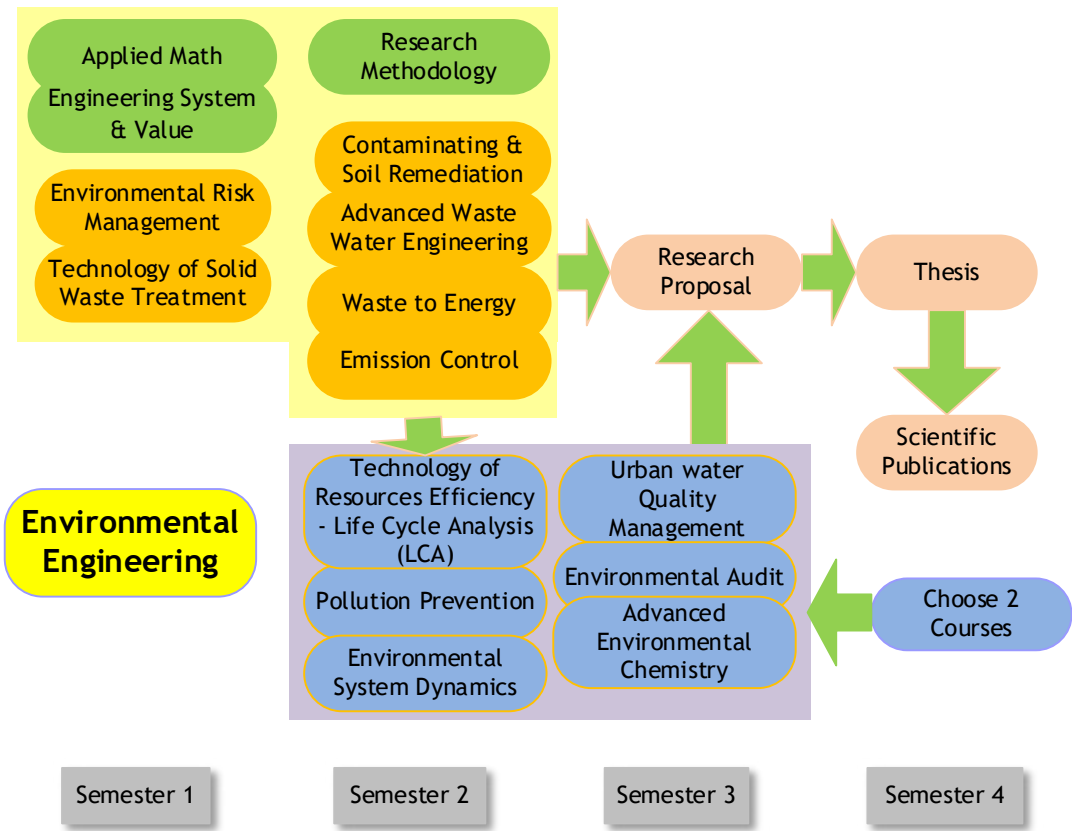


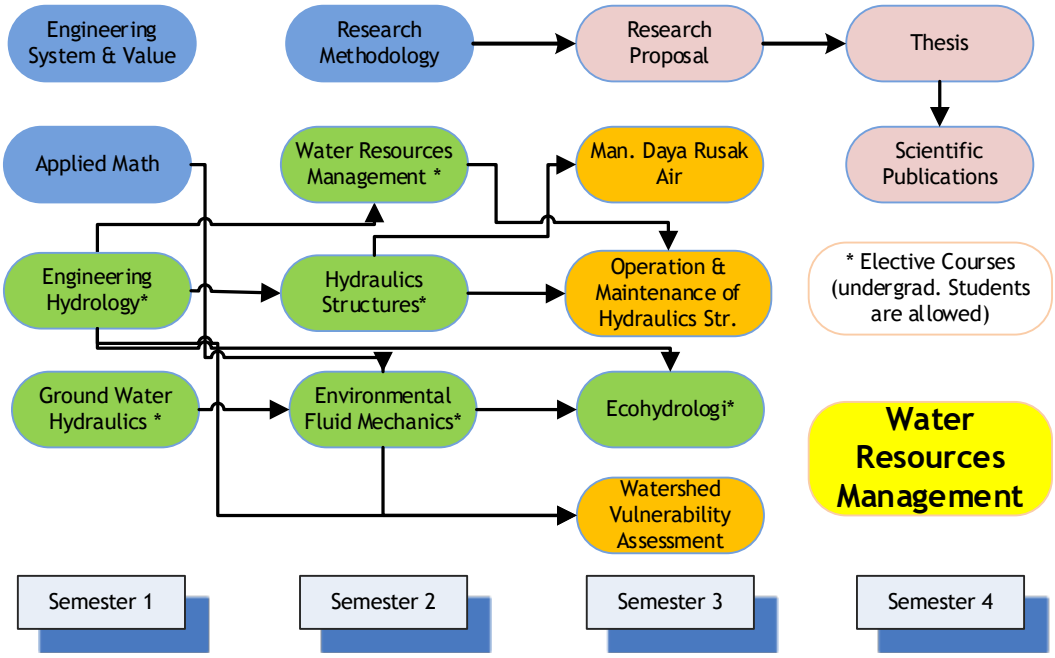
Flow Diagram of Subjects at Master Program

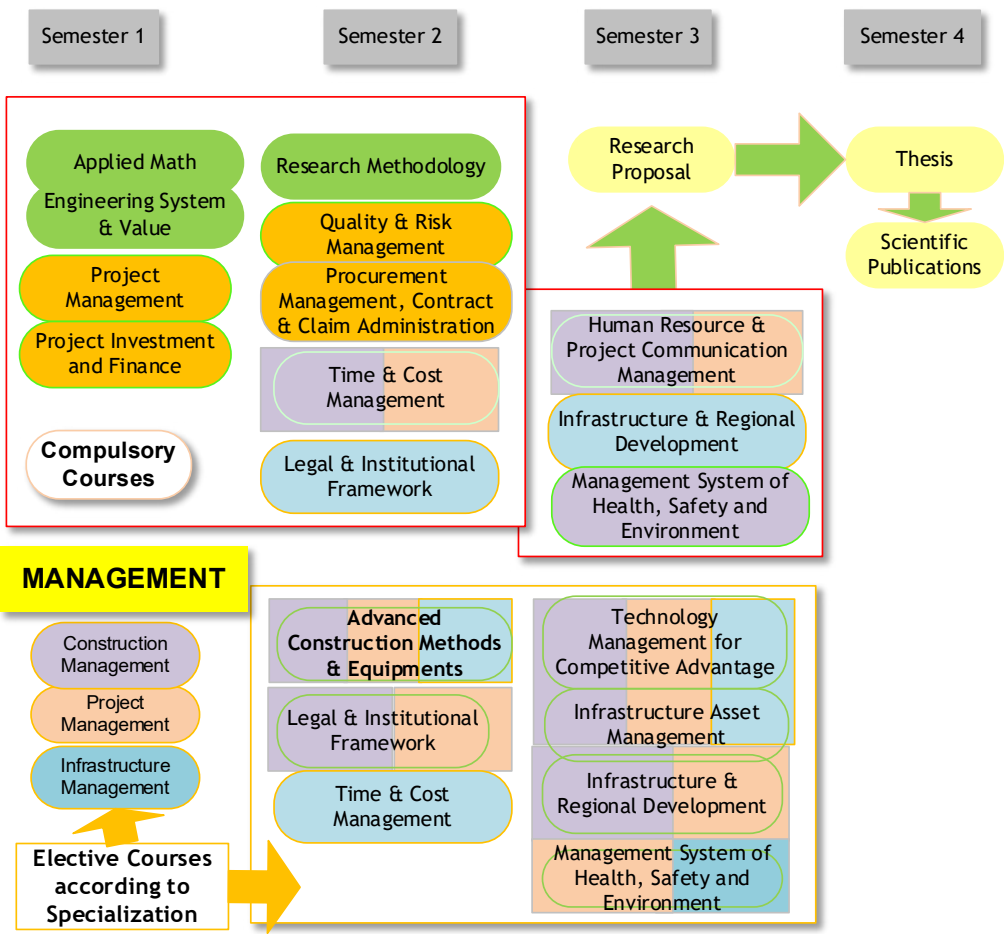





Semester 1
Semester 2
Semester 3
Semester 4
Engineering System & Value
Applied Math
Traffic Control Engineering
Transportation System
Research Methodology
Transportation Economics
Transportation Policy
Transportation Safety
TRANSPORTATION
Public Transport Management &Planning
Transportatin Modelling
Harbor Transportation Management & Planning
Airport Planning & Management
Logistic Transportation
Research Proposal
Thesis
Scientific Publications
Advanced Road Geometric Design
Road Preservation Strategy
Advanced Highway Materials
Advanced Pavement Engineering
Advanced Railway Transportation Technology
Operational & Maintanance of Railway Transportation
Assets, Environment & Safety
Railway Transportation Planning
Transportation & Environment
Construction & Rehabilitation of Railway Infrastructure
Elective Courses according to Track Plan
Transportation Planning
Highway Transportation
Railway


Environmental Engineering
Applied Math
Engineering System & Value
Environmental Risk Management
Technology of Solid Waste Treatment
Research Methodology
Contaminating & Soil Remediation
Advanced Waste Water Engineering
Waste to Energy
Emission Control
Technology of Resources Efficiency - Life Cycle Analysis (LCA)
Pollution Prevention
Environmental System Dynamics
Urban water Quality Management
Environmental Audit
Advanced Environmental Chemistry
Choose 2 Courses
Research Proposal
Thesis
Scientific Publications
Semester 1
Semester 2
Semester 3
Semester 4


Engineering System & Value
Research Methodology
Research Proposal
Thesis
Applied Math
Water Resources Management *
Man. Daya Rusak Air
Scientific Publications
Engineering Hydrology*
Hydraulics Structures*
Operation & Maintenance of Hydraulics Str.
* Elective Courses (undergrad. Students are allowed)
Ground Water Hydraulics *
Environmental Fluid Mechanics*
Ecohydrologi*
Water Resources Management
Watershed Vulnerability Assessment
Semester 1
Semester 2
Semester 3
Semester 4


Semester 1
Semester 2
Semester 3
Semester 4
Applied Math
Engineering System & Value
Project Management
Project Investment and Finance
Compulsory Courses
Research Methodology
Quality & Risk Management
Procurement Management, Contract & Claim Administration
Time & Cost Management
Legal & Institutional Framework
Research Proposal
Thesis
Scientific Publications
Human Resource & Project Communication Management
Infrastructure & Regional Development
Management System of Health, Safety and Environment
MANAGEMENT
Construction Management
Project Management
Infrastructure Management
Elective Courses according to Specialization
Advanced Construction Methods & Equipments
Legal & Institutional Framework
Time & Cost Management
Technology Management for Competitive Advantage
Infrastructure Asset Management
Infrastructure & Regional Development
Management System of Health, Safety and Environment

COURSE STRUCTURE MASTER PROGRAM CIVIL ENGINEERING

CODE	SUBJECT	CREDITS
	1st Semester	
Compulsory		
ENCV 801 001	Applied Mathematics	3
ENCV 801 002	Engineering System & Value	3
	Jumlah	**6**
Specialization Compulsory Structure		
ENCV 801 101	Prestressed Concrete Structure	3
ENCV 801 102	Structural Dynamics	3
	Jumlah	6
Specialization Compulsory Geotechnic		
ENCV 801 201	Advanced Soil Mechanics	3
ENCV 801 202	Geotechnic Investigation	3
	Jumlah	**6**
Specialization Compulsory Transportation		
ENCV 801 301	Traffic Control Engineering	3
ENCV 801 302	Transportation System	3
	Jumlah	**6**
Specialization Compulsory Water Resources Management		
ENCV 801 401	Engineering Hydrology	3
ENCV 801 402	Ground Water Hydraulics	3
	Jumlah	**6**
Specialization Compulsory Environmental Engineering		
ENCV 801 501	Environmental Risk Management	3
ENCV 801 502	Tech of Solid Waste Treatment: Op & Design	3
	Jumlah	**6**
Specialization Compulsory Project Management		
ENCV 801 601	Project Investment & Finance	3
ENCV 801 602	Project Management	3
	Jumlah	**6**
Specialization Compulsory Construction Management		
ENCV 801 601	Project Investment & Finance	3
ENCV 801 602	Project Management	3
	Jumlah	**6**
Specialization Compulsory Infrastructure Management		
ENCV 801 601	Project Investment & Finance	3
ENCV 801 602	Project Management	3
	Jumlah	**6**
Specialization Electives		
	Jumlah SKS semester 1	**12**

	2nd Semester	
Compulsory		
ENCV 802 003	Research Metodology	3
	Jumlah	**3**
Specialization Compulsory Structure		
ENCV 802 101	Earthquake Resistance Building	3
ENCV 802 102	Finite Element Method	3
	Jumlah	**6**
Specialization Compulsory Geotechnic		
ENCV 802 201	Slope Stabilization & Soil Improvement	3
ENCV 802 202	Environmental Geotechnics	3
	Jumlah	**6**
Specialization Compulsory Transportation		
ENCV 802 301	Transportation Economics	3
ENCV 802 302	Transportation Policy	3
ENCV 802 303	Transportation Safety	3
	Jumlah	**9**
Specialization Compulsory Water Resources Management		
ENCV 802 401	Environmental Fluid Mechanics	3
ENCV 802 402	Water Resources Management	3
ENCV 802 403	Hydraulics Structures	3
	Jumlah	**9**
Specialization Compulsory Environmental Engineering		
ENCV 802 501	Contaminating and Soil Remediation	3
ENCV 802 502	Advanced Waste Water Engineering	3
ENCV 802 503	Waste to Energy	3
ENCV 802 504	Emission Control	3
	Jumlah	**12**
Specialization Compulsory Project Management		
ENCV 802 601	Time & Cost Management	3
ENCV 802 602	Quality & Risk Management	3
ENCV 802 603	Procurement Manag, Contract & Claim Admin	3
	Jumlah	**9**
Specialization Compulsory Construction Management		
ENCV 802 601	Time & Cost Management	3
ENCV 802 602	Quality & Risk Management	3
ENCV 802 603	Procurement Manag, Contract & Claim Admin	3
	Jumlah	**9**
Specialization Compulsory Infrastructure Management		
ENCV 802 602	Quality & Risk Management	3
ENCV 802 603	Procurement Manag, Contract & Claim Admin	3
	Jumlah	**6**

Specialization Electives		
	Structure	6
	Geotechnic	3
	Transportation	3
	Water Resources Management	3
	Environmental Engineering	3
	Project Management	3
	Construction Management	3
	Infrastructure Management	3
	Jumlah SKS semester 2	**9**

	3rd Semester	
Compulsory		
ENCV 800 001	Research Proposal	1
	Jumlah	**1**
Specialization Compulsory Structure		
	Jumlah	**0**
Specialization Compulsory Geotechnic		
ENCV 803 201	Adv Foundation Eng & Deep Excavation	3
ENCV 803 202	Diynamics & Earthquake in Geotechnic	3
	Jumlah	**6**
Specialization Compulsory Transportation		
	Jumlah	**0**
Specialization Compulsory Water Resources Management		
ENCV 803 401	Ecohydrology	3
	Jumlah	**3**
Specialization Compulsory Environmental Engineering		
	Jumlah	**0**
Specialization Compulsory Project Management		
ENCV 803 601	HR and Project Communication Management	3
	Jumlah	**3**
Specialization Compulsory Construction Management		
ENCV 803 601	HR and Project Communication Management	3
ENCV 803 605	Management System of HSE	3
	Jumlah	**6**
Specialization Compulsory Infrastructure Management		
ENCV 803 603	Infrastructure & Regional Development	3
	Jumlah	**3**
Specialization Electives		
	Structure	6
	Geotechnic	3
	Transportation	6

	Water Resources Management	3
	Environmental Engineering	3
	Project Management	3
	Construction Management	0
	Infrastructure Management	3
	Jumlah SKS semester 3	**7**

	4th Semester	
Compulsory		
ENCV 800 002	Thesis	8
ENCV 800 003	Scientific Publications	2
	Jumlah	**10**
Specialization Compulsory Geotechnic		
	Jumlah	**20**
Specialization Compulsory Transportation		
	Jumlah	**20**
Specialization Compulsory Water Resources Management		
	Jumlah	**20**
Specialization Compulsory Environmental Engineering		
	Jumlah	**20**
Specialization Compulsory Project Management		
	Jumlah	**20**
Specialization Compulsory Construction Management		
	Jumlah	**20**
Specialization Compulsory Infrastructure Management		
	Jumlah	**20**
Specialization Electives		
	Jumlah SKS semester 4	**11**

Resume

Wajib Program Studi	**20**
Peminatan	
Total SKS Mata Kuliah Wajib Kekhususan	
Struktur	**12**
Geoteknik	**18**
Transportasi	**15**
Manajemen Sumber Daya Air	**15**
Teknik Lingkungan	**18**
Manajemen Proyek	**18**
Manajemen Konstruksi	**21**
Manajemen Infrastruktur	**15**

Total SKS Mata Kuliah Pilihan	
Struktur	12
Geoteknik	6
Transportasi	9
Manajemen Sumber Daya Air	9
Teknik Lingkungan	6
Manajemen Proyek	6
Manajemen Konstruksi	3
Manajemen Infrastruktur	9

Total Beban Studi	
Struktur	44
Geoteknik	44
Transportasi	44
Manajemen Sumber Daya Air	44
Teknik Lingkungan	44
Manajemen Proyek	44
Manajemen Konstruksi	44
Manajemen Infrastruktur	44

Mata Kuliah Pilihan

MATA AJAR PILIHAN SEMESTER GASAL		
Kode	**Mata Ajaran**	**SKS**
Pilihan Peminatan Struktur		
ENCV 803 101	Offshore Structure	3
ENCV 803 102	Bridge Structure	3
ENCV 803 103	Highrise Buildings Structure	3
ENCV 803 104	Plate & Shell	3
Pilihan Peminatan Geoteknik		
ENCV 803 203	Special Topics in Geotechnics	3
Pilihan Peminatan Manajemen Sumber Daya Air		
ENCV 803 402	Water Related Disaster Management	3
ENCV 803 403	**Watershed Vulnerability Assessment**	3
ENCV 803 404	Operation & Maint of Hydraulics Structures	3
Pilihan Peminatan Manajemen Infrastruktur		
ENCV 803 601	HR and Project Communication Manag	3
ENCV 803 602	Technology Manag for Competitive Advantage	3
ENCV 803 604	Infrastructure Assests Management	3
ENCV 803 605	Management System of HSE	3
ENCV 803 606	Manajemen Sistim Infrastruktur	3

Pilihan Peminatan Transportasi		
ENCV 803 301	Modelling Transportation	3
ENCV 803 302	Public Tranport Manag & Planning	3
ENCV 803 305	Advanced Road Geometric Design	3
ENCV 803 306	Advanced Pavement Engineering	3
ENCV 803 307	Advanced Highway Materials	3
ENCV 803 308	Road Preservation Strategy	3
ENCV 803 310	Assets, Environment and Safety	3
ENCV 803 311	Const & Rehab. of Railway Infrastructure	3
ENCV 803 312	Adv Railways Transport Technology	3
ENCV 803 313	Oper & Maintanance of Railway Transport.	3
ENCV 803 315	Logistic Transportation	3
Pilihan Peminatan Teknik Lingkungan		
ENCV 803 501	Urban water Quality Management	3
ENCV 803 502	Environmental Audit	3
Pilihan Peminatan Manajemen Proyek		
ENCV 803 602	Technology Manag for Competitive Advantage	3
ENCV 803 603	Infrastructure & Regional Development	3
ENCV 803 604	Infrastructure Assests Management	3
Pilihan Peminatan Manajemen Konstruksi		
ENCV 803 602	Technology Manag for Competitive Advantage	3
ENCV 803 603	Infrastructure & Regional Development	3
ENCV 803 604	Infrastructure Assests Management	3
ENCV 803 605	Management System of HSE	3

MATA AJAR PILIHAN SEMESTER GENAP		
KODE	**MATA AJAR**	**sks**
Pilihan Peminatan Struktur		
ENCV 802 103	Advanced Mechanics of Material	3
ENCV 802 104	Advanced Steel Structure	3
ENCV 802 105	Concrete Tech & Adv Reinforced Concrete	3
ENCV 802 106	Topics in Structural Engineering	3
Pilihan Peminatan Geoteknik		
ENCV 802 203	Numerical Methods in Geotechnical Eng	3
Pilihan Peminatan Teknik Lingkungan		
ENCV 802 505	LIfe Cycle Analysis (LCA)	3
ENCV 802 506	Pollution Prevention	3
ENCV 802 507	Environmental System Dynamics	3
Pilihan Peminatan Manajemen Proyek		
ENCV 802 604	Adv Construction Methods & Equipments	3
ENCV 802 605	Legal & Institutional Framework	3

Pilihan Peminatan Manajemen Konstruksi		
ENCV 802 604	Adv Construction Methods & Equipments	3
ENCV 802 605	Legal & Institutional Framework	3
Pilihan Peminatan Manajemen Infrastruktur		
ENCV 802 601	Time & Cost Management	3
ENCV 802 604	Adv Construction Methods & Equipments	3

COURSE SYLLABUS OF GRADUATE PROGRAM ON CIVIL ENGINEERING

ENCV801001
Applied Math
3 SKS
Competence in Curriculum: Problem Recognition & Solving
Learning Outcomes: Students should be able to implement procedures to find solutions of differential equations, equations which are common in civil science discipline, both analytically and numerically
Syllabus: Introduction: Role of mathematics in the civil engineering disciplines, review procedures to solve systems of equations and numerical procedure for calculating differential and integral; Differential equations classification; Analytical solutions of linear differential equations; Ordinary differential equation numerical solution: Predictor-corrector method, Runge-Kutta Method; Partial differential equation numerical solution: finite difference method, finite element method.
Prerequisites:
Text Books:
1. Erwin Kreyszig (2011) Advanced Engineering Mathematics Tenth Edition, John Wiley & Sons, Inc.
2. Chapra, Steven C.; Canale, Raymond P. (2015) Numerical Methods for Engineers, Seventh Edition, McGraw-Hill
3. Michael D. Greenberg (1998) Advanced Engineering Mathematics Second Edition, Prentice Hall

ENCV801002
Engineering System & Value
3 SKS
Competence in Curriculum: Problem Recognition & Solving
Learning Outcomes: Able to evaluate system engineering including analysing, simulating and optimizing to produce a better designed and more valuable system engineering.
Syllabus: Course Overview; Introduction to Systems Definitions & Concepts; Introduction to Sustainability Development; Optimization and Reliability, Design & Operation, Decision Making; Issues on Human, Organizational and Technology; Value Engineering and Innovation; New Product Development; System Dynamic and Simulation (MCS)
Prerequisites:
Text Books:
1. M.A. Berawi, (2014), Aplikasi Value Engineering pada industri konstruksi, UI Press, Jakarta.
2. M.A. Berawi (2015), Rekayasa Inovasi Mega Proyek Infrastruktur, UI Press Jakarta.
3. Value World, Journal of Society of American Value Engineers (SAVE International), USA.
4. Kaufman, JJ & Woodhead, RM (2006), Stimulating Innovation in products and Services, John & Willey Interscience.
5. Blanchard, B S (1997*). System Engineering Management*, Wiley-Interscience
6. Buede, DM (2009), The Engineering Design of Systems: Models and Methods, Wiley-Interscience
7. Ulrich, Karl T. and Eppinger, Steven D (2004) *Product Design and Development*, 3rd Edition, McGraw-Hill, New York

ENCV802003
Research Methodology
3 SKS
Competence in Curriculum: Prior knowledge for Research/Experiment, Communication
Learning Outcomes:
1. Able to explain the thinking concept of research method and apply them in selecting the appropriate research methodology and in preparing the research proposal
2. Able to explore the uniqueness and originality of the proposed research (uniqueness of civil engineering problems)

Syllabus: Methodological principles, research characteristic and process, quantitative and

qualitative research paradigm, scientific method, problem statement, construct hypotheses, critical and logic thinking, research strategy, data collection techniques and analysis techniques, scientific paper, seminar drafting guidance with potential mentors
Prerequisites:
Text Books:
1. Nazir, Moh, Metode Penelitian, Ghalia Indonesia,2003
2. Keputusan Rektor UI No 628, Pedoman Teknis Penulisan Tugas Akhir Mahasiswa Universitas Indonesia, 2008
3. FTUI, Pedoman Penulisan Thesis, 2006
4. Yin.Robert k, Studi Kasus Desain dan Metode, Rajagrafindo Persada, 2008
5. Riduwan, Skala pengukuran variable-variabel penelitian, Alfabeta, 2002
6. Tan, W. (2008). *Practical Research Methods* (Third Edition ed.). Singapore: Prentice Hall

ENCV800001
Seminar
1 SKS
Competence in Curriculum: Research/Experiment, Communication, Lifelong Learning
Learning Outcomes: Students should be able to apply the knowledge from the specificity / specialization that has been gained in preliminary studies, analyze the results and describe it orally (presentation) and written (seminar book)
Syllabus:
Prerequisites: Research Methodology

ENCV 800 002
Thesis
7 SKS
Competence in Curriculum: Research/Experiment, Communication, Lifelong Learning
Learning Outcomes:
1. Able to integrate the knowledge specificity of Civil Engineering in the design and implementation stage of the research to solve a problem, able to analyze and interpret research data to obtain valid conclusions
2. Able to explain the results of the research in the form of a scientific paper (thesis) and presentation

Syllabus: -
Prerequisites: Research Methodology and Seminar
Text Books:

ENCV800003
Scientific Publication
2 SKS
Competence in Curriculum: Communication
Learning Outcomes: Students should be able to explain the results of his/her research in the scientific literature using a proper Indonesian / English language according to the intended standard of writing journals / proceedings.
Syllabus: -
Prerequisites: Thesis
Text Books:

Course Syllabus of Structure Specialization

ENCV801101
Prestressed Concrete Structure
3 SKS
Competence in Curriculum: Technical Specialization, Communication
Learning Outcomes: Students should be able to design pre-stressed concrete according to the standard regulations, in buildings and long span bridges using factored Strength (Load and Resistance Factored Design, LRFD), serviceability

Syllabus:
Prestressed material review and how to design for bending based on Serviceability Limit State Design (SLSD) method. Load and factored strength design in the aspect of bending, shear and torsion. Serviceability limit on the aspect of deflection. Statically indeterminate structure. Loss of prestressing force due to friction and wobbling, Elastic shortening of concrete, anchor slip, creep and shrinkage of concrete, along with the relaxation of prestressing steel. Analysis of the columns and beams prestressed meeting point; analysis of prestressed anchor zone. Application in buildings and long span bridges. external prestressing, and special applications in cable stayed bridge.
Prerequisites: -
Text Books:

1. SNI 03-2874-2002: "Tata cara perencanaan struktur beton untuk bangunan gedung", Badan Standardisasi Nasional, 2002.
2. SNI T-14-2004: "Perencanaan struktur beton untuk jembatan", Badan Standardisasi Nasional, 2004.
3. ACI 318-02 & ACI 318R-02: "Building code requirements for structural concrete and commentary", American Concrete Institute, 2002.
4. AASHTO: "Standard specifications for highway bridges", American Association of State Highway and Transportation Officials, 17th Edition, 2002.
5. Y. Guyon: "Limit state design of prestressed concrete", Applied Science Publishers, Essex, 1974.
6. A.S.G. Bruggeling: "Structural concrete; Theory and its application", A.A. Balkema, Rotterdam, 1991.
7. R. Chaussin, A. Fuentes, R. Lacroix, J. Perchat: "Prestressed concrete", Presses de l'Ecole National des Ponts et Chaussees, Paris, 1992.
8. T.Y. Lin, N.H. Burns: "Design of prestressed concrete structures", John Wiley & Sons, New York, 1992.
9. R. Walther, B. Houriet, W. Isler, P. Moia: "Cable stayed bridges", Thomas Telford, London, 1988.
10. ACI Committee 209, "Prediction of creep, shrinkage, and temperature effects in concrete structures", ACI-209R-92, ACI Manual of Concrete Practice.
11. F.X. Supartono: "Beton Pratekan", Seminar HAKI untuk Konstruksi Beton dan Baja berdasarkan SNI-2002, Pekanbaru, 5 Oktober 2004.
12. F.X. Supartono: "External prestressing for building structural repair", FIP International Symposium, Johannesburg, South Africa, 9 – 12 March 1997.
13. F.X. Supartono: "Jembatan cable stayed", Seminar jembatan cable stayed, Direktorat Jendral Binamarga, Jakarta, Maret 1996.
14. F.X. Supartono: "Jembatan segmental beton pratekan dengan cara kantilever", Short course "Perencanaan dan teknologi konstruksi jembatan", Semarang, 11 Maret 1996.

ENCV801102
Structural Dynamics
3 SKS
Competence in Curriculum: Technical Specialization
Learning Outcomes: Students should be able to analyze civil engineering buildings subjected to dynamic forces.
Syllabus: Dynamic load types, structures and responses; structural modeling as a single-degree-of-freedom (SDOF) system; SDOF free vibration; SDOF Forced vibration: harmonic dynamic loads, periodic and erratic loads; Response analysis to SDOF using numerical integration method; generalization of SDOF; modelling of Multi-Degrees-of-Freedom (MDOF), static condensation applications; eigen problem; forced vibration on harmonic loading, spectra responses.
Prerequisites:
Text Books:

1. Chopra A.K., Dynamics of Structures, Prentice Hall, 1995
2. Clough R.W. Penzien J., Dynamic of Structures, McGraw-Hill, 1993

ENCV802101

Earthquake Resistance Building
3 CREDITS
Competence in Curriculum: Technical Specialization
Learning Outcomes: Students should be able to analyze the effect of earthquakes on civil engineering buildings and able to design earthquake proof buildings
Syllabus : Introduction : aspects of earthquake, causes, fault, wave, damage mechanism, size of the earthquake; Characteristics of ground motion and response spectrum; Architectural Considerations on the earthquake resistant structural system; Building dynamic response; Equivalent Static Analysis: The principle of equivalent static seismic forces, Equivalent static procedure according to SNI standard; Advanced Equivalent Static Analysis: The principle of equivalent static seismic forces; Equivalent static procedure according to SNI standard; Lateral stability and drift design; Seismic design of floor diaphragms; The design concept of capacity and ductility in earthquake planning; Portal structural seismic design and detailing: beams, columns, beam-column joint; Advanced seismic Structure Design & detailing portal: beams, columns, beam-column joint; Advanced seismic Structure Design & detailing portal : beams, columns, beam-column joint; Shear wall structure seismic design and detailing; Advanced shear wall structure seismic design and detailing; Double structural seismic design and detailing: portal and sliding walls
Prerequisites:
Text Books:

1. Farzad Naeim, the Seismic Design Handbook, 1989
2. Paulay and Priestly, Seismic Design of Reinforced Concrete and Masonry Buildings, 1992.
3. Chopra, Dynamic of Structures, 1995.
4. BSN, Tata Cara Perencanaan Ketahanan Gempa untuk Bangunan Gedung, SNI 03-1726-2002
5. BSN, Tata Cara Perencanaan Struktur Beton untuk Bangunan Gedung, SNI 03-2843-2002
6. BSN, Tata Cara Perencanaan Struktur Baja untuk Bangunan Gedung, SNI 03-1729-2002

ENCV802102
Finite Element Method
3 Credits
Competence in Curriculum: Technical Specialization
Learning Outcomes:

1. Able to apply finite element method (FEM) for 3-dimension elastic problem and 2-dimension solid elastic (plane stress and strain)
2. Able to use finite element method package, and create sub routine matrix of element strength.

Syllabus:
Introduction, FEM definition and concept, variation methods, Galerkin and Ritz solution, shape function, model displacement and mixed, one-dimensional element (lD) bars and beam of Euler Bernoulli, 2D isoperimetric element (plane stress, plain strain), 3D isoperimetric element, stiffness and time matrix, Gauss and Hammer numeric integration, application programming packages in 2D and 3D elastic problem, task of making subroutine elements (2D and 3D) and their incorporation in a PCFEAP (Personal Computer Finite element Analysis program) main program.
Prerequisite: Applied Mathematics
Reference Book:

1. Zienkiewicz, O.C., & R.L. Taylor, *The Finite Element Method*, voLl, 5th eds, McGraw Hill,2006
2. R.D. Cook, Malkus, M.E. P1esha, Concepts and Application of Finite Element Analysis, John Wiley and Sons, Inc., 4th eds, 2006
3. KATILI, Irwan, Metode Elemen Hingga untuk Pelat Lentur, UI Press-2003.
4. KATILI, Irwan, Metode Elemen Hingga untuk Analisis Tegangan, UI Press-2008

ENCV802103
Advanced Mechanics of Material
3 Credits
Competence in Curriculum: Technical Specialization

Learning Outcomes:
Able to deeply analyze the structure response due to static load or temperature with considering material and structure properties in elastic and inelastic condition.
Syllabus:
Mechanical properties of materials; Stress-strain theory; Temperature- stress strain relationship; Inelastic material properties; Application methods of energy; Torque; Asymmetric moment on straight beam; Central shear on beam with a cross section of thin walls; Curved beams; Beam over elastic foundation.
Prerequisite:
Reference Book:
1. Boresi A.P. et all, Advance 1. Mechanics of Material, John Wiley & Sons, Inc, 1993
2. R.C. Hibbeler, Mechanics of Materials, Prentice Hall, 2002

ENCV802104
Advanced Steel Structure
3 Credits
Competence in Curriculum: Technical Specialization
Learning Outcomes:
Able to design steel structure component that includes connection design, girder plate, portal and composite structure on simple high-rise building using elastic and plastic method.
Syllabus:
The calculation of continuous means with plastic method. Beam-Columns. Theory and Analysis of girders plate on building. Advance connection techniques. Portal and gable frame design. Steel composite structure and steel-concrete composite structures in simple high-rise buildings. Pre-stressed steel-concrete composite structures and application of Preflex system in building. Cold form section / Light Gage Member.
Prerequisite:
Reference Book:
1. Salmon C.G. and Johnson J.E., Steel Structures: Design and Behavior, Fourth Edition, Harper Collins Publishers, 1996
2. Bresler B. Lin T.Y., Scalzi J.B., Design of Steel Structures, John Wiley & Sons- Toppan Co., 1968
3. Segui William T., LRFD Steel Design, ITP-PWS Publishing Co., Boston, 1994
4. SNI-03-1729-2021, Badan Standarisasi Indonesia, Tata Cara Perencanan Struktur Baja untuk Bangunan Gedung, Standar, 2002

ENCV802105
Concrete Technology & Adv. Reinforced Concrete
3 Credits
Competence in Curriculum: Problem Recognition and Solving, Technical Specialization
Learning Outcomes:
1. Able to identify modern and future concrete technology, especially high-performance and/or high-grade concrete,
2. Able to design high quality concrete mix to achieve specific performance according to applicable legislation, to be applied in high-rise buildings and long span bridges.
3. Able to design reinforced concrete structural components include shear walls, beams coupling, boundary elements, beam-column panel connection.

Syllabus:
- Modern and future concrete, technology, engineering and behavior according to SNI (DOE) and ACI; Abrams-FXS formulation; Feret and Bolomey formulations. Concrete rheology; FXS model for concrete rheology; Visco elastic behavior of concrete rheology and its application in creep and shrinkage of concrete; FXS models of non-Newtonian.
- Reinforced concrete design for bending, axial, shear and torsion and confined concrete structure.
- Various research and developments; comparison of conditions based on SNI, ACI and NZS
- Design: Ductile structure wall, beam coupling, boundary elements, connection panel of portal beams and columns; shear strength, adhesion and stiffness of connection panel; Mechanisms and behavior of elastic and inelastic. Diagonal press field theory; Modified

compression field theory.
- Models strut and tie; and applications in the design of concrete structures.

Prerequisite:
Reference Book:

1. ACI: "ACI Manual of Concrete Practice", American Concrete Institute, 2015.
2. ACI Committee Report 363 R-92: "State of the Art Report on High Strength Concrete", 1992.
3. Ken W. Day: "Concrete Mix Design, Quality Control and Specification", E & FN Spon, 1995.
4. Krishna Raju: "Design of Concrete Mixes", CBS Publishers, 1985.
5. A.M. Paillere: "Application of Admixtures in Concrete", E & FN Spon, 1995.
6. T. Paulay and M.J.N. Priestley: "Seismic Design of Reinforced Concrete and Masonry Buildings", A Wiley-Interscience Publication, John Wiley & Sons, New York, 1992.
7. J.B. Mander: "Seismic Design of Bridge Piers", A Thesis submitted in partial fulfillment of the requirements for the Degree of Doctor of Philosophy in Civil Engineering at the University of Canterbury, University of Canterbury, Christchurch, New Zealand, 1983.
8. ACI Committee 318: "Building Code Requirements for Structural Concrete, ACI 318-14", American Concrete Institute, Detroit, 2014.
9. "International Building Code", International Code Council, 2015
10. Persyaratan beton structural untuk bangunan gedung, SNI 2847 : 2013
11. Beban minimum untuk perancangan bangunan gedung dan struktur lain, SNI 1727 : 2013
12. P.C. Cheung, T. Paulay and R Park: "Interior and Exterior Reinforced Concrete Beam-Column Joint of a Prototype Two-Way Frame with Floor Slab Design for Earthquake Resistance", Research Report 89-2, Department of Civil Engineering, University of Canterbury, Christchurch, New Zealand, 1989.
13. M.P. Collins and D. Mitchell: "Prestressed Concrete Structures" Prentice Hall, Englewood Cliffs, New Jersey, 1991.
14. Mac Gregor, J.G., Reinforced Concrete: Mechanics and Design, 6th. Edition, Pearson, 2012

ENCV803101
Offshore Structure
3 Credits
Competence in Curriculum: Technical Specialization
Learning Outcomes:
Able to design offshore buildings structures.
Syllabus:
Types of offshore buildings; Construction and Structures of offshore building; Fixed and floating design, Strength and force calculations of offshore building; Safety requirements; Semi-submersible construction; Single Buoy Mooring; FPSO; Maintenance and Repair of offshore building.
Prerequisite: -
Reference Book:

1. Subrata Chakrabarti, Handbook of Offshore Engineering, Elsevier Science, 2005
2. Yong Bai, Marine Structural Design, Elsevier Science, 2003
1. Cliff Gerwick, Construction of Marine and Off-shore Structures, CRC Press 1999

ENCV803102
Bridge Design
3 Credits
Competence in Curriculum: Technical Specialization
Learning Outcomes:
1. Able to analyze the development of bridge structure that includes determining the location and layout, know the structural system and types of steel and concrete bridge.
2. Able to design upper and lower bridge structure and plan the bridge construction method.

Syllabus:
The development and history of bridge; Bridge location and layout; Load regulation on highways and railways; Bridge structural system: top and bottom structure and foundation and support, bridge type geometry; wooden bridge; steel bridge: rolled and plate girders, composite, orthotropic deck, bridge frame, arch, suspension, cable stay; concrete bridges: bridge plate,

deck girder, box girder, pre-stressed segmental bridges, reinforced concrete frame, frame, arch, cable stay and pre-stressed bridge; substructures, pier and abutment; analysis and design of bridges: bridge load, load distribution on stringers, longitudinal beams and floor beams, pre-stressing effects, structural analysis and design; load on the substructure, soil pressure, seismic design; Design placement.

Prerequisite:

Reference Book:

1. MS Troisky, Planning and Design of Bridges, John Wiley & Sons, Inc, New York, 1994
2. SNI No. 1725-1989-F, Departemen Pekerjaan Umum, Pedoman Perencanaan Pembebanan Jembatan Jalan Raya
3. Departemen Pekerjaan Umum, Peraturan Perencanaan Teknik Jembatan – Bridge Management Systems, 1992,
4. RM Barker, JA Puckett, Design of Highway Bridges, based on AASHTO LRFD Bridge Design Specifications, John Wiley & Sons, New York, 1997
5. PP Xanthakos, Theory and Design of Bridges, John Wiley & Sons, New York, 1994
6. N Taly, Design of Modern Highway Bridges, The McGraw-Hill Company, Inc., New York, 1998
7. Mathivat, J., The Cantilever Construction of Prestressed Concrete Bridges, John Wiley & Sons, 1983
8. Prichard, B., Bridge Design for Economy and Durability, Concept for New, Strengthened and Replacement Bridges, Thomas Telford, London, 1992

ENCV803103
Highrise Structural Building
3 Credits
Competence in Curriculum: Technical Specialization
Learning Outcomes:

1. Able to apply the procedures for design and technology of pre-stressed concrete according to the standard regulations that apply to buildings and long span bridge.
2. Able to apply procedures for the design-based methods of Load Design and PBKT factored strength, Load and Resistance Factored Design (LRFD), as well as the limits of serviceability on various aspects of strength, stability and deflections, as well as pre-stressed anchor zones.

Syllabus:

Definition, history, and basic concept of pre-stressed concrete; Typical use of pre-and posttensioning technology; Material properties of concrete and soft reinforcing steel and pre-stress. Pre-stresses losses; Analysis of bending due to the workload (section are not linear elastic fractured); Ultimate strength of pre-stressed concrete cross section; Design of pre-stressed concrete cross section; Design of flexible cross section; Camber and deflection; Pre-stressed continuous beam analysis; Shear strength in pre-stressed beams; Bond and anchorage of pre-stressing steel; Applications for pre-stressed concrete slab. Application of pre-stressed concrete on bridge. Criteria for design of high-rise buildings; Load: gravity, wind and earthquakes; System Structure: Retention of gravity and lateral bracing; Modeling and Analysis. Frame planning (concrete and steel) and sliding walls and double system.

Prerequisite:

Reference Book:

1. SNI 03-2874-2002:"*Tatacara Perencanaan Struktur Beton untuk Bangunan Gedung*", Badan Standarisasi Nasional, 2002
2. *Building Code Requirements for Structural Concrete (ACI 318-05)*, Reported by ACI Committee 318
3. Lin, T.Y. & Burn, *Design of Prestressed Concrete Structures*, Third Edition, John Wiley & Sons, 1982
4. Nilson, A., *Design of Prestressed Concrete*, 2nd Edition, John Wiley & Sons, 1987
5. Edward G. Nawy, *Prestressed Concrete, A Fundamental Approach*, 2nd edition, Prentice Hall, 1996
6. Podolny, W. and Muller, JM., *Construction and Design of Prestressed Concrete Segmental Bridges*, John Wiley & Sons, 1982
7. *Tata Cara Perencanaan Struktur Baja untuk Bangunan Gedung*, SNI 03-1729-2002, BSN, 2002
8. *Specification for Structural Steel Buildings*, ANSI/AISC 360- 05

9. *Seismic Provision for Structural Steel Buildings*, ANSI/AISC 341- 05
10. Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications, ANSI/AISC 385-05

ENCV803104
Plate and Shells
3 Credits
Competence in Curriculum: Technical Specialization
Learning Outcomes:
Able to apply finite element method to analyze and designing of plate and shells structure.
Syllabus:
Plates: Plates formulation; Plate element with shear deformation; Kirchoff element; Test validation and performance of plate element; Shell: geometric description, the principle of virtual work and forms variation, isoperimetric elements, facet-plan element type; Design and analysis of shell structure; concept of plate and shell structures, type and shape of the structure shells, Some aspects of FEA for shell structure, Design and analysis: roof structure; cylindrical shell, gable HP, Folded Plate, Dome; Structure of tank with circular pre-stressing; silos and bunkers.
Prerequisite: -
Reference Book:
1. I. Katili, Metode Elemen Hingga untuk Pelat Lentur, Penerbit Universitas; 2003
2. David P. Billington, Thin Shell Concrete Structures, Second Edition, McGraw Hill Book Company, New York, 1982

ENCV 804 101
Special Topics in Structural Engineering
3 Credits
Competence in Curriculum: Technical Specialization
Learning Outcomes:
Knowing the latest technology or topics on structure specificity as well as the development of structural knowledge in the future.
Syllabus:
Selected topics in structure specificity.
Prerequisite:
Reference Book:

Course Syllabus of Geotechnics Specialization

ENCV 801 201
Advanced Soil Mechanics
3 Credits
Competence in Curriculum: Problem Recognition and Solving
Learning Outcomes:
Able to formulate the behavior of kinds of soil and soil condition.
Syllabus:
Critical state of soil mechanics; Effects of testing on soil shear strength; Effective stress and total stress approach; Loading and unloading; Short-term and long-term behavior; Further consolidation; The use of horizontal drainage. Unsaturated soil mechanics; Differences in behavior of saturated and unsaturated soil; Soil constitutive model.
Prerequisite:
Reference Book:
1. Soil Mechanics, 7th Ed., R.F. Craig, 2004.
2. Muni Budhu. Soil Mechanics 3rd Edition. 2011
3. Braja M. Das. Principal of Geotechnical Engineering 6th Edition. 2010
4. Potts & Zdravkovic, Finite Element in Geotechnical Engineering. 1999.

ENCV 801 202
Advanced Geotechnical Investigation
3 Credits
Competence in Curriculum: Problem Recognition and Solving, Experiment/Research
Learning Outcomes:
Able to formulate complex geotechnical investigation program
Syllabus:
General introduction of Advanced Experimental Laboratory that associated with Geotechnics; introduction, understanding and usage of test results using a Dilatometer, Pressuremeter, Plat Bearing, Swelling, Geotechnical instrumentation, Centrifuge, Triaxial UU/CU/CD, Long-Term Consolidation, Triaxial Cyclic. Further introduction and testing in the laboratory by means of triaxial CU and swelling; as well as field tests with Pressuremeter.
Prerequisite:
Reference Book:
1. Geotechnical Engineering Portable Handbook; Robert W. Day, McGraw-Hill, 2000.
2. Geotechnical Engineering, S Joseph Spigolon, Phd, PE, McGraw-Hill, 2001.
3. American Society of Testing and Material Annual Book of ASTM standards, ASTM, 1989.
4. Soil Mechanics, 7th Ed., R.F. Craig, 2004.

ENCV802202
Slope Stabilization and Soil Improvement
3 Credits
Competence in Curriculum: Problem Recognition & Solving; Experiments/Research, Technical Specialization, Sustainability.
Learning Outcomes:
Able to create synthesis of complex slope stabilization solution and the necessary strengthening.
Syllabus:
Slope stability analysis of finite and infinite with method of fellinius, bishops, and other methods; Analysis of avalanches by using software; Avalanche hazard analysis and slope improvement / strengthening: soil nailing; strengthening retaining wall structure; Soil improvement: stabilization by mechanical means (dynamic compaction, vibro flotation / compaction) vertical drainage with sand post (sand pile and sand drained), stabilization with chemicals, injection method.
Prerequisite:
Reference Book:
1. Bowles, J.E., Foundation Analysis and Design, McGraw-Hill Book Co., Singapore.
2. Ingels, O.G. and Metcalf, J.B., Soil Stabilization, Butterworths, Australia.
3. Muni Budhu, Soil Mechanics & Foundations, 3rd Ed., John Wiley & Sons. Inc, 2011.
4. Soil Mechanics, 7th Ed., R.F. Craig, 2004.
5. Duncan & Wright, Soil Strength and Slope Stability. John Wiley and Sons. 2005.
6. Abramson, et al., Slope Stability and Stabilization Methods, 2nd Ed. John Wiley and Sons. 2002.

ENCV802202
Environmental Geotechnics
3 Credits
Competence in Curriculum: Problem Recognition & Solving, Sustainability; Technical Specialization
Learning Outcomes:
Able to make synthesis of geotechnical solution from complex environmental issue.
Syllabus:
Geotechnical aspects: landfill geotechnical structure, behavior and properties of garbage, geosynthetic applications for landfill, cover land, landfill geotechnical analysis and design, long-term behavior of landfills; Type of soil and groundwater pollution, contaminated soil sampling,

transfer of contaminants in ground water, type of soil and groundwater containment, type of soil and groundwater remediation.

Prerequisite:

Reference Book:

1. Oweis, I.S., "Geotechnology of Waste Management, 2nd Ed." PWS Publishing Company, 1998.
2. Abramson, et al., Slope Stability and Stabilization Methods, 2nd Ed. John Wiley and Sons. 2002.

ENCV802203

Numerical Method in Geotechnical Engineering

3 Credits

Competence in Curriculum: Problem Recognition and Solving, Experiments and Research

Learning Outcomes:

Able to determine, executing, and analyzing the result of complex geotechnics issue.

Syllabus:

Introduction to numerical methods in geotechnical engineering; Geotechnical considerations; Constitutive law for geological media; Finite element in linear and non-linear material; Stress strain law in elastic-plastic and elasto-visco-plastic condition; Soil mechanics model with critical conditions (critical states); Completion of finite difference method and finite element in the beam foundation and elastic plate; Analysis of consolidation on soft ground and seepage; Some historical case. Geotechnical case analysis using numerical methods, and interpret the analysis result.

Prerequisite: -

Reference Book:

1. Bowles, J.E., Foundation Analysis and Design, McGraw-Hill Book Co., Singapore.
2. PottS, D.M. and Zaravkovic, L., Finite Element Analysis in Geotechnical Engineering, Thomas Telford Ltc., London.
3. Naylon, D.J., and Pande, G. N., Simpson, B., and Tabb, R., Finite Elements in Geotechnical Engineering, Pineridge Press, Swansea, UK.
4. Desai, C.S., and Christian, J.T., Numerical Methods in Geotechnical Engineering, Mc-Graw-Hill Inc., USA.

ENCV 803 201

Adv. Foundation Engineering & Deep Excavation

3 Credits

Competence in Curriculum: Problem Recognition and Solving, Experiment/Research, Technical Specialization.

Learning Outcomes:

Able to make synthesis of complex deep excavation solution

Syllabus:

Lateral deep foundations; Construction and analysis of diaphragm walls; Constitutive soil models and characteristics of compressible soil; Mat foundation application; The construction methods for large diameter bored pile; Interpretation result of loading test; Deep foundations lateral capacity; construction and analysis of diaphragm walls; Geotechnical work surveillance method.

Prerequisite:

Reference Book:

1. Geotechnical Engineering Portable Handbook; Robert W. Day, McGraw Hill, 2000.
2. Soil Mechanics in Engineering Practice; Terzaghi, K. & Peck, R.B., John Wiley and Sons Ltd, New York, 1967.
3. Foundation Analysis and Design; Bowles, J.E, McGraw-Hill Book Co. Singapore, 1997.
4. Foundation Engineering Handbook; Winterkorn, H.F. & Fang, H.Y., van Nostrand Reinhold, Ltd. 1975.
5. Analytical and Computer Methods in Foundation Engineering; Bowles, J.E, McGraw-Hill Inc., 1977.
6. Elements of Foundation Design, Smith, G.N, Pole, E.L, Granada Publishing Ltd., 1980.
7. Smith & Paul. Soil Mechanics & Foundation

ENCV 803 202
Diynamics & Earthquake in Geotechnic
3 Credits
Competence in Curriculum: Problem Recognition and Solving, Sustainability, Technical Specialization.
Learning Outcomes:
Able to create synthesis solution of various problem of geotechnics against earthquake and able to formulate machine foundation solution.
Syllabus:
Dynamic on soil; Basic vibration; Wave in elastic medium; Dynamic soil properties; Vibration foundation; Effect of earthquake on the ground; Seismic lateral earth pressure; Liquefaction; Engine foundation above pole; Vibration theory; Waves in an elastic medium; Dynamic properties of the soil; foundations and vibration. Introduction to the probabilistic analysis of earthquake hazard; Amplification analysis of ground earthquake; Liquefaction phenomenon; Slope stability analysis of earthquake; Analysis of lateral earth pressure due to earthquake. The introduction of soil improvement methods in order to lower the vibration and earthquake effects on the ground.
Prerequisite:
Reference Book:
1. S.L. Cramer, Geotechnical Earthquake Engineering, Prentice Hall, 1996.
2. Braja M. Das, Principles of Soil Dynamics, PWS-KENT Publishing Co., 1993
3. Chopra A.K., Dynamics of Structures, Prentice Hall, 1995

ENCV 803 203
Special Topics in Geotechnics
3 Credits
Competence in Curriculum: Problem Recognition & Solving, Experiments/Research, Technical Specialization.
Learning Outcomes:
1. Able to formulate solutions for complex soil-structure interaction.
2. Able to formulate the behavior of different kinds of rocks and rock mass conditions.
3. Able to formulate solutions for slope stability of rock mass.

Syllabus:
General introduction: Soil Structure Interaction; Buried structure and sheet pile wall and shallow foundation; SSI modelling in Plaxis 3D program; 3D plaxis application on the sheet pile wall and pile group; The use of geotextile in high vacuum to accelerate the consolidation process; The use of other additives to enhance the strength of the soil; The use of high pressure to perform injection for structure test strength associated with the sub structure.
Prerequisite:
Reference Book:
1. Journal ASCE, yang berkaitan dengan Soil Strucuture Interaction
2. Canadian Geotechnical Journal yang berkaitan dengan Soil Structure Interaction
3. Journal ASCE yang berkaitan dengan Stabilisasi Tanah
4. Canadian Geotechnical Journal yang berkaitan dengan stabilisasi tanah
5. Non-destructive test

Course Syllabus of Transportation Specialization

ENCV 801 301
Traffic Control Engineering
3 Credits
Competence in Curriculum: Technical Specialization
Learning Outcomes:
Students should be able to analyze traffic condition and characteristics using mathematical models and micro and macro modeling techniques as a tool for traffic flow analysis.

Syllabus:
Introduction; Characteristics of Humans; Vehicles and traffic infrastructure in traffic analysis; Junction control; Traffic flow surveys; Volume of traffic characteristic. Characteristics of traffic flow speed. Analysis of traffic flow density. Queues analysis and bottle neck theory. Models of traffic flow; Analysis of shock wave traffic management.
Prerequisite:
Reference Book:
1. Mannering, F. and Kilareski, W., 1998. *Principle of Highway Engineering and Traffic Analysis*, Willey & Sons.
2. May, A.D., 1990. *Traffic Flow Fundamental*, United State of America: Prentice-Hall, Inc.
3. McShane, W., Roess, R. and Prassas, E., 1998. *Traffic Engineering*, Prentice-Hall, Inc.
4. Taylor, M.A.P. and Young, W., 1988. *Traffic Analysis: New Technology and New Solutions*, Hodder Arnold.
5. MKJI, 1997. *Manual Kapasitas Jalan Indonesia*, Kementrian Pekerjaan Umum.
6. Wohl, M. and Martin, B., 1967. *Traffic System Analysis for Engineers and Planners*, McGraw-Hill.

ENCV 801 302
Transportation System
3 Credits
Competence in Curriculum: Problem Recognition and Solving
Learning Outcomes:
1. Able to analyze the components of transport system from various dimensions, as well as the latest issues related to the Indonesian and global transport system.
2. Able to design a transportation system that includes an operating system, which meets the demand and supply aspects of sustainability.

Syllabus:
Transportation system overview. Characterization and categorization of transportation system for single and dual mode. (Influence) Factors in the transportation system (planning, design, investment, operation, maintenance). System Demand. Supply systems. Issues of equality, accessibility, environmental, economic and disability.
Prerequisite: Transportation Engineering
Reference Book:
1. Grava, S., 2003. *Urban Transportation System*, McGraw-Hill.
2. Manheim, M., 1979. *Fundamentals of Transportation Systems Analysis. Vol 1: Basic Concept* 1st ed., The MIT Press.

Blunden, W. and Black, J., 1984. *The Land-Use / Transport System* 2nd ed., Pergamon-Press

ENCV 802 301
Transportation Economics
3 Credits
Competence in Curriculum: Problem Recognition and Solving, Sustainability
Learning Outcomes:
1. Able to use economy, social impact, in the process of problem solving of complex transportation.
2. Able to analyze the demand and supply of transport systems based on economic theory and behavior of the traveler.
3. Able to analyze the economic investment of transportation short-term and long-term project including measurement of the cost of externalities and financing aspects.

Syllabus:
Introduction to transport economics; Concept of demand and supply of transport systems. Spatial problems: movement, transport and location. Transport demand, costs and direct benefits of transport and recovery costs. External costs of transport: congestion, pollution, accidents and social impact. Transportation investment: the basics of pricing, subsidy, competence between transportation systems, understanding investment decisions (BCR, IRR and NPV).
Prerequisite:
Reference Book:
1. Kenneth Button, 2010., Transport Economics 3rd edition, Edward Elgar Publisher.

2. Stuart Cole, 2005, Applied Transport Economics. Policy, management & decision making 3rd edition, Kogan Page.
3. Quinet, E, Vickerman, R dan Vickerman RW, 2005. Principle of Transport Economic, Edward Elgar Publisher
4. McCarthy, P. 2007, Transportation Economics Theory and Practice: A Case Study Approach, 2nd edition, Blackwell Publishing

ENCV 802 302
Transportation Policy
3 Credits
Competence in Curriculum: Experiment/Research, Technical
Learning Outcomes:
Able to bring the uniqueness and originality from suggestion of transportation policy arrangement.
Syllabus:
Transport Policy Formulation; framework for assessing transport policy - land use, accessibility, air pollution, noise, accidents, and sustainability. Planning and transport policies and interaction with layout. Institutional arrangements for transportation planning and management. Risks, uncertainties and complexities in setting transportation policy. Transport policy at the local, regional, metropolitan and national; logistics transport policy.
Prerequisite:
Reference Book:
1. Shciller, P., Bruunm, E. and Kenworthy, J., 2010. *An Introduction to Sustainable Transportation: Policy, Planning* 1st ed., Routledge.
2. Morichi, S. and Acharya, S.R., 2013. *Transport Development in Asian Megacities: A New Perspective*, Springer.
3. Rodrigue, J.-P., Comtois, C. and Slack, B., 2009. *The Geography of Transport Systems* 3rd ed., Routledge.
4. Stopher, P. and Stanley, J., 2014. *Introduction to Transport Policy: A Public Policy View*, Edward Elgar Pub.

ENCV 802 303
Transportation Safety
3 Credits
Competence in Curriculum: Problem Recognition and Solving, Sustainability
Learning Outcomes:
Students able to design prevention program and transportation safety measures, road transportation (C5) and perform simple road transport audit.
Syllabus:
Introduction: The problem of road safety in Indonesia, road safety policy, and the introduction of road safety engineering. Data accidents: Development of road traffic accident data. The factors that cause accidents: factors of road users, vehicles factor and road and environment factor. Analytical approaches: starting point, macroscopic study, multivariate study and evaluation of the effectiveness of efforts to improve road safety. Handling of road engineering: the roadside hazard management, the protection system, safety at road works and the introduction of a road safety audit. Transport safety: the safety of railways, air transport safety and the safety of shipping.
Prerequisite: Has already taken Road Geometric Design or following matriculation subjects of Road Geometric Design in Strata 1.
Reference Book:
1. Fricker, J. and Whitford, R., 2004.Fundamentalsof Transportation Engineering: A Multimodal System Approach
2. Evans, L., 2004. *Traffic Safety*, Science Serving Society
3. Tjahjono, T., 2011. *Analisa Keselamatan Lalu Lintas Jalan*, Lubuk Agung.
4. Serial Rekayasa Keselamatan Jalan. Panduan Teknis 1. Rekayasa Keselamatan Jalan; Panduan Teknis 2. Manajemen Hazard Sisis Jalan; Panduan Teknis 3. Keselamatan di Lokasi Pekerjaan Jalan. Direktorat Jenderal Bina Marga, Kementerian Pekerjaan Umum Republik Indonesia.

Tahun 2012

ENCV 803 301
Transportation Modelling
3 Credits
Competence in Curriculum: Problem Recognition and Solving
Learning Outcomes:
Able to make a model based on transportation infrastructure network.
Syllabus:
Human characteristics; Vehicle and infrastructure in transportation analysis; Junction control; Traffic flow survey; Characteristics of: volume of traffic flow, traffic flow speed and density; Analysis of queue and bottlenecks theory; Traffic flow models; Shock wave analysis; Traffic Management.
Prerequisite: -
Reference Book: -

ENCV 803 302
Public Transport Management and Planning
3 Credits
Competence in Curriculum: Technical Specialization
Learning Outcomes:
Students are able to plan and design public transport system operation.
Syllabus:
Overview of public transport systems. Regulatory Framework, Public Transport Category and Mode of Technology, Components of public transportation system. Modern and efficient public transport system. Institutional Aspects. Planning of public transport networks. Route and Corridor Selection of public transportation. Operational Design. Financial planning and pricing. Contract system mechanism
Prerequisite: Transportation Engineering, Transportation System
Reference Book:
1. Giannopoulos, G., 1990. *Bus Planning and Operation in Urban Areas: A Practical Guide*, Gower Pub Co.
2. Vuchic, V., 2005. *Urban Urban Transit; Operation, Planning and Economics.*, Willey & Sons.
3. Bunting, M., 2004. *Makling Public Transport Work*, McGill-Queen's University Press.
4. ITDP, 2007. *Bus Rapid Transit Planning Guide*, Institute for Transportation & Development Policy

ENCV 803 305
Advanced Road Geometry Design
3 Credits
Competence in Curriculum: Technical Specialization
Learning Outcomes:
Able to design road geometry, road supporting facility, junction, geometric and parking facility with considering certain aspects regarding road safety.
Syllabus:
Introduction: basic of road geometric design associated with cross-section of the road, visibility, horizontal alignment, vertical alignment and alignment harmonization. Special aspects of road design: climbing lane, safety ramp (escape ramp), crossing lane on railways. Crossroads: Design consideration, Priority crossing, roundabout, Intersection with traffic signal control devices and non-level intersection. Signs, markings and delineation: design considerations, sign design, markings and delineation. Safety fence: design considerations, types of safety fence, rigid safety fence design, semi-rigid and flexible. Termination railing and fencing transition, crash cushion / attenuator. Parking and terminal: design considerations, Parking design, public transport passenger terminal and cargo terminal.

Prerequisite: Has already taken Road Geometric Design or following matriculation subjects of Road Geometric Design in Strata 1.

Reference Book:

1. AASHTO, 2004. *A Policy on Geometric Design of Highways and Streets*, Amerincan Association of State and Highway Transportation Officials.
2. Lamm, R., 1999. *Highway Design and Traffic Engineering Handbook*, McGraw-Hill.
3. Tjahjono, T., 2011. *Analisa Keselamatan Lalu Lintas Jalan*, Lubuk Agung.
4. DMRB, 2006b. *Geometric Design of Major/Minor Priority Junction*, Department for Transport, UK: Design Manual for Roads and Bridges, Vol 6, Sec 1.
5. DMRB, 2006c. *Geometric Design of Roundabout*, Department for Transport, UK: Design Manual for Roads and Bridges, Vol 6, Sec 1.
6. DMRB, 2006d. *Geometric Layout of Signal Controlled Junctions and Signalised Roundabouts*, Department for Transport, UK: Design Manual for Roads and Bridges, Vol 6, Sec 1.
7. DMRB, 2006e. *Layout of Grade Seperation Junction*, Department for Transport, UK: Design Manual for Roads and Bridges, Vol 6, Sec 2.
8. AusRoads, 2003. *Rural Road Design: A Guide to the Geometric Design of Rural Roads*, Australian Roads.
9. AusRoads, 2007. *Urban Road Design: A Guide to the Geometric Design of Major Urban Roads.*, Australian Roads.
10. NCHRP, 1992. *NCHRP Report 350: Recommended Procedure for the Safety Performance Evaluation of Highway Features*, National Cooperative Highway Research Program.
11. DIER Tasmania, 2005. *Road Safety Barrier Design: Guide Part A and B*, Transport Tasmania.

ENCV803306
Advanced Pavement Engineering
3 Credits
Competence in Curriculum: Technical Specialization
Learning Outcomes:

1. Able to investigate and conducting experiment of flexible and rigid road pavement.
2. Able to calculate the thickness of road pavement based on Mechanistic-Empirical Pavement Design principle with considering the nature and rheology of material due to load from traffic and environment condition so it has Long Term Pavement Performance (LTPP) and fulfill the criteria provided.

Syllabus:
Reviewing the various types of road pavement viewed from basic analysis and planning approach, Various forming materials related to the nature and base characteristics, Main factor for stress strain analysis planning for flexible pavements; Analysis of stress and strain for rigid pavement; Material characterization based on modulus, Fatigue characteristics and deformation; Loading and type and characteristics of loading; The use of software to calculate pavement thickness. The design of flexible pavements based on the empirical and mechanistic principle; Design of rigid pavement.
Prerequisite: Material Properties, Pavement Design
Reference Book:

1. Direktorat Jenderal Bina Marga, 2013. *Manual Desain Perkerasan Jalan. No 02/BM/2013*, Kementrian Pekerjaan Umum.
2. Huang, Y., 2004. *Pavement Analysis and Design* 2nd ed., Prentice-Hall, Inc.
3. Dawson, A., 2004. *Pavement Unbound*, Taylor and Francis.
4. Papagiannakis, A. and Masad, E., 2008. *Pavement Design and Materials*, Willey & Sons.
5. Correia, A. ed., 1993. Flexible Pavements. *Proceedings of the European Symposium Euroflex*

ENCV803307
Advanced Highway Materials
3 Credits
Competence in Curriculum: Technical Specialization
Learning Outcomes:
Able to analyze the nature and characteristic of material due to stress and strain as well as rheology of pavement material.

Syllabus:
Modeling of concrete pavement: pavement response models and performance models; Asphalt rheology: rheological models of asphalt mix, asphalt binder rheology; Damage resistance characterization; Rigidity characterization: Modulus characterization of asphalt material and asphalt concrete; Asphalt concrete damage models: model of deflection (rutting), model of fatigue; Characteristics of asphalt concrete mixture:; stiffness characteristics, characteristics of deflection / wave; fatigue characteristics and water content, influence of load and temperature. Rheological models of asphalt binder and the usage of binder modification; The use of additive materials for improving the quality of asphalt and asphalt concrete: polymer, recycled materials. Waste and by-product materials. Complex modulus and resilient of indirect tensile test, development model in making asphalt concrete models.
Prerequisite: Material Properties, Pavement Design
Reference Book:
1. Correia, A. ed., 1993. Flexible Pavements. *Proceedings of the European Symposium Euroflex*.
2. Huang, Y., 2004. *Pavement Analysis and Design* 2nd ed., Prentice-Hall, Inc.
3. oung, J., Mindness, S., Bentur, A. and Gray, R., 1997. *The Science and Technology of Civil Engineering Materials*, Prentice-Hall, Inc.
4. Kim, Y., 2008. *Modeling of Asphalt Concrete* 1st ed., McGraw-Hill

ENCV803308
Road Preservation Technology
3 Credits
Competence in Curriculum:
Learning Outcomes:
Syllabus:
Prerequisite:
Reference Book:

ENCV803311
Construction & Rehabilitation of Railway Infrastructure
3 Credits
Competence in Curriculum: Technical Specialization
Learning Outcomes:
Know the construction method for railways repair, able to monitor and assess the necessary repair and maintenance of railways.
Syllabus:
Railways infrastructure construction: Geo technology for subgrade, embankment, train lane, and mechanization for track construction; Maintenance and repair of railways; General aspects in the maintenance of railways infrastructure, rail grinding and re-profiling, tamping machines, stone blowing, ballast profiling and stabilization, mechanized track maintenance train, ballast cleaner, formation rehabilitation technologies; Inspection methods, methods of monitoring and detection methods; Monitoring substructure, vehicle for recording railways conditions, railways condition recording system.
Prerequisite
Reference Book:
1. EAPA, 2014. *Asphalt in Railway Tracks*, European Ashpalt Pavement Association.
2. Gomes Correia, A., Momoya, Y. and Tatsuoka, F., 2007. *Design and Construction of Pavements and Rail Tracks – Geotechnical Aspects and Processed Materials*, Taylor and Francis (CRC Press).
3. Coenraad, E., 2001. *Modern Railway Track* 2nd ed., MRT-Production.
4. Waters, J. and Selig, E., 1995. *Track Geotechnology and Substructure Management*, Thomas Telford Publishing

Course Syllabus of Water Resources Management Specialization

ENCV 801 401
Engineering Hydrology
3 Credits
Competence in Curriculum: Technical Specialization, Communication, Lifelong Learning
Learning Outcomes:

1. Assess the effectiveness of flood mitigation infrastructure in controlling water destructive force, based on the analysis of the results of reconstruction of hydrological design using deterministic and stochastic hydrological model (C5).
2. Self-organizing in independent and groups work, so as to demonstrate the mastery of course competencies in the form of a systematic written document and oral presentations that are effective and efficient (A4).

Syllabus:
Hydrological model system and classification; Hydrological phenomena in volume control, Work equation for various hydrological processes on volume control in the atmosphere; Work equation for various hydrological processes in the subsurface; Work equation for various hydrological processes on the surface; Basic and applied principles of hydrograph; Flood tracking through the dam; Flood tracking through channels; Hydrological statistics; Frequency analysis; Hydrology design; Hydrologic design reconstruction of water damage control infrastructure; Hydrology design effectiveness of water damage control infrastructure.
Prerequisite: Fluid Mechanics
Reference Book:

1. Bedient, Philip B. and Huber, Wayne C., 2002. Hydrology and Floodplain Analysis. Third Edition. Prentice-Hall, Inc. USA.
2. Chow, Ven Te, Maidment, David R. and Mays, Larry W., 1988. Applied Hydrology. McGraw-Hill Book Company, Singapore.

ENCV 801 402
Groundwater Hydraulics
3 Credits
Competence in Curriculum: Experiment/Research, Technical Specialization, Communication, Lifelong learning.
Learning Outcomes:

1. Able to weighing the alternatives of land use establishment based on the formulation of the recharge / discharge characteristic and spatial distribution pattern of groundwater in an area.
2. Able to prepare a paper on the alternative of land use establishment in a region with the characteristics of the groundwater flow in the known area, and present it orally.

Syllabus:
Concept of groundwater conservation; Role of groundwater flows quantification for civil engineering for conservation; Hydraulic head; Hydraulic conductivity; Calculation of flux (q) using Darcy's law; The law of mass conservation in a controlled volume space; Land property; General equation of groundwater flow, Radial flow formulation; Effect of pump network pumping on limited aquifer; Calculation of K and S value based on data from pumping tests; Formulations of the basic flow net theory equation; Flow net classical method application; Flowline concept application on the field; Regional groundwater; Numerical solution for differential equations; MODFLOW package usage; Project task
Prerequisite:
Reference Book:

1. Groundwater 3rd Edition, R. Allan Freeze and John A. Cherry, Prentice Hall, 1990
2. Applied Hydrogeology 2nd Edition, C.W. Fretter, Merril Publishing Co, 1988
3. Hidrolika Aliran pada Media Berpori, Hand out, Herr Soeryantono, 2014
4. Manual SEEP2D, ASRI
5. Manual Modflow, ASRI
6. Dynamics of Porous Media Edisi 1, Jacob Bear, Dover, 1988
7. Chapra, Steven C.; Canale, Raymond P. (2015) Numerical Methods for Engineers, Seventh Edition,

McGraw-Hill

ENCV802401
Environmental Fluid Mechanics
3 Credits
Competence in Curriculum: Technical Specialization, Sustainability, Communication, Lifelong learning.
Learning Outcomes:

1. Able to formulate equations of advection dispersion that accommodate chemical decay and precipitation in physics (sink / source), and
2. Able to write a paper about the model of dispersion of pollutants in water surface and underground, and present it orally.

Syllabus:
Chemical and physical properties of contaminants and water; Conservative form of mass conservation equations; General solutions; Particular solution; Advection dispersion equation that change in space and time for perfectly mixed systems; Analytic solution system advection dispersion equations changing space and time for the system perfectly mixed systems; Numerical finite difference method; Numerical solution of advection dispersion equations that change in space and time for perfectly mixed systems; Advection dispersion equation system varies with time and space for the imperfect mixed system; Advection dispersion analytic equation solution that change in space and time for an imperfect mixed system; Numerical solution of advection dispersion equations that change in space and time for an imperfect mixed system.
Prerequisite:
Reference Book:

1. Chapra, Steven C. (1997) Surface Water-Quality Modeling, International Edition, McGraw-Hill
2. Fischer, Hugo B.; List, E. John; Koh, Robert C. Y.; Imberger, Jorge; Brooks, Norman H. (1979) Mixing in Inland and Coastal Waters, Academic Press, Inc.
3. Chapra, Steven C.; Canale, Raymond P. (2015) Numerical Methods for Engineers, Seventh Edition, McGraw-Hill

ENCV802402
Water Resource Management
3 Credits
Competence in Curriculum: Problem Recognition and Solving, Sustainability, Communication, Lifelong Learning.
Learning Outcomes:
Able to work independently and in teams to assess (evaluate the process or complex design results) various aspects of Water Resources Management (MSDA) in solving the problem of water resources and is able to present the results of the assessment in the form of a written systematic document and able to present it verbally.
Syllabus:
Students are given the provision to understand: 1. The principles aspect and policy of water resources management (in Indonesia) and its development; 2. Aspects and models of Integrated Water Resources Management/IWRM for both national and international scale; 3. Management aspect based on regulation and government policy related to three (3) pillars of water resource management which is utilization, water destructive force controlling, and conservation; 4. Supporting aspects of water resources management which includes hydro economy; 5. Case management of water resources (or project) inside a Water Resource Management Area or basin.
Reference Book:

1. Peraturan Menteri Pekerjaan Umum. Nomor: 11A/PRT/M/2006 tentang Kriteria dan Penetapan Wilayah Sungai.
2. IWRM Resources. http://www.gwp.org/en/The-Challenge/IWRM-Resources/
3. GWP IWRM Toolbox: Useful Tool for Academia. http://www.gwp.org/gwp-inaction/news-and-Activities/GWP-IWRM-ToolBox-A-useful-tool-for-academia-/
4. Mays, Larry W., 1996. Water Resources Handbook. McGraw-Hill.
5. Loucks, Eric D., 1998. Water Resources and the Urban Environment. ASCE.
6. Beberapa Peraturan dan Kebijakan Nasional, Provinsi, dan Daerah terkait Pengelolaan Sumber

Daya Air.

ENCV802403
Hydraulics Structures
3 Credits
Competence in Curriculum: Problem Recognition and Solving, Communication, Lifelong Learning.
Learning Outcomes:
Students are able to calculate the dimensions needed, evaluating the strength and stability of important waterworks that are in suppletion system through open channel, drainage and small reservoir and calculating the physical model dimension for various scale.
Syllabus:
1. Scope and definitions; 2. Suppletion system work principle through open channels: - weirs design, sluice gate, measuring building, dividing building; 3. The principle of drainage channels system; - Micro drainage channel network design; -Highway drainage design; 4. The design of complementary waterworks: Crossworks, diversions, drop structures), embankments, strengthening of the cliff and bridge wing (wing wall); 5. Type and working system of reservoirs: dimension requirements design, ogee and siphon spillway, pump; 6. Scale model and similitude.
Prerequisite: Fluid Mechanics, Hydraulics, Water Engineering 1, Water Engineering 2
Reference Book:

1. Ven T. Chow (1959) Open Channel Hydraulics (reprinted 2009)
2. Bureau of Reclamation (1987) Design of Small Dams, United States Department of The Interior

ENCV 803 401
Ecohydrology
3 Credits
Competence in Curriculum: Problem Recognition and Solving, Sustainability, Communication, Lifelong Learning.
Learning Outcomes:
1. Able to assess the harmony between existing condition with green infrastructure concept, eco urban village, and environmental construction (Low Impact Development – LID).
2. Able to give recommendation based on 3 green infrastructure integration, eco urban village, and environmental construction (Low Impact Development – LID).

Syllabus:
Green Infrastructure, Eco Urban Village, Low Impact Development

ENCV803403
Watershed Vulnerability Assessment
3 Credits
Competence in Curriculum: Problem Recognition and Solving, Sustainability, Communication, Lifelong Learning.
Learning Outcomes:
1. Able to apply health rapid assessment device of a watershed based on Center Method for Watershed Protection.
2. Able to categorize the health status of the watershed based on waterproof land cover, water quality, and macrobentos diversity, and
3. Able to provide recommendations for further action to improve the health of the watershed.

Syllabus:
1. Land use planning, 2. Soil Conservation, 3. Border Bodies of Water, 4. Ideal Design Tread, 5. Erosion & Sedimentation Control, 6. Rain Management, 7. Liquid Waste Management, 8. Stakeholders Concern
Prerequisite:
Reference Book:

ENCV803404
Operation & Maintenance of Hydraulics Structures
3 Credits
Competence in Curriculum: Problem Recognition and Solving, Sustainability, Communication, Lifelong learning.
Learning Outcomes:
1. Able to perform waterworks technical audit that produce physical condition of waterworks.
2. Able to give follow up recommendation to expedite the operational of waterworks and preserve its sustainability.

Syllabus:
Students are given the provision of: 1. Suppletion system audit that covers: dam, sluice gate, measuring building, dividing building; 2. Drainage channel system audit that covers: micro drainage channel network; - road drainage; 3. Complimentary building that related to river audit: levee, retrofitting bridge cliff and wing, cross-structure, dodging-structure, threshold, crib; 4. Polder work system audit that includes reservoir, spillway and pump.
Prerequisite:
Reference Book:
1. Je Van Zyl (2014) Introduction to Operation and Maintenance of Water Distribution Systems EDITION 1, Water Research Commission
2. Suyono Sosrodarsono, Masateru Tominaga, 1994, Perbaikan dan Pengaturan Sungai, Pradnya Paramita, Jakarta

Course Syllabus of Environmental Engineering Specialization

ENCV801501
Environmental Risk Management
3 Credits
Competence in Curriculum: Problem Recognition and Solving, Sustainability
Learning Outcomes:
Able to analyze (C4) environmental risk based on toxicology approach to assess the impact of pollution to soil, air, and water.
Syllabus:
Introduction of environmental risks; Concepts, principles and usage of risk in environment; Risks typology and management methods; Techniques and methods for risk calculation; Integrated risk assessment; Ecological Risk Assessment (ERA) - Ecotoxicology; Human Risk Assessment (HRA) - Toxicology; The implementation of environmental risk assessment in industry; Application of environmental risk calculation in pollution case soil, air and water medium; Pollutant fate transport software usage, fugacity and risk assessment of chemicals in the environment.
Prerequisite: Has taken environmental chemistry class.
Reference Book:
1. Simon T (2014), Environmental Risk Assessment a Toxicological Approach
2. Lerche and Walter (2006), Environmental Risk Assessment: Quantitative Measures
3. International Journal of Risk Assessment and Management (IJRAM)
4. International Journal of Human and Ecological Risk Assessment (AEHS Foundation)

ENCV801502
Technology of Solid Waste Treatment: Operational and Design
3 Credits
Competence in Curriculum: Experiment/Research; Technical Specialization, Sustainability
Learning Outcomes:
Able to apply the knowledge regarding solid waste treatment in design process and treatment process.
Syllabus:
Overview of Integrated Solid Waste Management: the concept of sustainable solid waste

management, Development of IWMS (case studies and analysis), Elements of IWM; Physical characteristics, chemical, biological and solid waste generation; biological treatment, mechanical, mechanical-biological; thermal processing, landfilling and coating technology; recirculation of solid waste; design, structure and planning for the operating units.
Prerequisite: Integrated Solid Waste Management Design
Reference:
1. Integrated Solid Waste Management, Geroge Tchobanoglous, Hilary Theisen, Samuel A. Vigil, McGraw Hill International Edition, 1993.
2. Handbook of Solid Waste Management, George Tchobanoglous, Frank Kreith, McGraw Hill, 2002.

ENCV802501
Contaminating and Soil Remediation
3 Credits
Competence in Curriculum: Problem Recognition and Solving
Learning Outcomes:
Able to prepare remediation program design on contaminated land due to industrial activity or accident.
Syllabus:
Activities that could potentially cause contamination of hazardous and toxic materials on the environment (soil and groundwater); Types and forms of hazardous and toxic pollutants; Patterns and characteristics of the travel and spread of contaminants in the soil; Impacts and risks that pollutant can cause to the environment; Elimination method for contaminants spread in the soil; Restoration method of hazardous and toxic contaminated land; Physical recovery, Chemistry and Biochemistry; Technical design of soil and groundwater remediation; Economic and financial aspects for remediation projects; Field case study.
Prerequisite: Environmental laboratory, Environment microbiology, Operating and Process Unit, Industrial waste and hazardous material management, Liquid waste management.
Reference Book:
Remediation Engineering: Design Concept, Suthan S., CRC Lewis Publisher, 1999;
2. Innovations in Ground Water and Soil Cleanup: From Concept to Commercialization, National Research Council. National Academy Press.1997;
3. Environmental Hydrogeology, Philip E. LaMoreaux[et al], CRC Press.2009;
4. Pengantar Prinsip Pengelolaan Limbah B3, Firdaus Ali, Global Enviro. 2011.

ENCV802502
Advanced Waste Water Engineering
3 Credits
Competence in Curriculum: Problem Recognition and Solving
Learning Outcomes:
Able to evaluate the implementation of waste treatment in the context resources recovery and analyze issues of sustainability in the operation and maintenance of waste treatment and combine the technical and non-technical aspect in ensuring the sustainability of wastewater treatment that based on resource recovery.
Syllabus:
Nutrient recovery concept; Energy and water from waste; Sustainability in waste treatment in Indonesia; Sustainable waste treatment analysis; Nutrient recovery technology design; Energy and water (Biological Nutrient Removal, Anaerobic Digestion, Membrane Technology), Methods of pre-and post-processing of waste (processing mechanical, thermal and biological).
Prerequisite: Process and Operating Unit
Reference Book:
1. Metcalf and Eddy, 2014, Wastewater Engineering: Moving towards Resource Recovery
2. WEF, 2015, Moving Towards Resource Recovery Facilities
3. Kerstens et al, 2015, Feasibility analysis of wastewater and solid waste systems for application in Indonesia
4. Moss et al, 2013, Enabling the Future: Advancing Resource Recovery from Biosolids
5. Lohri, 2013, Feasibility assessment tool for urban anaerobic digestion in developing countries

6. Davis, 2010, Water and Wastewater Engineering

ENCV802503
Waste to Energy
3 Credits
Competence in Curriculum: Problem Recognition and Solving, Technical Specialization
Learning Outcomes:
Able to identify characteristics and requirements of waste, whether its solid or liquid that has the potential to be recovered as a source of alternative energy that are environmentally friendly.
Syllabus:
Calculation of thermo-chemical conversion and bio-chemistry against energy content in the waste material, technological alternatives that can be used and designing it applications. Lecture is held face-to-face, discussions, group work and presentations. Lectures conducted entirely in Indonesian, unless there is a teacher or guest speakers from abroad.
Prerequisite:
Reference Book:
1. Young, G.C. 2010. Municipal Solid Waste to Energy Conversion Processes. A John Wiley & Sons, Inc., Publication. New Jersey.
2. Tchobanoglous, G., Theisen, H., Vigil, S.A. 1993. Integrated Solid Waste Management. McGraw-Hill International. New York.
3. Tchobanoglous, G., Kreith, F. 2002. Handbook of Solid Waste Management. 2nd Edition. McGraw-Hill. New York.
4. UNEP. 2005. Solid Waste Management. Vol. I and II. Cal Recovery Incorporated. California.
5. Regulations (UU, PP, Perpres, Permen, Kepmen, Perda, Pergub, dll), Norms, standards, guidance, manuals, and others about waste management
6. On line references (Digital Journal and Clipping Media), Lecture handouts, and other reading materials relevant to this subject.

ENCV802504
Emission Control
3 Credits
Competence in Curriculum: Problem Recognition and Solving; Technical Specialization; Lifelong Learning
Learning Outcomes:
Able to analyze and evaluate type and sources of greenhouse gas emission that were cause by solid waste treatment and the methods to control it.
Syllabus:
Process in solid waste treatment that produce emission; Greenhouse gasses; Emission inventory; Emission control in landfill; Landfill design for emission control; Emission control with the usage of technology; Learning is done throughout interactive lecture, assignment, and assistances. Learning activities is also includes researches. Scope of the study is solid waste and its management, emission produced, as well as its prevention. Indonesian and English language are used during the process of learning.
Prerequisite: Air Pollution
Reference Book:
1. Tchobanoglous, G., Thiessen, H., & Vigil, S. (2003). *Integrated Solid Waste Management: Engineering Principles and Management Issues*. Singapore: McGraw-Hill Inc.
2. Nevers, N.D., *Air Pollution Engineering*, McGraw-Hill, USA, 2000
3. US Environmental Protection Agency. (2015). *LFG Energy Project Development Handbook*

ENCV802505
Life Cycle Analysis (LCA)
3 Credits
Competence in Curriculum: Sustainability
Learning Outcomes:
Able to use a set of model to give an assessment on sustainable solid waste management.

Syllabus:
Integrated solid waste management overview; Sustainable solid waste management concept; IWMS development (case study and analysis); IMW element; Solid waste generation and composition; Waste collection; Central sorting; Biological treatment; Thermal treatment; Landfilling; Material recycling; Model: STAN 2, Prognosis and IWM 2.
Prerequisite: Integrated Solid Waste Management
Reference Book:
1. Integrated Solid Waste Management, Geroge Tchobanoglous, Hilary Theisen, Samuel A. Vigil, McGraw Hill International Edition, 1993.
2. Handbook of Solid Waste Management, George Tchobanoglous, Frank Kreith, McGraw Hill, 2002.
3. Integrated Solid Waste Management: a Life Cycle Inventory, Forbes McDougall, Peter White, Marina Franke, Peter Hindle, Blackwell Science, 2001.

ENCV802506
Pollution Prevention
3 Credits
Competence in Curriculum: Technical Specialization
Learning Outcomes:
Able to assess the engineering process in pollution prevention in a particular industrial sector with mass balance analysis and economic benefits of pollution prevention programs oriented to the concept of pollution prevention completion in a process of production/clean production and not an on of pipe solution.
Syllabus:
Pollution prevention (P2) concept; Benefits and obstacles of P2; P2 application assessment procedure and case studies; Economic analysis of P2 program application; Introduction of eco-labeling and life cycle assessment; P2 program on construction design process and demolition of buildings, food industry, wood products, agencies and offices; P2 Case Study on an industry.
Prerequisite:
Reference:
1. Harry M. Freeman, INDUSTRIAL POLLUTION PREVENTION HANDBOOK, Mc Graw-Hill, New
2. York, 1995, 935 pages
3. United States Environmental Protection Agency (EPA), Facility Pollution Protection Prevention Guide (FP2G), epa/600/r-92/088, Washington DC, May 1992, 143 Pages
4. Paul Bishop, Fundamental and Practice, Pollution Prevention

ENCV802507
Environmental System Dynamics
3 Credits
Competence in Curriculum: Sustainability
Learning Outcomes:
1. Able to explain the basic principles of environment as a system with the interaction of environmental components (social, natural and artificial).
2. Able to formulate the amount, concentration, danger level and the impact of environmental pollutants.

Syllabus:
Definition of basic environmental system with natural environment subsystem, artificial and social; Dynamics of environmental system (integration of basic principles of environmental science: interaction, interdependence, diversity, harmony, and sustainability); Dynamics of physical environment system (cycle of matter and energy, hydrological cycle, food chain and environmental pollution harassment); Environmental physical system management model (determining factor, media and interaction of environmental physical component in an environment system) Social system management model (conflict management and environment mediation); Physical case studies; Social case study.
Prerequisite:
Reference Book:
1. Tyller Miller, Living in The Environment, McGraw-Hill, Singapore, 1994
2. Amy, The Polities of Environmental Mediation, Columbia University Press, 1987

3. Fisher dkk, Mengelola Konflik Ketrampilan dan Strategi Untuk Bertindak, The British Council, Jakarta, 2000

ENCV803501
Urban water Quality Management
3 Credits
Competence in Curriculum: Technical Specialization, Sustainability
Learning Outcomes:
Student able to predict (C5) the capacity and load on the water surface with water quality modeling software.
Syllabus:
Introduction to urban water management in spatial planning and city infrastructure; Type of resources, allocation of water and water availability; Critical water quality and water usage in infrastructure perspective; Water quality and impact of urban waste in correlation with causality and health risks; Calculation of pollution load of solid and liquid waste; Determination of capacity and load on the water surface; Calculation of Total Maximum Daily Load (TMDL) on the water surface; Technology interventions and policy in controlling water quality and municipal waste; Water quality modeling (QUAL2E, Epanet, Aquatox ..); Application of case management of urban water quality using software.
Prerequisite: Has taken environmental chemistry and Domestic Waste Water Planning and Applied Mathematics class.
Reference Book:
1. Spoon R (2015), Water Quality Management Handbook, Ingram Publisher.
2. Aley R (2007) Water Quality Control Handbook, WEF Press
3. Wang LK et al. (2012) Advances in Water Resources Management, Springer (eBook)

ENCV803502
Environmental Audit
3 Credits
Competence in Curriculum: Sustainability
Learning Outcomes:
Able to perform audit and arrange environmental audit report
Syllabus:
Definitions, principles, concepts and environmental policy in environmental audit; Basic Law and the policy of the environmental audit regulation; Basic Principles of AL (Determination of the key issues and the scope of the audit); Understanding of ISO 1400: Improvement of Environmental Management and Sustainable Development; Study of the Environment Manage Plan/Environmental Management Plan (RKL / RPL); Basic Principles of Auditing (basic principles, procedures, hierarchies and processes in environmental auditing); Types of Audit (compliance audits, waste audits, audit processes); Audit method (procedures for determining, weight, importance and valuation of the environmental audit). Audit document; Audit Case Study (documents cases study).
Prerequisite:
Reference Book:
1. ”Audit and Reduction Manual for Industrial Emissions and Wastes”; United Nations Environment Programme, Industry and Environment Office, United Nations Industrial Development Organization. ISBN: 92-807-1303-5
2. ”Moving Ahead with ISO 14000”, Improving Environmental Management and Advancing Sustainable Development; edited by: Philip A. Marcus & John T. Willig, Wiley Series in Environmental Quality Management John Wily & Sons, Inc, 1997, ISBN 0-471-16877-7.
3. “Panduan Audit Sistem Manajemen Mutu dan/atau Lingkungan”; SNI 19-19011-2005. Badan Standarisasi Nasional.

Course Syllabus of Construction/Project/Infrastructure Specialization

ENCV 801 601
Project Investment and Finance
3 Credits
Competence in Curriculum: Problem Recognition and Solving
Learning Outcomes:

1. Able to implement the principle of project funding in analyzing the risks associated with the projects financing and evaluate project funding.
2. Able to analyze cases of investment and projects financing in real world.

Syllabus:
Basics of engineering economics; Basics of engineering economic analysis; Decision-making in engineering economics; Inflation, depreciation, tax and sensitivity analysis; introduction of project funding; Structure of project funding; Sources of project funding; Risks in project financing; Project funding modelling; Introduction of sharia-based project funding.
Prerequisite:
Reference Book:

1. Leland Blank-Anthony Tarquin. Engineering Economy, 7th edition. McGraw Hill. 2012
2. Finnerty, J. D. (2007). Project Financing: Asset-Based Financial Engineering. John Wiley & Sons, Inc., ISBN-13: 978-0-470-08624-7
3. Gatti, S. (2008). Project Finance in Theory and Practice. Elsevier. Academic Press

ENCV 801 602
Engineering Project Management
3 Credits
Competence in Curriculum: Problem Recognition and Solving
Learning Outcomes:

1. Ability to make synthesis (identification, evaluation, and implementation strategy) solution of the problems associated with the entire group knowledge on project management.
2. Able to applying the knowledge of concept of thinking in project management to analyze the problem in the project, acquire the solution and implement it.

Syllabus:
Project management overview; Initiation and scope management; Time management; Cost management; Human Resource Management; Quality management; Communications management; Risk management; Management of procurement of goods and services; Execution & Control; Control & Closing.
Prerequisite:
Reference Book:

1. Kerzner, Harold, Project Management, John Wiley & Sons, Inc., 2006.
2. Project Management Institute, A Guide to Project Management Body of Knowledge, 2013
3. Baguley, Philip, Managing Successful Projects, Pitsman Publishing, 1995.
4. Barker, Stephen and Cole, Rob, Brilliant Project Management, Pearson Education Limited, 2007.
5. Barkley, Bruce T. and Saylor, James H., Customer-driven Project Management, McGraw-Hill, Inc., 1994.
6. Cleland, David I., Project Management – Strategic Design & Implementation, McGraw Hill, 1999.
7. Cleland, David I. ND King, William R. (ed), Project Management Handbook, Van Nostrand Reinhold, 1988.
8. Gilbreath, Robert D., Winning at Project Management, John Willey & Sons, Inc, 1986.
9. Grey, Stephen, Practical Risk Assessment for Project Management, John Willey & Sons, Inc., 1995.
10. Hollick, Malcolm, An Introduction to Project Evaluation, Longman Cheshire Pty Limited, 1993.
11. McGhee, Pamela and McAliney, Peter, Painless Project Management, John Willey & Sons, Inc., 2007.
12. Newton, Richard, Project Management Step by Step, Pearson Education Limited, 2006.
13. Nicholas, John M., Managing Business & Engineering Projects, Prentice-Hall, Inc., 1990.
14. O'Connell, Fergus, Fast Projects, Pearson Education Limited, 2007.
15. Project Management Institute, Project Management Journals.
16. Verma, Vijay K., Human Resource Skills for the Project Manager, Project Management Institute,

1996.
17. Verma Vijay K., Organizing Projects for Success, Project Management Institute, 1995.

ENCV802601
Time and Cost Management
3 credits
Competence in Curriculum: Problem Recognition and Solving, Technical Specialization
Learning Outcomes:
1. Able to make synthesis (identification, evaluation, and implementation strategy) solution of problems related to the management of time and costs in construction projects.
2. Able to arrange project scheduling, critical path analysis and how to manage the critical path.
3. Able to estimate the cost and arrange budget structure of a project, controlling, optimizing cash flow and calculating profit and loss in a project.

Syllabus:
Time Management:
Defining activities based on WBS and work packages; Relationship between activity, Activity sequence; Determining the activity of which may be done in parallel and must be done sequentially; Definition of the resources required to perform activities, including the competencies required; Time duration used for completing activities, Developing project schedule.
Cost Management:
Quantity surveyor task and cost estimator, Estimation process, budgeting, controlling, and earned value management (EMV).
Prerequisite: Have knowledge of: 1) Project integration management (project lifecycle, project change management, 2) Project scope management (scope statement, WBS, RAM, etc.)
Reference Book:
1. Skill and Knowledge of Cost Engineering, AACE 2004
2. Hougan, Gregory Effective Work Breakdown Structure, Management Concepts , ,
3. Boussabaine Halim A., Whole Life-cycle Costing, Risk and Risk Responses, , Blackwell Publishing
4. Potts, Keith, Construction Cost Management, , Taylor & Francis
5. Cost and Value Management in Projects, Ray R.Venkataraman, John Wiley and Sons
6. PMBOK, PMI, 5th edition, 2012, PMI
7. Control of Risk, A guide to the systematic management of Risk from Construction, CIRIA
8. Dell'Isola Alphonse Value Engineering Practical Application for design, construction, maintenance and Operation, RS Mean
9. Brooks, Martin, Estimating and tendering for construction works, Elsevier
10. Practice Standard for Earned Value Management, PMI
11. Smith, Jim & Jaggar, David Building Cost Planning for the design Team, , Elsevier, Butterworth-Heinemann
12. Kerzner, Harold, Project Management, John Wiley & Sons, Inc., 2006.
13. Project Management Institute, A Guide to Project Management Body of Knowledge, 2013

ENCV802602
Quality and Risk Management
3 Credits
Competence in Curriculum: Problem Recognition and Solving, Technical Specialization
Learning Outcomes:
Able to make synthesis (Identification, Evaluation, and strategic implementation) solution of issue regarding quality and risk management in construction project.
Syllabus:
Definition and benefits of quality and risk management, as well as the influence of risk in achieving the quality of the project; Quality of the project which includes the identification of needs and standards so as to achieve the expected quality; Documenting project implementation process and evaluate the process and work result in accordance to plan; Evaluation of the

project results and provide the innovation and know the issues regarding quality management; Risks that could cause failure in project quality achievement; Planning and potential risk identification during the project; Various methods and software to analyze the identified risks priorities; identification of various actions (risk response) in order to minimize the impact of risk; Supervision to know the indication of deviation with risk management approach; Application of risk management that has been used on various types of projects.

Prerequisite:

Reference Book:

1. Project Management Institute (2013), *A Guide to Project Management Body of Knowledge*, 5th edition.
2. Wideman, R.M., *Risk Management. A Guide to Managing Project Risk and Opportunities*, 1992, Project Management Institute
3. AS/NZS ISO 3100:2009. *Risk Management – Principles and guidelines*. 2009. Standards New Zealand.
4. Kerzner, Harold (2010). Project Management Best Practices: Achieving Global Excellence, 2nd Edition. Hoboken, New Jersey: John Wiley & Sons, Inc.
5. Flanagan, R, George Norman. (1993). Risk Management and Construction. Oxford, Blackwell Scientific Publication.
6. Total Quality Management Handbook

ENCV802603

Procurement Management, Contract & Claim Administration

3 Credits

Competence in Curriculum: Problem Recognition and Solving, Technical Specialization

Learning Outcomes:

1. Able to make synthesis (identification, evaluation, and implementation strategy) solution of problems related to procurement management, contract administration and claims on construction projects.
2. Able to manage project procurement as well as able to make the project contract.

Syllabus:

Planning and procurement strategy; Contract planning; Tender evaluation and selection; Selection and arrangement of procurement procedures strategy; Type of contracts and arrangement of agreement in work contract; Contracts closing and litigation; Legal and regulatory aspects involved in procurement process; Legal and regulatory aspects involved in the process of contract administration; Validation of work contracts.

Prerequisite:

Reference Book:

1. Project Management Institute. (2013). *A Guide to the Project Management Body of Knowledge:* (4th ed.). Project Management Institute.
2. Huston, C. H., "Management of Project Procurement", McGraw-Hill, New York, 1996
3. Bower, D., "Management of Procurement". Thomas Telford, London, 2003
4. Clough, R.H "Construction Contracting" John Wiley and Sons, 1994
5. Lysons, K. "Purchasing", Pitman Publishing, 1996

ENCV802604

Advanced Construction Methods & Equipment

3 credits

Competence in Curriculum: Problem Recognition and Solving, Technical Specialization

Learning Outcomes:

1. Able to make synthesis (identification, evaluation, and implementation strategy) solution of problems related to the method determination and construction equipment.
2. Able to develop methods and equipment in construction projects.

Syllabus:

Concept and definition of construction methods and examples of construction projects; Project life cycle and technology in construction; Construction projects implementation; Methods used for project implementation; Definition of project scope, Description of the project; In depth

study of condition in the field of construction projects; Discussions regarding project layout condition; Determining the necessary resources; Explanations of technology for foundation construction; Determining the sequence of project activities; Explanations of technology for high-rise buildings construction; Project risk determination; Explanation of road construction technology; Determination of health and safety policy; Factors of incidents and loss prevention; Explanation of bridge construction technology; Evaluation of quality policy; Technology of tunnels and dams construction; Cost and budget determination; Resource consumption planning; Preparation of project reports.

Prerequisite:

Reference Book:

1. Construction Methods & Management (Nunnally) - Pearson Practice Hall
2. Clough, Richard H. 1986, Construction Contracting USA: John Wiley & Sons Inc
3. R.L Paurifoy, C J. Schexnayder, and A Shapira, Construction Planning, Equipment and Methods, McGraw - Hill
4. Halpin, Daniel W and Ronald - Woodhead, 1998, Construction Management, USA John Wiley & Sons Inc.
5. Barrie, D.S and Boyd Paulson, 1984 Professional Construction Management, New York: McGraw-Hill Book Company
6. Holroyd, T.M. Site Management for Engineers, Thomas Telford, London, 1999
7. Project Management Body of Knowledge, Project Management Institute – USA.
8. Project Management – Techniques in Planning and Controlling Construction Projects, Ahuja, H.N.
9. Manual of Practice, The Construction Specification Institute – USA.
10. Principles of Project Management – Negotiating & Contracting for Project Management, John R Adams.
11. Project Management for Engineering and Construction, Garold D. Oberlender

ENCV802605

Legal and Institutional Framework

3 Credits

Competence in Curriculum: Problem Recognition and Solving

Learning Outcomes:

Able to apply knowledge of various regulations and policies in the field of infrastructure to resolve the legal issues in the case of infrastructure projects.

Syllabus:

State institutions related to infrastructure; Laws and regulations related to infrastructure; Authority of central and regional government; Contract law; Land law (the provision of land for construction of public interest), Law of corporation; GCG and corruption; Supporting law/ related (business ethics, business competition, etc.); Case study of legal aspects related to infrastructure.

Prerequisite:

Reference Book:

1. UUD 1945 and Amendments;
2. Jimly Asshidiqie, *Konstitusi Ekonomi*, Penerbit Kompas, Jakarta, 2010.
3. Kementerian Perencanaan Pembangunan Nasional/Badan perencanaan Pembangunan Nasional, *Kumpulan Peraturan Terkait Kerjasama Pemerintah dan Swasta (KPS),* Direktorat Pengembangan Kerjasama Pemerintah dan Swasta, Jakarta, 2012.
4. Fred B.G Tumbuan, *Indonesian Unincorporated Business Entities and the Limited Liability Company*, Penerbit PT. Eles Media Komputindo-Kompas Gramedia, Jakarta 2011.
5. Taryana Soenandar, *Prinsip-prinsip Unidroit sebagai Hukum Kontrak dan Penyelesaian Sengketa Bisnis Internasional*, Penerbit Sinar Grafika, Jakarta, 2004

ENCV 803 601

Human Resource and Project Communication Management

3 Credits

Competence in Curriculum: Technical Specialization

Learning Outcomes:

1. Able to identify and analyze the process of human resource management and communication in construction projects.
2. Able to manage the organization and human resources required during the project

Syllabus:
HRM organization function; Scope and depth of HRM; HR planning; Develop Human Resource Plan; Project organization; Job Description, RAM / RACI, Job Analysis, Job value / Positional weight; Acquire project team; Procurement and placement of human resources; Develop project team; Process of improving competence; Manage project team; Project team performance assessment; Communication management, Process, Flow Document; Project Performance Report; Stakeholders Management; Measurement and evaluation of project performance; Calculating project overhead cost.
Prerequisite:
Reference Book:
1. Project Management Institute (2013), *A Guide to Project Management Body of Knowledge*, 5th edition.
2. Kerzner, Harold (2010). Project Management Best Practices: Achieving Global Excellence, 2nd Edition. Hoboken, New Jersey: John Wiley & Sons, Inc.
3. Szymanski, Robert A Szymanski, Donald P. Pulschen, Donna M (1995) Computers and Information System.
4. Armstrong, Michael (2008), Strategic Human Resources Management; A Guide to Action, 4th Edition, London: Kogan Page.

ENCV803602
Technology Management for Competitive Advantage
3 Credits
Competence in Curriculum: Technical Specialization
Learning Outcomes:
1. Able to explain the impact of competitive technologies in context of business, industry and economy, as well as cultural and organizations context in application.
2. Able to choose and compile competition strategy to increase competitiveness.
3. Able to innovate and creatively selecting and implementing technology in a process in order to meet VRIO (Valuable, Rare, inimitable and organized) criteria to enhance its competitiveness in the global competition.

Syllabus:
Technology in the context of economy, industry, business and company; Culture and organizational context; Competitive strategy; Technology, product and industry evolution; Intellectual property rights protection; Developing road map of application of technology management in business models.
Prerequisite:
Reference Book:
1. Gaynor, Handbook of Technology Management, McGraw Hill
2. Joshua S. Gans and Scott Stern 2003. "The product market and the market for "ideas": commercialization strategies for technology entrepreneurs." *Research Policy*
3. Saloner, Garth, Andrea Shepard, and Joel Podolny. 2001. *Strategic Management*. New York: John Wiley & Sons.
4. Christian N Madu, Management of New Technologies for Global Competitiveness, Jaico Publishing House
5. Barney J, Hesterley W.J, Pearson, 2012,Strategic Management and competitive advantage,
6. Burgelman & Maidique, Mc Graw Hill Irvin, 2003-Strategic Management of Technology and Innovation-
7. Nayaranan V.K., Prentice Hall, 2001Managing Technology and Innovation for Competitive Advantage-
8. Stuart Hart and Bernard Ramanantsoa Strategic Technology Management-Pierre Dussauge,
9. Khalil, Tarek M Management of Technology –
10. Davila, Toni, Epastien, Marc J, The Innovation Paradox, Berret-Kohler, 2014
11. Furr, Nathan, Dyre, Jeff, The Innovator's Method, Harvard BusinessReview Press, 2014
12. Teece, D.J Dynamic Capability and Strategic Management, Oxford University Press, 2009

ENCV 803 603
Infrastructure and Regional Development
3 Credits

Competence in Curriculum: Technical Specialization
Learning Outcomes:
1. Able to identify and analyze infrastructure development in a region associated with the region's economy.
2. Able to explain the conception of the relations between planning and developing of infrastructure in a region and its relationship with the region's economy.

Syllabus:
Introduction; Theory of regional development; Developing the concept of spatial transport and strategic area; Determining the area of regional influence; Urban and rural area development; Development and spatial planning of coastal areas; Future regional spatial planning; Developing economic corridor; Regional connectivity; Connectivity of ASEAN regional area; Financing regional development; Infrastructure in regional development; Infrastructure case study in regional Development.
Prerequisite:
Reference Book:
1. Bambang Susantono, Ph.D. Infrastructure and Regional Development in Indonesia. 2015. Delft Academic Press. ISBN: 978-90-6562-323-2.
2. Prof. Dr. Rahardjo Adisasmita, M.Ec. Ekonomi T ata Ruang Wilayah. 2014. Graha Ilmu. ISBN: 978-602-262-225-3.
3. Wong, Cecilia. Indicators for Urban and Regional Planning: The Interplay of Policy and Methods. 2006. The RTPI Library Series. ISBN: 0-415-27452-4.
4. Stevenson, Deborah. Cities and Urban Cultures. 2003. Open University Press. ISBN: 0-335-20844-4.
5. Ed: Taylor, Peter J, Derudder, Ben, Saey, Pieter and Witlox, Frank. Cities in Globalization: Practices, Policies and Theories. Routledge Taylor and Francis Group. ISBN: 978-0-415-40984-1.

ENCV 803 604
Infrastructure Asset Management
3 Credits
Competence in Curriculum: Technical Specialization
Learning Outcomes:
1. Able to identify and analyze the process of infrastructure asset management
2. Able to describe infrastructure asset management and give an illustration in implementations of asset management in an infrastructure to achieve sustainability in the infrastructure sector.

Prerequisite:
Infrastructure Asset Management, Asset evaluation, Asset valuation, Optimization in asset management, Asset allocation, Risk management in infrastructure assets.
Reference Book:
1. Rice, M. R, DiMeo, R.A., Porter, M.P. (2012) Nonprofit Asset Management. John Wiley & Sons, Inc.
2. Schneeweis, T., Crowder, G. B., Kazemi, H. (2010) The New Science of Asset Allocation. John Wiley & Sons, In

ENCV 803 605
Management System of Health, Safety and Environment
3 SKS
Competence in Curriculum: Technical Specialization, Sustainability
Learning Outcomes:
1. Be able to identify and analyze the process of health management, occupational safety and environmental protection in construction projects.
2. Be able to implement MHSE in any construction projects in order to not damaging the environment as well as in efforts to create a working environment that is healthy, safe, and productive.

Syllabus:
Basic principles and standards of HSE Management; Relevance of Work Productivity with HSE Management; Model structure of HSE process and legal aspect and regulation related to HSE Management; Analysis and evaluation of danger and risk in construction projects; Source

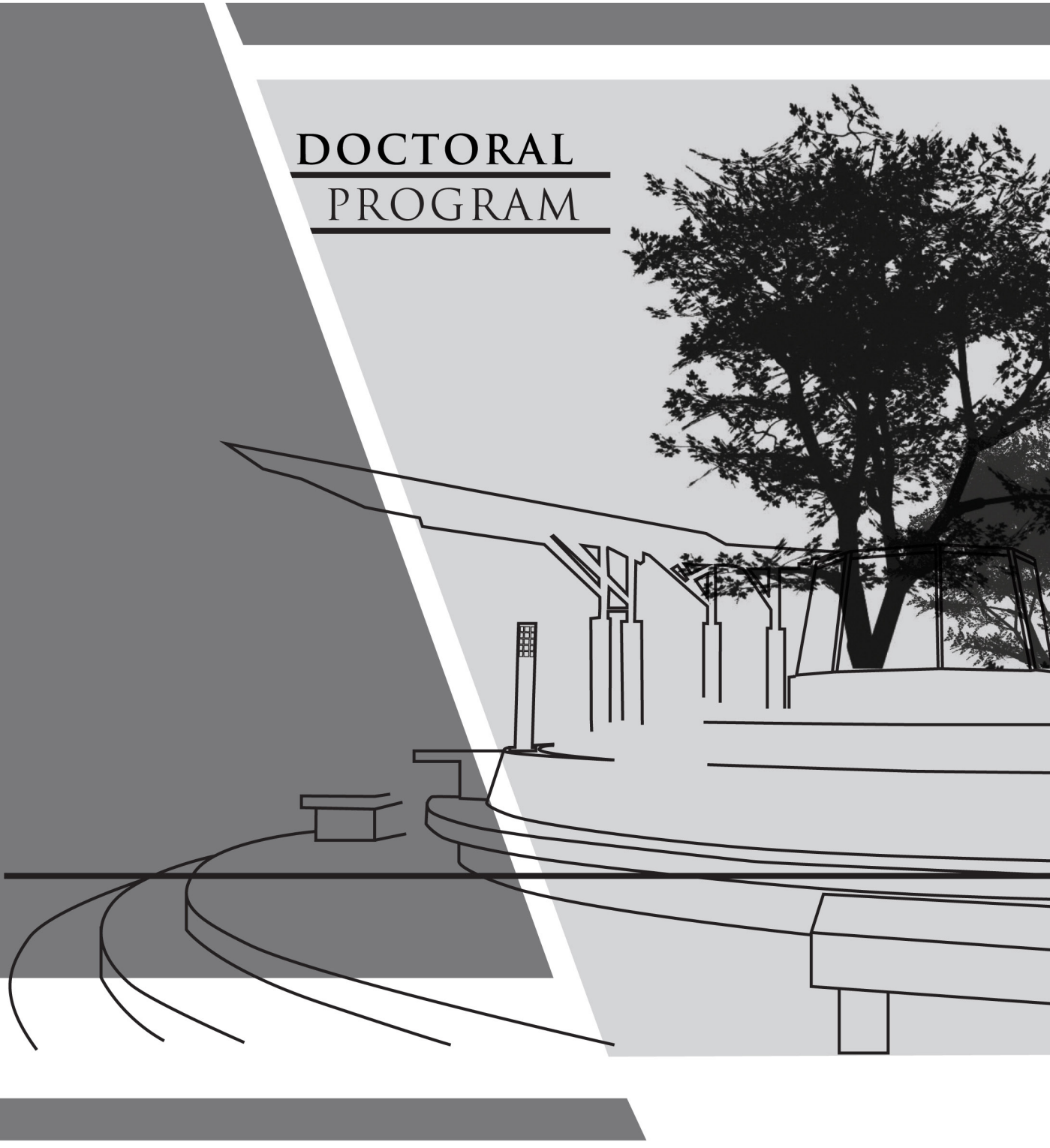
of potential dangers and risk; Health and Safety Management in project implementation; Environmental management and pollution control in project implementation; Methods and strategies for controlling and handling incidents and working accident; Internal audit of HSE Program; HSE Program arrangement in civil engineering project.

Prerequisite: --

Reference Book

1. Charles A. Wentz. *Safety, Health and Environment Protection*. McGraw-Hill Education (Int'l Ed.). 1999. ISBN-13: 978-0071168618.
2. Regulations (UU, PP, Perpres, Permen, Kepmen, Perda, Pergub, dll), OHSAS 8001-2007, ISO 9001-2008, and ISO 14001-2004.
3. On line references (Digital Journal and Clipping Mass Media), Lecture Handouts, and other reading materials relevant to this subject

DOCTORAL PROGRAM



6. 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
ENCV900001	Kekhususan 1	Special Subject 1	4
		Sub Total	**10**
	Semester 2	**2nd Semester**	
ENGE900002	Analisis Kualitatif & Kuantitatif	Qualitative & Quantitative Analysis	4
ENCV900002	Kekhususan 2	Special Subject 2	4
ENCV900004	Proposal Riset	Research Proposal	6
		Sub Total	**14**
	Semester 3	**3rd Semester**	
ENCV900006	Publikasi – Konferensi Internasional	Publication – International Conference	4
		Sub Total	**4**
	Semester 4	**4th Semester**	
ENCV900007	Ujian Hasil Riset	Research Result Examination	10
		Sub Total	**10**
	Semester 5	**5th Semester**	
ENCV900008	Publikasi II – Jurnal Internasional	Publication II – International Journal	8
		Sub Total	**8**
	Semester 6	**6th Semester**	
ENCV900010	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**	
ENCV900003	Seminar Berkala Kelompok Ilmu	Research Group Periodic Seminar	8
		Sub Total	**8**
	Semester 2	**2nd Semester**	
ENCV900004	Proposal Riset	Research Proposal	6
		Sub Total	**6**
	Semester 3	**3rd Semester**	
ENCV900005	Publikasi I – Konferensi Internasional	Publication I – International Conference	4
		Sub Total	**4**
	Semester 4	**4th Semester**	
ENCV900007	Ujian Hasil Riset	Research Result Examination	10
		Sub Total	**10**
	Semester 5	**5th Semester**	
ENCV900008	Publikasi II – Jurnal Internasional	Publication II – International Journal	8
		Sub Total	**8**
	Semester 6	**6th Semester**	
ENCV900009	Publikasi III – Jurnal Internasional	Publication III – International Conference	8
ENCV900010	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)

ENCV900001
Special Subject 1
4 SKS

ENCV900002
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.

ENCV900003
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.

ENCV900004
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.

ENCV900007
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.

ENCV900006
Publication - International Conference
4 SKS

ENCV900005
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.

ENCV900008
Publication II - International Journal
8 SKS

ENCV900009
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.

ENCV900008
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.

UI Campus, Depok 16424
Ph : +62 21 7863503-05, 78888430
Fax : +62 21 7270050

www.eng.ui.ac.id