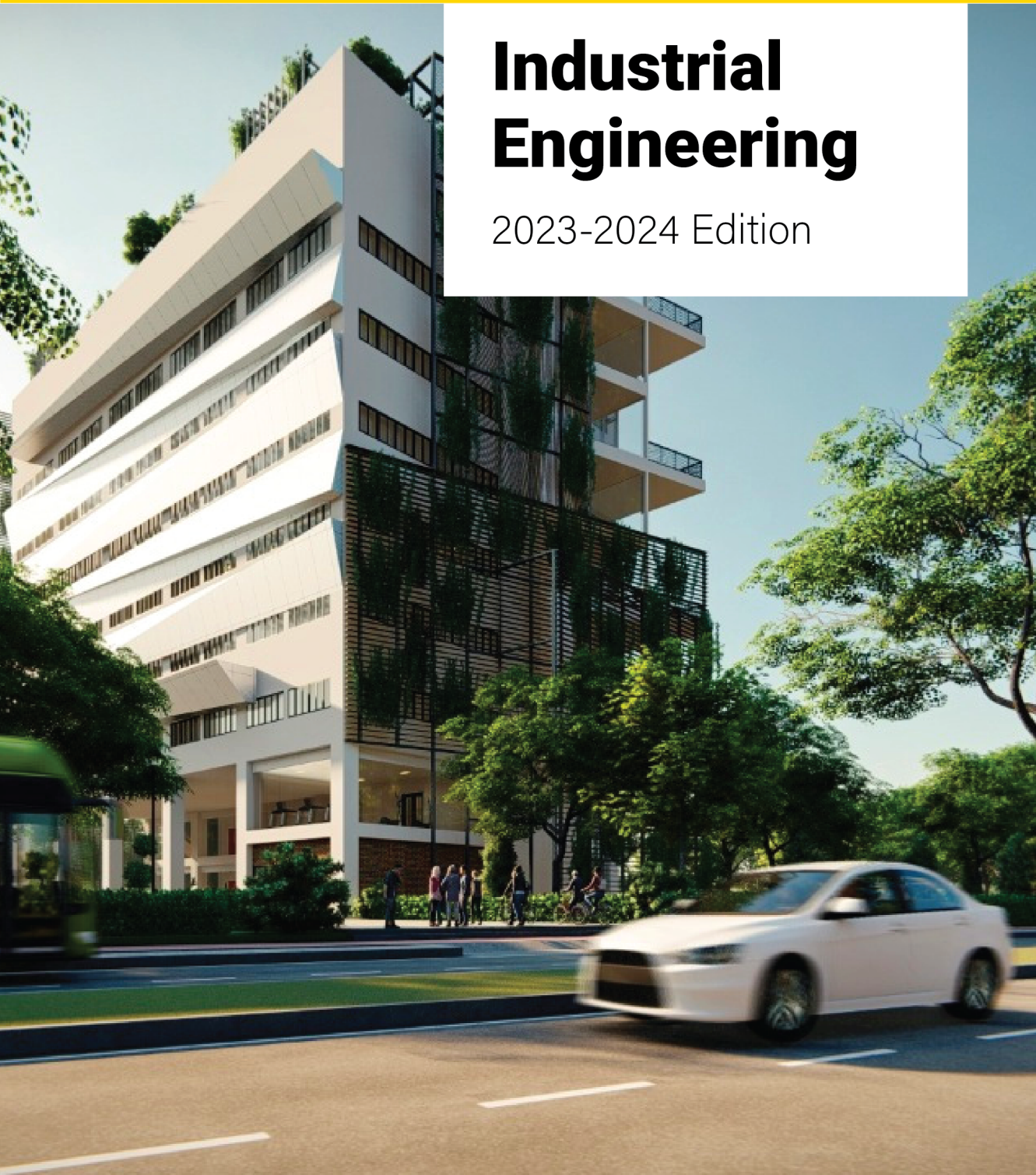
UNIVERSITAS INDONESIA

FAKULTAS TEKNIK

Industrial Engineering

2023-2024 Edition



FACULTY OF ENGINEERING

UNIVERSITAS INDONESIA

ACADEMIC GUIDEBOOK

2020 - 2024

2023 EDITION

Author

Faculty of Engineering Universitas Indonesia

Cover Design and Layout

Faculty of Engineering Universitas Indonesia

Publisher

Faculty of Engineering Universitas Indonesia

Email humas@eng.ui.ac.id

website http://eng.ui.ac.id

Faculty of Engineering Universitas Indonesia

INDUSTRIAL ENGINEERING GUIDEBOOK

2020 - 2024

2023 Edition

The Committee

Chair : Dean of Engineering

Prof. Dr. Heri Hermansyah, ST., M.Eng., IPU

Advisory Committee :

Prof. Dr. Ir. Yanuar, M.Eng

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

Editor :

Dr. Nyoman Suwartha, S.T., M.T., M.Agr.

Prof. Dr. Ir. Widodo Wahyu Purwanto, DEA.

Prof. Dr. Fitri Yuli Zulkifli, M.Sc.

Dr.-Ing. Ova Candra Dewi, M.Sc.

Andyka Kusuma, S.T., M.Sc., Ph.D.

Dr.-Ing. Mohammad Adhitya, S.T., M.Sc.

Dr. Abdul Halim M.Eng.

Ahmad Zakiyuddin, S.T., Ph.D.

Kristanti Dewi Paramita, S.Ars., M.A., Ph.D.

Dr. Dianursanti, S.T., M.T

Dr. Zulkarnain, S.T., M.T.

Secretariat :

Yunita Dewi Hapsari

Design :

Muhammad Reyhan Husain Wicaksono

Published by Faculty of Engineering
Universitas Indonesia

Head Office

Dekanat Building 2nd Floor
+6221 7863504, +6221 7863505
+6221 7270050
http://www.eng.ui.ac.id/

Public Relations and Protocol

Office of Public Relations and Protocol
PAF Building 1st floor
+6221 78888430 ext 118
+6221 78888076
Email : humas@eng.ui.ac.id

PREFACE

Welcome to FTUI !

On behalf of the Faculty of Engineering Universitas Indonesia (FTUI). I would like to extend our warmest welcome to all students joining us this year. Our faculty is one of the largest faculty in the Universitas Indonesia and is proud to call ourselves one of Indonesia's leading education and research institutions. With the support of our faculty members, we provide an excellent learning and research environment for our students.

This 2023 Academic Guidebook is intended for all students of the Undergraduate Program (Regular, Non Reguler, International), Master Program, Professional Program, and Doctoral Program, to be used during their study at the Faculty of Engineering Universitas Indonesia. The curriculum, syllabus, and academic staff are listed, as well as all support information provided for you. The information contained within this book is also helpful for those considering continuing their study in the engineering field at the Universitas Indonesia.

Continuing the previous Academic Guidebook, we have refined the curriculum design based on the spirit of the Industrial Revolution 4.0 and the concept of "Merdeka Belajar Kampus Merdeka". The curriculum was designed based on the Outcome Based Education (OBE) system. The international standard engineering education outcome has been set in intended to prepare our graduates to be able to compete not only at the national or regional level but also in the global labor market.

In this guidebook, you will also find general information on FTUI and our Department/Study Program. It contains the education system, the academic regulations, the curriculum, and the syllabus of the subject taught in all our programs. In this guidebook, we are also proud to inform that starting the Academic Year 2023/2024, we opened the Professional Engineer Program (PPI) for the Recognition of Past Learning (RPL). This is a formal education program that uses work experience as the basis for continuing education for equality with certain qualifications. In addition, starting the Academic Year 2023/2024, FTUI will open the Master Program by Research. This program is a development of the existing Master Program by Course. This program is opened to provide learning opportunities for the community broad range, both from graduate students, and academics, to practitioners who already have research experience.

Lastly, I would like to convey my gratitude and appreciation to our stakeholders and the curriculum team for their contributions to the renewal curriculum. My sincere thank goes to all faculty members who have helped with the compilation of this academic guidebook, especially the Vice Dean for Academic, Research, and Student Affairs, the Vice Dean for Resources, Venture, and General Administration, the Associate Dean for Academic, the Heads and Vice Heads of Department, the Head of Study Programs, and the committee members. With the spirit of FTUI Entrepreneur Vision #ExcellentImpactful, let us deliver our graduates to be the best engineers in their field wherever they are.

Depok, November 2023
Faculty of Engineering Universitas Indonesia

Prof. Dr. Heri Hermansyah, ST., M.Eng., IPU

Table of Content

CHAPTER 1

PROFILE OF DEPARTMENT

Profile of Departments

Department of Industrial Engineering

General

Industrial Engineering Education in Universitas Indonesia offers unique blends of skills and knowledge in designing, improving, and installing complex integrated systems of people, materials, information, equipment and energy to deliver value to its users.

Our graduates are developed to have a strong problem-finding and problem-solving capabilities using quantitative techniques, process-based systems thinking and design-oriented approaches. With an integration of engineering and management science principles, our graduates are welcome almost in any industrial sectors. You will find our graduates in the service sectors such as banking, government, health sector, consulting, quality management, technology services and others. In the manufacturing sector, our graduates have roles in operations/productions, human resources, maintenance, logistics and distributions.

Our research focuses on the problems faced by our urban communities, due to the facts that UI's location is in the first urban city of Indonesia, our capital city of Jakarta. We want to make sure that we can continuously contribute in developing a sustainable city that are balanced in economic growth, social inclusiveness and environmentally conscious.

Corresponding Address

Department of Industrial Engineering

Faculty of Engineering Universitas Indonesia

Kampus UI Depok 16424, Indonesia

Telp: +62-21-78888805

Fax: +62-21-78885656

Email: sekretariat@ie.ui.ac.id

http://www.ie.ui.ac.id

Vision

"To be at the forefront of Industrial and Systems Engineering education in Indonesia through excellent and sustainable value-adding research and innovations"

Mission

Providing an excellent industrial engineering education, supported with internationally recognised competitive research, and community engagement activities that are adaptive, beneficial and professional to support Indonesia's sustainable development.

Management

Dr. Komarudin, ST., M.Eng
Head of Department

Dr. Zulkarnain, ST., MT.
Vice Head of Department

Head of Laboratory

Prof. Dr. Ir. T. Yuri M. Zagloel, MEngSc
Head of Manufacturing System Laboratory

Prof. Ir. Isti Surjandari P., MT, MA, PhD
Head of Statistics and Quality Engineering Laboratory

Dr. Maya Arlini Puspasari, S.T., M.T., M.B.A.
Head of Human Factors Laboratory

Prof. Dr. Ir. M. Dachyar, M.Sc.
Head of Management Information System and Decision Support Laboratory

Prof. Dr. Akhmad Hidayatno, ST, MBT.
Head of System Engineering Modeling and Simulation Laboratory

Prof. Dr.-Ing. Amalia Suzianti, ST, MSc.
Head of Product Development and Innovation Laboratory

Board Of Professors

1. **Prof. Dr. Ir. Teuku Yuri M. Zagloel, MengSc**, yuri@ie.ui.ac.id (Ir, UI; MEngSc., University of New South Wales, Australia ; Dr, UI), Introduction to Industrial Engineering, Total Quality Management, Lean Operations, Sustainable Manufacturing and Innovation, Manufacturing Facilities Planning and Analysis, Manufacturing System.
2. **Prof. Ir. Isti Surjandari P., MT., Ph.D,** isti@ie.ui.ac.id (Ir, UI; MT, ITB; MA, Ohio State University, USA; Ph.D, Ohio State University, USA) Introduction to Economics, Industrial Statistics, Multivariate Analysis, Data Mining, Decisions, Uncertainties and Risks, Service Engineering, Advanced Statistics.
3. **Prof. Dr. Ir. Djoko S. Gabriel, MT.,** dsihono@ie.ui.ac.id (Ir, ITB; MT, ITB; Dr, UI) Plant Layout Design, Industrial Feasibility Analysis, Supply Chain Management, Technology Management.
4. **Prof. Dr. Ir. M. Dachyar, M.Sc.,** mdachyar@yahoo.com, mdachyar@ui.ac.id (Ir, UI; MSc, VU Brussel, Belgium; Dr, IPB) Information System, Industrial Project Management,

Customer Relationship Management, Innovation Management, Decisions, Uncertainties and Risks, Service Engineering, Operations Management.

5. **Prof. Dr. Ir. Rahmat Nurcahyo, M.Eng.Sc.,** rahmat@eng.ui.ac.id (Ir, UI; MEngSc. Univ of New South Wales, Australia; Dr, UI) Production Planning and Inventory Control, Total Quality Management, Maintenance System, Industrial Feasibility Analysis, Competitive Analysis, Human Capital Management.

6. **Prof. Dr. Akhmad Hidayatno, ST., MBT.,** akhmad@eng.ui.ac.id (ST, UI; MBT, UNSW, Australia, Dr, UI) System Modelling, Quality System, Industrial Simulation, System Engineering, Technology Management, System Dynamics, Interpersonal Skills, Advance Modelling, System Thinking.

7. **Prof. Dr.-Ing. Amalia Suzianti, ST, MSc.** suzianti@ie.ui.ac.id (ST, UI; MSc., BTU Cottbus, Germany; Dr.-Ing., TU-Berlin, Germany – University of Luxembourg) Product Design, Industrial Engineering Design, Industrial Technology Management, Product Lifecycle Management, Sustainable Manufacturing and Innovation, Knowledge Management, Industrial System Design, Technology Entrepreneurship.

Full-Time Faculty

1. **Andri Dwi Setiawan,** a.d.setiawan@ui.ac.id (ST, ITB; MSc, TU Delft, The Netherlands; Dr., TU Eindhoven, The Netherlands) Decision under Uncertainty and Risk, Energy Management, Renewable and Sustainable Energy Systems, Systems Engineering, Support and Logistics for Systems Engineering, Technology Policy Modelling with System Dynamics.

2. **Andri Mubarak,** andrimubarak@ui.ac.id (ST, UI; M.Sc ,TU Berlin, Germany) Sustainable manufacturing and Innovation, Innovation management, Design Thinking, Facilities Layout Design.

3. **Armand Omar Moeis,** armand.omar@ui.ac.id (ST, UI; MSc, TU Delft, The Netherlands; Dr., UI) System Modelling, System Engineering, Industrial Simulation, System Dynamics, Advanced Modelling, System Thinking.

4. **Arian Dhini,** arian@ie.ui.ac.id (ST, ITB; MT, UI; Dr, UI) Statistics and Probability, Industrial Statistics, Cost Accounting, Multivariate Analysis, Advanced Statistics.

5. **Arry Rahmawan,** arryrahmawan@ui.ac.id (ST, UI; MT, UI) System Modelling, System Engineering, Industrial Simulation, System Dynamics, Serious Simulation Gaming

6. **Billy M. Iqbal,** billy@eng.ui.ac.id (SDs, ITB; MT, UI) Cognitive Ergonomics, Human Factors in Industrial Design, Product Design Human Digital Modelling and Simulation

7. **Dendi P. Ishak,** dendi@ie.ui.ac.id (BSIE ; MSIE, Wayne State University, USA; Dr, Universiti Teknologi Mara, Malaysia) Introduction to Industrial Engineering, Maintenance System, Customer Relationship Management, Competitive Analysis, Information System, Industrial Project Management, Safety Engineering and Management.

8. **Erlinda Muslim,** erlinda@eng.ui.ac.id (Ir, ITB; MEE, UTM Malaysia) Cost Accounting, Product Design, Industrial Feasibility Analysis, Competitive Analysis, Industrial Psychology and Organization, Industrial Strategic Design, Human Capital Management, Technology Policy, Industrial Policy, Industrial System Design.

9. **Fauzia Dianawati,** fauzia@ie.ui.ac.id (Ir, UI; MSi, UI) Industrial Psychology and Organization, , Industrial Project Management, Industrial Strategic Design, Human Capital Management.

10. **Farizal,** farizal@ie.ui.ac.id (SMIA, UI; MSc, Oklahoma State University, USA ; PhD. University of Toledo, USA) Engineering Economics, Linear Programming, Finance and Investments, Operations Research, Advanced Operations Research, Advanced Optimization

11. **Inaki M. Hakim,** inakimhakim@ie.ui.ac.id (ST, Universitas Sebelas Maret Surakarta ; MT, ITB) Production Process, Industrial Psychology and Organization, Sustainable Manufacturing and Innovation, Reconfigurable Manufacturing System

12. **Irvanu Rahman,**
irvanurahman@ui.ac.id (ST, UI; MT, UI; MPA, UCL, United Kingdom) System Analysis, Sustainability, Technology Policy Analysis.

13. **Komarudin,**
komarudin74@ui.ac.id (ST, UI; MEng. UTM, Malaysia; Dr, Vrije Universiteit Brussel, Belgium) System Modelling, Advanced Operations Research, Advanced Optimization, Game Theory, Liniear and Stochastic Programming, Queuing Theory, Data Science

14. **Maya Arlini Puspasari,**
mayaarlini@ui.ac.id (ST, UI; MT, UI;MBA, NTUST; Dr, ITB) Ergonomics, Mental Workload, Safety Engineering

15. **Novandra Rhezza Pratama, S.T., M.T., Ph.D.**
novandra@ui.ac.id (ST, UI; MT, UI; Ph.D, Tokyo Institute of Technology) Management Information System, Enterprise Engineering, Business Process Management, , Industrial Management

16. **Romadhani Ardi,**
romadhani.ardi@ui.ac.id (ST, UI; MT, UI; Dr, UDE, Germany) Production System, Production Planning and Inventory Control, Quality System, Advanced Modelling..

17. **Zulkarnain,**
zulkarnain@ie.ui.ac.id (ST, UI; MT, UI; Dr, Oulu Univ, Finland) Operations Research, Supply Chain Management, Data Mining, Service Engineering, Advanced Statistics.

Part-Time Faculty

1. **Amar Rachman,**
amar@ie.ui.ac.id (Ir, UI; MEIM, KULeuven, Belgium) Linear Programming, Operations Research, Advanced Operations Research, Introduction to Mechanics and Electronics in Factory.

2. **Angella Natalia Ghea Puspita,**
angella.natalia21@ui.ac.id (ST, IT Telkom; MT, UI) Optimization, Techno Economy, Machine Learning, Mineral Processing

3. **Annisa Marlin Masbar Rus,**
annisamarlin@ui.ac.id (ST, UI; M.Sc., University of Warwick) Data Mining, Healthcare Systems, Statistics and Probability, Industrial Statistics.

4. **Boy Nurtjahyo Moch,**
boymoch@eng.ui.ac.id (Ir, UI; Wayne State University, USA) Methods, Standards and Work Design, Macro Ergonomics, Cognitive Ergonomics, Human Digital Modelling and Simulation, Human Factors in Industrial Design, Safety Engineering and Management.

5. **Danu Hadi Syaifullah,**
(ST, ITB; Msc, UNSW; PhD, CU) Ergonomic and Human Factor, Safety Engineering, Safety Management System

6. **Ekky Tammarar,**
ekky.tamarar@ui.ac.id (ST, UI; M.Sc. TU Denmark) Innovation Management, Technology Management, Operations Research, Supply Chain Management.

7. **Enrico Laoh,**
enricolaoh@ui.ac.id, (ST, UI; MT, UI) Statistics and Probability, Design of Experiment, Decision Uncertainty and Risk, Operations Research, Computational Methods in Industrial Engineering.

8. **Early Lula Afif,**
early.lula04@ui.ac.id (ST, UI ; MT, UI) Supply Chain Management, Sustainability

9. **Fitria Yuliani,**
fitria.yuliani21@ui.ac.id (ST, UI; MT, UI) Operation research, techno-economic, policy analysis, sustainability

10. **Laksmi Ambarwati,**
laksmi.ambarwati31@ui.ac.id (ST, ITS ; MT, UI) Techno Economic, PPIC, Operations research, queueing theory

11. **Mirna Lusiani,**
mirna.lusiani31@ui.ac.id (ST, UI; MT, UI) Supply Chain Management, Data Mining, Production Planning and Inventory Control

12. **Nurul Lathifah,**
nurul.lathifah02@ui.ac.id (ST, UII; MSc, UGM) Behavioural Operational Research, Simulation, Supply Chain Management

13. **Nora Nisrina,**
nora.nisrina04@ui.ac.id (ST, ITB; MT,UI) Operations Research, Production Planning & Inventory Control, Supply Chain Management

14. **Rahmi Lathifah Islami,**
rahmi.lathifah@ui.ac.id (S.Stat, Unpad ; M.Stat, Unpad)Operational Research, Applied Statistics

15. **Rheinanda Kaniaswari,**
rheinanda.k@ui.ac.id (ST, UI; MT UI) Technology Management, Product Design

16. **Safira Nurul Fathia**
safira.nurul04@ui.ac.id (ST, UI; MSc, KTH) Technopreneurship, Innovation Management, Product Development

17. **Salsabila Annisa Arista,**
salsabila.annisa04@ui.ac.id (ST, UI; MT, UI) Ergonomics and Human Factors, Design for Aging, Inclusive Design

18. **Teuku Naraski Zahari,**
naraski@ui.ac.id (ST, ITB; MT, UI), Decisions, Uncertainties and Risks, Operations Research, Engineering Drawing.

19. **Yadrifil,**
yadrifil@yahoo.com (Ir, UI; MA, Oregon State University, USA) Production System, Production Planning and Inventory Control, Lean Operations, Manufacturing Facilities Planning and Analysis, Manufacturing System, Industrial Strategic Design, Operations Management.

CHAPTER 2

ACADEMICS SYSTEM AND REGULATION

Academic System and Regulation

General

Teaching and Learning Activities

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

Semester Credits Units (SKS)

Education in FTUI is provided in a variety of ways, including lectures, assignments (e.g., calculation tasks, planning, designs), practical work, seminars, lab, studio, and research for thesis writing. All educational activities that must be undertaken by a student to earn a bachelor's degree are contained within the academic loads and measured in semester credit units (SKS).

- Semester Credit is the measurement of the learning experience obtained by students in 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 of 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.
- One Semester Credit of online learning is 170 (one hundred seventy) minutes per week per semester.
- One semester is an effective learning process for at least 16 weeks of lectures or other scheduled activities and additional activities. Also included in the schedule is one week of midterm examination and another one or two weeks of final examination.
- To earn a bachelor's degree, a student must complete all educational activities with a total academic load of 144 credits spread 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 a minimum of 18-20 hours of scheduled interactions 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 (6,25%), Basic Engineering Subjects (15-20%), Basic Skills Subjects (30-35%), Core Subjects (35-40%). Subjects are categorized as either compulsory subjects and electives. They can be taken across departments or faculties.

Grade Point Average

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

The calculation is made by multiplying the number of credits and the letter grade for each course, divided by the number of credits.

$$IP = \left(\frac{\sum_{MA} (\text{Bobotnilai} \times \text{sks})}{\sum_{MA} \text{sks}} \right)$$

Semester Grade Point Average (SGPA)

Grade Point Average (GPA/IPK)

If the calculation involves the grade point values of all subjects taken during the educational program period, the result is called the Cumulative Grade Point Average (CGPA), which is used as a basis for study evaluation. Courses taken into account are the ones listed in the Study Plan Form (FRS). CGPA 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 a letter grade of 'BS', 'I', or 'TK'.

Academic Performance Evaluation

Assessment of academic ability is performed on an ongoing basis by CLO (Course Learning Outcomes). There is at least one CLO derived from the Expected Learning Outcome (ELO) for each subject. Each CLO might be derived into several sub-CLO where each sub-CLO consists of several lecture materials and types of learning evaluations. A student will be assessed on their academic ability if they meet 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 every semester, students can download Semester Grade Record as a report of their academic performance from SIAK NG (https://academic.ui.ac.id/). Assessment of study efficacy is carried out using letters and grade points according to Table 2.1.

The highest grade is 'A' with a grade point of 4.00, and the minimum passing grade of a course is 'C' with a grade point of 2.00. A lecturer may assign an 'Incomplete' (I) grade if a student has not made a reasonable attempt to complete major session assignments or laboratory projects. The lecturer should make a reasonable effort to inform the student as early as possible that an essential part of the session work is incomplete. The 'I' mark should be changed to another

grade within one month; otherwise, it will automatically change to 'E' grade. The 'T' mark is given for no attendance in the exam. The 'BS' mark is given for special lecture (such as internship, seminar, and final project) that has not been completed. These 'BS' courses are not taken into account in the calculation of Semester Study Unit, SGPA, and CGPA.

Table 2.1. Grade Value and Point

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

Length of Study and Academic Load

Undergraduate Program

The academic load students can take proposed by the students for the approval of the Academic Counselor based on their previous Semester Grade Point Average (SGPA) as stated in the Study Plan (FRS). Students must take the entire allocated credits and courses during their first semesters. The minimum academic load for the Undergraduate Program is 144 (one hundred and forty-four) credits, while the maximum academic load is 160 (one hundred and sixty) credits, including the final project. The entire academic load can be completed in a minimum of 7 (seven) semesters and maximum of 12 (twelve) semesters.

As for the second semester, these following rules apply:

- Students can take all credits load allocated for the second semester according to the structure of the applicable curriculum.
- Students can take more credits from the credit load allocated for the second semester if the SGPA obtain in the 1st semester is in accordance with the provision of the maximum credit load amounts shall follow the provision in the Maximum Credit Load Table.

From the third semester onward, the maximum credit load allowed to be taken is determined by the SGPA of the previous Semester (not including the short semester). It follows the provision of Maximum Credit Load as shown in Table 2.2 with respect to course prerequisites (if any). If necessary, the Academic Advisor (PA) can add a maximum of 2 extra credits upon the approval of the Vice Dean.

Master Program

The academic load in the FTUI's Master Program curriculum is set at 40-44 credits after finishing

the Undergraduate Program. The length of study is scheduled for 4 (four) semesters and can be completed in minimum 2 (two) semesters and a maximum of 6 (six) semesters; exclude short semester.

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

SGPA	Maximum Credit
< 2,00	12
2,00 – 2,49	15
2,50 – 2,99	18
3,00 – 3,49	21
3,50 – 4,00	24

The student's academic load is proposed by the students for the Academic Counselor (PA) approval based on their last semester SGPA as stated in the Semester Grade List (DNS). Provisions on the academic load are as follows:

- AA semester's academic load is registered by a student as they carry out online registration according to the predetermined schedule. Students are required to take all subjects as allocated in the first-semester curriculum.
- For students with SGPA less than 2.50, a provision stating that the number of credits taken for the following semester does not exceed nine credits is applicable.
- The maximum number of credits that can be taken on the Master Program is 18 (eighteen) credits (for Regular Master Program) per semester.
- Any Exemption from the provisions of academic load should be with the permission of the Vice Dean.

Matriculation for Master

The Matriculation Program is aimed at synchronizing the students' ability to achieve the minimum requirements for continuing education in the Master Program of FTUI. The program is compulsory for students coming from a four-year diploma program (D4) or graduates from a non-linear undergraduate study program.

Matriculation is achieved by taking classes of subjects required by each Faculty/Study Program within the Undergraduate Program curriculum. The maximum allowed credit load for this Matriculation Program is 12 (twelve) credits, which can be completed in 2 (two) semesters (6 credits in the first semester and 6 credits in the second semester). Students are allowed to continue their study in the Master Program only if they pass all matriculation subjects in a maximum 2 (two) semesters with a matriculation GPA of 3.00 (three points zero).

Fast Track (Master – Doctoral Program)

Fast Track (Master – Doctoral Program) is an educational program organized to accelerate students who have excellent academic ability to complete their studies in the Master Program and Doctoral Program in the same field of science within a maximum of 10 (ten) semesters.

To take part in the Master-Doctoral Fast-Track Program, students must fulfill the following requirement:

a. have obtained 18 (eighteen) credits with a minimum GPA of 3.50 (three point five zero) at the end of the second semester.

b. The study period for the Master-Doctoral Fast-Track Program is a maximum of 10 (ten) semesters.

c. Study Load on the curriculum of the Master-Doctoral Fast-Track Program, as follows:

1. For the Master program, that is according to the total credits in the master study program including 12 - 16 (twelve to sixteen) the credits include elective courses taken from the compulsory doctoral program;

2. For the Doctoral program, a minimum of 50 (fifty) credits, including 12 - 16 (twelve to sixteen) credits, are courses that are recognized through credit transfers.

Students who cannot complete their education within 10 (ten) semesters only get a Master's Degree.

Doctoral Program

The academic load in the FTUI's Doctoral Program curriculum is set at 50 credits after finishing the Master Program. The students register a semester's academic load through online academic registration during the predetermined schedule. New students are required to take all subjects as allocated in the curriculum for the first and second semesters. Students must retake any research courses with a 'BS' grade from previous semesters. The students propose students' academic load for each semester for the approval of the Academic Counselor (PA) or the Doctorate Promoter.

The length of study is scheduled for 6 (six) semesters and can be completed in a minimum of 4 (four) semesters and a maximum of 10 (ten) semesters. Students in the Doctoral Program may be granted an extension of maximum 2 (two) semesters if they have never received an extension before, have

achieved a minimum grade of 'B' for research result examination, and have obtained a recommendation from their Promoter and a guarantee that they will complete their study within the granted extension period. The proposal for such extension is regulated in a Rector's Decree based on the proposal of the Dean.

Undergraduate Final Project (Skripsi)

Undergraduate Final Project (Skripsi) is a compulsory course for undergraduate students of FTUI taken to complete their study and earn a degree in engineering. The course is the application of science that has been obtained student has studied, in the form of a scientific paper, engineering design, assembly or models and accessories. It is equivalent to other skills courses and tailored to the scope of each Study Program. The following requirements, both academic and administrative, must be met before students are allowed to start writing their undergraduate thesis:

- The Undergraduate final project has been registered in the Study Plan Form 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 Final Project can be taken in both odd and even semesters in the running academic year. On SIAK NG, students must fill out the name of their Skripsi Supervisor and the title of their Skripsi to be verified by the Vice Head of Department. At the end of the semester, the supervisor will announce the Skripsi grade on SIAK NG and change the title of the thesis (if necessary). The completed undergraduate final project must be submitted in the form of a hardcover book, and students must upload their final revision in a pdf file to UI-ana (lib.ui.ac. id/ unggah). The undergraduate's final project must be assessed in an undergraduate thesis examination by the Supervisor and examiners assigned by the Head of Department.

Thesis (Master Program)

The thesis is a report of research findings 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 theory using a certain method. The thesis should be written in Bahasa Indonesia with English abstract. For Master Program students who are given the opportunity to conduct research and thesis preparation abroad, they are allowed to write the thesis in English with a Bahasa Indonesia abstract while still following the appropriate format stated in the Final Project Writing Guidelines of Universitas Indonesia. Exemption from this rule applies only to Study Programs in collaboration with universities abroad, as stated in the cooperation charter.

Requirements for a student to start writing a Thesis are:

- The student's thesis has been registered in the Study Plan Form Form (FRS) every semester.
- The Head of Study Program has designated a lecturer to be the student's Thesis Supervisor.

Students are responsible for all thesis research costs. Students can actively meet with any of their lecturers as potential supervisors to request a thesis topic. In addition, in the middle of the second semester, the Head of Study Program can start announcing thesis topics from which the students of the Master Program can choose to prepare their thesis proposal in the form of a seminar. The Head of Study Program will also announce a list of Thesis Supervisors assigned to guide the students in writing and finish the approved topic. The thesis examination committee consists of a committee chair and a minimum of 3 or a maximum of 5 examiners, including the Thesis Supervisor. Responsible for the implementation of the thesis writing is the Thesis Coordinator in each Department. Thesis counseling should be provided by a maximum of two people, the main Supervisor and the second Supervisor. The main Supervisor should be the permanent university lecture holding a Ph.D degree. The second Supervisor is the university permanent lecture or temporary lecturer or expert from national or international institutions holding a Ph.D. or Master's Degree with professional certifications and qualifications equal to level nine (9) of the Indonesian Qualifications Framework (KKNI).

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

- The thesis has been registered in Study Plan Form Form [FRS] in the said semester
- The thesis has been declared eligible for examination by the Thesis Advisor
- The thesis that 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 is carried out under the guidance and evaluation of a Promoter with the following qualifications: a full-time university lecturer; a Professor or Doctor with an academic title of Associate Professor; have expertise relevant to the dissertation topic, and 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 acknowledged by a team of experts appointed by the Academic Senate of Universitas Indonesia. The Promoter may be assisted by a maximum of 2 (two) Co-promoters from within the University, partner universities, or other institutions in cooperation with the Promoter Team. The Co-promoter must have the following qualifications: a full-time or a part-time lecturer or an expert from another institution; hold a minimum title of Doctor/ Ph.D with an academic title of at least Senior Lecturer, and have expertise relevant to the dissertation topic.

Internship for Undergraduate Student

The internship is an out-of-campus activity that encourages students to apply their scientific knowledge in a real work situation. The requirements for internship are set by each Department, and it accounts for 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 Double Degree Undergraduate Program, students are required to complete internships when they are in partner universities (except in UDE, Germany). For example, in Australia, the internship is one of the requirements set by the Institution of Engineers Australia (IEAust) to obtain an accredited B.E. (Bachelor of Engineering) Degree. The internship is a good opportunity for students to apply their skills and build networks in the industry. It is strongly suggested that students do their internships in partner universities. However, if they cannot do so, they are allowed to have their internship in Indonesia with prior permission from the partner universities.

Supplementary Exam

Students are allowed to take a supplementary examination for midterm and final examinations on the following conditions: sick, grievance, or representing Universitas Indonesia in a competition. Students with a sickness excuse are obliged to submit an application for supplementary exam signed by their parents/guardian and a medical certificate from a doctor or hospital that treats them; students with grievance or death in the family (death of the father, mother, older or younger siblings) are obliged to submit an application for supplementary exam signed by their parents/guardian; students representing Universitas Indonesia in the competition are obliged to submit a Letter of Assignment/Letter of Reference stating the competition in which they represent UI. The supplementary exam can only be taken with 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 the number of credits a student may obtain from a university after an evaluation process by a Credit Transfer Team in each Faculty/ Department in the University. Students who have registered and studied at an undergraduate study program or other equivalent education programs, whether in Universitas Indonesia or 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 as the courses listed in the curriculum for the Undergraduate Program in FTUI, (ii) the academic record must date back not more than 5 years from the credit transfer application date, (iii) if the academic record is obtained from a university other than 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 the Undergraduate Program is 50% of the total academic load that a student is required to complete in accordance with the curriculum of the Study Program he/ she is currently studying in. The courses transferred will be indicated with a 'TK' mark in the academic transcript.

The credit transfer procedures are as follows: (i) The student submits a letter requesting credit transfer to the Head of the designated Department; (ii) The Head of Department will form a team to recommend which courses the student has previously taken can be transferred; (iii) The recommendation will be sent to the Dean of FTUI; (iv) The Dean of FTUI will issue a Credit Transfer Decree; and (v) The Faculty's Center of Administration will assign a 'TK' mark to all the relevant courses in the student's SIAK NG account.

Credit Transfer for Non Reguler Class Students of Diploma Graduates

As of 2011, all Extension Programs in FTUI are merged into Non Reguler Classes in the Undergraduate Program. For diploma graduates registered as students in these Non Reguler Classes, credits obtained from the previous diploma program will be transferred in blocks of credits equivalent to the

number of the first and second semester credits in their study program. Students begin their study in the third semester by taking a full academic load according to the package provided for the third semester. Afterward, they can take credits according to their SGPA in the following semester.

Study Abroad

There are many opportunities available for undergraduate students, both from Regular and Non Reguler programs to participate in Student Exchange programs abroad, such as in Japan, Korea, Taiwan, Singapore, and many other countries. Student exchange programs generally last for 1-2 semesters and are 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. Students 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 (Undergraduate – Master Program)

FTUI students, Regular, Non Reguler, 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's 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 a 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:

1. 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.
2. For the Master Program is 40-44 credits including the 16-22 credits from subjects mentioned in point an above and are acknowledge through credit transfer.

If a 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 elective subjects in their completion of the Undergraduate Program and cannot be acknowledged 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:

1. Have a minimum GPA of 3.50 with a total of 120 credits (until 6th semester).
2. Have a minimum Institutional TOEFL/EPT score of 500 (students may use the score from the EPT test they took as a new student in FTUI)
3. Have a high motivation for research

Procedure for Fast Track Program:

1. 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).
2. Students who are interested in participating in the Fast Track Program are required to fill out the Registration Form.
3. The Fast Track Registration Forms will be evaluated by a team headed by the Head of Department.
4. 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 Form. The student's Study Plan Form 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.

5. Undergraduate thesis and thesis of the student are expected to be of continuous research to maximize knowledge, experience and quality research result.
6. 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.

Fast Track (Undergraduate – Doctoral Program)

Fast Track (Undergraduate – Doctoral Program) is an educational program organized by the University to accelerate students who have an excellent academic performance to complete their studies in the Undergraduate Program and Doctoral program in the same study field at the maximum of 12 (twelve) semesters.

Merdeka Belajar Kampus Merdeka Program

Merdeka Belajar Kampus Merdeka Program is a policy of the Minister of Education and Culture, which aims to encourage students to master various sciences useful for entering the world of work. Merdeka Campus provides an opportunity for students to choose freely several courses they will take. The implementation of Merdeka Belajar – Kampus Merdeka Program in the curriculum starting on 2O2O/2021 Academic Year. The Merdeka Belajar – Kampus Merdeka Program is the right for all undergraduate study programs.

Fulfillment of time and study load for undergraduate students or applied undergraduate programs can be implemented by:

a. follow the entire learning process in the study program to the period and study load; or
b. follow the study program's learning process to fulfill part of the time and learning load, and perform the rest learning process outside the study program.

The student may apply for the following elective courses scheme:

a. Fast-Tack program with a minimum of 24 (twenty-four) and a maximum of 54 (fifty-four) credits of choice focused on elective courses and postgraduate level courses at the same field of science as the field of science at the bachelor level.
b. Major-Minor Program with a minimum of 24 (twenty-four) and a maximum of 54 (fifty-four) credits the choice is focused on one different Study Program (across Study Programs/cross faculties/cross clumps of knowledge).
c. Double Major Program with a minimum of 24 (twenty-four) and a maximum of 54 (fifty-four) credits the choice is focused on one different Study Program (across Study Programs/cross faculties/cross disciplines) plus the rest of the Mandatory courses in the second Study Program to fulfill the minimum Expected Learning Outcome of the second study program.
d. Independent study Choice with a maximum of 54 (fifty-four) Optional credits are used for outside learning activities study program as stated in the Policy Merdeka Learning - Merdeka Campus.
e. The selection of the selected subject application scheme is consulted with the Study Program.

The form of learning activities that can be carried out outside the Study program include:

a. Student Exchange
b. Internship/Work Practice
c. Teaching assistant in education unit
d. Research
e. Humanity project Proyek
f. Entrepreneurial activities
g. Independent Study/Project
h. Building a Thematic Real Work Village/Lecture

The number of hours of learning activities is 45 Hours per week for one credit. Implementation of activities must be accompanied by lecturers advisor. The conversion of activities to credits will be carried out by faculty evaluators and verifiers, based on the number of hours and type/form of activities. The evaluator is a lecturer in the study program from the student or other Study Programs in the Faculty assigned to assist and monitor student activities. Verificators are officials at the Faculty level who are responsible for Education and/or Student Affairs in

charge of perform verification, assign weighting, and propose assessment of student performance in student activities.

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

- **Administrative registration in Universitas Indonesia**
  July - August
- **Academic registration in Universitas Indonesia**
  August
- **Course period**
  August – January
- **Mid-semester examination**
  October
- **End of Semester Examination**
  December - January
- **Deadline for grade assignment in SIAK-NG**
  January
- **Departmental Judicium**
  1st: October
  2nd: January
- **Faculty Yudicium**
  1st: November
  2nd: January
- **Graduation**
  February

Term 2

- **Administrative registration in FTUI**
  January - February
- **Academic registration in FTUI**
  January - February
- **Course Period and examination**
  February - May
- **Mid-semester examination**
  March - April
- **End of Semester Examination**
  May
- **Graduation**
  August

Short Semester

- **Administrative Registration**
  June
- **Academic Registration**
  May - June
- **Course period**
  June - August
- **Mid-semester Examination**
  July
- **End of Semester Examination**
  August

Note:

*) Schedules are subject to change

Note:

1. Short Semester course period is held for 8 weeks, including mid-semester and final semester examinations.
2. 2 credit courses consist of two 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.
3. 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.
4. A student can take up to a maximum of 12 credits during the short semester.
5. Courses offered are determined by the Department.
6. 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.
7. 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.
8. 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 dead line will not be registered at that particular semester will be included toward student's allowed length of study. A 50% penalty will be imposed to students who do not make payment on time. 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 Study Plan Form or Formulir Rencana Studi (FRS) during the academic registration period. The main duties of Academic Advisor are:

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

Students should login to https://academic.ui.ac.id using username and password provided by the Office of Direktorat Sistem & Teknologi Informasi (DSTI) UI. Students could get their username and password at PPMT (Pusat Pelayanan Mahasiswa Terpadu) 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 are not followed to take part in the academic activities in the relevant semester, which is counted towards their length of study
3. Students who are not active as referred to in points (1) are not charged with tuition.
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.

Exception Administrative Registration

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

- The students are required to obtain the approval of 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 relevant semester.
- The approval will be used by the students for paying the tuition fee manually.
- The 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 the minimum GPA as required at the end fourth semester for the 2+2 program;
2. Have 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
3. Program curriculum for semester 1-4.
4. Achieve the minimum IELTS or TOEFL scores as

required.

5. If their GPA is less than required, the students must stay at UI and repeat some subjects to improve their GPA, while administratively and academically registered at FTUI.

6. If their 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
Queensland Univ. of Technology	3.0	IELTS minimum 6.5 with no band lower than 6
Curtin University		
The Univ. of Queensland		
The Univ. of Sydney		TOEFL iBT in accordance to partner university's requirement
Monash University	3.2	

English Language Requirements for Undergraduate International Program Single Degree

Students of the Undergraduate International Program Single Degree are required 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	6.0	No bands lower than 5.5
TOEFL iBT	75	No bands lower than 17

This English Language Certificate is one of the requirements before they may proceed to have their Undergraduate Thesis/ Final Project Exam.

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

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

Graduate Predicate

Students are considered to have passed the Undergraduate Program and will earn a Bachelor's 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 compulsory courses and acquired a minimum of 144 credits in accordance with the applicable curriculum with 'C' as the lowest grade and completed all 8-semester scheduled academic load within 8-12 semesters; have completed all administrative obligations, including returning all borrowed library and laboratory collections; and have completed all obligations within their study period and/or all assignments given in accordance with the curriculum of the Study Program (including revising Final Project) with a GPA of ≥ 2.00 (two point zero). Honors predicate for a graduate is determined by the student's CGPA as follows: Summa cum laude (3.90-4.00), Cum Laude (3.61-3.89), Very Satisfactory (3.25-3.60), Satisfactory (2.76-3.24). For an undergraduate student to graduate Cum Laude, he/she must finish his/her study within 8 (eight) semesters with minimum GPA 3,51 and without retaking any courses.

Students are considered to have passed the Master Program and will earn a Master of Engineering or Master of Architecture Degree if they have passed all the required 40–44 credits; achieve a ≥ 3.00 GPA with 'C' as the lowest grade; do not exceed the maximum study period; and have met all administrative requirements. The honors predicate for a graduate is determined by the student's CGPA as follows: Summa cum laude (3.95-4.00), Cum Laude (3.76-3.94), Very Satisfactory (3.51-3.75), Satisfactory (3.00-3.50). For a Master Program student to graduate Cum Laude, his/her length of study must not exceed 4 (four) semesters with minimum GPA 3,76 and without retaking any courses.

Students are considered to have passed the Doctoral Program and will earn a Doctoral Degree if they have passed all the required 50 credits; achieve a minimum GPA of 3.00 with minimum 'C' for in-class courses and minimum 'B' for research courses; do not exceed the maximum study period; and have met all administrative requirements. Honors predicate for a graduate is determined by the student's CGPA as follows: Summa cum laude (3.95-4.00), Cum Laude (3.76-3.94), Very Satisfactory (3.51-3.75), Satisfactory (3.00-3.50). For a Doctoral Program student to graduate Cum Laude, his/her length of study must not exceed 8 (eight) semesters without retaking any courses or academic leave (except for a student with outstanding achievement based on the Promoter and examiner team's judgment, the length of his/her study must not exceed 10 (ten) semesters). The mark 'BS' is not counted as course repetition. If a student's GPA is within the 3.76–4.00 range but he/she fails to meet the other requirements, he/she will be awarded a 'Very Satisfactory' predicate.

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 at least 120 credits with a minimum of C at the end of their tenth semester;
- Attain all required credit with a minimum of C at the end of their twelfth semester;

Or:

- Have the following issues: 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.
- It was proven to be in violation of rules or regulations that caused the student to lose his right as FTUI student.
- Deemed unfit to continue their study based on consideration from a team of Medical Doctors appointed by the Head of the University.

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

Master's 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 9 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 Vice Dean with a copy to the Head of the Department.

Doctoral Program

The Maximum length of study to earn a Doctoral degree in FTUI is 10 (ten) semesters, starting from registration to graduation. **Students of the Doctoral Program (Class and Research)** will lose their right to continue to study (dropping out) if:

- Students do not register academically and administratively for two consecutive semesters, thus automatically being considered to have resigned from UI.
- Students fail to obtain a minimum of 'B' for their research proposal examination or a similar exam at the end of their fourth semester.
- Students fail to complete a minimum of 50% of their research based on the judgment of the Promoter Team by the end of their sixth semester.
- Students fail to complete a minimum of 75% of their research based on the judgment of the Promoter Team by the end of their eighth semester.
- At the end of the study period (ten semesters), students fail to complete 4 points above.
- Students fail to do the following by the end of their study period of ten semesters: producing 1 (one) scientific paper based on research for their dissertation as the main author with an option to work with the Promoter Team as their co-writer that has been accepted to be published in an indexed international journal (8 credits); submitting proof of compliance with the foregoing requirement as part of the requirements for promotion exam, and submitting 1 (one) dissertation and participating in a promotion exam as the final step of the Doctoral Program (6-8 credits).
- Students exceed the maximum length of study (10 semesters).
- Students are proven to be in violation of rules or regulations that causes the students to lose their rights as an FTUI student.

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 do not register academically and administratively for two consecutive semesters, thus automatically being considered to have resigned from UI.
- Students fail to obtain a minimum of 'B' for their research proposal examination or a similar exam at the end of their fourth semester.
- Students fail to complete a minimum of 50% of their research based on the judgment of the Promoter Team by the end of their sixth semester.
- Students fail to complete a minimum of 75% of their research based on the judgment of the Promoter Team by the end of their eighth semester.
- At the end of the study period (ten semesters), students fail to complete 4 points above.
- Students fail to do the following by the end of their study period of ten semesters: producing 1 (one) scientific paper based on research for their dissertation as the main writer that is presented at an international scientific conference and published in the proceedings as a full paper (6 credits); producing 1 (one) scientific paper based on research for their

dissertation as the main writer with an option to work with the Promoter Team as their co-writer that has been accepted to be published in an indexed international journal (8 credits); submitting 1 (one) scientific paper that has been accepted to be published in a nationally accredited journal; submitting proof of compliance with the foregoing requirement as part of the requirements for promotion exam; and submitting 1 (one) dissertation and participating in a promotion exam as the final step of the Doctoral Program (6-8 credits).

- Students exceed the maximum length of study (10 semesters).
- Students are proven to be in violation of rules or regulations that causes the students to lose their rights as an FTUI student.

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.

Academic Leave

Students who wish to be away from their academic endeavors at FTUI for one to two semesters, but intend to return to FTUI are eligible for an academic leave of absence. Leave of absence can only be given to a student who has studied at FTUI for at least two semesters, unless under specific circumstances. Academic leave for special circumstances is an academic leave that is given to a student for unavoidable reasons, such as: carrying out state task, undertaking university task, or undergoing medical treatment, which prohibit the said student from participating in academic activities. Academic leave is not counted as part of the length of study.

Procedures of Academic Leave

1. To apply for academic leave, a student must write a letter requesting for academic leave to the Head of Department. Head of Department will give recommendation to Vice Dean based on the student request before the beginning of the administrative registration period of the relevant semester.
2. If the academic leave is approved by the Vice Dean, PAF will change the status of the student to 'academic leave' before the beginning of the administrative registration period of the relevant semester, and the amount of tuition will be automatically changed.
3. The student must pay 25% of tuition during the period of administrative registration of the intended semester.
4. If the student has been granted an academic leave but fails to pay the required tuition during the registration period, the academic leave will be canceled, and the student's status will change to 'inactive' (empty).
5. In the situation as stated above, if the student still insists on making payment after the registration period has passed, the student will be charged a late administrative registration fee in the amount stated in the Rector's Regulation on Academic Fees.
6. If the student fails to pay during the prescribed period of administrative registration, Exceptional Administrative Registration will apply.
7. If the academic leave is proposed not in accordance with point (1) above, or proposed after the semester starts, the student must pay the full amount (100%) of tuition.

Faculty and Department Judiciums

Judicium 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.

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 on student's request, while the diploma and academic transcripts are issued only once at the time of the student's graduation. Student Academic History and Academic Transcript contain the names, course codes and grades of all courses that the student have taken 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 highest education level), 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 in hard copy form on a student request as required. A valid DNS is signed by

the academic administration official in the Faculty level.

Academic Record chronologically lists all academic activities of a student since the FRS time registered as a student until no longer registered, either due to graduation, expulsion, or resignation. The academic status of a student for each semester is recorded in the Academic Record. The Academic Record is also used as a source of information for the student, Academic Advisor, and Study Program to help the student to achieve success in their study and is issued as required on the student's request and validated by the Vice Dean of the Faculty.

Academic Transcript is given to students that have been declared to fulfill all requirements to graduate from a Study Program in a faculty meeting and contains 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 languages, Bahasa Indonesia and English. The Academic Transcript will be given to students with no outstanding tuition fees.

Diploma is given to a student who has been verified in a faculty members meeting to complete all requirements to graduate from a Study Program. Diploma contains information on the personal identity of the diploma holder (name, place and date of birth), academic title, name and signature of the Rector and Dean, issuance date of diploma, 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 may request another 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 outstanding tuition fees.

Offenses and Sanctions

In any courses, no student shall engage in any form of unethical or improper conducts, including but not limited to examination offenses, such as:

1. Utilizing unauthorized materials/notes to enhance performance during on examination.
2. Attempting to observe the work of another student.
3. Taking an examination for another person, or permitting someone else to do so.
4. Collaborating improperly by joint effort on discussion in anyway expressly prohibited by lecturer.
5. 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 Panitia Penyelesaian Pelanggaran Tata Tertib (Offence Settlement Committee) (PT32) may be held.

Academic Sanction for Perpetrators of Academic Cheating In Exams

1. Academic sanction in the form of the revocation of the said exam (E grade) for the student caught or proven committing academic offence in the examination process, such as working with any other student, copying any other student's work or giving answer to any other student;
2. Academic sanction in the form of study period revocation (for all subjects) for the said semester for the student caught or proven committing academic offence in examination process such as opening books, notes or any other equipment prepared beforehand;
3. Academic sanction in the form of revocation of study period for the said semester and one semester suspension for the student caught or proven committing academic offence in the examination process due to collaborating with any third party outside of the examination room;
4. Academic sanction in the form of expulsion from the Faculty of Engineering, Universitas Indonesia, for the student caught or proven committing academic offence in the examination process by substituting any other examinee or by having someone else to take their place;
5. Academic sanction in the form of expulsion from the Faculty of Engineering, Universitas Indonesia, for the student

caught or proven committing academic offence in the examination process for planning and carrying out the plan to help any other examinee;

6. Other academic offence will be handled through a hearing by the Offence Settlement Committee (Panitia Penyelesaian Pelanggaran Tata Tertib (P3T2)), Faculty of Engineering, Universitas Indonesia;

7. Student is entitled to submit an appeal to the Faculty Academic Senate with the help of their Academic Advisor and the Vice Dean for Academic, Research, and Student Affairs, Faculty of Engineering, Universitas Indonesia..

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.

Academic Regulation Of The Universitas Indonesia

List of Academic Regulations at Universitas Indonesia can be accessed via http://respository.ui.ac. id. Below is a list of Decrees that functioned as reference for education program at Universitas Indonesia

General:

1. 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

1. Decree of the Rector Universitas Indonesia Number: 285/SK/R/UI/2003 on the Implementation Guidelines for Cross-Faculty Lectures in Universitas Indonesia
2. Decree of the Board of Trustees Universitas Indonesia Number: 006/MWA-UI/2004 on the Universitas Indonesia's Academic Curriculum
3. Decree of the Rector of Universitas Indonesia Number: 491/SK/R/UI/2004 on Universitas Indonesia Education Activities Conclusion Regulations
4. Decree of the Board of Trustees Universitas Indonesia Number: 001/TAP/MWA-UI/2005 on the Establishment of Academic Degrees in the Universitas Indonesia.
5. 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
6. Regulation of the Board of Trustees Universitas Indonesia Number: 006/Peraturan/MWA-UI/2005 on Student Learning Outcomes Evaluation at Universitas Indonesia
7. Regulation of the Board of Trustees Universitas Indonesia Number: 007/Peraturan/MWA-UI/2005 on Academic Education Implementation Norms in Universitas Indonesia
8. Regulation of the Board of Trustees Universitas Indonesia Number: 008/Peraturan/MWA-UI/2005 on Professional Education Curriculum Norms in Universitas Indonesia
9. Decree of the Rector of Universitas Indonesia Number: 838/SK/R/UI/2006 on Administration of Universitas Indonesia Student's Learning Outcomes
10. Decree of the Rector of Universitas Indonesia Number: 012/SK/R/UI/2007 on Implementation of the of Students Learning Activity in Universitas Indonesia
11. Decree of the Rector of Universitas Indonesia Number: 450/SK/R/UI/2008 on the Implementation of E-Learning in the University Indonesia
12. Decree of the Dean of Faculty of Engineering Universitas Indonesia Number: 3 year 2019 on the English Requirements for Undergraduate International Program Single Degree and Double Degree Faculty of Engineering Universitas Indonesia.
13. Decree of the Rector of Universitas Indonesia Number : 16 year 2020 on the Implementation of Undergraduate Program in Universitas Indonesia
14. Decree of the Rector of Universitas Indonesia Number : 5 year 2021 on the Implementation of Master Program in Universitas Indonesia
15. Decree of the Rector of Universitas Indonesia Number : 8 year 2021 on the Implementation of Doctoral Program in Universitas Indonesia
16. 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.
17. 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.
18. 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.
19. Decree of the Dean of Faculty of Engineering Universitas Indonesia Number : 2 year 2022 on the Scientific Publication Assessment Guide for Master Program and Doctoral Program in Faculty of Engineering Universitas Indonesia.
20. Decree of the Dean of Faculty of Engineering Universitas Indonesia Number : 703 year 2016 ont the Credit Transfer

Research

1. Decree of the Board of Trustees Universitas Indonesia Number 002/SK/MWA-UI/2008 on University's Research Norms
2. Decree of the Board of Trustees Universitas Indonesia Number 003/SK/MWA-UI/2008 on Research Policy at Universitas Indonesia
3. 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

CHAPTER 3

LABORATORY FACILITIES

LIST OF NAMES OF HEADS OF LABORATORY AND INDUSTRIAL ENGINEERING DEPARTMENT

YEAR 2023

No	Head of Laboratory	Laboratory	Laboratory Assistant	Equipment in the Lab	Subjects Related to Lab
1	Prof. Dr. Akhmad Hidayatno, ST, MBT.	Rekayasa sistem, Pemodelan dan Simulasi	Dede Sutrisna	1. Workstation, 15 Unit 2. Printer, 2 unit 3. Smart Board, 2 unit 4. Smart TV, 2 Unit 5. Air Purifier, 4 Unit 6. touchscreen Proyektor, 1 Unit 7. TV Monitor, 4 unit	Permodelan Sistem Simulasi Industri Sistem Kualitas Adopsi Teknologi berbasis Sistem Dinamis Keputusan, Ketidakpastian, Risiko Logistik Maritim
2	Prof. Ir. Isti Surjandari Prajitno, MT, MA, PhD.	Statistik dan Rekayasa Kualitas	Dede Sutrisna	1. Workstation, 15 Unit 2. Printer, 2 unit 3. Smart Board, 1 unit 4. Smart TV, 2 Unit 5. Air Purifier, 1 Unit 6. Proyektor, 1 Unit 7. White Board, 1 Unit	Teori probabilitas Statistika Dasar Statistika Industri Statistika Multivariat Analitika Data dan Visualisasi Data Mining
3	Prof. Dr. Ir. M. Dachyar, M.Sc.	Manajemen Sistem Informasi dan Pendukung Keputusan	Dede Sutrisna	1. workstation 18 Unit 2. Smart TV, 2 Unit 3. Printe, 2 Unit 4. PC Server, 2 Unit	Sistem Informasi Perancangan Proyek Industri Rekayasa Proses Bisnis Manajemen Hubungan Konsumen Manajemen Inovasi Manajemen Jasa

4	Dr. Maya Arlini, ST., MT., MBA.	Ergonomics Centre	taufan hadi prasetio	1. Antroscan 2. Accousti Room 3. Heat n Cold 4. VR, 1 Unit 5. Workstation, 16 unit 6. Smart TV, 6 unit 7. BMI, 1 unit 8. Anthropometer, 3 unit 9. Laser distance meter, 4 unit 10. Lux meter, 6 unit 11. Software Jack, 1 unit 12. Eyetracker, 1 unit 13. Tobii, 1 unit 14. Go PRo, 4 unit 15. EEG inside 5ch, 1 unit 16. EEG 12ch, 1 unit	Perancangan kerja, metode dan standar kerja Faktor manusia dalam rekayasa dan desain Faktor manusia dalam sistem transportasi pintar Simulasi digital manusia
5	Prof. Dr. Ir. Yuri M. Zagloel, MEngSc.	Sistem Manufaktur	taufan hadi prasetio	1. Cnc 2. Lps 3. TPS 4. lcd, 1unit 5. Layar Proyektor, 2 Unit 6. Proyektor, 2 unit 7. Workstation, 8. 3D Printer eder 5, 1 unit 9. 3D Priter ender 5 pro plus, 1 unit	Proses Produksi Perencanaan Produksi dan Pengendalian Persediaan Sistem Rantai Pasok Reliabilitas dan Pemeliharan Perancangan Fasilitas dan Penanganan Material Logistik Ramping Operasi Ramping Manufaktur Berkelanjutan Ekonomi Sirkular dalam Rantai Pasok
6	Prof. Dr.-Ing. Amalia Suzianti, ST., M.Sc.	Product Development	taufan hadi prasetio	1. 3D Pirnter mixmax, 2 unit 2. 3D Printer Ender Plus, 2 unit 3. 3D Printer , 4unit 4. Printer, 2 Unit 5. Workstation, 5 unit 6. Mac, 1 unit 7. 3d scanner, 2 unit 8. smart tv, 1 unit	Menggambar teknik Perancangan produk Perancangan teknik industri Berpikir Desain Manajemen Siklus Hidup Produk

CHAPTER 4

UNDERGRADUATE PROGRAM

Undergraduate Program in Industrial Engineering

Program specification

1.	**Awarding Institution**	Universitas Indonesia	
2.	**Host Institution**	Universitas Indonesia	
3.	**Faculty**	Engineering	
4.	**Program Tittle**	Undergraduate Program in Industrial Engineering	
5.	**Vision and Mission**	The vision of the industrial engineering undergraduate program of the Universitas Indonesia is to be the leading study program in Indonesia in developing the field of industrial engineering to design, improve and install a complex and integrated industrial system through a systematic problem-solving process by using analytical, computational and experimental methods to improve productivity and sustainable quality. The mission of the industrial engineering undergraduate program of the Universitas Indonesia is to implement an industrial engineering higher education program with international awareness, supported by internationally competitive research and provide adaptive, useful, and professional community service to support Indonesia's sustainable development.	
6.	**Class**	Regular, Non Reguler, international, Fast Track	
7.	**Final Award**	Bachelor of Engineering	
8.	**Accreditation / Recognition**	Accreditation Excellent by BAN-PT and international Assessment by AUN-QA	
9.	**Language(s) of Instruction**	Indonesian and English	
10.	**Study Scheme (Full Time / Part Time)**	Full Time	
11.	**Entry Requirements**	High School graduate/equivalent or D3/Polytechnic graduate and pass the entrance exam	
12.	**Study Duration**	Scheduled for four years	
	Type of Semester	Number of Semester	Number of weeks / semester
	Regular	8	16
	Short (optional)	3	8
13.	**Aims of the study program** 1. Apply industrial engineering knowledge to design, improve, and install integrated industrial systems to enhance the organization's global competitive advantage. 2. Provide professional skills and knowledge to succeed in the preferred profession. 3. Provide the ability to work effectively and ethically as a leader, team member, and as an individual to make better improvement in the organization.		
14.	**Graduate Profile:** An industrial engineer that has roles in designing, improving, and installing a complex and integrated industrial system through a systematic problem-solving process using various analytical, computational, and experimental tools and methods to improve productivity and quality.		

15.	**Expected Learning Outcomes:** Bachelor of Industrial Engineering has expected learning outcomes as follow: 1. The ability to apply mathematics, science, and engineering principles 2. The ability to design and implement research and research projects, as well as analyzing and interpreting data. 3. The ability to design, implement and improve the performance of an integrated system, component, or process to meet realistic constraints such as economics, environment, social, politics, law, ethics, human factors, health and safety, manufacturing feasibility, and sustainability 4. The ability to identify, formulate, and solve engineering problems. 5. The ability to use modern and required techniques, skills, and tools in engineering practice 6. The ability to be active in a multi-disciplinary team. 7. The ability to work professionally and have ethical responsibilities 8. Has a broad understanding of the impact of engineering problem-solving in global, economic, environmental, and social contexts. 9. The ability to study independently and continuously (lifelong learning) 10. The ability to communicate using spoken and written languages in Indonesian and English for both academic and non-academic activities (UI's competence) 11. The ability to use information and communication technology (UI's Competence) 12. The ability to identify a variety of entrepreneurial efforts that are characterized by ethical innovation and self-sustained (UI's competence) 13. The ability to critical, creative, and innovative thinking and has the intellectual curiosity to solve problems at individual and group levels (UI's competence) 14. The ability to provide alternative solutions to various problems that arise in the community, nation, and state of Indonesia (UI's competence).

16. Curriculum composition

No.	Types of teaching eyes	Credits	Percentage
I	Compulsory courses at the university level	19	12,5%
II	Compulsory courses at the faculty level	19	13,2%
III	Compulsory courses at the study program level	85	59,00%
IV	Elective courses	15	10,4%
V	Special courses (internship and undergraduate thesis)	7	4,9%
	Total	145	100%
	Total Credits for Graduation		**145 sks**

Job Prospects

Graduates of industrial engineering Universitas Indonesia are directed to have strong and systematic problem-solving skills with a multi-disciplinary approach in an industrial engineering scientific framework. The science of Industrial Engineering itself is unique engineering filed because it involves a multi-disciplinary approach. Graduates of this study program have been working on manufacturing and public and private services industries in the field of production management, human resources, maintenance systems, logistics and supply chain management, finance and banking, management, and I.T. consulting services.

Expected Learning Outcome Interconnection

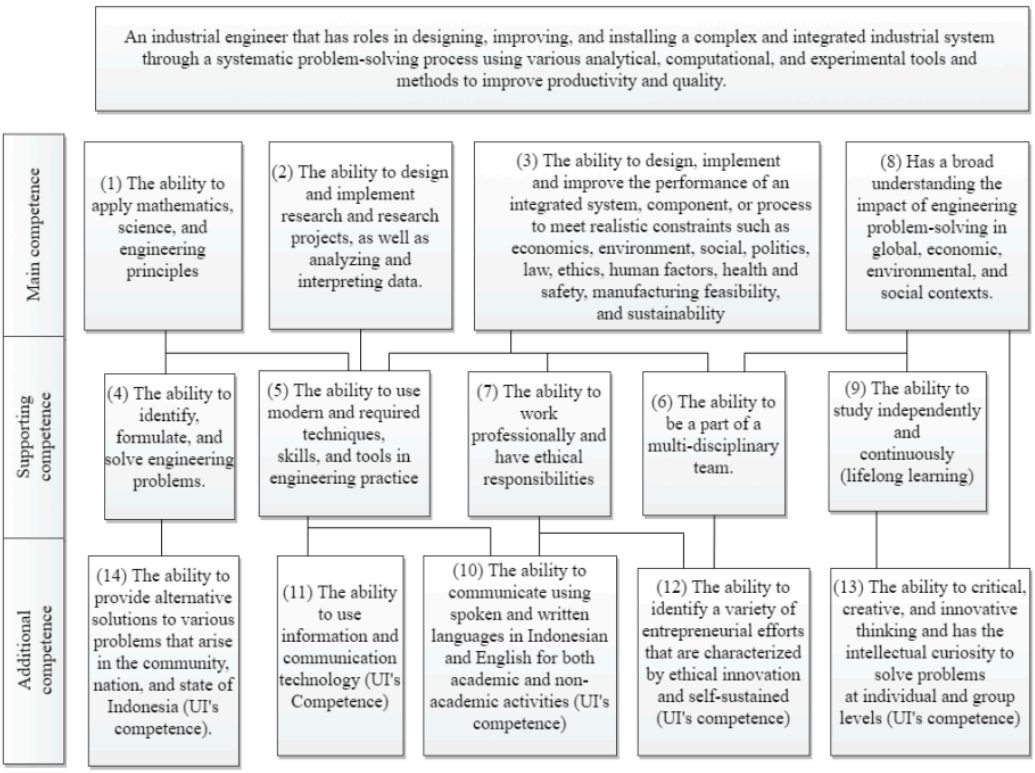
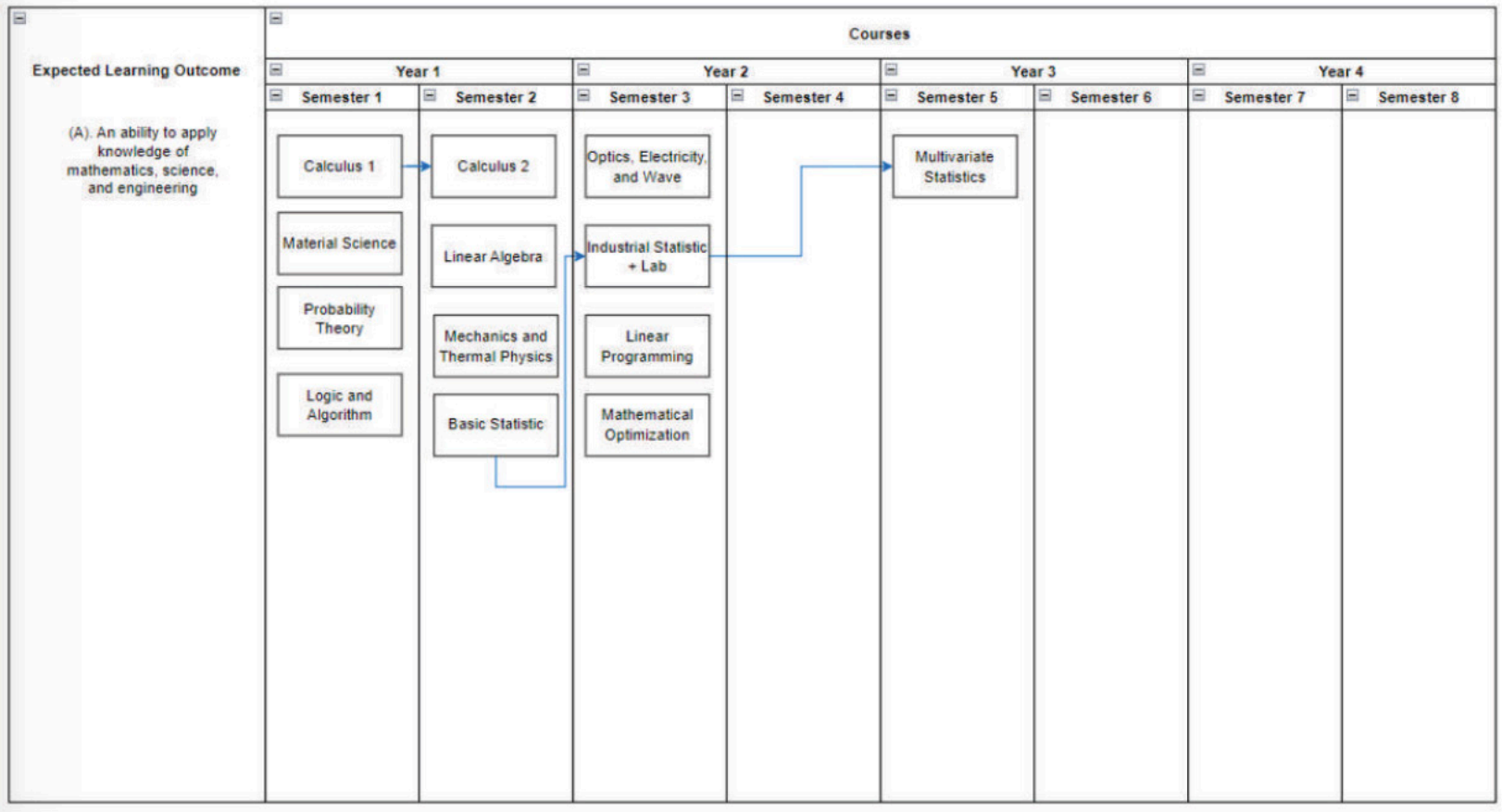
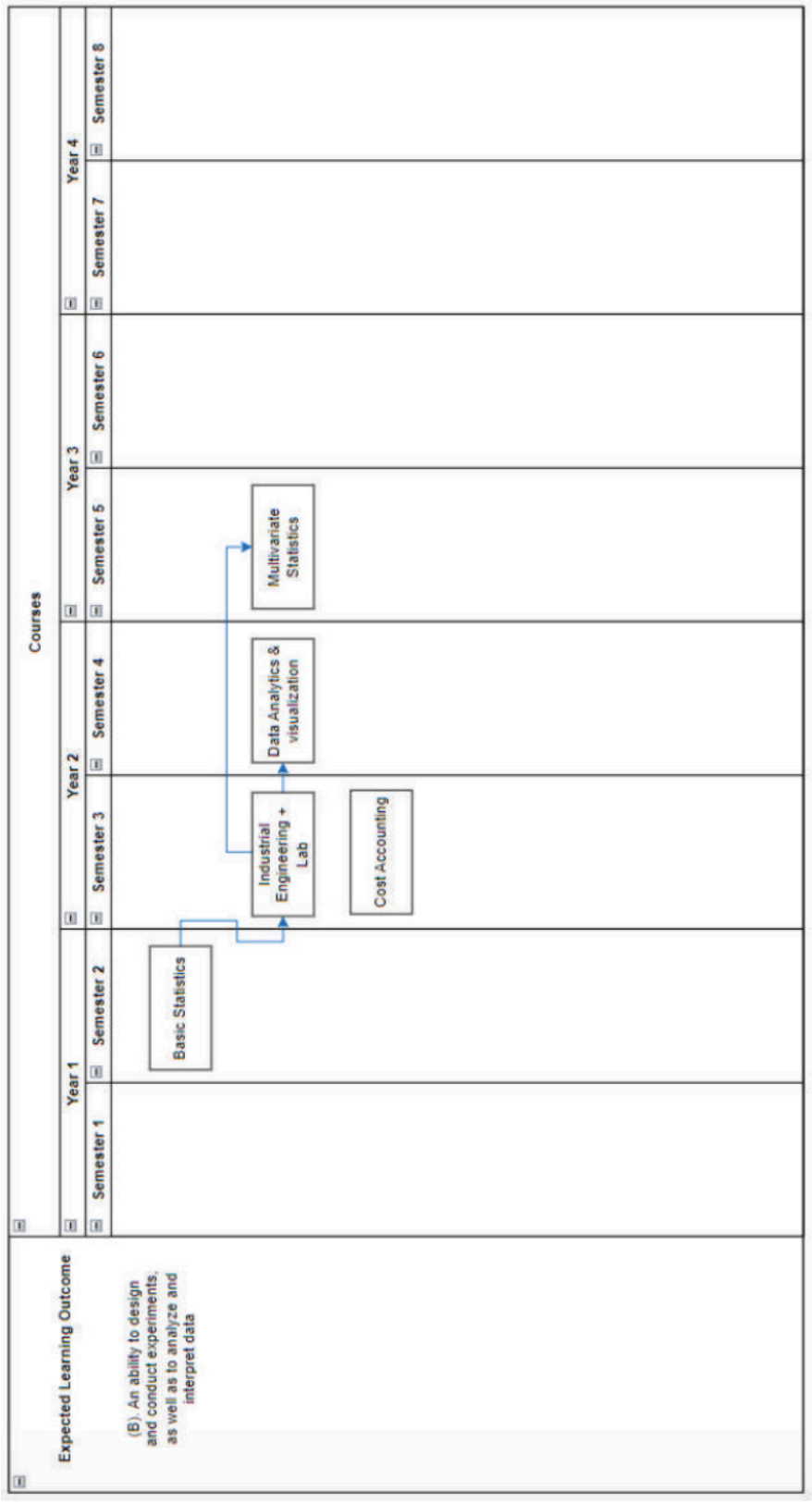
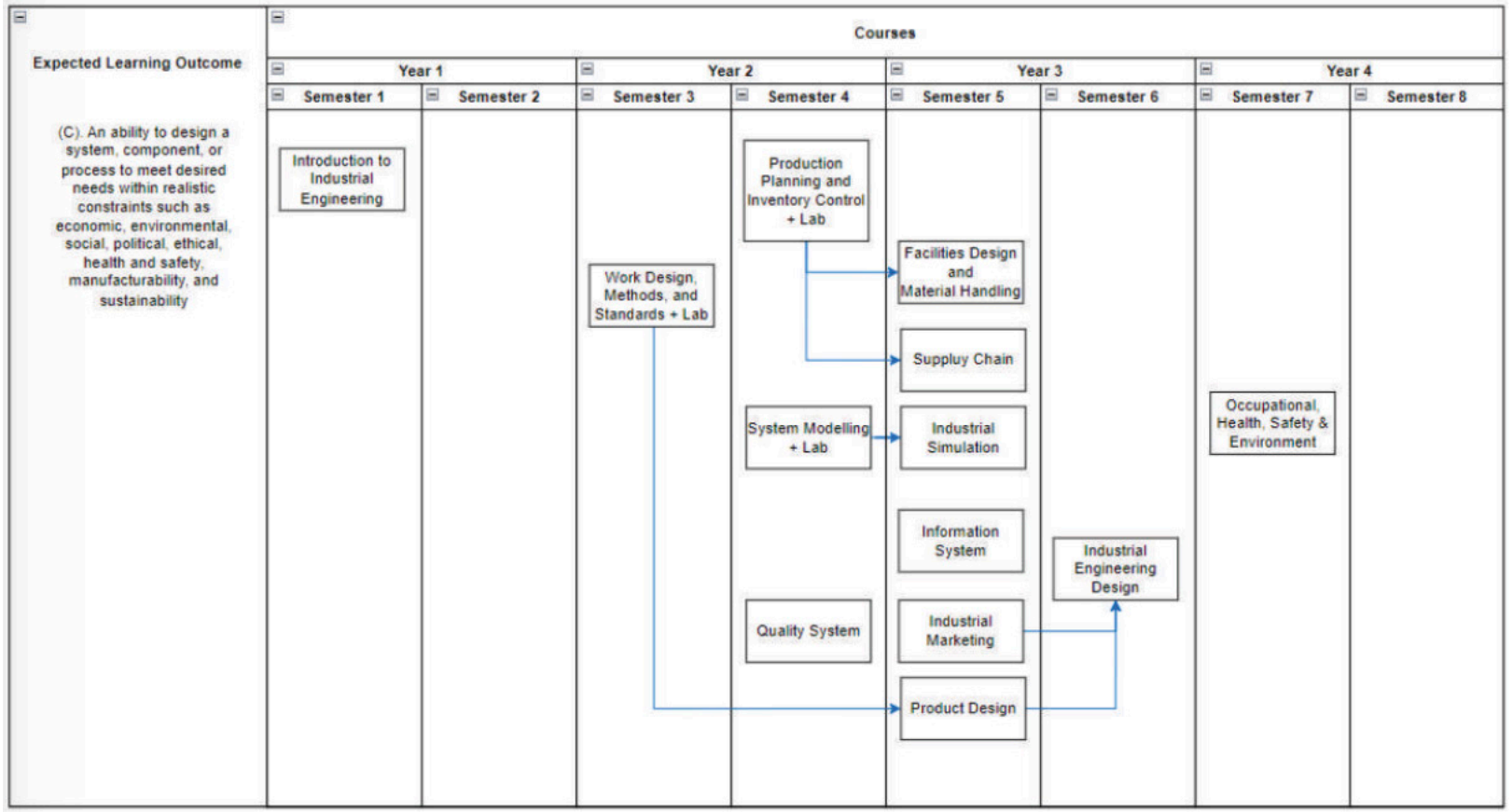


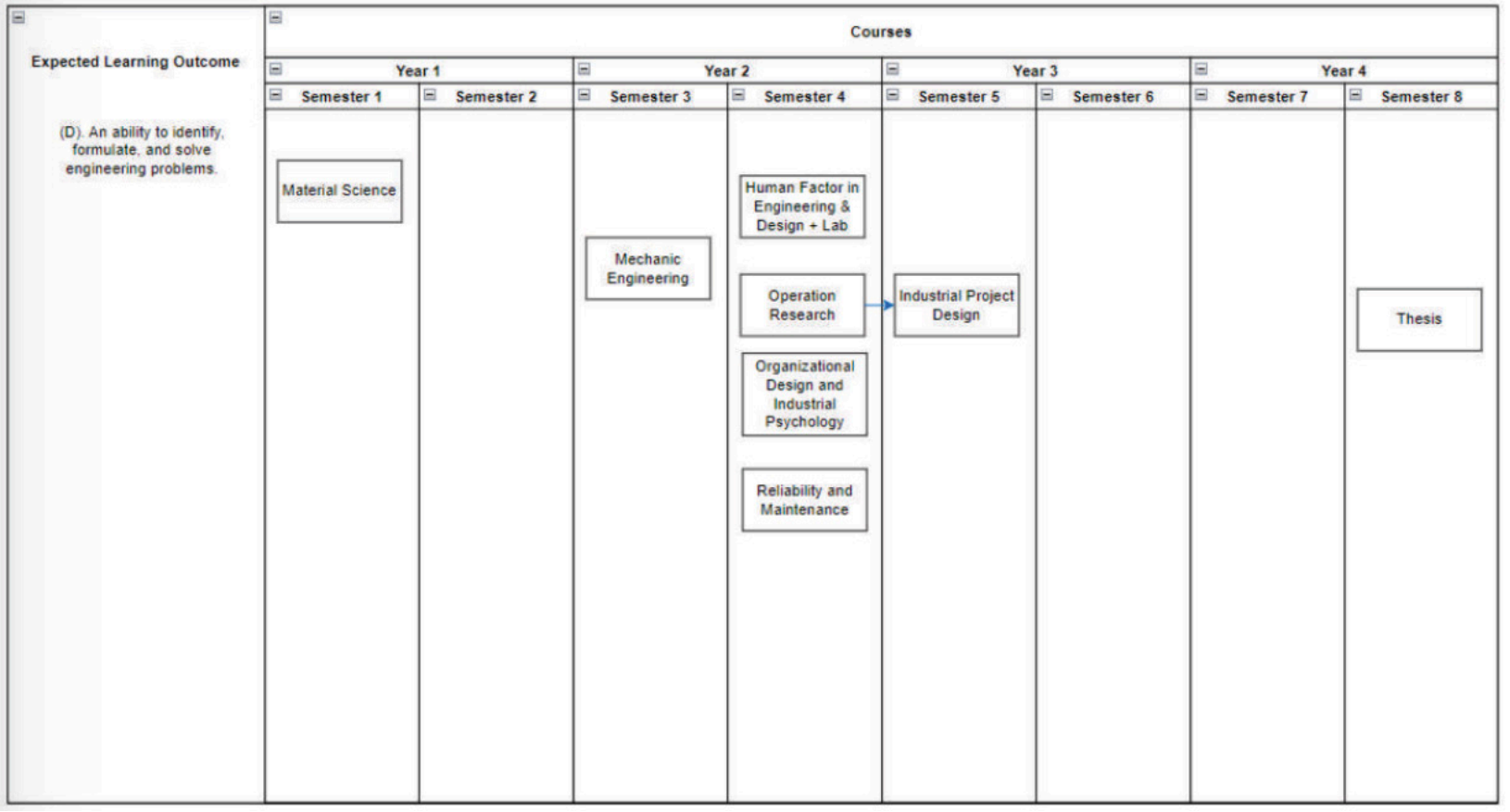
Fig. 1 Competencies Network for Industrial Engineering Study Program

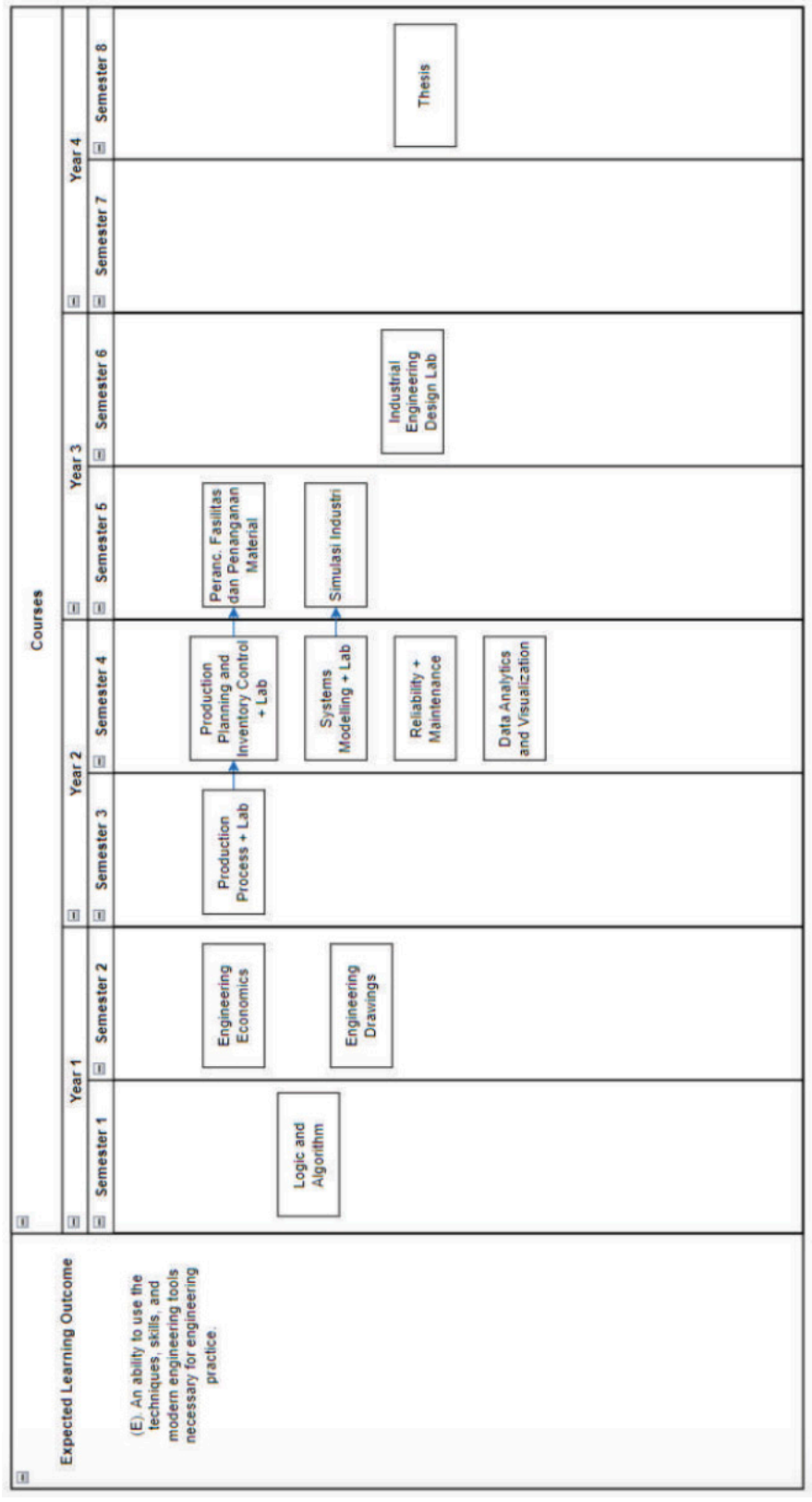
Flowchart of courses to attain the expected learning outcomes in the Bachelor of Industrial Engineering




Courses
Expected Learning Outcome
(B). An ability to design and conduct experiments, as well as to analyze and interpret data
Year 1
Semester 1
Semester 2
Year 2
Semester 3
Semester 4
Year 3
Semester 5
Semester 6
Year 4
Semester 7
Semester 8
Basic Statistics
Industrial Engineering + Lab
Data Analytics & visualization
Multivariate Statistics
Cost Accounting

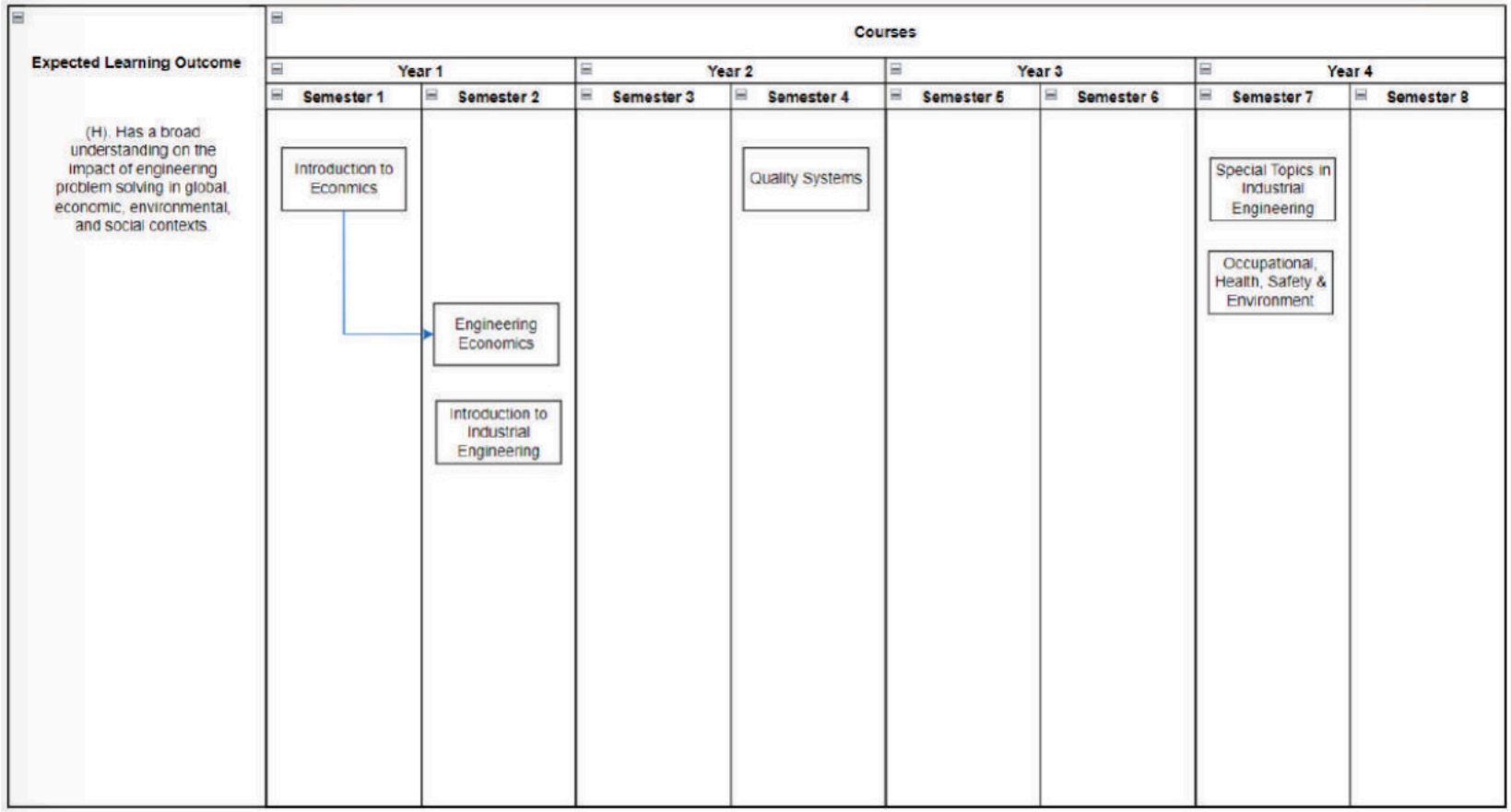

Expected Learning Outcome
(C). An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
Courses
Year 1
Year 2
Year 3
Year 4
Semester 1
Semester 2
Semester 3
Semester 4
Semester 5
Semester 6
Semester 7
Semester 8
Introduction to Industrial Engineering
Production Planning and Inventory Control + Lab
Work Design, Methods, and Standards + Lab
Facilities Design and Material Handling
Suppluy Chain
System Modelling + Lab
Industrial Simulation
Occupational, Health, Safety & Environment
Information System
Industrial Engineering Design
Quality System
Industrial Marketing
Product Design


Expected Learning Outcome
Courses
Year 1
Year 2
Year 3
Year 4
Semester 1
Semester 2
Semester 3
Semester 4
Semester 5
Semester 6
Semester 7
Semester 8
(D). An ability to identify, formulate, and solve engineering problems.
Material Science
Mechanic Engineering
Human Factor in Engineering & Design + Lab
Operation Research
Organizational Design and Industrial Psychology
Reliability and Maintenance
Industrial Project Design
Thesis


Courses
Expected Learning Outcome
(E) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
Year 1
Year 2
Year 3
Year 4
Semester 1
Semester 2
Semester 3
Semester 4
Semester 5
Semester 6
Semester 7
Semester 8
Logic and Algorithm
Engineering Economics
Engineering Drawings
Production Process + Lab
Production Planning and Inventory Control + Lab
Systems Modelling + Lab
Reliability + Maintenance
Data Analytics and Visualization
Peranc. Fasilitas dan Penanganan Material
Simulasi Industri
Industrial Engineering Design Lab
Thesis

Expected Learning Outcome	Courses							
	Year 1		Year 2		Year 3		Year 4	
	Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
(F). An ability to function on multi-disciplinary teams.		MPKT S					Occupational, Health, Safety & Environment Internship	

Expected Learning Outcome	Courses							
	Year 1		Year 2		Year 3		Year 4	
	Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
(G). An understanding of professional and ethical responsibility.	Religion						Internship	


Expected Learning Outcome
(H). Has a broad understanding on the impact of engineering problem solving in global, economic, environmental, and social contexts
Courses
Year 1
Year 2
Year 3
Year 4
Semester 1
Semester 2
Semester 3
Semester 4
Semester 5
Semester 6
Semester 7
Semester 8
Introduction to Econmics
Engineering Economics
Introduction to Industrial Engineering
Quality Systems
Special Topics in Industrial Engineering
Occupational, Health, Safety & Environment

Expected Learning Outcome	Courses							
	Year 1		Year 2		Year 3		Year 4	
	Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
(I). An ability to study independently and continuously (lifelong learning)							Special Topics in Industrial Engineering	Thesis

Expected Learning Outcome	Courses							
	Year 1		Year 2		Year 3		Year 4	
	Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
(J). An ability to communicate using spoken and written languages in Indonesian and English for both Academic and non-Academic activities	English Religion						Internship	Thesis

Expected Learning Outcome	Courses							
	Year 1		Year 2		Year 3		Year 4	
	Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
(K). An ability to use information and communication technology		Integrated MPKT			Information Systems			

Expected Learning Outcome	Courses							
	Year 1		Year 2		Year 3		Year 4	
	Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
(L). An ability to identify a variety of entrepreneurial efforts, characterized by ethnical innovation and self-sustained						Industrial Engineering Design		

Expected Learning Outcome	Courses							
	Year 1		Year 2		Year 3		Year 4	
	Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
(M). An ability to perform critical, creative, and innovative thinking and has an intellectual curiosity to solve problems at individual and group levels		Integrated MPKT				Industrial Engineering Design		

Expected Learning Outcome	Courses							
	Year 1		Year 2		Year 3		Year 4	
	Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
(N). An ability to provide alternative solutions to various problems that arise in the communities, nation, and Indonesia		Integrated MPKT				Industrial Engineering Design		

Fig. 2 Course Mapping for Expected Learning Outcome

Course Flowchart

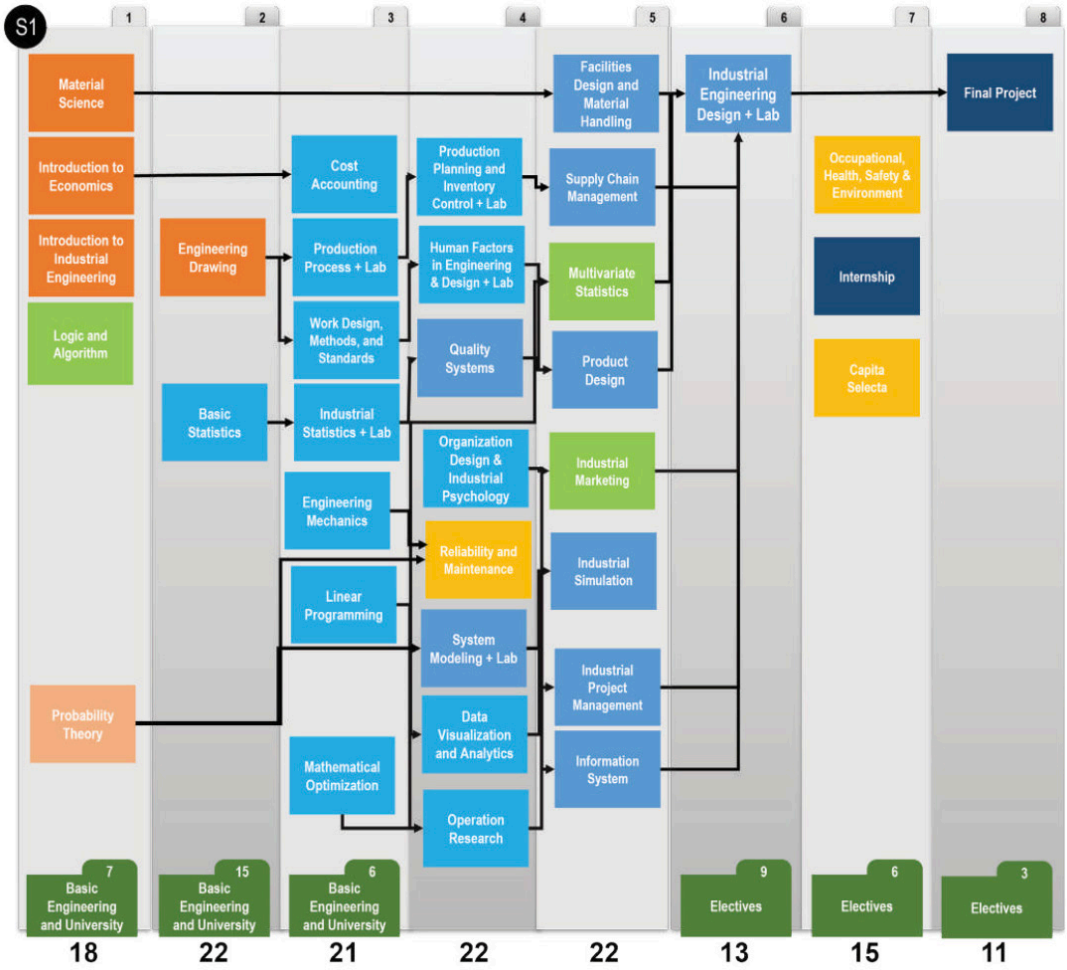


Fig. 3. Course Diagram to attain the competency of Bachelor program in Industrial

Curriculum Structure Reguler/ Non Reguler Class Undergraduate Industrial Engineering

Code	Subject	SKS
	1st Semester	
UIGE600003	English	2
ENGE600001	Calculus 1	3
ENIE601001	Introduction to Industrial Engineering	2
ENIE601002	Introduction to Economics	2
ENIE601003	Material Sciences	2
UIGE600004	Religion	2
ENIE601004	Probability Theory	2
ENIE601005	Algorithm and Computation	3
	Subtotal	**18**
	2nd Semester	
ENGE600004	Linear Algebra	4
ENGE600005	Mechanics and Thermal Physics	3
UIGE600007	MPKT	6
ENIE612006	Engineering Drawing	2
ENIE612007	Basic Statistics	2
ENGE610011	Engineering Economics	3
ENGE610002	Calculus 2	3
	Subtotal	**23**
	3rd Semester	
ENGE600007	Optics, Electricity and Wave Physics	3
ENIE603008	Engineering Mechanics	2
ENIE603009	Work Design, Methods, and Standards + Lab	3
ENIE603010	Production Process + Lab	3
ENIE603011	Industrial Statistics + Lab	3
ENIE603012	Linear Programming	3
ENIE603013	Mathematical Optimization	2
ENIE603014	Cost Accounting	2
	Subtotal	**21**
	4th Semester	
ENIE604015	Production Planning and Inventory Control + Lab	3
ENIE605016	Quality Systems	3
ENIE604017	Human Factor in Engineering & Design + Lab	3
ENIE604018	Operations Research	3
ENIE604019	Organizational Design and Industrial Psychology	3
ENIE604020	Systems Modeling + Lab	
ENIE604021	Reliability and Maintenance	2
ENIE604022	Data Analytics and Visualization	2
	Subtotal	**22**
	5th Semester	
ENIE615023	Facilities Design and Material Handling	3
ENIE615024	Product Design	2
ENIE615025	Industrial Project Design	3
ENIE615026	Supply Chain System	3
ENIE615027	Industrial Simulation	3
ENIE615028	Information Systems	3
ENIE615029	Multivariate Statistics	3
ENIE615030	Industrial Marketing	2
	Subtotal	**22**
	6th Semester	
ENIE616031	Industrial Engineering Design	3
ENIE616032	Industrial Engineering Design Lab	1
	Electives	3
	Electives	3
	Electives	3
	Subtotal	**13**
	7th Semester	
ENIE617033	Internship	2
ENGE610012	Occupational, Health, Safety & Environment	2
ENIE617034	Special Topics in Industrial Engineering	2
	Electives	3
	Electives	3
	Electives	3

	Subtotal	**15**
	8th Semester	
ENIE608035	Final Project in Industrial Engineering	5
	Electives	3
	Electives	3
	Subtotal	**11**
	Total	**145**

Course Structure for International Class of Industrial Engineering

Code	Subject	SKS
	1st Semester	
UIGE610003	English	2
ENGE610001	Calculus 1	3
ENIE611001	Introduction to Industrial Engineering	2
ENIE611002	Introduction to Economics	2
ENIE611003	Material Science	2
UIGE610004	Religion	2
ENIE611004	Probability Theory	2
ENIE611005	Logic and Algorithm	3
	Subtotal	**18**
	2nd Semester	
ENGE610004	Linear Algebra	4
ENGE610005	Mechanics and Thermal Physics	3
UIGE610011	MPKT	6
ENIE612006	Engineering Drawing	2
ENIE612007	Basic Statistics	2
ENGE610011	Engineering Economics	3
ENGE610002	Calculus 2	3
	Subtotal	**23**
	3rd Semester	
ENGE610007	Optics, Electricity and Wave Physics	3
ENIE613008	Engineering Mechanics	2
ENIE613009	Work Design, Methods, and Standards + Lab	3
ENIE613010	Production Process + Lab	3
ENIE613011	Industrial Statistics + Lab	3
ENIE613012	Linear Programming	3
ENIE613013	Mathematical Optimization	2
ENIE613014	Cost Accounting	2
	Subtotal	**21**
	4th Semester	
ENIE614015	Production Planning and Inventory Control + Lab	3
ENIE615016	Quality Systems	3
ENIE614017	Human Factor in Engineering & Design + Lab	3
ENIE614018	Operations Research	3
ENIE614019	Organizational Design and Industrial Psychology	3
ENIE614020	Systems Modeling + Lab	3
ENIE614021	Reliability and Maintenance	2
ENIE614022	Data Analytics and Visualization	2
	Subtotal	**22**
	5th Semester	
ENIE615023	Facilities Design and Material Handling	3
ENIE615024	Product Design	2
ENIE615025	Industrial Project Design	3
ENIE615026	Supply Chain System	3
ENIE615027	Industrial Simulation	3
ENIE615028	Information Systems	3
ENIE615029	Multivariate Statistics	3
ENIE615030	Industrial Marketing	2
	Subtotal	**22**
	6th Semester	
ENIE616031	Industrial Engineering Design	3
ENIE616032	Industrial Engineering Design Lab	1
	Electives	3
	Electives	3
	Electives	3
	Sub Total	**13**
	7th Semester	
ENIE617033	Internship	2
ENGE610012	Occupational, Health, Safety & Environment	2
ENIE617034	Special Topics in Industrial Engineering	2

	Electives	3
	Electives	3
	Electives	3
	Subtotal	**15**

	8th Semester	
ENIE618035	Final Project in Industrial Engineering	5
	Electives	3
	Electives	3
	Subtotal	**11**
	Total	**145**

Transition Policy from the 2016 to the 2020 Curriculum

1. New curriculum 2020 will be applied effectively from Odd Semester 2020/2021. In principle, after curriculum 2020 is implemented, then only courses from this new curriculum will be opened.
2. The enforcement of the transitional period is one year, i.e., in Even Semester Year 2020 / 2021 and Odd Semester Year 2021 / 2022. During this transition period, if a course in curriculum 2020 is in odd semester while in previous curriculum in even semester (vice versa), then this course can be held (if necessary) in each semester of Year 2020 / 2021.
3. For students who have not passed the compulsory courses in curriculum 2016, they are required to take the same or equivalent course in curriculum 2020. Equivalence courses can be seen in the table below. All courses in the curriculum 2016 that are not listed in equivalence table have not changed, both in names and credits.
4. When there is a change in the number of course credits, then the number of graduation credits that be counted in, is the number of credits when it was taken. If a student took the same or equivalent courses whose credits or names have changed, then it will be acknowledged under a new name or a new credit. (Please course equivalence table).
5. When a compulsory subject in the curriculum 2016 is deleted and there is no equivalence in the curriculum 2020 then:

a. For students who have passed these subjects, the credits that are achieved will be counted in the calculation of graduation 145 credits.
b. For students who did not pass these courses, they can take new compulsory courses or choose elective subjects in the curriculum 2020 to complete 145 credits. This selected course(s) will be counted as elective one(s), even though this course is originally a compulsory subject in the Curriculum 2020.

No	Name of the Course in 2016 Curriculum	Credits in 2016	Name of the Course in 2020 Curriculum	Credits in 2020
1	Plant Layout	3	Facilities Design and Material Handling	3
2	Product Design + Lab	3	Product Design	2
3	Maintenance System	2	Reliability and Maintenance	2
4	Industrial Simulation + Lab	3	Industrial Simulation	3
5	Project Management	2	Industrial Project Design	3
6	Supply Chain Management	3	Supply Chain Systems	3
7	Industrial Engineering Design + Lab	3	Industrial Engineering Design	3
			Industrial Engineering Design Lab	1

Course Syllabus of University Subjects

INTEGRATED CHARACTER BUILDING

UIGE600007/ UIGE610011
6 credits

Syllabus :

The Integrated Character Building is part of the Higher Education Personality Development Lecture which is held for students which contains elements of the internalization of basic life values, interaction/ relationship skills, nationality and academic skills as the basis for student personality to carry out learning according to scientific disciplines.

MPKT is carried out in the form of a series of learning activities outside the formal class. activities carried out include participation in lectures/seminars, internships, field work practices, social work, sports and/or arts activities and other forms of activities that have the main goal of equipping students with soft skills and proven by portfolio documents. The form of this learning activity is different from the MPKT courses that have been carried out at the previous UI.

The material provided at MPKT aims to form a human thinking pattern with values and morals to create a human personality by having critical, logical, creative, innovative thinking, and having intellectual curiosity and an entrepreneurial spirit. The material provided includes 9 UI values, national, state and citizen values based on Pancasila. Solving problems in science, technology, health, and humans as natural managers by using reasoning and utilizing Information and Communication Technology (ICT) to achieve the final objectives of this module.

Lecture activities are carried out using an online student-centered learning (SCL) approach which can use the following methods: experiential learning (EL), collaborative learning (CL), problem-based learning (PBL), question-based learning, and project based learning. The use of these various methods is carried out through group discussion activities, independent assignment exercises, presentations, writing papers in Indonesian and interactive discussions in online discussion forums. The language of instruction in this lecture is Indonesian.

Graduate Learning Outcomes :

- CPL 1: Able to use spoken and written language in Indonesian and English both for academic and non-academic activities (C3, A5)
- CPL 2: Have integrity and are able to think critically, creatively, and innovatively and have intellectual curiosity to solve problems at the individual and group level (C4, A3)
- CPL 3: Able to provide alternative solutions to various problems that arise in the community, nation, and country (C4, A2)
- CPL 4: Able to take advantage of information communication technology (C3)
- CPL 5: Able to identify various entrepreneurial efforts characterized by innovation and independence based on ethics (C2, A5)

Course Learning Outcomes :

- CPMK 1: After completing this course, students are able to apply self-regulated learning characteristically in studying critically, logically, creatively, innovatively through analysis of societal problems, nation, state, and Pancasila ideology based on self-understanding as individuals and members. the community by using good and correct Indonesian and the latest information and communication technology (C4, A4)
- CPMK 2: Able to identify various entrepreneurial efforts characterized by innovation and independence based on ethics (C2, A5)
- CPMK 3: After completing this course, students are able to apply self-regulated learning characteristically in pursuing integrated and comprehensive knowledge through analysis of science problems, technology based on the role of nature manager by using good and correct Indonesian and information technology and current communications. (C4, A4)
- CPMK 4: After completing this course, students are able to plan creative activities to solve problems in society and the world of work/ industry by showing creativity, critical thinking, collaborative self-discipline using good and correct Indonesian as well as the latest information and communication technology (C5, A5)

Prerequisite : -

ACADEMIC WRITING

UIGE610002
2 credits
The Objectives :

To activate students, English so that they will be able to communicate effectively in English;

To enable students to develop the learning strategies and study skills needed to finish their study successfully and o continue learning on their

own after taking the MPK program (to develop independent learners)

Main Competencies :

- Listen to, understand and take notes of key information in academic lectures of between 5-10 minutes length;
- Improve their listening skills through various listening materials and procedures;
- Speak confidently, ask questions in and contribute to small group discussions;
- Use different reading strategies needed to the effective readers;
- Improve their reading skills through extensive reading material;
- Develop skills in connecting ideas using appropriate transitions and conjunctions;
- Work as part of a group to prepare and deliver a 25-minute presentation on an academic topic using appropriate organization, language and visual aids;
- Write a summary of a short academic article;
- Write an expository paragraph;
- Write a short essay.

Learning Method : Active learning, Contextual language learning, small group discussion.

Prerequisite :

1. Students Learning Orientation/Orientasi Belajar Mahasiswa (OBM)

ENGLISH

UIGE600003
2 credits
Learning Objectives :

After attending this subject, students are expected to capable of use English to support the study in university and improve language learning independently.

Syllabus :

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

ISLAMIC STUDIES

UIGE6000010/UIGE610005
2 credits
General Instructional Objectives :

The cultivation of students who have concern for social, na-tional and countrys issues based on Islamic values which is applied in the development of science through intellectual skills.

Learning Objectives :

Course participants are expected to do the following when faced with a problem or issue which they must solve :

1. Analyze the problem based on the Islamic values they adopted;
2. Analyze the problem by implementing active learning stages;
3. Discuss and express their thoughts and ideas by using proper and correct Indonesian language in discussion and academic writing.

Syllabus :

Islam history: the meaning of Islam, the characteristic of Islam, the sources of Islamic teachings, Muhammad SAW as prophet and history figure, introduction of Islam in Indonesia, the teaching essence of Islam: the basic principle of Islam teachings, the unity of Allah, worship prac-tice in live, eschatology and work ethics, human's basic rights and obligation, social structure in Islam: sakinah mawaddah and ramhah family, the social implication of family life, Mosque and the development of Islam, zakat and the economic empowerment of the people, Islam society, Science: reason and revelation in Islam, Islam's motivation in development of science, science characteristics, source of knowledge, IDI (each Faculty and Department/Study Program).

CATHOLIC STUDIES

UIGE6000011/UIGE610006
2 credits
General Instructional Objectives :

To help deliver students as intellectual capital in implementing lifelong learning process to become scientists with mature personality who uphold humanity and life.

Be scholars who believe in God according to the teachings of Jesus Christ by continuing to be responsible of his faith in life in church and society.

Syllabus :

Almighty God and the God teachings; Man, Morals, science technology and art; harmony between religions; Society, Culture, Politics, Law: the substance of theses studies will be addressed by integrating the four dimensions of the teachings of the Catholic faith: the personal dimension, the dimension of Jesus Christ, the dimension of the Church, and Community dimension. Dimensions are implemented in the following themes: People, Religion, Jesus Christ, the Church, and Faith in the society.

CHRISTIAN STUDIES

UIGE6000012/UIGE610007
2 credits
General Instructional Objectives :

Cultivating students with comprehensive Christian knowledge and teaching in the midst of the struggle and the fight of the nation while also discussing the student's participation in line with the study to help improve and build our country.

Learning Objectives :

Course participants are expected to do the following when faced with a problem or issue which they must solve:

1. Analyze the problem based on the Christian values
2. Analyze the problem by implementing active learning stages
3. Discuss the problem by using proper and correct Indonesian language

Syllabus :

History (Historical terms): Status of the Bible, the existence of God and Morality, Christ the Savior, the Holy Spirit as existence reformer and outlook on the world: Faith and Knowledge of Science, Church and service, Ecclesiology, Spiritual and enforcement of Christian Human Rights and the world of ethics: Christian Ethics, Christian and worship, Christianity and politics, Christian love and social reality: Christian Organizations, Students and Service, Christian and expectations.

HINDU STUDIES

UIGE6000013/UIGE610008
2 credits

Syllabus :

Hindu religion, Hindu history), Source and scope of Hinduism (the Veda as the source of Hindu religion teachings, the scope of the teachings in Hindu religion), The concept of the God (Brahman) according to the Veda, the Path to Brahman (Catur Marga Yoga, Mantra and Japa), Human Nature (The purpose of human life, Human's duties, obligations, and responsibilities both individually or collectively), Ethics and morality (Principles teaching, self-control), in-depth understanding of the scripture (deep understanding of the Bhagawadgita, deep understanding of the Sarasamuschaya), The Role of Hinduism in science, technology, and art (Hinduism benefits in science and technology in accordance with each department, benefit / the role of Hinduism in the arts), Cohesion and community's prosperity / independence (Benefits of unity in the religious plurality, independent community (kerthajagathita) as a common goal, Tri Pitakarana), Culture as an expression of Hindu religious practice, Contribution to the Hindu religion teachings in the political life of nation and country, laws and the enforcement of justice, Awareness of and obeying the Rita / Dharma.

BUDDHIST STUDIES

UIGE6000014/UIGE610009
2 credits

Syllabus :

Almighty God and the God Study (Faith and piety, Divine Philosophy/Theology), Human (Human Nature, Human Dignity, Human Responsibility), Moral (Implementation of Faith and Piety in everyday life), Science, Technology and Art (Faith, Science and Charity as a unity, the Obligation to study and practice what you are taught, Responsibility for nature and environment), harmony between religion (religion is a blessing for all mankind, the essence of the religious plurality and togetherness), community (the role of religious society in creating a prosperous independent society, the responsibility of religious society in the realization of human rights and democracy), Culture (the responsibility of religious society in the realization of critical thinking (academic), work hard and fair), Politics (Religion contribution in the political life of nation and country), Law (Raise awareness to obey and follow God's law, the role of religion in the formulation and enforcement of law, the function of religion in the legal profession).

KONG HU CU STUDY

UIGE6000015/UIGE610010
2 credits

Course Syllabus of Faculty Subjects

CALCULUS 1

ENGE600001/ENGE610001
3 credits
Course Learning Outcomes:

Able to use the basic concepts of calculus related to -a function of one variable, the derivative and integration of the function of one variable in order to solve its applied problems.

Graduates Learning Outcomes:

Able to apply mathematics, science, basic engineering, and engineering specialization to be used in solving complex engineering problems.

Syllabus :
Introduction, Functions and Limits, The Derivative, Applications of the Derivative, The Definite Integral, Applications of The Definte Integral, Transcendental Functions, Techniques of Integration, Indeterminate Forms and Improper Integrals.

Prerequisite: None

Textbooks:

Main reference:
D. Varberg, E. J. Purcell, S.E. Rigdon, Calculus, 9th ed., Pearson, Prentice Hall, 2007.

Additional eferences:
1. George B. Thomas Jr., Thomas' Calculus Early Transcendental, 12th ed., Addison–Wesley Pearson, 2009.
2. Howard Anton, Calculus, 10th ed., John Wiley and Sons, 2012.

CALCULUS 2

ENGE600002/ENGE610002
3 SKS
Course Learning Outcomes:

Students are able to use the concepts of sequences, series, conic sections, and the basic concepts of calculus which involve the function of two or three variables to solve their applied problems.

Graduates Learning Outcomes:

Able to apply mathematics, science, and basic engineering and an engineering specialization to be used in solving complex engineering problems.

Syllabus: :
Infinite sequences and infinite series, Test for convergence of positive series and alternating series, Power series and operation on operations, Taylor and MacLaurin series, Conic sections , Calculus in polar coordinates, Derivatives, limits, and continuity of multi-variables functions, Directional derivatives and gradients, Chain Rule, Tangent planes and Approximations, Lagrange multipliers. Double integrals in Cartesian coordinates and polar coordinates, triple integrals in Cartesian coordinates, cylindrical coordinates and spherical coordinates, Applications of double and triple Integral.

Prerequisite: Calculus 1

Textbooks:
1. D. Varberg, E. J. Purcell, S.E. Rigdon, Calculus, 9th ed., PEARSON, Prentice Hall, 2007.
2. Thomas, Calculus Thirteenth Edition Volume 2, Erlangga, 2019.

CALCULUS

ENGE600003/ENGE610003
4 SKS
Course Learning Outcomes:

Students are able to use the basic concepts of calculus involving functions of one to three variables to solve their applied problems.

Graduates Learning Outcomes:

Able to apply mathematics, science, and basic engineering and an engineering specialization to be used in solving complex engineering problems.

Syllabus :

Introduction, Functions and Limits, Derivatives, Derived Applications, Indeterminate Integral, Integral Applications, Infinite Row, and Series. Derivatives with many variables, Duplicate Integral (2 and 3), Duplicate Integral Application.

Prerequisite: None

Textbooks:

Main :
D. Varberg, E. J. Purcell, S.E. Rigdon, Calculus, 9th ed., Pearson, Prentice Hall, 2007.

George B. Thomas Jr., Thomas' Calculus Early Transcendental, 12th ed., Addison – Wesley Pearson, 2009.

LINEAR ALGEBRA

ENGE600004/ENGE610004
4 SKS
Course Learning Outcomes:
Students are able to calculate linear system problems to solve engineering problems.

Graduates Learning Outcomes:

Able to apply mathematics, science, and basic engineering and an engineering specialization to be used in solving complex engineering problems.

Syllabus :

Linear Systems and matrix equations, Determinants, Euclid vector spaces, Common vector spaces, eigenvalues and eigenvectors, inner product spaces, Diagonalization and General Linear Transformation.

Prerequisite: None

Textbooks:
1. Elementary Linear Algebra, Howard Anton & Chris Rorres, 11th edition, 2014
2. Gilbert Strang, Introduction to linear algebra 3rd edition Wellesley Cambridge Press, 2003

MECHANICAL AND HEAT PHYSICS

ENGE600005 / ENGE610005
3 credits
Course Learning Outcomes:

Able to explain the basic concepts of mechanics and thermodynamics, and be able to apply them to understand natural phenomena and human engineering, including their applications.

Graduate Learning Outcomes:

Able to apply mathematics, science, and basic engineering and an engineering specialization to be used in solving complex engineering problems.

Syllabus:

Units, Magnitudes and Vectors, Motion Along Straight Lines, Motion in Two and Three Dimensions, Newton's Laws of Motion, Applications of Newton's Laws, Kinetic Energy, and Work, Potential Energy and Energy Conservation, Center of Mass, Linear Momentum, Rotation, Rolling Motion, Torque, Angular Momentum, Oscillation, Mechanical and Sound Waves, Gravity, Statics and Elasticity, Fluid Mechanics, Temperature, Heat, Law I Thermodynamics, Ideal Gas and Kinetic Theory of Gas, Heat Engine, Entropy, and Law II Thermodynamics.

Prerequisite: none

Textbooks:
1. Halliday, Resnick, and Walker, Principles of Physics 10th Edition, Wiley, 2014.
2. Serway Jewett, Physics for Scientists and Engineers 9th Edition, Thomson Brooks / Cole, 2013.
3. Giancoli, Physics for Scientists and Engineers 4th Edition, Pearson, 2008

ELECTRICAL MAGNETIC, OPTICAL AND WAVE PHYSICS

ENGE600007 / ENGE610007
3 credits
Course Learning Outcomes:

Students are able to apply the basic concepts of electrical physics, magnetism, waves, and optics to solve problems in the engineering field.

Graduate Learning Outcomes:

Able to apply mathematics, science, and basic engineering and an engineering specialization to be used in solving complex engineering problems.

Syllabus:

Unit, Magnitude, Vector, Electric Charge, Electric Field, Gauss Law, Electric Potential, Capacitance, Electric Current, Resistance, Direct Current, Magnetic Field Due to Electric Current, Magnetic Field Source, Induced GGL, Inductance, Alternating Current, Electromagnetic Waves, Light Properties and Propagation, Optical Geometry.

Prerequisite: none

Textbooks :
1. Halliday, Resnick, and Walker, Principles of Physics 9th Edition, Wiley, 2011.
2. Serway Jewett, Physics for Scientists and Engineers 9th Edition, Thomson Brooks / Cole, 2013.
3. Giancoli, Physics for Scientists and Engineers 4th Edition, Pearson, 2008.

BASIC CHEMISTRY

ENGE600009 / ENGE610009
2 credits
Course Learning Outcomes:
Students are able to analyze the principe of basic chemistry for application in engineering.

Graduates' Learning Outcomes:
Able to apply mathematics, science, and basic engineering to be used in solving complex engineering problems.

Syllabus:

Material and measurements, atoms, molecules and ions, stochiometry, water phase reactions and solution stochiometry, thermochemistry, chemical equilibrium, acid and base equilibrium, electrochemistry, chemical kinetics, and chemical applications.

Prerequisite: none

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

ENGINEERING ECONOMY

ENGE600011 / ENGE610011
3 credits
Course Learning Outcomes:

Students are able to analyze the economic and financial feasibility of making economic practice decisions.

Graduate Learning Outcomes:

Able to apply the principles of technical management and decision making based on economic considerations, in individual and group, as well as in project management.

Syllabus:

Introduction to Engineering Economics, Time Value of Money, Combining Factors, Interest Rates, Money Worth Analysis, Rate of Return Analysis, Effects of Inflation, Benefit Cost & Break-Even Point Analysis, Sensitivity Analysis, Depreciation, Tax Analysis, Cost Estimation & Allocation, Capital Budgeting & Replacement Analysis.

Prerequisite:
1. Civil Engineering : -
2. Environmental Engineering : -
3. Naval Engineering : -
4. Industrial Engineering : must pass the introductory Economic course and have completed 38 credits
5. Chemical Engineering : -
6. Bioprocess Engineering : -

Textbooks:
1. Blank, Leland and Tarquin, Anthony. 2018. Engineering Economy 8th Ed. McGraw Hill.
2. Park, Chan S. 2016. Contemporary Engineering Economics 6th Ed. Pearson. Upper Saddle River.
3. White, Case and Pratt. 2012. Principles of Engineering Economic Analysis 6th ed. John Wiley and Sons.

STATISTICS AND PROBABILISTICS

ENGE600010 / ENGE610010
2 credits
Course Learning Outcomes:

Students are able to handle quantitative data/ information starting from the descriptive stage (collection, organization, and presentation) to the inductive stage, which includes forecasting and drawing conclusions based on the relationship between variables for decision making.

Graduate Learning Outcomes:
1. Apply descriptive statistics and probability theory to data processing and serving
2. Apply probability distribution to data processing and serving
3. Apply the principles of sampling and estimation for decision making
4. Apply hypothesis test samples for decision making

Syllabus:

Introduction to Statistics for Engineering Studies, Probability Theory, Dasar Basic concepts and definitions, Distribution Probability, Sampling, Estimation, Hypothesis testing, Hypothesis test 1 sample at an average value, Regression

Prerequisite: none

Textbooks :
1. Harinaldi, Basic Principles of Statistical Engineering and Science, Erlangga, 2004
2. Montgomery, DC., And Runger, GC., Applied Statistics and Probability for Engineers, John Wiley Sons, 2002

HSE PROTECTION

ENGE600012 / ENGE610012
2 credits
Course Learning Outcomes:

Upon completion of this subject students are expected to be able to carried out hazard identification, and characterization, to propose appropriate methods for risk reduction and mitigation, and to design safety management system. The student is also expected to improve their awareness on industrial safety and health, and understanding on safety regulation framework and standards as well as environmental program.

Graduate Learning Outcomes:
1. Students are expected to understand safety, health and environmental aspect as an integral part of fundamental principal in engineering code of ethics.
2. Students are expected to be able to carry out process of risk assessments by considering risk factors in the impact of hazards on people, facilities, and the surrounding community and environemt.
3. Students are expected to understand the regulatory framework and standard related to the stages of life cycle of machine, building structure, construction, and process.
4. Students are able to design and propose an effective hazard communication, management and engineering control, and risk mitigation through an engineering assignment project.
5. Students are able to identify the knowledge required to perform risk assesment, investigation and design improvement through a multidisiplinary case of incident and accident.

Syllabus:

Introduction to SHE Regulation and Standards, SHE Perception (Risk and Environment), Identification, Assessment and Management, Construction, machinery and Noise hazards, Process safety hazard and analysis technique, Fire and explosion hazard, Electrical hazard, Toxicology in the Workplace, Ergonomy Aspect, Hazard communication to employees, Environmental Protection, Case studies, Safety Health and Environment audits.

Prerequisite: none

Textbooks :

1. Charles A. Wentz, Safety, Health and Environmental Protection, McGraw Hill, 1998.
2. Asfahl, C.R., Rieske, D. W., Sixth Edition Industrial Safety and Health Management, Pearson Education, Inc., 2010.
3. United Kingdom - Health and Safety Executive, http://www.hse.gov.uk/
4. National laws and regulations related to the K3 Management System and the Environment.
5. Related Journal (http://www.journals.elsevier.com/safety-science/) etc, related standards and publications.

Courses at Industrial Engineering Study Program

INTRODUCTION TO INDUSTRIAL ENGINEERING

ENIE601001
2 credits
Learning Objectives :

Able to provide introduction and view of basic concepts on the scope of the science of industrial engineering that can be applied in the real world either in the manufacturing industry or services.

Syllabus:

The history and development of industrial engineering disciplines, industrial engineering and systems, production systems, work measurement, location and layout of facilities, operation methods, material movement, distribution and route determination, production planning, and controlling quality control.

Prerequisite: -

Teaching Book:

1. Groover, M. P. (2007). Fundamentals of modern manufacturing: materials processes, and systems. John Wiley & Sons.
2. Kibbe, R. R., Neely, J. E., Meyer, R. O., White, W. T., Bonkoski, M., & Bradshaw, P. (2006). Machine tool practices. Pearson Prentice Hall.
3. Wayne C. Turner et al. (1993). Introduction to Industrial Engineering, third volume (translation), Prentice-Hall.
4. De Garmo Ernest Paul, Black, J. T., & Kosher, R. A. (1990). Materials and processes in manufacturing. Macmillan.

INTRODUCTION TO ECONOMICS

ENIE601002
3 credits
Learning Objectives :

Able to explain the principles and problems in economic sciences, both microeconomics and macroeconomics.

Syllabus:

Ten Principles of Economics, Thinking Like an Economist, The Market Forces of Supply and Demand, Elasticity and Its Application, Consumers, Producers, and The Efficiency of Markets, The Costs of Production, Firms in Competitive Markets, Measuring a nation's Income, Production and Growth, Saving, Investment, and the Financial System, Tools of Finance, The Monetary System, Open-Economy Macroeconomics: Basic Concepts, Aggregate Demand, and Aggregate Supply

Prerequisite: -

Teaching book:

1. Mankiw, N. G. (2014). Principles of Economics. Cengage Learning.
2. Kishtainy, N., et al. (2012). The Economics Book: Big Ideas, Simply Explained. Dorling Kindersley Ltd.
3. Kishtainy, N. (2014). Economics in Minutes: 200 Key Concepts Explained in an Instant. Quercus Publishing.
4. Economic development-related journals.

MATERIAL SCIENCE

ENIE601003
2 credits
Learning Objectives :

Students are expected to understand the processing, characteristics, and application of engineering materials. Structure and bonding in materials, material processing for all types of engineering materials, as well as a basic concept in materials testing.

Syllabus:

Overview of Materials, Crystal Structure, Defects in Solids, Diffusion, Mechanical properties and Strengthening, Mechanism, Failure, Phase Diagram, and Equilibrium, Material Selection, Measurement and Inspection, Ceramics, Polymers, Composites, Electrical Properties, Semiconductors and Growth, Biomaterials.

Prerequisite: -

Teaching book:

Callister Jr, W. D., & Rethwisch, D. G. (2012). Fundamentals of Materials Science and Engineering: an integrated approach. John Wiley & Sons.

PROBABILITY THEORY

ENIE602002
3 credits
Learning Objectives :

Able to explain the principles of probability and application in solving problems concerning industrial engineering.

Syllabus:

Introduction to probability, sample and event space, conditional probability, Bayes theorem, random variables, discrete and continuous random variable, cumulative distribution functions, expectations, combined probability distribution, introduction to Bernoulli and Poisson processes, several discrete probability distributions, several continuous probability distributions, Central Limit Theorem,

Prerequisite: -

Teaching Book:

1. Walpole, R. E., Myers, R. H., Myers, S. L., & Ye, K. (2012). Probability and Statistics for Engineers and Scientists, 9th Edition, Pearson.
2. Devore, J. L. (2016). Probability and Statistics for Engineering and the Sciences. Cengage Learning.
3. Montgomery, D. C., & Runger, G. C. (2011). Applied statistics and probability for engineers. John Wiley & Sons.
4. Dekking, F. M. C. Kraaikamp, H. P. Lopuhaa, and L. E. Meester, A Modern Introduction to Probability and Statistics: Understanding Why and How, Springer, London, 2005

LOGIC AND ALGORITHMS

ENIE603004
3 credits
Learning objectives:

Able to implement computational techniques, i.e., the ability to use advanced functions in spreadsheets, the ability to perform simulations by using spreadsheets, the ability to solve mathematical programming models with Solver in Excel, the ability to use automation in spreadsheets, the ability to describe computer algorithms, design, and analysis of algorithm and the ability to use one of the computer programming languages.

Syllabus:

Advanced functions in the spreadsheet, Monte Carlo simulation, Solver in a spreadsheet Macros and VBA, Flow chart and pseudocode, Java, or Python basics.

Prerequisite: -

Teaching Book:

1. Walkenbach, J. (2010). Excel 2010 Power Programming with VBA (Vol. 6). New York: Wiley.
2. Sedgewick, R., & Wayne, K. (2007). Algorithms and data structures. Princeton University, C.O.S., 226.

ENGINEERING DRAWING

ENIE602002
2 credits
Learning Objectives :

Able to draw objects on 2 and 3 dimensions based on the principles of engineering either manually, as well as in a virtual environment.

Syllabus:

Introduction to drawing techniques, orthographic projection images, perspective drawing, Axonometric projection (Isometric), drawing assembly, AutoCAD, Autodesk Inventor.

Prerequisite: -

Teaching book:

Robertson and Bertling. (2013). How to Draw. Design Studio Press

BASIC STATISTICS

ENIE603006
2 credits
Learning objectives:

Able to summarize, present, interpret and analyze data and information to support a valid and reliable conclusion in the decision-making situation in which there are elements of uncertainty and variation.

Syllabus:

Introduction to statistical and data analysis, descriptive statistics, sampling theory, central limit theorem, introduction to inference statistics, estimation, hypothesis testing, Linear regression analysis and correlation, Nonparametric method.

Prerequisite: probability theory

Teaching Book:

1. Walpole, R. E., Myers, R. H., Myers, S. L., & Ye, K. (2012). Probability and Statistics for Engineers and Scientists, 9th Edition, Pearson.
2. Devore, J. L. (2016). Probability and Statistics for Engineering and the Sciences. Cengage Learning.
3. Montgomery, D. C., & Runger, G. C. (2011). Applied statistics and probability for engineers. John Wiley & Sons.
4. Harinaldi. (2006) *Statistical Principles for*

Engineering and science. Brian G.

ENGINEERING MECHANICS

ENIE613008
2 credits
Learning objectives:

Able to apply mathematical technique and graphic from vector analysis and physical principles that required for static balance.

Syllabus:

Force Vectors, Particle Balance, Force Resultant, Structure Analysis, Internal Forces, Friction, Centre of Gravity and Centroid, Inertia Moment.

Prerequisite: Mechanics and Thermal Physics

Teaching Book:

1. Meriam, J. L., & Kraige, L. G. (2012). Engineering mechanics: dynamics (Vol. 2). John Wiley & Sons.
2. Hibbeler, R.C. (2013). Engineering Mechanics: Statics. 13th Edition. Pearson Prentice Hall

WORK DESIGN, METHODS, AND STANDARDS + LAB

ENIE603003
3 credits
Learning objectives:

Course participants can measure, analyze, design, and increase the effectiveness and efficiency of human work through methods improvements and work standards.

Syllabus:

Introduction and a general introduction to work planning Analysis, *Problem Solving Tools, Operation Analysis, Man-Machine chart, and Flow Process chart, Manual Work Design, Workplace, Equipment, and Tool design, work Environment design, Time study, Lab, Performance Rating and Allowances, Standard Data, work Sampling, Predetermined Time study, Wage Design, Training and Learning Curves.*

Prerequisite: Probability theory

Teaching Book:

1. Andris, F., & Benjamin, N. (2004). *Standard and Work Design Method.* Mcgraw-Hill, New York & London.
2. MacLeod, D. (2006). *The Ergonomics Kit for General Industry.* C.R.C. Press.
3. Ralph, M. B. (1980). *Motion and Time Study: Design and Measurement of Work*. John Wiley and Sons.

PRODUCTION PROCESS + LAB

ENIE603005
3 credits
Learning objectives:

Able to know the basics of production process related to the type of material used, the process of production processes related to the manufacturing process based on the materials used and machining processes and tools used.

Syllabus:

The basics of production processes, casting process, plastic forming process, Metal forming process, Metal plate forming process, production process for Wood Working, Theory and explanation of machining process, the theory, and technology of sculpture and cutting, practicum of Wood Working Process module, theory and grinding process, basic theory and concepts of C.N.C., practicum module Metal Working Process, machining and operation Machining, cutting process of material with a coitional machine, theory and welding process.

Prerequisite: Introduction to Industrial engineering

Teaching Book:

1. Groover, M. P. (2007). Fundamentals of modern manufacturing: materials processes, and systems. John Wiley & Sons.
2. Kibbe, R. R., Neely, J. E., Meyer, R. O., White, W. T., Bonkoski, M., & Bradshaw, P. (2006). Machine tool practices. Pearson Prentice Hall.
3. E. Paul DeGarmo, J. Black, A. Kohser. (1988) *Material and Processes in Manufacturing*, 7th edition. Macmillan.
4. S. Kalpakjian (1989). *Manufacturing Engineering and Technology.* Addison Wesley.
5. Boothroyd, G., and Knight, W. (1989). *Fundamentals of Machining and Machine Tools*, 2nd edition, Dekker.
6. Lab Module

INDUSTRIAL STATISTICS + LAB

ENIE604011
3 credits
Learning objectives:

Able to explain various statistical methods in the branch *of Design of Experiments* (D.O.E.), to be able to design experiments and *statistics Quality Control* (S.Q.C.), that follow the assumptions and rules of statistics so that the conclusions taken can be used as a basis in the decision making process.

Syllabus:

Experimental design, inferential statistics, *Analysis of Variance* (ANOVA), *Randomized Complete Block Design (RCBD), Latin Square, General factorial Designs, 2k Design, Random models, and Mixed models, Nested Design*, Introduction to *Statistics Quality Control (S.Q.C.), Control Chart.*

Prerequisite: Basic Statistics

Teaching Book:

1. Montgomery, Douglas C. (2013). Design and analysis of experiments 8th Edition. John Wiley & Sons.
2. Montgomery, Douglas C. (2009). Statistical Quality control 6th Edition. New York: John Wiley & Sons.
3. Walpole, R. E., Myers, R. H., Myers, S. L., & Ye, K. (2012). Probability and Statistics for Engineers and Scientists, 9th Edition, Pearson.

LINEAR PROGRAMMING

ENIE6130012
3 credits
Learning objectives:

Capable of designing a problem-solving solution by implementing mathematical models for engineering and management issues.

Syllabus:

Introduction to Linear Program, Simplex, Duality and Sensitivity Analysis, Transportation Problem, Assignment Problem, Network Problem, Integer Programming, Multi-Goal Mathematical Programming, Network.

Prerequisite: -

Teaching Book:

1. Hillier, F. S. (1967). Introduction to Operations Research: Frederick S. Hillier and Gerald J. Lieberman. Holden-Day.
2. Winston, W. L., & Goldberg, J. B. (2004). Operations Research: Applications and Algorithms (Vol. 3). BelmonteCalif Calif: Thomson/Brooks/Cole.
3. Taha, H. A. (2011). Operations Research: An Introduction (Vol. 790). Pearson/Prentice Hall.

MATHEMATICAL OPTIMIZATION

ENIE613013
2 credits
Learning objectives:

Able to model, analyze, and solve the problems related to industrial systems by using nonlinear complex mathematical models.

Syllabus:

Integer and Combinatorial Optimization, Convex Optimization, Semi-definite Programming, Robust Optimization, Stochastic Programming, Graphs, and Network Optimization

Prerequisite: Logika dan Algoritma

Teaching Book:

1. Discrete Mathematics and Its Applications – Kenneth H. Rosen, McGraw-Hill
2. Kandiller, Levent, 2007. Principles of Mathematics in Operations Research, Springer Science + Business Media, LLC
3. Bazaraa, M.S., Sherali, H.D., and Shetty, C.M., 2006. Nonlinear Programming, Theory and Algorithms, Wiley-Interscience..

COST ACCOUNTING

ENIE603004
2 credits
Learning objectives:

Course participants understand accounting principles and can calculate accounting problems systematically and present them as a financial report. They should also be able to analyze and evaluate the conditions of the company based on those reports.

Syllabus:

Introduction to accounting and accounting standards used in Indonesia, accounting cycles, financing structures, introduction to depreciation systems, cost analysis in production volumes, *Activity Based Costing*, budget processes, budgets, and their assumptions, cost control mechanisms.

Prerequisite: Introduction to Economic sciences

Teaching Book:

1. Blocher, E.J., Stout, D.E., Cokins, G. Cost Management, a Strategic Emphasis 5th edition. McGraw Hill

PRODUCTION PLANNING AND INVENTORY CONTROL + LAB

ENIE604012
3 credits
Learning objectives:

Able to design, implement and evaluate production planning and inventory control system that is integrated with production flow supervision, production scheduling, and internal processes resulting in a high-quality product at the right time and low price.

Syllabus:

Introduction to production planning and control of inventories, demand forecasting, aggregate planning & disaggregated and production master schedule, material management: Material needs planning, Inventory control, labor scheduling, production line balance, and production scheduling, enterprise resource planning system.

Prerequisite:

Teaching Book:

1. Arnold, Tony, et. al., Introduction to Materials Management, Pearson, 2012

2. Chapman, Stephen M., The Fundamentals of Production Planning and Inventory Control, Pearson, 2006
3. Chase., et. al., Operations and Supply Chain Management, Irwin McGraw-Hill, 14E, 2014
4. Davis, Robert P., et. al., Study Guide to The Professional Engineers' Examination for Industrial Engineers, 2nd Ed., IIE Press, 198

QUALITY SYSTEM

ENIE605020

3 credits

Learning objectives:

Able to design a quality improvement system that can guarantee and improve the quality of products and processes continuously based on fact (number) with a mathematical approach (statistics) considering the national and international quality standards.

Syllabus:

3 Pillars of quality: continuous improvement, customer focus and total participation, PDCA concept, seven tools and seven new tools, process mapping techniques, standard roles, internal standards(S.O.P., WI) and external (ISO, JIS), Lean Six Sigma.

Prerequisite: Human factors in engineering design

Teaching Book:

1. A. Al. (2002). The Six Sigma Way Team Fieldbook, McGraw-Hill, New York
2. Katsuya Hosotani (2000). Q.C. Problem Solving Approach: Solving Workplace Problems the Japanese Way, 3A Corporation, Tokyo
3. Tague, Nancy R. (2015) The Quality Toolbox. ASQ Quality Press. Milwaukee. Wisconsin.

HUMAN FACTORS IN ENGINEERING AND DESIGN + LAB

ENIE600008

3 credits

Learning objectives:

Being able to have knowledge and expertise in the science of human factors that encompasses the physical, cognitive, and environmental aspects of students as a basis for designing and improving the quality of products, processes, workstations, and organizations.

Syllabus:

Introduction to human factors in engineering and design, Physical ergonomics, Anthropometry applied (Applied Anthropometry), Human Information Processing, Signal Detection Theory, user interface design, Cognitive test, lighting and climate, noise and vibration, Safety in Human Factors: Hazard Identification and Analysis

Prerequisite: Work planning, working methods, and standards + practicum

Teaching Book:

1. Sanders, M.S. and McCormick, E.J. (1993). Human Factors in Engineering and Design, 7th edition. McGraw-HillTambahan:
2. Tillman, B. and Tillman, P. and Rose, R.R. and Woodson, W.E. (2016). Human Factors and Ergonomics Design Handbook, 3th edition. McGraw-Hill Education
3. Stanton, N.A. and Hedge, A. and Brookhuis, K. and Salas, E. and Hendrick, H.W. (2004). Handbook of Human Factors and Ergonomics Methods. CRC Press

OPERATIONS RESEARCH

ENIE603007

3 credits

Learning objectives:

Able to have knowledge and expertise to use mathematical optimization models that can be transformed into deterministic and stochastic in solving problems of engineering and management.

Syllabus:

Dynamic programming (deterministic), dynamic programming (stochastic), Markov chain, decision analysis, game theory, Nonlinear programming, queue theory, optimization simulation

Prerequisite: Linear Programming

Teaching Book:

1. Ahuja, Magnanti, and Orlin, Network Flows: Theory, Algorithm, and Application. 1993
2. Taylor III, Introduction to Management Science, 11th edition, 2013
3. Any relevant and useful web page(s)

ORGANIZATIONAL DESIGN AND INDUSTRIAL PSYCHOLOGY

ENIE603004

3 credits

Learning objectives:

Capable of designing a team-based organizational structure with a division of roles and job descriptions. Course participants can analyze the influencing factors of designand organization management in the industry, including human capital assets.

Syllabus:

Introduction to organizational and industrial psychology, understanding and insight into industrial and organizational psychology, workforce selection and placement, labor training and development, occupational conditions and occupational psychology, corporate leadership, organizational and working groups, organizational development and culture,

work weighing

Work motivation, job satisfaction, stress, and occupational safety, consumer psychology.

Prerequisite: Introduction to Industrial engineering

Teaching Book:

1. Griffin, R. W., & Moorhead, G. (2011). Organizational behavior. Nelson Education.
2. DeCenzo, D. A., Robbins, S. P., & Verhulst, S. L. (2016). Fundamentals of human resource management. John Wiley & Sons.

SYSTEM MODELING AND LAB

ENIE605020

3 credits

Learning objectives:

Able to choose and model the right modeling approach based on scope, type, limitation of various approaches modeling and simulation system according to the general modeling and simulation methodology.

Syllabus:

Modeling concepts, the general methodology of system Modeling: conceptualization, development, Simulation and analysis of simulated results, examples of cases of modeling, validation and verification of discrete modeling, user-requirement methodology, report drafting techniques, and presentation of modeling results.

Prerequisite: Basic statistics, probability theory

Teaching Book:

1. Bankes, S. C. (1993). Exploratory Modeling and The Use of Simulation for Policy Analysis. RAND Note
2. Chermack, T. J. (2011). Scenario Planning in Organizations, Berrett-Koehler Publishers Inc.: San Fransisco.
3. Harrell, C. et al (2000). Simulation Using Promodel, McGraw-Hill Higher Education New York
4. Harrell, C. et al (2000). Promodel Complete User Guide, McGraw-Hill Higher Education New York
5. Martelli, A. (2014). Models of Scenario Building and Planning: Bocconi on Management, Palgrave Macmillan: Milan.
6. Render, B., Stair, R., Hanna, M. (2019). Quantitative Analysis Management:
7. Reid & Sanders (2012). Operations Management: An Integrated Approach, 5th Edition: Supplement C: Waiting Line Models
8. Siebers, P. O., Macal, C. M., Garnett, J., Buxton, D., & Pidd, M. (2010). Discrete-event simulation is dead, long live agent-based simulation! Journal of Simulation, 4(3), 204-210.
9. Walck C. (2007) Hand-book on statistical distributions for experimentalists. University of Stockholm

RELIABILITY AND MAINTENANCE

ENIE604014

2 credits

Learning objectives:

Course participants understand the important aspects of the maintenance system management and the type of approach that is currently used in the industry. Capable of designing equipment maintenance or machine-based scheduling *preventive Maintenance* concept.

Syllabus:

Reliability. Organizing for Maintenance Operations. Paperwork Control. Maintenance Job Planning and Scheduling. Maintenance Work Measurement and Standards. Preventive Maintenance Measuring and Appraising Maintenance Performance. Total Productive Maintenance. Maintenance Management in Action

Prerequisite:

Teaching Book:

1. Charles E. Ebelling. (Ed. 8 -2010). An Introduction to Reliability and Maintanability Engineering. Waveland Press, Illinois

DATA ANALYTICS AND VISUALIZATION

ENIE604022

2 credits

Learning objectives:

Being able to explain data better, presents clear evidence of the findings to the intended audience, and tells the data story and clearly describes the points you want to convey through the graph.

Syllabus:

Introduction to Data Analytics And Visualization, Data-Driven Organization, Data Ingestion, And Data Quality, Mining Frequent Itemset, Finding Similar Item, Clustering, Value of Visualization, Information Visualization, Data For Data Graphics, Design Principles, Storytelling, Multivariate Displays, Visualization of Multidimensional Data, Visualization of Networks, Tools/Systems For Data Analytics And Visualization

Prerequisite: Industrial Statistics + practicum

Teaching Book:

1. Zuo, Zhiya., and Once, Jan Carlo. Python Tutorial Series. GitHub. https://github.com/zhiyzuo/python-tutorial.
2. Introduction to Data Science Fall 2015. University of California Berkeley https://bcourses.berkeley.edu/courses/1377158.
3. James, G., Witten, D., Hastie, T., & Tibshirani,

R. (2021). An introduction to statistical learning: with applications in R. Springer.
4. Borwankar, Nitin., and Cooper, Philip. Open Data Science Training. GitHub. https://github.com/nborwankar/opendatasci
5. Masino, Aaron., and Ozdemir, Sinan. machine_learning. GitHub. https://github.com/masinoa/machine_learning

FACILITIES PLANNING AND MATERIAL HANDLING

ENIE615023
3 credits

Learning objectives: able to design factory layout and its facilities that optimize material movement and minimize costs.

Syllabus:

Design function, the outline of planning procedures, process design, Material Flow planning, Analytical Engineering, relationship planning between activities, production, and manufacturing services, calculation, of space area, allocation of areas, material transporting equipment, preparation of plant building. Factory site Selection.

Prerequisite: production planning and Inventory Control

Teaching Book:

1. Heragu, S. (2016). *Facilities Design 4th edition*. Boca Raton, FL: C.R.C. Press.
2. Apple, J.M. (1977). *Plant Layout and Material Handling.* New York: The Ronald Press Company.
3. Tompkins, J. A., White, J. A., Bozer, Y. A., & tanchoco, J.M.A. (2010). *Facilities Planning 4th edition*. Danvers: John Wiley & Sons, Inc.

PRODUCT DESIGN

ENIE605024
2 credits
Learning objectives:

Able to design a new product-service concept in the form of minimum viable product based on a market research.

Syllabus:

Ideation, Strategic Brand Management, Costumer Needs Identification, Product Specification, Product Concept, Testing the Concept, Product Architecture, Design for Manufacturing, Design for Assembly, Prototyping, Product Development Project

Prerequisite: Human Factors in Engineering and Design + Lab

Teaching Book:

1. Ulrich, Karl T.; Steven D. Epingger. 2008. Product Design Development. 3rd Edition. New York, NY: McGraw Hill
2. Bralla, James G. 1996. Design for Excellence. New York, NY: McGraw-Hill
3. Kahn, Kenneth B. 2013. The PDMA Handbook of New Product Development. Hoboken, NJ: Willey
4. Dieter, George E. 2000. Engineering Design. 3rd edition. New York, NY: McGraw Hill

INDUSTRIAL PROJECT DESIGN

ENIE600023
3 credits
Learning objectives:

Able to design the scheduling of industrial projects and their allocation of resources effectively and efficiently.

Syllabus:

System theory, PMDA Organization project, project resources, staff organization and project team, time Management, *Critical Path Method,* PERT, Project graphs, cost control.

Prerequisite: Introduction to Industrial Engineering and Engineering Economics

Teaching Book:

1. Apple, James M. Plant Layout and Materials Handling, Third Edition. Wiley, 1977.
2. Blumberg, Donald F. Introduction to Management of Reverse Logistics and Closed Loop Supply Chain Processes. CRC Press, 2004.
3. Chapman, Steve, & Arnold, Tony K. Introduction to Materials Management, Eight Edition. Pearson, 2016.
4. Cooper.Winning at New Products. 4th Edition.2017
5. Fiksel, Joseph. Design for Environment: A Guide to Sustainable Product Development, Second Edition. McGraw-Hill, 2011.
6. Grieves, Michael, Product Lifecycle Management: Driving the Next Generation of Lean Thinking. McGraw-Hill, 2005.
7. Kezner, Harold. Project Management: A Systems Approach to Planning, Scheduling, and Controlling, 10th Edition. John Wiley and Sons, 2009.
8. Killi, Steinar Westhrin. Additive Manufacturing: Design, Methods, and Processes. Pan Standford Publishing, 2017.
9. Newnan, Donald G., Eschenbach, Ted G., P. Lavelle, Jerome. Engineering Economic Analysis 13th Edition. Oxford University Press, 2017.
10. Osterwalder, Alexander & Pigneur, Yves. Business model generation: A handbook for visionaries,

game changers, and challengers. John Wiley & Sons, 2010.

11. Salvendy., Gavriel. Handbook of Human Factors and Ergonomics. Wiley, 2012
12. Shtub, Avraham & Cohen, Yuval. Introduction to Industrial Engineering, Second Edition. CRC Press, 2017.
13. Simchi-Levi, David, Philip, Kaminsky, Simchi-Levi, Edith. Designing and Managing the Supply Chain: Concept, Strategies, and Case Studies, Third Edition. McGraw-Hill, 2007.
14. Trott, Paul, Innovation Management and New Product Development. 5th Edition. 2015.
15. Ulrich & Eppinger. Product Design and Development. 5th Edition. McGraw-Hill. 2017

SUPPLY CHAIN SYSTEMS

ENIE616026

3 credits

Learning objectives:

Able to determine effective and efficient supply chain system design solutions based on product, market, and customer characteristics.

Syllabus:

Inventory management and *Risk Pooling,* network Planning, supply contracts, information roles in supply chains, supply chain integration, distribution strategies, strategic alliances, outsourcing strategies.

Prerequisite: Production planning and Inventory Control

Teaching Book:

1. Simchi-Levi, D., Kaminsky, P., Simchi-Levi, E., & Shankar, R. (2008). Designing and managing the supply chain: concepts, strategies, and case studies. Tata McGraw-Hill Education.
2. Chopra, S., & Meindl, P. (2007). Supply chain Management. Strategy, planning & operation. In Das summa summarum des Management (pp. 265-275). Gabler.

INDUSTRIAL SIMULATION

ENIE605020

3 credits

Learning objectives:

Able to design computer simulation based on complex industrial systems and to implement feasibility analysis based on the simulation.

Syllabus:

Continuous Modeling Concept, Continuous Modeling Methods, Causal Loop Diagram, Stock-Flow Diagram, Behaviours over Time, Scenario Development, Model Verification and Validation.

Prerequisite: Pengantar Teknik Industri dan Ekonomi Teknik

Teaching Book:

1. Tennent, J., & Friend, G. (2011). Guide to business modelling (Vol. 89). John Wiley & Sons.
2. Benninga, S. (2014). Financial Modeling (MIT Press). Bessis, J.(1998) Risk Management in Banking John Wiley & Sons Ltd.
3. Proctor, K. S. (2004). Building financial models with Microsoft Excel: A guide for business professionals (Vol. 269). John Wiley & Sons.
4. Sengupta, C. (2004). Financial modeling using excel and VBA (Vol. 152). John Wiley & Sons.
5. Knaflic, C. N. (2015). Storytelling with data: A data visualization guide for business professionals. John Wiley & Sons.
6. L Day, A. (2009). Mastering Risk Modelling.
7. Powell, S. G., & Baker, K. R. (2009). Management science: The art of modeling with spreadsheets. Wiley.
8. Walsh, C. (2008). Key management ratios: the 100+ ratios every manager needs to know. Pearson Education.

INFORMATION SYSTEM

ENIE605028

3 credits

Learning objectives:

Able to plan an information system by paying attention to the flow of existing information to achieve a competitive company. The initial information system is created through database management that will generate important information and analysis that will support the decision making to be taken.

Syllabus:

Introduction to management information systems. MIS/IT as a competitive advantage. I.T. and Electronic Commerce. Database and database management. System Analysis and Design. M.I.S. and its relationship with R.Q.M. and Q.S. CBIS. Accounting Information System. Decision Support System. Executive Information System. Marketing, Manufacturing Information System. Financial, Human Resource Information System.

Prerequisite: organization and Industrial psychology

Teaching Book:

1. Management information system / Raymond Mcleod, Jr. George P. Schell, - 10th ed., Pearson Prentice Hall, 2008

2. Management information system managing the digital firm / Kenneth C. Laudon, Jane P. Laudon, - 16th ed., Pearson, 2020

MULTIVARIATE STATISTICS

ENIE803433
3 credits
Learning objectives:

Able to design research, build a research model, analyze data, and interpret research results using proper multivariate methods and data set characteristics.

Syllabus:

Introduction to Multivariate methods, Data characteristics, exploratory factor analysis, multiple regression analysis, double discriminant analysis, logistic regression, conjoin analysis, cluster analysis, multidimensional scaling, Correspondence Analysis, structured Equation Model (Introduction), confirmatory factor analysis, structured equation model testing, multiple variant analysis.

Prerequisite: Industrial Statistics

Teaching Book:

Hair, et al. (2014). *Multivariate Data Analysis*. To Pearson.

INDUSTRIAL MARKETING

ENIE615030
2 credits
Learning objectives:

Students can conduct market research based on *marketing mix* and perform segmentation analysis, *targeting*, and *positioning* of a *brand* in a digital marketing ecosystem

Syllabus:

Marketing strategies and plans, information collection and demand forecasting, market research, market analysis, Business Analytics, *Brand Equity and Positioning,* pricing strategies, Digital marketing.

Prerequisite: organization and Industrial psychology

Teaching Book:

1. Kotler, P., Keller, K. L., & Manceau, D. (2012). Marketing Management. 14Eedition. NewJersey: Prentice Hall.
2. Kotler, P., Kartajaya, H., & Setiawan, I. (2021). Marketing 5.0: Technology for Humanity. John Wiley & Sons.

INDUSTRIAL ENGINEERING DESIGN + LAB

ENIE600023 - ENIE606032
3 + 1 credit
Learning objectives:

Able to design an effective and efficient solution in the form of integrated services and manufacturing products following the needs and characteristics of the industry in the studied; the solution was developed in a structured design team that works with professionals and has ethical responsibilities.

Syllabus:

Product lifecycle, project management for product development, *Canvas Business model*, ergonomic design, Alpha and Beta Prototyping, financial model, *design for manufacturing*, *design for environment,* distribution system, recycling system.

Prerequisite: Product design, Perancangan Organisasi, Tata Letak Pabrik, Perancangan Proyek Industri, Akuntansi Biaya, Ekonomi Teknik, PPIC

Teaching Book:

1. Apple, James M. Plant Layout and Materials Handling, Third Edition. Wiley, 1977.
2. Blumberg, Donald F. Introduction to Management of Reverse Logistics and Closed Loop Supply Chain Processes. CRC Press, 2004.
3. Chapman, Steve, & Arnold, Tony K. Introduction to Materials Management, Eight Edition. Pearson, 2016.
4. Cooper.Winning at New Products. 4th Edition.2017
5. Fiksel, Joseph. Design for Environment: A Guide to Sustainable Product Development, Second Edition. McGraw-Hill, 2011.
6. Grieves, Michael, Product Lifecycle Management: Driving the Next Generation of Lean Thinking. McGraw-Hill, 2005.
7. Kezner, Harold. Project Management: A Systems Approach to Planning, Scheduling, and Controlling, 10th Edition. John Wiley and Sons, 2009.
8. Killi, Steinar Westhrin. Additive Manufacturing: Design, Methods, and Processes. Pan Standford Publishing, 2017.
9. Newnan, Donald G., Eschenbach, Ted G., P. Lavelle, Jerome. Engineering Economic Analysis 13th Edition. Oxford University Press, 2017.
10. Osterwalder, Alexander & Pigneur, Yves. Business model generation: A handbook for visionaries, game changers, and challengers. John Wiley & Sons, 2010.
11. Salvendy., Gavriel. Handbook of Human Factors and Ergonomics. Wiley, 2012
12. Shtub, Avraham & Cohen, Yuval. Introduction to Industrial Engineering, Second Edition. CRC Press, 2017.
13. Simchi-Levi, David, Philip, Kaminsky, Simchi-Levi, Edith. Designing and Managing the Supply Chain: Concept, Strategies, and Case Studies,

Third Edition. McGraw-Hill, 2007.
14. Trott, Paul, Innovation Management and New Product Development. 5th Edition. 2015.
15. Ulrich & Eppinger. Product Design and Development. 5th Edition. McGraw-Hill. 2017

SPECIAL TOPIC IN INDUSTRIAL ENGINEERING
ENIE617034
2 credits
Learning objectives:

Able to explain the development of industry and its engineering, business opportunities, and the problems faced in general.

Syllabus:

Held by inviting a competent guest lecturer in the field to suit the needs of each course (can be different in each Semester).

Prerequisite: -

Teaching Book: -

Special Lecture

INTERNSHIP
ENIE617033
2 credits
Learning objectives:

Able to explain the application of various scientific engineering industry in the world of employment and reflecting on what has been studied during the lecture

Syllabus:

Prerequisite: refer to internship standard procedure

Teaching Book: -

FINAL PROJECT IN INDUSTRIAL ENGINEERING
ENIE608035/ENIE618035
5 credits
Learning Objectives :

Able to raise the problem and opinion in a scientific discussion systematically, clearly, and correctly. Able to compile ideas/solutions/opinions in scientific writing following the rules of scientific writing integrating science that has been studied.

Syllabus:

The science of Industrial engineering to solve a real-world case study

Prerequisite:

Teaching book:
1. Manual of the Universitas Indonesia thesis
2. Technical guideline for Universitas Indonesia student final assignment.
3. IEEE Citation Reference.
4. Ivan Stojmenovic, "How to Write Research Articles in Computing and Engineering discipline," IEEE Transactions on Non Reguler and Distributed Systems, Vol. 21, No. 2, February 2010.

Elective Courses

INTERPERSONAL SKILLS
ENIE605036
3 credits
Learning Objective(s):

Course participants are able to implement the principles of effective communication and behavior standard according to ethics and habits in a professional level of organization.

Syllabus:

Basics of Communication Science. Reading and Controlling Body Language. Listening and Inquiring Skill to Facilitate, Development of Presentation Materials, Presentation Preparation, Processing the Question and Answer Session, Formal Writing Skill (Proposal, Report, Letter, Correspondence, Manner), and Effective Reading.

Pre-requisite(s): -

Text Book(s):

1. Interpersonal Skills in Organizations, 7th Edition, Suzanne de Janasz and Karen Dowd and Beth Schneider. McGraw Hill. 2022

Additional References:

1. Human Relations: Interpersonal Job-Oriented Skills, 9 Edition, Andre J. DuBrin. Pearson Education Inc. Upper Saddle, New Jersey. 2007.
2. Interpersonal Skills for Leadership 2nd Edition. Susan Fritz, F. William Brown, Joyce Povlacs Lunde, dan Elizabeth A. Banset. Pearson Education – Prentice Hall. New Jersey. 2005
3. Human Relations in Business: Developing Interpersonal and Leadership Skills. Michael G. Aamodt dan Bobbie L. Raynes. Thomson Learning, Belmont. 2001

PRODUCT LIFE CYCLE MANAGEMENT
3 credits
Learning Objective(s):

Course participants are able to understand the product life cycle and its role in creating company's innovation strategy.

Syllabus: Product Life Cycle Concept, Product Life Cycle Phase Management, PLM and Innovation Strategy, Product Development Strategy in Enterprise.

Pre-requisite(s): -

Text Book(s):
1. Innovation Management and New Product Development: Paul Trott, 5th Edition, 2012.
2. Strategic Management of Technological Innovation: Melissa A. Schiling, 3rd Edition, 2010.
3. Winning at New Products: Robert G. Cooper, 3rd Edition, 2011.
4. Product Design Development: Karl T.Ulrich & Steven D. Eppinger, 4th Edition, 2007

MACROERGONOMICS

3 credits
Learning Objective(s):

Students are expected to evaluate the design of a working system consisting of variables that interacts with hardware and software in internal physical environments, external environments, and organizational structures.

Topic:

Introduction to the ergonomic macro, methods and tools used in the analysis of work and design systems, introduction of integration of organizations in the context of productivity, safety, health and quality of work life.

Pre-requisite(s): Human Factors in Engineering and Design

Text Book(s):
1. Pengantar Makro Ergonomi
2. Kajian struktur sistem kerja
3. Metode makroergonomi: Macroergonomics Analysis of Structure (MAS)
4. Metode makroergonomi: Macroergonomics Analysis and Design (MEAD)
5. Metode makroergonomi: System Analysis Tools (SAT)
6. Metode makroergonomi: Participatory Ergonomics
7. Metode makroergonomi: Metode lain untuk mengevaluasi desain sistem
8. Makroergonomi dan produktivitas
9. Metode makroergonomi: Kansei Engineering

FINANCE AND INVESTMENTS

3 credits
Learning Objective(s):

Course participants possess the knowledge about industrial finance and investments in general and multinational including international trading and finance.

Syllabus:

International Trade Theory, Trade Policies, Monetary and Payment System, Market and Exchange Mechanism, International Investment, Multinational Finance, Foreign Investment Analysis.

Pre-requisite(s):

Text Book(s):
1. Berk, Jonathan, and Peter DeMarzo, Corporate Finance, 2nd edition, Pearson, Boston, 2010.

INNOVATION MANAGEMENT

3 credits
Learning Objective(s):

Course participants are able to understand the concept and steps in developing innovation within organization.

Syllabus:

State of the art 'Innovation', Innovation Development Strategy, Country Innovation, Process Innovation, Innovation Development Procedure, Technology Empowerment to Develop Innovation.

Pre-requisite(s): -

Text Book(s):
1. Burgelman, R.A., Christensen, C.M., Wheelwright, S.C. 2009. Strategic management of technology and innovation. McGraw-Hill Irwin, Boston.
2. Schilling MA. 2013. Strategic management of technological innovation (4th ed.). McGraw-Hill: New York, NY.
3. Tidd, J., Bessant, J.R. 2014. Strategic innovation management. Wiley, Hoboken.

CUSTOMER RELATIONSHIP MANAGEMENT

3 credits
Learning Objective(s):

Course participants are able to understand the role and function of customer relationship management in improving organization's/company's competitiveness.

Syllabus:

Concept and Procedure of CRM Implementation in Organization, CRM Process Management, Managing Networks for CRM performance CRM Success Measurement, Best Practices of CRM Implementation, Managing supplier partner relationships, IT for CRM

Pre-requisite(s): Information System

Textbooks:
1. Francis Buttle and Stan Maklan. Customer Relationship Management, Routledge, Edition: Third.

LEAN OPERATIONS

3 credits
Learning Objective(s):

Course participants are able to understand the concept of effective manufacturing process.

Syllabus:

History and Concept of Lean Operations and Manufacturing, Strategy and Procedure of Lean Manufacturing Implementation, Toyota Production System

Pre-requisite(s): Production System

Text Book(s):

1. Wilson, L. (2009). How to Implement Lean Manufacturing, McGrawHill.
2. Askin, R.G., (2002). Design and Analysis of Lean Production System, John Wiley & Sons.
3. Pascal, D. (2007). Lean Production Simplified, Productivity Press.

RECONFIGURABLE MANUFACTURING SYSTEM

3 credits
Learning Objective(s):

Course participants are able to understand the concept of manufacturing facility analysis and planning and the differences compared to models of manufacturing system and supported with laboratory work.

Syllabus:

General RMS Characteristics, Enabling Technologies and Reconfigurable Characteristics, Reconfigurable Machines.

Pre-requisite(s): Production System

Text Book(s):

1. Meyers, F.E., Stephens, M.P. (2005). Manufacturing Facilities Design and material Handling, 3rd Ed. Prentice-Hall.

LINEAR AND STOCHASTIC PROGRAMING

3 credits
Learning objectives:

Students understand and master the theory and fundamentals of linear and stochastic programming, capable of using advanced techniques in linear and stochastic programing and can apply both linear and stochastic programming and use the software to solve linear and stochastic programming problems and tools.

Syllabus:

Introduction, The geometry of Linear Models, The Simplex Method, Duality Theory, The Interior point Method, Modeling Languages, Sensitivity Analysis, Advanced Models and Methods, Two-stage Stochastic Optimization, Chance-Constrained Programming.

Prerequisite: -

Teaching Book:

1. D. Bertsimas and J.N. Tsitsiklis, Introduction to Linear Optimization, Athena Scientific (1997).
2. John R. Birge and Francois Louveaux. Introduction to Stochastic Programming (Springer Verlag, 1997).
3. Alexander Shapiro, Darinka Dentcheva, and Andrzej Ruszczynski. Lectures on Stochastic Programming – Modeling and Theory (SIAM, 2009)

QUEUING THEORY

3 credits
Learning objectives:

Students understand and master simple queue models, network queues and cycle queues. Students are also expected to master the completion techniques of the queue model and translate the real issue into the queue model.

Syllabus:

Introduction, Simple Markovian model, Advanced Markovian model, Networks, Series, Cyclic Queues, Networks, Series, Cyclic Queues, Fluid Models, Stability and Optimization, Traffic, Dependency.

Prerequisite: -

Teaching Book:

1. Leonard Kleinrock, "Queueing Systems Volume I: Theory", New York: Wiley, 1975.
2. Donald Gross, John F. Shortle, James M. Thompson and Carl M. Harris, "Fundamentals of Queueing Theory", New York: Wiley, 2008

DATA MINING

3 credits
Learning Objective(s):

Course participants are able to organize the extraction, process, and data analysis in a right way to make decisions.

Syllabus:

Concept and Process of Data Mining, Algorithm in Data Mining, Data Mining Application in Organization.

Pre-requisite(s): Statistics and Probability, Industrial Statistics.

Text Book(s):

1. Nisbet, R. (2009). Handbook of Statistical Analysis and Data Mining Applications, Elsevier.

SYSTEMS ENGINEERING

3 credits

Learning Objective(s):

Course participants are able to understand the basics of system engineering management in industries to be able to cultivate a design process, installation, management and termination of a complex system.

Syllabus:

Concept and methodology of industrial system engineering. System Life-Cycle: Concept –Development – Production – Benefit and Support – End of System. Vee-Model. Processes in System Life Cycle: Technical Process. Project Process. Organization Process and Acquisition Process of Goods and Services. System Value and Life Cycle Costing. The Role of Modeling and Simulation in System Engineering.

Pre-requisite(s): System Modeling

Text Book(s):

1. Cecilia Haskins, CSEP, Kevin Forsberg, CSEP and Michael Krueger, CSEP. *Systems Engineering Handbook: A Guide For System Life Cycle Processes And Activities*, version 3.1, 2007
2. Kossiakoff, Alexander and William N. Sweet. *Systems Engineering Principles and Practice*. John Wiley & Sons. Hoboken – New Jersey, 2003.
3. ISO/IEC 15288 Standard for Systems Engineering. International Organization Standard (ISO).

ENTERPRISE COMPETITIVENESS ANALYSIS

3 credits

Learning Objective(s):

Course participants are able to analyze company's internal and external factors for setting up company strategy for achieving competitive advantage through value innovation and strategic position and capabilities development.

Syllabus:

Understanding Industry Profitability, The Vertical Boundaries of the Firm, Strategic Positioning for Competitive Advantage, Leveraging Market Power to Grow, Risk Management, Competitor and Competition, Competitive Intelligence

Textbooks:

1. Besanko, David. 2007. Economics of Strategy, Willey, 4th edition.
2. Sharp, S. 2009. How to minimize risk, avoid surprise, and grow your business in a changing world. John Willey.
3. Porter, M. 2008. The Five Competitive Forces That Shape Strategy. Harvard Business Review
4. Porter, M. 1998. Competitive Strategy: Techniques for Analyzing Industries and Competitors. Free Press.
5. Carbal, Luis. 2000. Introduction to Industrial Organization, MIT Press

ADVANCED OPTIMIZATION

3 credits

Learning Objective(s):

Course participants are able to design and implement various heuristic and meta-heuristic optimization algorithms to solve problems in industrial engineering field.

Syllabus:

Introduction to Optimization. Complexity Theory. Basics of Heuristic. Hill Climbing Algorithm. Greedy Algorithm, Simulated Annealing, Tabu Search, Genetic Algorithm, Challenge Counter Techniques, Multi-destinations metaheuristic.

Pre-requisite(s): Operation Research

Textbook:

1. Zbigniew Michalewicz,. David B. Fogel (2004). *How to Solve It: Modern Heuristics*, Springer.
2. Essentials of Metaheuristics, Sean Luke (2009). *Essentials of Metaheuristics,* Lulu, available at http://cs.gmu. edu/~sean/book/metaheuristics/
3. Andries P. Engelbrecht (2007) *Computational Intelligence, An introduction*, John Wiley & Sons, England.

HUMAN DIGITAL MODELING AND SIMULATION

3 credits

Learning objective(s):

Course participants are able to model digital human and simulate it to obtain more effective and efficient work design

Syllabus:

Anthropometry, Human Factors and Ergonomics in Healthcare, Ergonomics Modelling & Usability Evaluation, Human Factors, Ergonomics and Safety in Manufacturing and Service Industries. Introduction to Jack Software and Motion Capture.

Pre-requisite(s): Human Factors in Engineering & Design

Textbooks:-

1. Introduction to Human Digital Modeling
2. Application of Human Digital Simulation
3. Principles of Biomechanics
4. Predictive Modeling
5. Jack Simulation Software (concepts, tutorials and case studies
6. Basic Principles of Cognitive Ergonomics

7. Usability Testing Methods: Value Proposition, User Interview, Task Analysis, Card Sorting, Focus Groups, Questionnaires of SUS, QUIS, UEQ, PANAS, Eye tracking
8. Human Centric Innovation
9. Game Thinking
10. Metode IDEEAS

DECISION UNCERTAINTIES AND RISK

3 credits

Learning objective(s):

Course participants are able to analyze risks and uncertainties based on statistical tools accurately to make decision

Syllabus:

Concept and Decision-Making Process, Uncertainty Theory, Risks Analysis Prerequisites: Statistics and Probability, Industrial Statistics

Prerequisite(s): Statistics and Probability

Textbooks:

1. Parmigiani, G. (2009). *Decision Theory: Principles and Approaches*, John Wiley.
2. Yoe, C. (2011). Principles of risk analysis: decision making under uncertainty. CRC press.

DESIGN THINKING

3 credits

Learning objectives:

Students understand the principles of design thinking and understand how implementation and benefits in the process of designing, decision making and problem solving

Syllabus:

Philosophy of Design Thinking, Steps and Phases in Design Thinking, Design Centric Culture, User Centric Design, Lean UX, Design Thinking and Problem Solving

Prerequisite: -

Teaching Book:

1. The Effective Change's Manager Handbook, Richard Smith et al., 2014, APMG International.
2. HBR Must Read Change Management, John P. Kotter, 2007, HBR.

BUSINESS PROCESS REENGINEERING

3 credits

Learning objective(s):

Course participants are able to design a system by using business process reengineering which could measure and assure the quality and speed of an organization's operation process based on facts by using mathematical approaches, simulations and information stream compared to worldwide best-practice.

Syllabus:

Reengineering: The Path to Change, Rethinking Business Process, Business Process Reengineering, BPR in Service Industry, Manufacturing Industry and Information Technology, BPR methodology, Business Process Simulation, Business Process Management.

Pre-requisite(s): Introduction to Industrial Engineering

Textbooks:

1. Rengineering Corporation , Michael Hammer & James Champy, Harper-London (2006)
2. Business Process Change – Reengineering Concepts, Methods and Technologies, Varun Grover & William J. Kettinger, Idea Group Publishing (1998)
3. Business Process Reengineering A Complete Guide - 2021 Edition, The Art of Service (2021)
4. Business Process Reengineering – Text and Cases, R Radhakrisnan, PHI - New Delhi (2010) 5. Business Process Reengineering: A Consolidated Methodology, Subramanian Muthu , Larry Whitman , S. Hossein
5. Cheraghi, Proceedings of the 4 th Annual International Conference on Industrial Engineering Theory, Applications, and Practice, 1999 U.S. Department of the Interior (1999)
6. The Practical Guide to Business Process Reengineering using IDEF0, Feldmann Clarence.G, (1998), Donet Publishing New York
7. Managing Business Process Flows, Anupindi, R., Chopra, S., Deshmukh, S. D., Van Mieghem, J. A., & Zemel, E., Upper Saddle River, NJ: Prentice Hall. (1999).
8. Business Process Mapping: Improving Customer Satisfaction, J. Mike Jacka, Paulette J. Keller, Wiley; 2nd edition (2009)
9. Process Mapping: How to Reengineer your Business Process., Hunt, Daniel.V., (1996), John Wiley and Sons Inc, New York
10. Process Innovation , Reengineering work through information technology, Davenport, Harvard Business School Press 2004
11. Enterprise Ontology: Theory and Methodology. Jan L. Dietz. Springer Berlin Heidelberg (2006).

HEURISTIC METHODS IN OPTIMIZATION

3 credits

Learning objective(s):

Course participants are able to design heuristic and metaheuristic algorithms to solve optimization problems with single or multiple objectives. Course participants are also able to design Non Reguler and hybrid metaheuristic algorithm. These meta-heuristic

algorithms would be implemented in a programming language.

Syllabus:

Introduction, Single-Solution Based Metaheuristics, Population-Based Metaheuristics, Population-Based Metaheuristics, Metaheuristics for Multiobjective Optimization, Hybrid Metaheuristics, Non Reguler Metaheuristics.

Textbooks:

1. El-Ghazali Talbi, Metaheuristics: From Design to Implementation, Wiley:2009

CONSTRAINT PROGRAMMING

3 credits
Learning objective(s):

Course participants are able to build a constraint programming model, and to understand how solver constraint programming works and its advance methods in increasing efficiency.

Syllabus:

Propositional Logic, Modeling problems as SAT, Automated Reasoning: preliminaries, Resolution, Systematic Search, Stochastic Local search, Constraint Satisfaction Problems, Search Algorithms, Constraint type, Advanced technique, Modeling.

Textbooks:

1. Rina Dechter, Constraint Processing, 2003, Morgan Kauffmann.
2. Edward Tsang, Foundations of Constraint Satisfaction. Books On Demand: 2014.

STATISTICAL LEARNING

3 credits
Learning objectives:

Students are able to explain the *machine learning* Framework and apply a *supervised learning* with a focus on regression and classification.

Syllabus:

Linear and polynomial regression, logistic regression and linear discriminant analysis; cross-validation and the bootstrap, model selection and regularization methods (ridge and lasso); nonlinear models, splines and generalized additive models; tree-based methods, random forests and boosting; support-vector machines. Some unsupervised learning methods are discussed: principal components and clustering (k-means and hierarchical).

Prerequisite:

Teaching Book:

1. James, G., Witten, D., Hastie, T. and Tibshirani, R., 2013. An introduction to statistical learning (Vol. 112, p. 18). New York: springer.

INTELLIGENT PRODUCT-SERVICE SYSTEM

3 credits
Purpose of Learning:

Students are able to explain the framework of the product system-intelligent services and then propose a form of implementation improvement on the given case study.

Syllabus:

Digital Marketing, ICT-based consumer needs analysis, *Value Proposition, Stakeholders Management, crowdsourcing*

Prerequisite:

Teaching Books:

1. Van Halen, C., Vezzoli, C. and Wimmer, R., 2005. Methodology for product service system innovation: how to develop clean, clever and competitive strategies in companies. Uitgeverij Van Gorcum.

CIRCULAR ECONOMY FOR BUSINESS AND SUPPLY CHAIN

3 credits
Learning objectives:

Students are able to design business models and supply chain models built on the basis of a circular economic concept that is characterized by the imputation of material inputs, waste, energy by ensuring material and energy within a closed system loop

Syllabus:

Introduction to the circular economy, history of concept development, sustainable issues, *Butterfly Diagram, Economy Sharing, Closed-Loop Supply Chain, Reuse-remanufacturing-Recycling,* Products Durability

Prerequisite: -

Teaching Book:

1. Weetman, C., 2016. A circular economy handbook for business and supply chains: Repair, remake, redesign, rethink. Kogan Page Publishers.

SERVICES SYSTEMS ENGINEERING

3 credits
Learning objectives:

Students can understand the specificity of the service sector in terms of initial design, management, measurement methods of quality of performance of workers, and the method of measuring customer satisfaction, starting from service encounter, to the needs of managers in the service sector to combine

marketing, technology, workers and information to be able to compete.

Syllabus:

Introduction to service engineering, new services development, technology on services, establishment of service companies, operations management services, quality services, capacity planning and Model queuing, forecasting demand on services, inventory management services.

Prerequisite:-

Teaching Book:

1. Cecilia Haskins, CSEP, Kevin Forsberg, CSEP and Michael Krueger, CSEP. SYSTEMS ENGINEERING HANDBOOK: A GUIDE FOR SYSTEM LIFE CYCLE PROCESSES AND ACTIVITIES, version 3.1, 2007
2. Kossiakoff, Alexander and William N. Sweet. Systems Engineering Principles and Practice. John Wiley & Sons. Hoboken-New Jersey, 2003.
3. ISO/IEC 15288 Standard for Systems Engineering. International Organization Standard (ISO).

LEAN LOGISTICS

3 credits
Learning objectives:

Students are able to evaluate manufacturing and logistics systems and propose improvements using the lean approach.

Syllabus:

Introduction, 7 *Waste, Lean Manufacturing, lean Supply Chain, lean Six Sigma, Toyota Production Systems*

Prerequisite:

Teaching Book:

Baudin, M., 2005. Lean logistics: the nuts and bolts of delivering materials and goods. CRC press.

FORECASTING METHOD

3 credits
Learning objectives:

Students are able to use forecasting methods to historical data available and choose the best forecasting method in favor of decision making.

Syllabus:

Introduction, *Sales and Operation Planning,* historical Data, *Moving averages, Winter Method,* ARIMA, error

Prerequisite:

Teaching Book:

1. Makridakis, S., Wheelwright, S.C. and Hyndman, R.J., 2008. Forecasting methods and applications. John wiley & sons.

TECHNOLOGY ADOPTION-BASED SYSTEM DYNAMICS

3 credits

Learning objectives:

Students are able to compile, analyze results and present a continuous model of technological adoption process using dynamic system modeling to evaluate the impact of technological adoption on complex systems

Syllabus:

Theory of Planned Behavior, Technology Acceptance model, Bass Diffusion model, diagram system, causal Loop Diagram, Stock-Flow diagram, model formulation, model testing, scenario analysis

Prerequisite:-

Teaching Book:

1. Public Policy Analysis : New Developments. Warren E. Walker, Wil A. H. Thissen . Springer. 2014.
2. Thinking in Systems: A Primer. Donella H. Meadows and Diana Wright. Chelsea Green Publishing. 2008
3. Powersim Studio 2003 Reference Guide. Powersim SA. 2003

AGENT BASED MODELING

3 credits
Learning Objectives:

Students understand the concepts and methodology of agent-based modeling as well as using agent-based modeling tools to create simple models.

Syllabus:

The basic concept of Agent-based modeling, Exploration of a wide variety of ABM cases historically, conceptualization model: ODD Overview, Design Concepts and Details, model development, Verification, validation and replicationofL Mode, scenario analysis

Prerequisite:-

Teaching Book:

1. Introduction to Agent-Based Modeling: Modeling Natural, Social, and Engineered Complex Systems with NetLogo. Uri Wilensky, William
2. Rand. The MIT Press. 2015
3. AnyLogic in Three Days: Modeling and Simulation Textbook. Ilya Grigoryev
4. Chapter 7: Documenting Social Simulation

Models: The ODD Protocol as a Standard. Volker Grimm, Gary Polhill, and Julia Touza.in B.
5. Edmonds and R. Meyer (eds.), Simulating Social Complexity: Understanding Complex Systems, Springer-Verlag Berlin Heidelberg 2013

MODEL-BASED DECISION MAKING

3 credits

Learning objectives:

Students are able to apply a variety of management models that include frameworks, methods and management tools to solve problems that arise in conducting system engineering and presenting the solution well

Syllabus:

Model Based Decision Making, Mental Model, Frameworks as a Model, Models and Tools for Questioning Structure, Tools for Generating Alternatives, Tools for Prioritizing, Tools for Deployment, Tools for Monitoring and Control, Case Study Analysis

Prerequisite:

Teaching Book:

1. Figuera, J., Greco, S., Ehrgott, M. (2005). Multi Criteria Decision Analysis: State of the Art Surveys. Kluwer Academic Publishers.
2. Ragsdale, C. (2004). Spreadsheet Modeling & Decision Analysis. SouthWestern Colege Publisher.

SERVICE MANAGEMENT

3 credits

Learning objectives:

Students are expected to understand the basic concept of service management that exists in the service industry and manufacturing industry, making service management as one of the operations that will support the enterprise to be superior to compete from the others**.**

Syllabus:

Introduction, concept value in service management, service strategy, information technology.

Prerequisite:

Teaching Book:

1. Service Management An Integrated Approach to Supply Chain Management and Operations / Cengiz Haksever, Barry Render, 2013
2. Service Science The Foundations of Service Engineering and Management / Robin G. Qiu, 2014
3. Service Management / Prof. H. R. Appannaiah, DR. P. N. Reddy, DR. H. V. S. Raghavan, 2010.

HUMAN FACTORS IN INTELLIGENT TRANSPORT SYSTEM

3 credits

Learning objectives:

Students are able to design vehicle and transportation systems involving human factors, related to their needs and limits by recognizing the basic-based vehicle design principles of human factors involving the function – the design functions to be a good and accountable design approach according to the needs of the user.

Syllabus:

Vehicle types, vehicle parts, general vehicle user characteristics, selection specifications, Concept design

Prerequisite:

Teaching Book:

1. Barfield, Woodrow; Thomas A. Dingus. 1997. Human Factors in Intelligent Transportation Systems. 1st Edition. Florida: CRC Press.
2. Sanders, M.S. and McCormick, E.J. (1993). Human Factors in Engineering and Design, 7th edition. Mc Graw-Hill

Additional:

1. Nemeth, Christopher P. 2004. Human Factors Methods for Design (Making Systems Human-Centered). 1st Edition. Florida: CRC Press.
2. Castro, Candida. 2009. Human Factors of Visual and Cognitive Performance in Driving. 1st Edition. Florida: CRC Press.

CHANGE MANAGEMENT

3 credits

Learning objectives:

Students are able to provide answers through strategy recommendation and change Management Activity series in accordance with the needs and characteristics of the industry.

Syllabus:

Pengantar *Change Management, Case Studies of Change Management Success Factors, The Dimensions of Change, Preparing for Organisational Change, Seven Steps to Change – A Systematic Approach, Implementing Change Management*

Prerequisite:-

Teaching Book:

1. The Effective Change's Manager Handbook, Richard Smith et al., 2014, APMG International.
2. HBR Must Read Change Management, John P. Kotter, 2007, HBR.

INTRODUCTION TO TECHNOPRENEURSHIP

3 credits

Learning objectives:

Students are able to explain the steps in starting a digital *start up* and designing the *canvas business model*

Syllabus:

Introduction to technology entrepreneurship, *business model Canvas,* case study, *pitching*, *venture capital,* failure of digital *start up*

Prerequisite:

Teaching Book:

1. Mankani, D., 2003. Technopreneurship: The Successful entrepreneur in The new economy. Pearson/Prentice Hall.

MARITIME LOGISTICS

3 credits

Learning objectives:

Students are able to design, analyze, and improve the performance of the maritime logistics system in general, and container terminals as well as scheduled cruise (liner) in particular.

Syllabus:

Maritime Economy, containerization, scheduled sailing, Berth Allocation problem, Quay Crane allocation problem, Stacking problem, Stowage Planning, Integration phase, Intermodality, Synchomodality, LPG supply chain, Fuel supply chain, Integtation phase.

Prerequisite: -

Teaching Book:

1. Notteboom, T. E., Pallis, A. a., De Langen, P. W., & Papachristou, A. (2013). Advances in port studies: the contribution of 40 years Maritime Policy & Management. Maritime Policy & Management, 40(7). https://doi.org/10.1080/03088839.2013.851455
2. Levinson, M. (2006). The Box: How the Shipping Container Made the World Smaller and the World Economy Bigger. Princeton:Princeton University Press.
3. Song, D. W., & Panayides, P. M. (2015). Maritime Logistics: a Guide to Contemporary Shipping and Port Management.
4. Mangan, J., Lalwani, C., Butcher, T., & Javadpour, R. (2012). Global Logistics and Supply Chain Management (2nd ed.). Chihester:John Wiley & Sons, Ltd.
5. International Chamber of Commerce. (2020). Incoterms 2020: ICC Rules for the Domestic and International Trade Terms. Paris.
6. Rodrigue, J.-P., Comtois, C., & Slack, B. (2013). The Geography of Transport Systems (Third Edit). London: Routledge. https://doi.org/10.1080/10630732.2011.603579
7. Kap, H. K., & Gunther, H.-O. (Eds.). (2007). Container Terminals and Cargo Systems: Design, Operations Management, and Logistics Control Issues. Berlin: Springer Berlin Heidelberg.
8. Meisel, F. (2009). Seaside Operations Planning in Container Terminals. https://doi.org/10.1007/978-3-7908-2191-8
9. Lee, S. W., Song, D. W., & Ducruet, C. (2008). A tale of Asia's world ports: The spatial evolution in global hub port cities.Geoforum, 39(1), 372–385. https://doi.org/10.1016/j.geoforum.2007.07.010
10. Mulder, J., & Dekker, R. (2014). Methods for strategic liner shipping network design. European Journal of Operational Research, 235(2), 367–377. https://doi.org/10.1016/j.ejor.2013.09.041

SUSTAINABLE MANUFACTURING AND INNOVATION

3 credits

Learning Objective(s):

Course participants are able to understand the environmental and sustainability aspects of manufacturing process and their roles in increasing the competitiveness of enterprise and innovation development.

Syllabus:

Concept and Sustainability Process in manufacturing process. Green Manufacturing (Remanufacturing, Reuse, Recycling), Renewables and Resource Utilizations, Green Logistics and SCM, Eco-Innovation, Best Practices in Sustainable Manufacturing.

Pre-requisite(s): Production System

Text Book(s):

1. Allen,D.T (2012). Sustainable Engineering Concepts, Design and Case Studies, Prentice Hall
2. Cooper. Robert G dan Edgett,Scott J.Edget , (2005), New Product Development,Product Development Institute, Canada.
3. Hermasolilla,J.G (2009). Eco-Innovation When Sustainability and Competitiveness, Shake Hands.
4. Jovane, F (2010) The Manufacture Roa : Towards Competitive and Sustainable High-Adding Value Manufacturing, Springer

ENERGY MANAGEMENT

3 credits

Learning objectives:

Students understand the principles of energy management including energy supply and demand so that students can cultivate a "sense" of the

importance of energy and include it as a factor in decision making.

Syllabus: Energy and civilization, energy sources and sustainability, future of energy, economic analyst and life cycle cost, life cycle analysis, lighting, ventilation and cooling system, sustainable transportation system, effective energy management program, effective energy Management program, Modeling policies and energy planning

Prerequisite: -

Teaching Book:

1. John Randolph and Gilbert M. Masters, Energy for Sustainability, Technology, Planning, Policy. Island Press, 2008
2. Barney L. Capehard, Wayne C. Turner, and William J. Kennedy, Guide to Energy Management 6th ed. CRC Press, the Fairmont Press, 2008
3. Wayne C. Turner and Steve Doty, Energy Management Handbook 6th ed. CRC Press, the Fairmont Press, 2007
4. Politic of Energy, 2007
5. Papers and related publications

INTRODUCTION TO DATA SCIENCE

3 credits
Learning objectives:

Students understand and master the data collection and processing techniques, as well as the extraction techniques from existing data, especially in the field of industrial engineering.

Syllabus:

Introduction, variable and Operator type, *Loops* and *Arrays,* object and class, Data sorting, *asymptotic Notation, recurrences, quicksort, Randomized algorith*

Prerequisite:-

Teaching Book:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithm", The MIT Press, Cambridge, Massachusetts London, England

NUMERIC METHODS AND APPLICATIONS

3 credits
Learning objectives:

The students understand in Logic the numerical engineering equipment to solve various problems in the form of mathematics and physics that are widely encountered in engineering and even social and economic sciences. Tough solutions become very easy through dynamic system approaches that introduce iterating techniques or those in computer science do looping techniques. Therefore, it takes the systematic steps according to the way the computer thinks logic in achieving the solution. Various examples of applications are devoted to solving the problems of industrial engineering.

Syllabus:

Function theory, such as looking for an average number, the influence of linearization function of many ranks, looking for root or point-zero functions, interpolation and extrapolation; calculating the area and volume of an object without form with a numerical approach based on integration formula; solves the system of equations with many variables, including the simulation of the equation system models

Prerequisite: -

Textbooks:

1. Burden, Richard L. dan J Douglas Faires dan Albert C. Reynolds. 1981. Numerical Analysis. Boston: Prindle, Weber and Schmidt.
2. Hombeck, Robert W. 1975. Numerical Methods. New York: Quantum Publishersd, Inc
3. Chapra, Steven C dan Raymond P. Canale. 2002. Numerical Methods for Engineers. Boston: McGraw Hill Co.
4. McCalla, Thomas Richard. 1967. Introduction to Numerical Methods and Fortran Programming.

   New York: JohnWiley & Sons

Course Structure for Bachelor and Master Fast Track student in Industrial engineering

Code	Subject	SKS
	7th Semester	
ENIE801001	Systems Thinking	3
ENIE801004	Advanced Operation Research	3
ENIE801003	Operation Management	3
ENIE801002	Industrial Systems Engineering	3
	Subtotal	**12**
	8th Semester	
ENIE801005	Research Methodology	2
ENIE801006	Advanced Statistics	3
	Mandatory Course for Track	3
	Mandatory Course for Track	3
	Subtotal	**11**
	9th Semester	
	Mandatory Course for Track	3
	Elective Course for Track	3
	Elective Course for Track	3
ENIE800007	Research Proposal	2
	Subtotal	**11**
	10th Semester	
ENIE800008	Publication	2
ENIE800009	Thesis	4
	Subtotal	**6**

Course Structure for Bachelor, Master and Doctoral Fast Track Student in Industrial engineering

Code	Subject	SKS
	7th Semester	
ENIE607034	Special Topics in Industrial Engineering	2
ENIE801001	Systems Thinking	3
ENIE801002	Industrial Systems Engineering	3
ENIE801003	Operation Management	3
ENIE801004	Advanced Operations Research	3
	Subtotal	**14**
	8th Semester	
	Research Methodology	2
ENIE801005	Advanced Statistics	3
ENIE801006	Mandatory Course for Track	3
	Mandatory Course for Track	3
	Subtotal	**11**
	9th Semester	
	Mandatory Course for Track	3
	Elective Course for Track	3
ENIE801007	Elective Course for Track	3
	Thesis Proposal	2
	Subtotal	**11**
	10th Semester	
ENIE800008	Publication	**2**
ENIE800009	Thesis	**8**
ENIE900004	Research Proposal	**6**
	Subtotal	**16**
	11th Semester	
ENIE900006	Publication – International Conference	**4**
	Subtotal	**4**
	12th Semester	
ENIE900007	Research Result Examination	**10**
	Subtotal	**10**
	13th Semester	
ENIE900008	Publication 2 – International Journal	**8**
	Subtotal	**8**
	14th Semester	
ENIE900010	Doctoral Promotion	**6**
	Publication III – International Journal	**8**
	Subtotal	**14**

CHAPTER 5

MASTER PROGRAM

Master Program in Industrial Engineering

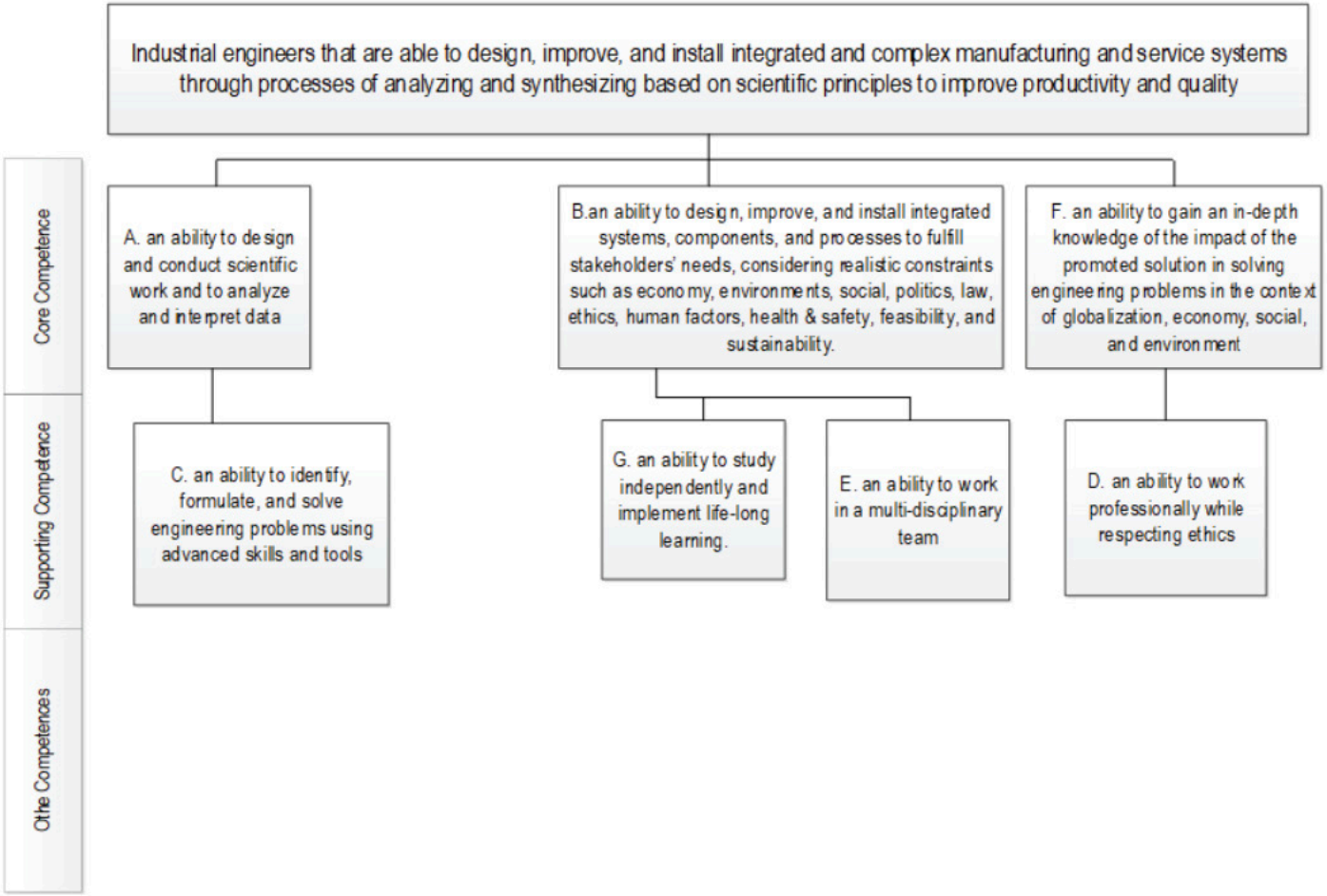
Program Specification

1.	**Degree Awarding University**	Universtas Indonesia	
2.	**Managing Institution**	Universtas Indonesia	
3.	**Faculty**	Engineering	
4.	**Study Program**	Master Program of Industrial Engineering	
5.	**Vision and Mission**	Vision: To be a leading master study program in Indonesia in developing industrial engineering knowledge to design, improve, and install a complex and industrial systems through analysis and synthesis processes in scientific research principles to increase productivity and sustainable quality. Mission: To conduct an Industrial Engineering graduate program with an international perspective supported by research that can compete internationally to support sustainable development goals in Indonesia.	
6.	**Class**	Reguler, Research	
7.	**Degree**	Master of Engineering	
8.	**Accreditation Status**	A-grade based on BAN-PT Accreditation	
9.	**Language**	Bahasa Indonesia	
10.	**Study Scheme**	Full Time	
11.	**Submission Requirement**	Hold a Bachelor's degree in Engineering, Natural Science, Economics, and Business; passed the UI entrance exam.	
12.	**Duration**	2 years	
	Semester	Number of semester	Number of weeks/semesters
	Reguler	4	16
	Short Semester	1	8
13.	**Aims of the program:** 1. To implement processes of analyzing and synthesizing based on scientific principles in Industrial Engineering's body of knowledge in designing, improving, and installing integrated systems. 2. To excel in research skills and scientific knowledge in advancing graduate students' careers. 3. To master the ethics of work in scientific communities for promoting improvement in the organizations.		
14.	**Graduates Profile:** Industrial engineers that are able to design, improve, and install integrated and complex manufacturing and service systems through processes of analyzing and synthesizing based on scientific principles to improve productivity and quality.		

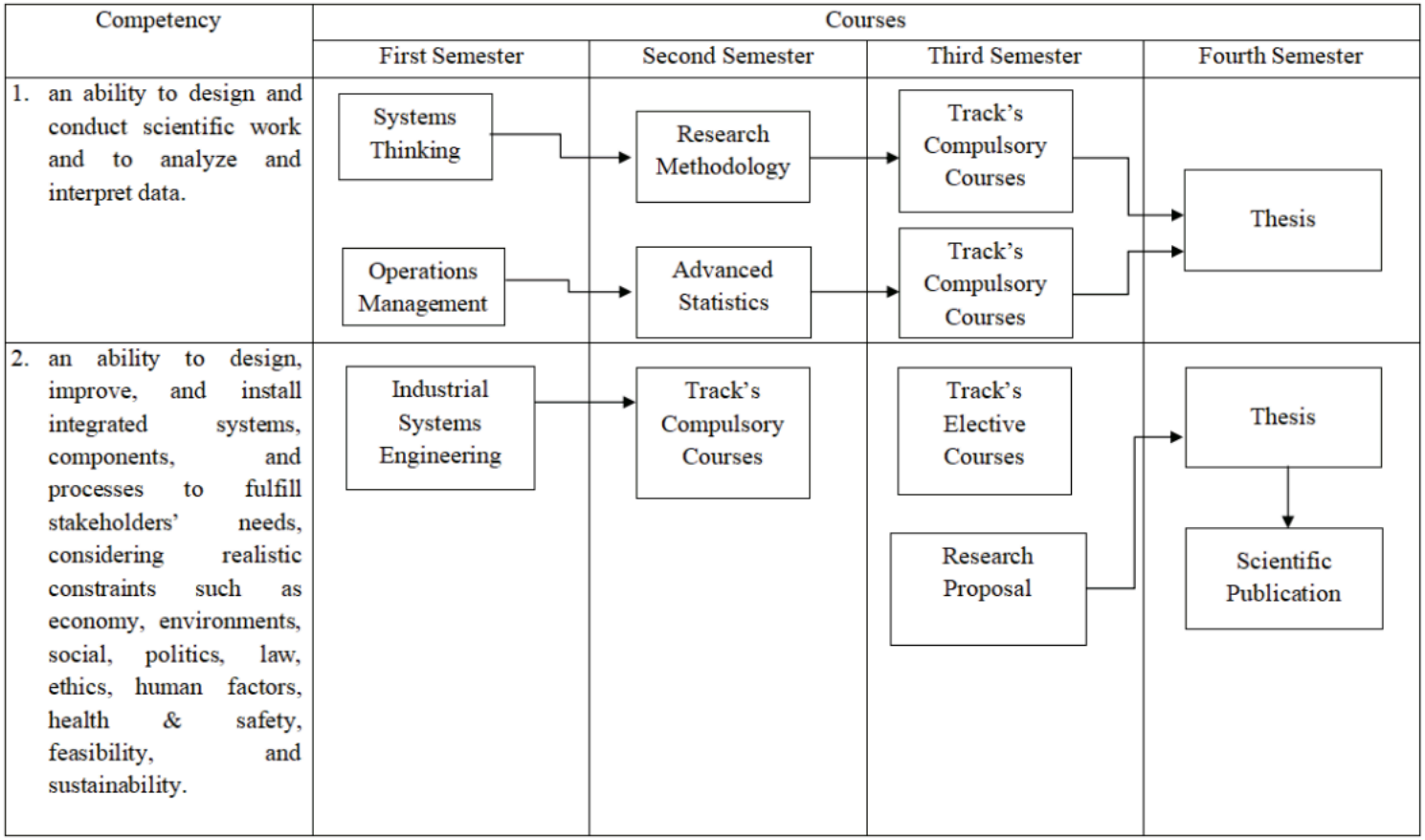
15.	**Expected Learning Outcomes:** 1. an ability to design and conduct scientific work and to analyze and interpret data. 2. an ability to design, improve, and install integrated systems, components, and processes to fulfill stakeholders' needs, considering realistic constraints such as economy, environments, social, politics, law, ethics, human factors, health & safety, feasibility, and sustainability. 3. an ability to identify, formulate, and solve engineering problems using advanced skills and tools. 4. an ability to work professionally while respecting ethics. 5. an ability to work in a multi-disciplinary team. 6. an ability to gain an in-depth knowledge of the impact of the promoted solution in solving engineering problems in the context of globalization, economy, social, and environment. 7. an ability to study independently and implement life-long learning.

No.	Type of Courses	Credit Hours (SKS)	Percentage
I	**Compulsory Courses of Study Program**	17	38,64%
II	**Compulsory Courses of Specialization**	9	20,45%
III	**Elective Courses**	6	13,64%
IV	**Matriculation**	12	
V	**Special Courses**	12	27,27%
	Total	44	100 %
	Total Credits		44 Credits

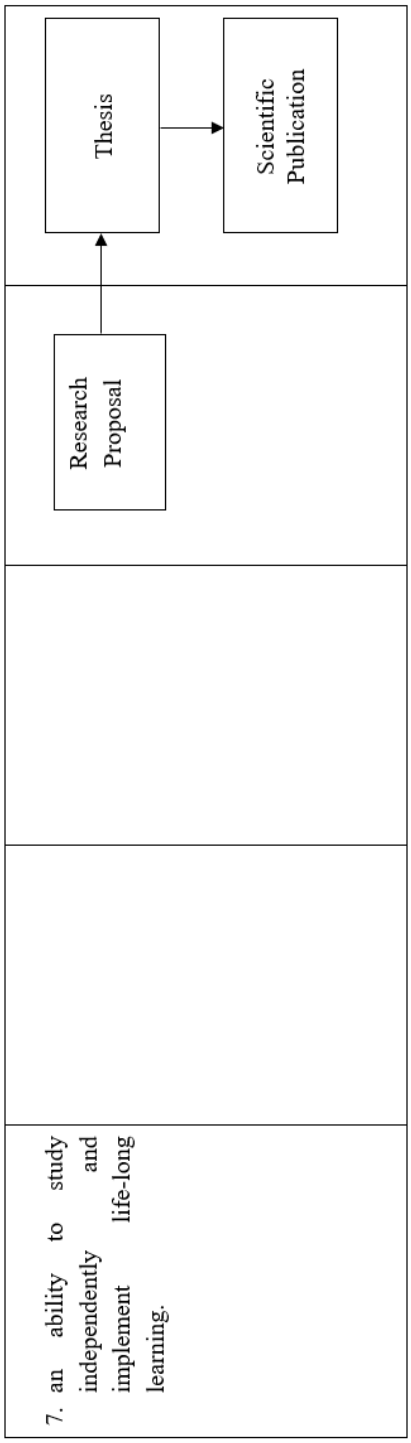
The Network of Expected Learning Outcomes



Flow Diagram of Courses based on Expected Learning Outcomes



3. an ability to identify, formulate, and solve engineering problems using advanced skills and tools.	Advanced Operations Research →	Track's Compulsory Courses →	Track's Elective Courses →	Thesis
4. an ability to work professionally while respecting ethics.		Research Methodology →	Research Proposal →	Thesis
5. an ability to work in a multi-disciplinary team.		Track's Compulsory Courses →	Track's Elective Courses	
6. an ability to gain an in-depth knowledge of the impact of the promoted solution in solving engineering problems in the context of globalization, economy, social, and environment.	Industrial Systems Engineering →	Track's Compulsory Courses →	Track's Elective Courses →	Thesis


7. an ability to study independently and implement life-long learning.
Research Proposal
Thesis
Scientific Publication

Curriculum Structure of Industrial Engineering Master Program

Code	Subject	SKS
	1st Semester	
ENIE801001	Systems Thinking	3
ENIE801002	Industrial Systems Engineering	3
ENIE801003	Operation Management	3
ENIE801004	Advanced Operations Research	3
	Linear Programming	
	Basic Statistics	
	Sub Total	**12**
	2nd Semester	
ENIE801005	Research Methodology	2
ENIE801006	Advanced Statistics	3
	Track's Compulsory Courses	3
	Track's Compulsory Courses	3
	Engineering Economics	
	Human Factors in Engineering & Design	
	Sub Total	**11**
	3rd Semester	
ENIE800007	Research Proposal	2
	Track's Compulsory Courses	3
	Track's Elective Courses	3
	Track's Elective Courses	3
	Sub Total	**11**
	4th Semester	
ENIE800008	Scientific Publication	2
ENIE800009	Thesis	8
	Sub Total	**10**
	Total	**44**

Compulsory Specialization Subjects

Code	Subject	SKS
2nd Semester		
	Innovation And Design Engineering	
ENIE802108	Product and Service Innovation	3
ENIE802109	Work Safety Engineering and Management	3
	Production and Logistics System	
ENIE802216	Manufacturing System	3
ENIE802217	Inventory System	3
	Industrial Management	
ENIE802324	Industrial Project Development	3
ENIE802325	Industrial Strategic Management	3
	Data and Quality Engineering	
ENIE802432	Multivariate Analysis	3
ENIE802433	Quality and Reliability	3
	Systems Design and Management	
ENIE802540	Decisions and Risks in Systems Engineering	3
ENIE802541	Systems Engineering and Analysis	3
	Sub Total	
3rd Semester		
	Innovation And Design Engineering	
ENIE803110	Macroergonomics	3
	Production and Logistics System	
ENIE803218	Logistics System	3
	Industrial Management	
ENIE803326	Strategic Sourcing Management	3
	Data and Quality Engineering	
ENIE803434	Data Mining	3

	Systems Design and Management	
ENIE803542	Systems Performance Modeling	3
	Track's Elective Courses	3
	Track's Elective Courses	3
	Sub Total	

Elective Courses

Code	Subject	SKS
	Innovation And Design Engineering	
ENIE803111	Knowledge Management	3
ENIE803112	Cognitive Ergonomics	3
ENIE803113	Technopreneurship	3
ENIE803114	Human Performance Engineering	3
ENIE803115	Industrial Technology Management	3
	Production and Logistics System	
ENIE803219	Total Quality Management	3
ENIE803220	Lean Manufacturing	3
ENIE803221	Industrial Organization	3
ENIE803222	Maritime Logistics	3
ENIE803223	Transportation Systems	3
	Industrial Management	
ENIE803327	Engineering Management in the Value of Materials	3
ENIE803328	Industrial Economics	3
ENIE803329	Supply Chain Management	3
ENIE803330	Maintenance Management	3
ENIE803331	**Enterprise Information Systems**	3
	Data and Quality Engineering	
ENIE803435	Decision Uncertainties and Risk	3
ENIE803436	Consumer Relationship Management	3
ENIE803437	Advanced Optimization	3
ENIE803438	Prognostic and Machinery Health Management	3
ENIE803439	Service Engineering	3
	Systems Design and Management	
ENIE803543	Systems Engineering Management	3
ENIE803544	Supports and Logistics for Systems Engineering	3
ENIE803545	Technology Policy Modeling using System Dynamics	3
ENIE803546	Decision and Policy Models	3
ENIE803547	Renewable and Sustainable Energy Systems	3

Master By Research

Code	Subject	SKS
	1st Semester	
ENEE800102	Research Proposal Examination	4
ENEE800101	Scientific Seminar	8
	2nd Semester	
ENEE800203	Proceeding Publication	4
ENEE800204	Research Result Examination	6
	3rd Semester	
ENEE800105	Journal Publication	8
	4th Semester	
ENEE800206	Master Thesis	10

Syllabus Master Program Industrial Engineering

System Thinking

ENIE801001
3 Credits
Learning Objective(s) :

Students are expected to implement model-based management concept by understanding systems' problems. The development of systems' mindset will be conducted through the introduction of soft OR in the form SSM approach as a case study

Syllabus:

Introductory lecture, changing yourself by changing the way of thinking, introduction to systems thinking, the Beer Game, Mental Model, language system, Causal Loop diagram, Stock and Flow diagram, General System Blueprint, System Archetypes, Problem Solving with Systems Thinking, introduction of SSM concept, the case study discussion of Albion Group with SSM, development of insight on the scope of modeling.

Pre-requisite(s): -

Text Book(s):

1. Meadows, D. (2008). Thinking in Systems: A Primer. Chelsea Green Publishing
2. Checkland, P., Scholes, J. (2001). Soft Systems Methodology in Action. John & Wiley.
3. Senge, P. M. (1994). The Fifth Discipline Fieldbook: Strategies and Tools for Building a Learning Organization. Crown Business.

Industrial System Engineering

ENIE801002
3 Credits
Learning Objective(s):

Students are expected to promote the design and development of effective and efficient solutions through the framework of industrial engineering systems in accordance with the needs and characteristics of the industry

Syllabus:

Definition of industrial systems engineering, Strategic Management, New Product Development, Supply Chain Management, Industry Level View, Societal Trends, Industry trends, Economy Trends, Technology Trends, Industry 4.0, Case Studies of Industry 4.0, the Shifting of Global Manufacturing competitiveness, Marketing 4.0, Industrial System Design analysis in the case of different industries.

Pre-requisite(s): -

Textbook(s):

1. Chris Harris, Rick Harris, Chuck Streeter - Lean Supplier Development_ Establishing Partnerships and True Costs Throughout the Supply Chain (2010, Productivity Press)
2. Cindy Alvarez - Lean Customer Development. Building Products Your Customers Will Buy (2014, O&_039_Reilly Media)
3. David Simchi-Levi Philip Kaminsky Edith Simchi-Levi - Managing the Supply Chain_ The Definitive Guide for the Business Professional (2003)
4. Paul Trott - Innovation Management and New Product Development (2017, Pearson)
5. Shoshanah Cohen, Joseph Roussel - Strategic Supply Chain Management (2004, McGraw-Hill)

Operations Management

ENIE801003
3 Credits
Learning Objective(s):

The students are expected to master various calculations and analysis for activities in the manufacturing industry and service industry, such as planning activities in project management, understanding the product design, conducting the best process analysis for manufacturing companies or services, taking into account the quality of the work and the quality of services provided to customers, analyzing the strategic supply chain for the company, and applying a variety of quantitative techniques to promote operations excellence.

Syllabus:

Operations Management, Operating Strategy, Introduction to Project Management, Introduction to the Design Process, Process Analysis, Service Operational Classification, Total Quality Management, Supply Chain Strategy, Capacity Management, Lean Logic, Demand Management, Sales and Operations Planning, Material Requirement Planning.

Prerequisite(s): -

Textboks:

1. Jacobs, F. R., Chase, R. B., & Aquilano, N. J. (2004). Operations management for competitive advantage. Boston: Mc-Graw Hill, 64, 70.
2. Reid, R. D., & Sanders, N. R. (2019). Operations management: an integrated approach. John Wiley & Sons

Advanced Operations Research

ENIE801004
3 Credits
Learning Objective(s):

Students are expected to master the theory and basic of integer programming, using advanced techniques

in integer program, can apply integer programming knowledge and use the software to solve the problems of integer programming.

Syllabus:

What is Integer Programming, Formulating Integer Programs, Linear Algebra and Convexity, Polyhedral and Dimension, Introduction to Branch and Bound, Relaxation, Duality, Decomposition Methods, Branching Methods, Search Strategies, Introduction to Computational Complexity, Certificates and Complexity Classes, Easy Integer Programs, Integral Polyhedral, Combinatorial Algorithms, Describing Polyhedral, Valid Inequalities, Valid Inequalities From Disjunctions, Strong Valid Inequalities and Lifting, Structured Inequalities, Branch and Cut, Branch and Price, Primal Heuristics, Numerical Analysis.

Pre-requisite(s): -

Text Book(s):

1. Conforti, M., Cornuéjols, G., & Zambelli, G. (2014). Integer programming (Vol. 271). Berlin: Springer.
2. Wolsey, L. A., & Nemhauser, G. L. (2014). Integer and combinatorial optimization. John Wiley & Sons.
3. Taha, H. A. (2017). Operations Research An Introduction. Pearson Education Limited 2017.
4. Hillier, F. S., & Lieberman, G. J. (2005). Introduction to operations research. McGraw-Hill Science, Engineering & Mathematics.

Research Methodology

ENIE801005
2 Credits
Learning Objective(s):

Students are expected to understand the basic concepts used in quantitative and qualitative research methods, including the steps of a scientific research to produce a thesis as a prerequisite for completion of master's degree program.

Topics:

Introduction, Selecting a Problem and Reviewing the Literature, Identifying and Labeling Variables, Constructing Hypotheses and Meta-Analyses, and Constructing Operational Definitions of Variables, Types of Research, Concluding Steps of Research, Additional Approaches.

Pre-requisite(s): -

Text Book(s):

1. Manual Penyusunan Tesis Universitas Indonesia dan Departemen Teknik Industri, 2008.
2. Pedoman Teknis Penulisan Tugas Akhir Mahasiswa Universitas Indonesia. IEEE Citation Reference.
3. Stojmenovic, I. (2010). "How to Write Research Articles in Computing and Engineering Disciplines," IEEE Transactions on Non Reguler and Distributed Systems, Vol. 21, No. 2.

Advanced Statistics

ENIE801006
3 Credits
Learning Objective(s):

Students are expected to manage the collection, processing, & data analysis by following the assumptions and rules of statistics in conducting the experimental design (Design of Experiment) so that the conclusions can be used as the basis in the decision making process

Syllabus:

Review of Basic Statistical Concepts, Single Factor Experiment (Fixed Effect Model), Single Factor Experiment (Random Effect Model), Randomized Complete Block Design, Latin Square Design, General Factorial Design, 2k Factorial Design, Blocking in Factorial Design, Factorial Experiments with Random Factors, Fractional Factorial Design, Nested Design, Response Surface Model, Statistics and Quality Control.

Pre-requisite(s): Basic Statistics

Text Book(s):

1. Montgomery, D. C. (2017). Design and analysis of experiments. John wiley & sons.
2. Berger, P. D., & Maurer, R. E. (2002). Experimental Design with Applications in Management. Engineering and the Sciences. Cengage Learning.
3. Montgomery, D. C. (2009). Statistical quality control. New York: Wiley.

Research Proposal

ENIE801007
2 Credits
Learning Objective(s):

Students are expected to write a systematic research proposal based on a novel problem formulation through a tourough examination on the body of literature and real-world cases and phenomenon.

Pre-requisite(s): -

Text Book(s):

a. Pedoman Teknis Penulisan Tugas Akhir Mahasiswa Universitas Indonesia. IEEE Citation Reference.
b. Ivan Stojmenovic, "How to Write Research Articles in Computing and Engineering Disciplines," IEEE Transactions on Non Reguler and Distributed Systems, Vol. 21, No. 2, February 2010.

Product and Service Innovation

ENIE802108
3 Credits
Learning Objective(s):

Students are expected to evaluate the existing concept and case studies of innovation development in organizations.

Topics:

State of the art in 'Innovation', Innovation Development strategy, Innovation Development Stages, Technology Policy for Innovation Development

Pre-requisite(s): -

Text Book(s):
1. Lean Product Playbook, Dan Olsen, 2016
2. Strategic Management of Technological Innovation: Melissa A. Schiling, 3 rd Edition, 2010.
3. Winning at New Products: Robert G. Cooper, 3rd Edition, 2011.

Work Safety Engineering and Management

ENIE802109
3 Credits
Learning Objective(s):

Students are expected to evaluate a design and management of occupational safety as one aspect in human factor-based work system

Topics:

Introduction to occupational safety management and engineering, application of occupational safety management and engineering, work fatigue, risk model and risk management, human error and safety culture.

Pre-requisite(s): Human Factors in Engineering and Design

Text Book(s):
1. Glendon, A. I., & Clarke, S. (2015). Human safety and risk management: A psychological perspective. CRC Press.
2. Ridley, J., & Channing, J. (Eds.). (2008). Safety at work. Routledge.

Macroergonomics

ENIE603003
3 Credits
Learning Objective(s):

Students are expected to evaluate the design of a working system consisting of variables that interacts with hardware and software in internal physical environments, external environments, and organizational structures.

Topic:

Introduction to the ergonomic macro, methods and tools used in the analysis of work and design systems, introduction of integration of organizations in the context of productivity, safety, health and quality of work life.

Pre-requisite(s): Human Factors in Engineering and Design

Text Book(s):
1. Hendrick, W.H,. Kleiner, Brian, (2002). *Macroergonomics: Theory, Methods, and Applications (Human Factors and Ergonomics)*
2. Stanton, N,. Hedge, A, (2005). *Handbook of Human Factors and Ergonomics Methods*, CRC Press LLC.

Manufacturing System

ENIE802216
3 Credits
Learning Objective(s):

Students are expected to evaluate manufacturing systems based material flow, storage level, capacity, and process duration. The scope of discussion includes analysis of manufacturing operations from the input, process, and output side. In addition, this lecture will also discuss how to build discrete models of existing systems.

Topic:

Types of manufacturing systems, lean manufacturing, capacity planning, schedulling, sales and operation planning, plant layout.

Prerequisite(s): -

Textbooks:
1. Hopp, W. J., & Spearman, M. L. (2011). Factory physics. Waveland Press.
2. Jacobs, F. R., Chase, R. B., & Aquilano, N. (200). Operations management for competitive advantage. Boston: Mc-Graw Hill.

Inventory System

ENIE802217
3 Credits
Learning Objective(s):

Students are expected to demonstrate the analytical skills required to understand the knowledge and principles of inventory management and warehousing. This course emphasizes the importance of the role and functionality of inventory and warehousing operations in logistics and supply chain management.

Topic:

Introduction to Inventory and Warehousing Management, Materials Handling, Inventory Manage-

ment, Warehousing Operations and Management, Deterministic Models – Economic Lot Scheduling Problems, Discrete-Time-Markov-Chain, Poisson Process, Continuous-Time Markov Chain, Markov Decision Process, Single and Multi-Echelon Inventory Systems, Game Theory & Decentralized Supply Chains, Socially Responsible Supply Chains, Healthcare Operations, Big Data and Supply Management, Sustainability and Social Networks.

Prerequisite(s): -

Textbooks:

a. Axsäter, S. (2015). Inventory control (Vol. 225). Springer.
b. Coyle, J.J., Jr. Langley, C.J., Novack, R.A, & Gibson, B.J. 2013). Managing Supply Chains: A Logistics Approach. (9th ed.). McGraw-Hill.

Logistics System

ENIE803218
3 Credits
Learning Objective(s):

Students are expected to design an effective and efficient logistics system of material flow side, storage level, and lead time. A system capable of delivering goods from the provider to the consumers, the right time, and the quality of excellence. The scope of the discussion includes analysis of the material flow of providers, manufacturers, distributors, retailers, and consumers.

Topic:

Introduction to the concept of logistics systems, urban and inter-island logistics, logistics systems and value-added processes, elements and problems in logistics systems, logistics Systems, the Internet and Industry 4.0, logistics systems modeling.

Prerequisite(s): -

Textbooks:

a. Simchi-Levi, D., Kaminsky, P., Simchi-Levi, E., & Shankar, R. (2008). Designing and managing the supply chain: concepts, strategies and case studies. Tata McGraw-Hill Education.
b. Bowersox, D., Closs, D., & Cooper M. D., (2012). Supply Chain Logistics Management (4th Edition). McGraw-Hill.
c. Goetschalckx, M. (2011). Supply chain engineering (Vol. 161). Springer Science & Business Media.

Industrial Project Development

ENIE802324
3 Credits
Learning Objective(s):

Students are expected to make research and analysis planning on the development of industrial projects, taking into account the location, consideration of the various risks that will arise, and other factors so that mistakes on project development are minimal.

Topic:

Definition of project management, project success, project manager functions, work relationships on organizations, conventional organizations, matrix organizations, time management, performance measurement, compensation, project scheduling, project specifications , Gantt Chart, project reports, budget, earned value measurement system, plan costs, actual cost, trade-off analysis; trade-off contracts, risk identification, risk monitor, risk control, industrial development: facts and direction of policy-making.

Prerequisite(s): -

Textbooks:

a. Kerzner, H. (2017). Project management: a systems approach to planning, scheduling, and controlling. John Wiley & Sons.
b. United Nations. Commission on Sustainable Development. (2007). Industrial development for the 21st century: Sustainable development perspectives. United Nations Publications.

Industrial Strategic Management

ENIE802325
3 Credits
Learning Objective(s):

Students are expected to evaluate vision, and organizational mission, discuss principles, techniques and models of organizational and environmental analysis and discuss the theory and practice of strategy formulation and implementation of corporate governance and business ethics in developing effective strategic leadership.

Topic:

What is Strategic Management, Mission, Goals and Objectives, Analyzing the External Environment of the Firm, Analyzing the Internal Environment of the Firm, Recognizing a Firm's Intellectual Assets, Business Level Strategy, Corporate Level Strategy, International Strategy, Strategic Control and Corporate Governance.

Prerequisite(s): -

Textbooks:

1. Porter, M. E. (1996). What is strategy?. Harvard business review, 74(6), 61-78
2. Collins, J., & Porter, M. E. (2010). Strategy and competitive Advantage. Montanna. Edu, 102-124

3. David, F. R., & David, F. R. (2013). Strategic management: Concepts and cases: A competitive advantage approach.Pearson.
4. Charles, et.al. 2012
5. Dobbs, et.al. 2014
6. Wu, et.al. 2012
7. Yunna, et.al. 2014
8. Cassidy, et.al. 2013

Strategic Sourcing Management

ENIE803326
3 Credits
Learning Objective(s):

Students are expected to explore strategic sourcing management and promote the understanding of strategic role management in supply chain operations, demand for value creation. Procurement and inventory management plays an important role in the company's ability to operate efficiently and competitively within a contemporary global business environment.

Topic:

Introduction to Strategic Sourcing and Supply Management, The Purchasing Process, The P2P Process, Purchasing Organization, and Commodity Strategy Development, Vendor Relationship Management, Supplier Evaluation and Selection and the Analytic Hierarchy Process, Supplier Performance Management, Quality Management, and Supply Base Integration, Global Sourcing and Outsourcing, Electronic Procurement and Strategic Cost Management, Negotiations, Law, and Contract Management, Ethics and Green Procurement

Prerequisite(s): -

Textbooks:

1. Sollish, F., & Semanik, J. (2011). Strategic global sourcing best practices. John Wiley & Sons.

Multivariate Analysis

ENIE802432
3 Credits
Learning Objective(s):

Students are expected to design research models, analyze data and interpret the research results done using the right multivariate method based on data set characteristics

Topics:

Introduction to Multivariate methods, data characteristics, exploratory factor analysis, multiple regression analysis, double discriminant analysis, logistic regression, conjoint analysis, cluster analysis, multidimensional scaling, correspondence analysis, structural equation modeling, confirmatory factor analysis, structured equation model testing, multiple variant analysis.

Pre-requisite(s): -

Text Book(s):

1. Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2013). Multivariate data analysis: Pearson new international edition. Pearson Higher Ed.

Quality and Reliability

ENIE802433
3 Credits
Learning Objective(s):

Students are expected to design the size of quality and reliability of products or services, evaluating the existing parameters, maintain or improve the value of quality and reliability of products or services and consider the cost and profitability of the application of existing models and methods.

Topics:

Introduction to Quality and Reliability, mathematics for quality and reliability, quality recognition, quality analysis methods, quality management and financing, the introduction of reliability, static reliability evaluation model, dynamic reliability evaluation model, reliability evaluation method, reliability testing, reliability and financing management.

Pre-requisite(s): -

Text Book(s):

1. Dhillon, B. S. (2006). Maintainability, maintenance, and reliability for engineers. CRC press.

Data Mining

ENIE605046
3 Credits
Learning Objective(s):

Students are expected to excute data extract and pattern analysis from large amounts of data.

Syllabus:

Introduction to Data Mining, data preprocessing, exploratory data analysis, dimensioning methods, statistical analysis, data model preparation, classification, clustering, association rules

Pre-requisite(s): -

Text Book(s):

1. Introduction to Data Mining (Second version 2018), P.-N. Tan, M. Steinbach, and V. Kumar, AddisonWesley, 2018.
2. Data Mining: Practical Machine Learning. Tools and Techniques, Second Edition. Ian H. Witten and Eibe Frank

Decision and Risk in Systems Engineering

ENIE802540
3 Credits
Learning objective(s):

Students are expected to explore the process of systems engineering in helping decision-making process with its uncertainties and risks.

Syllabus:

Decision Making Process, Introduction to Risk Process, Risk Management Basic Concepts and Steps, Step 1 : Establishing the Context and Criteria of Assessment, Step 2 : Identify Risk (Risk Identification), Step 3: Analyze Risk, Risk Analysis Tools (Quantitative Risk), Step 4: Evaluating Risk, Step 5: Treating Risk, MCDM, Introduction to AHP, Game Theory 1, Game Theory 2.

Prerequisite(s): -

Text books:
1. Figuera, J., Greco, S., Ehrgott, M. (2005). Multi Criteria Decision Analysis: State of the Art Surveys. Kluwer Academic Publishers.
2. Ragsdale, C. (2004). Spreadsheet Modeling & Decision Analysis. SouthWestern Colege Publisher.

System Engineering and Analysis

ENIE802541
3 Credits
Learning Objective(s):

Students are expected to understands the concepts, methods and tools of analyst-based systems that have a comprehensive, connectivity and contextual feature in the face of systematic and complex problems that can formulate better decisions and policies.

Topic:

System engineering in the world of complex systems, common analytical principles and system analysis, Introduction to Performance Management History and Concepts, various analyses conducted in system engineering, requirements analysis, strategy analysis, operational analysis, business process analysis, operational analysis tools, financial analysis, risk analysis, scenario analysis, Business Case.

Pre-requisite(s): -

Text Book(s):
1. Cadle, J., Paul, D., & Turner, P. (2014). Business analysis techniques. Chartered Institute for IT.
2. Blanchard, B. S., & Fabrycky, W. J. (2010). Systems engineering and analysis. Prentice Hall International Series in Industrial & Systems Engineering.
3. Haskins, C., Forsberg, K., & Krueger, M. (2011). Systems Engineering Handbook: A Guide for System Life Cycle Processes and Activities. International Council on Systems Engineering (INCOSE). INCOSE-TP-2003-002-03.2. 2.

System Performance Modelling

ENIE803542
3 Credits
Learning Objective(s):

Students are expected to conduct specifications, predictions and performance evaluation of systems designed through various approaches to system modeling.

Topics:

The concept and role of modeling and simulation in system engineering, financial modelling, business process modeling, discrete modeling with Promodel, scenario development.

Pre-requisite(s): -

Text Book(s):
1. Haskins, C., Forsberg, K., & Krueger, M. (2011). Systems Engineering Handbook: A Guide for System Life Cycle Processes and Activities. International Council on Systems Engineering (INCOSE). INCOSE-TP-2003-002-03.2. 2.
2. Kossiakoff, A., Sweet, W. N., Seymour, S. J., & Biemer, S. M. (2011). Systems engineering principles and practice. John Wiley & Sons.
3. ISO/IEC 15288 Standard for Systems Engineering. International Organization Standard (ISO).

Special Courses

Thesis

ENIE800009
8 Credits
Learning objective(s):

Students are expected to solve complex industrial engineering problems through thesis study.

Prerequisite(s): -

Text books:
a. Pedoman Teknis Penulisan Tugas Akhir Mahasiswa Universitas Indonesia. IEEE Citation Reference.
b. Ivan Stojmenovic, "How To Write Research Articles in Computing and Engineering Disciplines," IEEE Transactions on Non Reguler And Distributed Systems, Vol. 21, No. 2, February 2010.

Scientific Publication

ENIE800008
3 Credits
Learning objective(s):

Students are expected to publish his / his scientific articel in national or international journal or proceeding.

Prerequisite(s): -

Text books:
1. Pedoman Teknis Penulisan Tugas Akhir Mahasiswa Universitas Indonesia. IEEE Citation Reference.
2. Ivan Stojmenovic, "How To Write Research Articles in Computing and Engineering Disciplines," IEEE Transactions on Non Reguler And Distributed Systems, Vol. 21, No. 2, February 2010.

Elective Courses

Knowledge Management

ENIE803112
2 Credits
Learning Objective(s):

Students are able to systematically evaluate the maturity level of a company in managing its knowledge assets and then be able to provide comprehensive improvement advice to allow such knowledge assets to be used to reinforce the company's strategic objectives.

Syllabus:

Knowledge management, Life cycles for knowledge management systems, Knowledge engineering, Knowledge acquisition, Knowledge modelling, Knowledge technology (Decision support systems, Meta-interpreters, Enterprise resource planning systems, Business Intelligence), Knowledge transfer and sharing, Knowledge intensive organizations and innovations

Pre-requisite(s): -

Textbook(s):
1. Amrit Tiwana, The Knowledge Management Toolkit: Practical Techniques for Building A Knowledge Management System, Prentice-Hall, New Jersey, 2000.
2. M.Rao, Knowledge Management Tools and Techniques: Practitioners and Experts Evaluate KM Solutions. Elsevier Inc. Oxford – UK. 2005.
3. Murray Jennex, Case Studies in Knowledge Management, Idea Group Publishing, 2005.
4. Handsout Perkuliahan Manajemen Pengetahuan
5. Ikujiro Nonaka and Hirotaka Takeuchi, The Knowledge Creating Company: How Japanese Companies Create the Dynamics of Innovation, Oxford University Press, New York, 1995.
6. Heidi Collins, Enterprise Knowledge Portals, AMACOM, New York, 2003.
7. Bryan Bergeron, Essentials of Knowledge Management, John Wiley & Sons, Inc. New Jersey 2003.

Cognitive Ergonomics

ENIE803112
3 Credits
Learning Objective(s):

Students are able to provide knowledge and expertise to analyze, design, and apply the work system and products in accordance with human cognitive abilities.

Syllabus:

Mental workload, decision-making, skilled performance, human-computer interaction, human reliability, work stress, eye tracking, EEG, human-system design

Pre-requisite(s): -

Text book(s):
1. Salvendy, G., & Karwowski, W. (2016). Advances in cognitive ergonomics. CRC Press.
2. Stanton, N. A., Hedge, A., Brookhuis, K., Salas, E., & Hendrick, H. W. (Eds.). (2004). Handbook of human factors and ergonomics methods. CRC press.

Technopreneurship

ENIE803113
3 Credits
Learning Objective(s):

Students are able to explain the steps in starting a digital start up and designing the business model canvas

Syllabus:

Introduction to technology entrepreneurship, business model canvas, case study, pitching, venture capital, failure of digital start up

Pre-requisite(s): -

Text book(s):
1. Mankani, D., 2003. Technopreneurship: The Successful entrepreneur in The new economy. Pearson/Prentice Hall.

Human Performance Engineering

ENIE803114
3 Credits
Learning Objective(s):

Students are able to understand the human performance engineering and capable of measuring, evaluating, and analyzing performance and behaviour in various applied fields and in relation to technological and engineering developments.

Syllabus:

An Introduction to Human Performance engineering, methods and tools used in human performance engineering, Human performance engineering in product usability and design.

Pre-requisite(s): -

Text book(s):
1. Bailey, R.W. Human Performance Engineering, Prentice Hall, 1982.
2. Jurnal dan artikel terkait HPE.

Industrial Technology Management

ENIE803115
3 Credits
Learning Objective(s): :

Students are able to propose appropriate management patterns for technological developments and choose technologies that can support business models and corporate strategic plans.

Syllabus:

Technology Acquisition, Technology Forecasting, Technology Strategy and Competitiveness, Technology Adoption, Selection and Implementation in Technology Management.

Pre-requisite(s): -

Textbook(s):
1. Khalil, T.M. and Shankar, R., 2000. Management of technology: The key to competitiveness and wealth creation (pp. 7-11). Boston: McGraw-Hill.
2. Drucker, P.F., 2011. Technology, management, and society. Harvard Business Press.

Total Quality Management

ENIE803219
3 Credits
Learning Objective(s):

Understand the management of total quality management from the perspective of industrial engineering that emphasizes the design, improvement and installation aspects of the organizational system.

Syllabus:

Statistical Process Control, Total Quality Management, TQM Pillars, History of TQM, Six Sigma: Define, Measure, Analyze, Improve, Control.

Pre-requisite(s): -

Text Book(s):
1. Rao, et al, "Total Quality Management: Cross Functional Perspective", 1996.

Lean Manufacturing

ENIE803220
3 Credits
Learning Objective(s):

Students can understand the concept of an effective manufacturing process based on Toyota Production Systems

Syllabus:

History and concept of lean manufacturing, strategies and steps of deploying lean Manufacturing, Toyota Production System

Pre-requisite(s): -

Text Book(s):
1. Wilson, L. (2009). How to Implement Lean Manufacturing, McGrawHill.
2. George L.M. (2004). Lean Six Sigma Pocket Toolbook: A Quick reference Guide to Nearly 100 Tools for Improving Process Quality, Sppeed, and Complexity, McGrawHill

Industrial Organization

ENIE803221
3 Credits
Learning Objective(s):

Student are expected to design the structure of a team-based organization with a division of roles and work descriptions that design is then used in a research project.

Syllabus:

Introduction to organization and industrial psychology, understanding and insight into industrial and organizational psychology, employment selection and placement, training and development of manpower, occupational conditions and psychological psychology, corporate leadership, organizational and working groups, organizational development and culture, work motivation, job satisfaction, stress and occupational safety, consumer psychology.

Pre-requisite(s): -

Text Book(s):
1. Robbins, S. P. (2017). Organizational behavior, 17th Edition. Pearson Education.
2. Griffin, R.W. and Moorhead, G., 2011. Organizational behavior. Nelson Education.

Maritime Logistics

ENIE803222
3 Credits
Learning Objective(s):

Students are able to design, analyze, and improve the performance of the maritime logistics system in general, and container terminals as well as scheduled cruise (liner) in particular.

Syllabus:

Maritime Economy, containerization, scheduled sailing, Berth Allocation problem, Quay Crane allocation problem, Stacking problem, Stowage Planning, Integration phase, Intramodality, Synchomodality, LPG supply chain, Fuel supply chain, Integration phase.

Pre-requisite(s): -

Text Book(s):

1. Notteboom, T. E., Pallis, A. a., De Langen, P. W., & Papachristou, A. (2013). Advances in port studies: the contribution of 40 years Maritime Policy & Management. Maritime Policy & Management, 40(7). https://doi.org/10.1080/03088839.2013.851455
2. Levinson, M. (2006). The Box: How the Shipping Container Made the World Smaller and the World EconomyBigger. Princeton: Princeton University Press.
3. Song, D. W., & Panayides, P. M. (2015). Maritime Logistics: a Guide to Contemporary Shipping and Port Management.
4. Mangan, J., Lalwani, C., Butcher, T., & Javadpour, R. (2012). Global Logistics and Supply Chain Management (2nd ed.). Chihester: John Wiley & Sons, Ltd.
5. International Chamber of Commerce. (2020). Incoterms 2020: ICC Rules for the Domestic and International Trade Terms. Paris.
6. Rodrigue, J.-P., Comtois, C., & Slack, B. (2013). The Geography of Transport Systems (Third Edit). London: Routledge. https://doi.org/10.1080/10630732.2011.603579
7. Kap, H. K., & Gunther, H.-O. (Eds.). (2007). Container Terminals and Cargo Systems: Design, Operations Management, and Logistics Control Issues. Berlin: Springer Berlin Heidelberg.
8. Meisel, F. (2009). Seaside Operations Planning in Container Terminals. https://doi.org/10.1007/978-3-7908-2191-8 9. Lee, S. W., Song, D. W., & Ducruet, C. (2008). A tale of Asia's world ports: The spatial evolution in global hub port cities.Geoforum, 39(1), 372–385. https://doi.org/10.1016/j.geoforum.2007.07.010
9. Mulder, J., & Dekker, R. (2014). Methods for strategic liner shipping network design. European Journal of Operational Research, 235(2), 367–377. https://doi.org/10.1016/j.ejor.2013.09.041
10. Stopford, M. (2009). Maritime Economics (3rd Edition). London: Routledge.
11. Grammenos, C. (Ed.). (2010). The Handbook of Maritime Economics and Business (2nd Editio). London: Lloyd's List.
12. The Danish Shipowners' Association. (2010). The Economic Significance of Maritime Clusters: Lessons Learned from European Empirical Research.
13. Zhou, Q., & Yuen, K. F. (2021). Low-sulfur fuel consumption: Marine policy implications based on game theory. Marine Policy, 124(November 2020), 104304. https://doi.org/10.1016/j.marpol.2020.104304

Transportation Systems

ENIE803223
3 Credits
Learning Objective(s):

Students are expected to understand the basics of transportation system (both goods and people) and role in supporting effective and efficient production system.

Syllabus:

Introduction of basic elements of transportation systems, problems and economic aspects of transportation systems, transportation system planning, transportation models, multimodal transportation, transportation and environment, and technological developments in the field of transportation.

Pre-requisite(s): -

Text Book(s):

a. Rodrigue, J-P. (2017). The geography of transport systems. Fourth Edition. New York: Routledge
b. Black, J. (1981). Urban transport planning: theory and practice. London: The Johns Hopkins University Press
c. Hay, W. W. (1987). An introduction to transportation engineering. Krieger Pub Co.
d. Morlok, E.K., (1978). Introduction to transportation engineering and planning. Mc Graw Hill, Inc.

Engineering Management in The Value of Materials

ENIE803327
3 Credits
Learning Objective(s):

students are able to master knowledge and possess expertise in the form of understanding the meaning of engineering management, material value and engineering management in the creation of value, a paradigm that becomes the foundation of the concept and the ability to choose the right approach, process and/or treatment of materials, and able to apply engineering principles that contribute to the improvement and

Syllabus:

Engineering management, Engineering Design, material value, Engineering Management in material

value Creation, material value upgrading, materials value conservation, design for material value upgrading, material value conservation, Design for materials value upgrading, design for material value conservation

Pre-requisite(s): -

Text Book(s):

1. Wodecki, A. (2019). Artificial intelligence in value creation: Improving competitive advantage. Springer.
2. Cinquini, L., Di Minin, A., & Varaldo, R. (Eds.). (2013). New business models and value creation: A service science perspective. Milan: Springer.
3. Manu, A. (2016). Value creation and the internet of things: How the behavior economy will shape the 4th industrial revolution. Routledge.
4. Morse, L. C., Babcock, D. L., & Murthy, M. (2014). Managing engineering and technology. Pearson.

Industrial Economics

ENIE803328
3 Credits
Learning Objective(s):

After attending this lecture participants can learn about the economic provision, i.e. business ventures that apply as sellers (providers of goods and services), variables in the industrial market, covering the market of goods and services, the money market and the labor market; as well as a variety of fiscal policies, monetary and payment balances that can affect and control certain variables, such as income, interest rates and prices, so as to understand the real role of an industrial business the

Syllabus:

Introduction: Modeling in industrial economics, consumer behaviour and demand function, technology concept and production function, company cost function and supply function, balance in competitive market

Pre-requisite(s): -

Text Book(s):

1. Chacholiades, Miltiades. 1978. International Trade And Policy. New York: McGraw-Hill
2. Gould, JP. and CE. Ferguson. 1980. Microeconomic Theory. Homewood: Richard D. Irwin
3. Griffin, Ricky W. and Ronald J. Ebert. 2004. Business. Upper Saddle River: Pearson-Prentice Hall
4. Martin, Stephen. 1988. Industrial Economics: Economic Analysis and Public Policy. Englewood Cliffs: Prentice Hall

Supply Chain Management

ENIE803329
3 Credits
Learning Objective(s):

Students are able to determine effective and efficient supply chain system design solution based on product, market and customer characteristics.

Syllabus:

Inventory Management and Risk pooling, network Planning, supply contracts, information role in supply chain, supply chain integration, distribution strategy, strategic alliances, outsourcing strategy.

Prerequisite:-

Text Book(s):

1. Simchi-Levi, D., Kaminsky, P., Simchi-Levi, E., & Shankar, R. (2008). Designing and managing the supply chain: concepts, strategies and case studies. Tata McGraw-Hill Education.
2. Chopra, S., & Meindl, P. (2007). Supply chain management. Strategy, planning & operation. In Das summa sumum des management (pp. 265-275). Gabler.

Maintenance Management

ENIE803330
3 Credits
Learning Objective(s):

Students are able to design scheduling of maintenance based on Preventive Maintenance concept.

Syllabus:

System theory, project PMDA organization, project resources, staff organization and project team, time Management, Critical Path Method, PERT, project charts, cost control.

Pre-requisite(s): -

Text Book(s):

1. Mann, Jr.,L. (1978). Maintenance Management. Lexington Books
2. Nakajima, Seiichi. (1988). Introduction to Total Productive Maintenance.
3. Levitt, J. (2003). Complete guide to preventive and predictive maintenance. Industrial Press Inc.

Enterprise Information Systems

ENIE803331
3 Credits
Learning Objective(s):

Students are able to make early planning an information system by paying attention to the flow of existing information to achieve a competitive company. The initial information system is created through a database management that will generate important information and analysis that will support the decision making to be taken.

Syllabus:

Introduction to management information systems. MIS/IT as competitive advantage. IT and Electronic Commerce. Database and database management. System Analysis and Design. MIS and its relationship with RQM and QS. CBIS. Accounting Information System. Decision Support System. Executive Information System. Marketing, Manufacturing Information System. Financial, Human Resource Information System.

Pre-requisite(s): -

Text Book(s):

1. Dym, C., & Little, P. (2005). Engineering design: A material and processing approach.
2. Heller, E. D. (1971). Value management: value engineering and cost reduction. Addison-Wesley Publishing Company.
3. Cross, N., (1994). Engineering Design Methods : Strategies for Product Design, John Wiley & Son, New York

Decisions, Uncertainties and Risk

ENIE803435
3 Credits
Learning Objective(s):

Students are able to analyse risk and uncertainty based on statistical tools in good & correct for decision making

Syllabus:

Concept and decision making process, Theory of uncertainty, risk analysis

Pre-requisite(s): -

Text Book(s):

1. Parmigiani, G. (2009). Decision Theory: Principles and Approaches , John Wiley.

Costumer Relationship Management

ENIE803436
3 Credits
Learning Objective(s):

Students understand the role and function of relationship management with customers in improving the competitiveness of the Company (the organization)

Syllabus:

The concept and implementation steps OF CRM in the organization, CRM process management, measuring the success of CRM, Best Practices implementation OF CRM.

Pre-requisite(s): -

Text Book(s):

1. Peppers, D. (2011). Managing Customer Relationship: A Strategic Framework, John Wiley& Sons.

Advanced Optimization

ENIE803437
3 Credits
Learning Objective(s):

Students can design and implement a variety of heuristic and metaheuristic optimization algorithms to resolve issues in the field of industrial engineering.

Syllabus:

Introduction to optimization, theory of complexity, heuristic fundamentals, Hill Climbing algorithm, Greedy algorithm, Simulated Annealing, Taboo Search, Genetic algorithm, technique dealing constraints, multi-purpose metaheuristic

Pre-requisite(s): -

Text Book(s):

1. How to Solve It: Modern Heuristics, Zbigniew Michalewicz, David B. Fogel. Springer, 2004
2. Essentials of Metaheuristics, Sean Luke, 2009, Essentials of Metaheuristics, Lulu, available at http://cs.gmu.edu/sean/book/metaheuristics/
3. Computational Intelligence, an introduction, Andries P. Engelbrecht, John Wiley & Sons, England: 2007.

Prognostic and Machinery Health Management

ENIE803438
3 Credits
Learning Objective(s):

Students are able to analyze failures in the machining system using predictive analysis approaches and propose appropriate management concept to stop such failures before they occur.

Syllabus:

Thermal Power generation, condition-based maintenance, machine learning methods for Fault detection and Diagnosis, methods for handling unbalanced Data, lesson-based machine learning methods ANN and SVM

Pre-requisite(s): -

Text Book(s):

1. Yan, J., 2014. Machinery prognostics and prognosis oriented maintenance management. John Wiley & Sons.
2. Levitt, J., 2003. Complete guide to preventive and predictive maintenance. Industrial Press Inc..

Service Engineering

ENIE803439
3 Credits
Learning Objective(s):

Students are able to understand the specificity of the service sector in terms of initial design, management, measurement methods of quality of performance workers, and methods of measuring customer satisfaction, starting from service encounter, to the needs of managers in the service sector to combine marketing, technology, workers and information to be competitive.

Syllabus:

Introduction to service engineering, new services development, technology on services, establishment of service companies, operations management services, quality services, capacity planning and Model queuing, forecasting demand on services, inventory management services.

Pre-requisite(s): -

Text Book(s):

1. Fitzsimmons, J. A., & Fitzsimmons, M. J. (1994). Service management for competitive advantage. New York, NY: McGraw-Hill.

Systems Engineering Management

ENIE803543
3 Credits
Learning Objective(s):

Students can understand basic systems engineering management in the industry so as to manage a process design, installation, management and termination of a complex system

Syllabus:

Industrial System Engineering concepts and methodologies. System lifecycle: concept, development, production, utilization and support, as well as the end of the system. Vee-Model. Processes in the system lifecycle: technical process, project process, organizational process and the acquisition process of goods or services. Total System Value and Life Cycle Costing.

Prerequisite(s): -

Textbook(s):

1. Eisner Howard, Essentials of Project and Systems Engineering Management, 3rd Edition, John Wiley & Sons. New Jersey. 2008
2. INCOSE Systems Engineering Handbook: A Guide for System Life Cycle Processes and Activities, 4th Edition. 2015
3. Chang, CM. Service Systems Management and Engineering: Creating Strategic Differentation and Operational Excellence, John Wiley & Sons. New Jersey. 2010

Support and Logistics for System Engineering

ENIE803544
3 Credits
Learning Objective(s):

Students understand the tools and methods of conducting planning and management of resource and logistics support in the process of engineering the system.

Syllabus:

Outsourcing Principles and Methods, Acquisition and Supply, Logistics Planning, Principles of Supply Chain Management System, Scheduling and Sourcing

Pre-requisite(s): -

Text Book(s):

1. Business Analysis, 2nd Edition, James Cadle, Debra Paul, Paul Turner, British Informatics Society Limited (BISL), Swindon, UK, 2010.
2. Business Analysis Techniques: 72 Essential Tools for Success, James Cadle, Debra Paul, Paul Turner, British Informatics Society Limited (BISL), Swindon, UK, 2010.
3. Systems Engineering and Analysis (5th Edition). Prentice Hall International Series in Industrial & Systems Engineering. 2010. Benjamin S. Blanchard dan Wolter J. Fabrycky. Upper Saddle River, New Jersey.
4. Cecilia Haskins, CSEP, Kevin Forsberg, CSEP and Michael Krueger, CSEP. SYSTEMS ENGINEERING HANDBOOK: A GUIDE FOR SYSTEM LIFE CYCLE PROCESSES AND ACTIVITIES, version 3.1, 2007

Technology Policy Modelling Using System Dynamics

ENIE803545
3 Credits
Learning Objective(s):

Students understand concepts, methods and tools of dynamic system modeling to specify, predict and evaluate the impact of a policy so that they can formulate better policy decisions.

Syllabus:

Introduction to technology policies and policies, technological aspects in policy, introduction to Dynamic systems, basic models of dynamic system-based policy analysis, case studies modeling policy,

Pre-requisite(s): -

Text Book(s):

1. Public Policy Analysis : New Developments. Warren E. Walker, Wil A. H. Thissen . Springer. 2014.

2. Thinking in Systems: A Primer. Donella H. Meadows and Diana Wright. Chelsea Green Publishing. 2008
3. Powersim Studio 2003 Reference Guide. Powersim SA. 2003

Decision and Policy Models

ENIE803546
3 Credits
Learning Objective(s):

Students can understand the concept, method and approach of a game-based model theory in the face of complex problems that can formulate appropriate decisions and policies.

Syllabus:

A Strategic Form of play, Nash equilibrium, Continuous and Discontious games, evaluation and learning in the game, games with perfectly NIR-perfect information, Nash collective action, recurring games, mechanism design, social options and voting theory.

Pre-requisite(s): -

Text Book(s):

1. Figuera, J., Greco, S., Ehrgott, M. (2005). Multi Criteria Decision Analysis: State of the Art Surveys. Kluwer Academic Publishers.
2. Ragsdale, C. (2004). Spreadsheet Modeling & Decision Analysis. SouthWestern Colege Publisher.

Renewable and Sustainable Energy Systems

ENIE803547
3 Credits
Learning Objective(s):

tudents can understand the concepts, methods and foundations of the design of renewable and sustainable energy systems.

Syllabus:

Introduction to Sustainable Energy, Carrying Capacity and Exponential Growth, Key Sustainability Considerations, Energy Efficiency and Conservation, Conventional Energy, Renewable Energy

Pre-requisite(s): -

Text Book(s):

1. Usher, B. 2019. Renewable energy: a primer for the twenty-first century. Columbia University Press: New York.
2. Smets, A., Jäger, K., Isabella, O., van Swaaij, R., Zeman, M. 2015. Solar Energy: The physics and engineering of photovoltaic conversion, technologies, and systems. UIT Cambridge, England.
3. De Bruijn & Herder, 2009, System and Actor Perspectives in Sociotechnical Systems, IEEE Transactions on Systems, Man and Cybernetics, Vol. 39.

Transition Policy

1. New curriculum 2020 will be applied effectively from Odd Semester 2020/2021. In principle, after curriculum 2020 is implemented, then only courses from this new curriculum will be opened.
2. The enforcement of the transitional period is one year. During this transition period, if a course in curriculum 2020 is in odd semester while in previous curriculum in even semester (vice versa), then this course can be held (if necessary) in both semesters.
3. For students who have not passed the compulsory courses in curriculum 2016, are required to take the same course or equivalent in curriculum 2020. Equivalence courses can be seen in the table below. All courses in the curriculum 2016 that are not listed in equivalence table have not changed, both in names and credits.
4. When there is a change in the course credits, then the number of graduation credits counted in, is the number of credits when it was taken. The same or equivalent courses when are equated with different credits, if retaken, or just taken will be acknowledged under a new name and credits. (see course equivalence table).
5. When a compulsory subject in the curriculum 2016 is deleted and there is no equivalence in the curriculum 2020, then:

a. For students who have passed these subjects, the credits that are achieved will be counted in the calculation of graduation 44 credits.

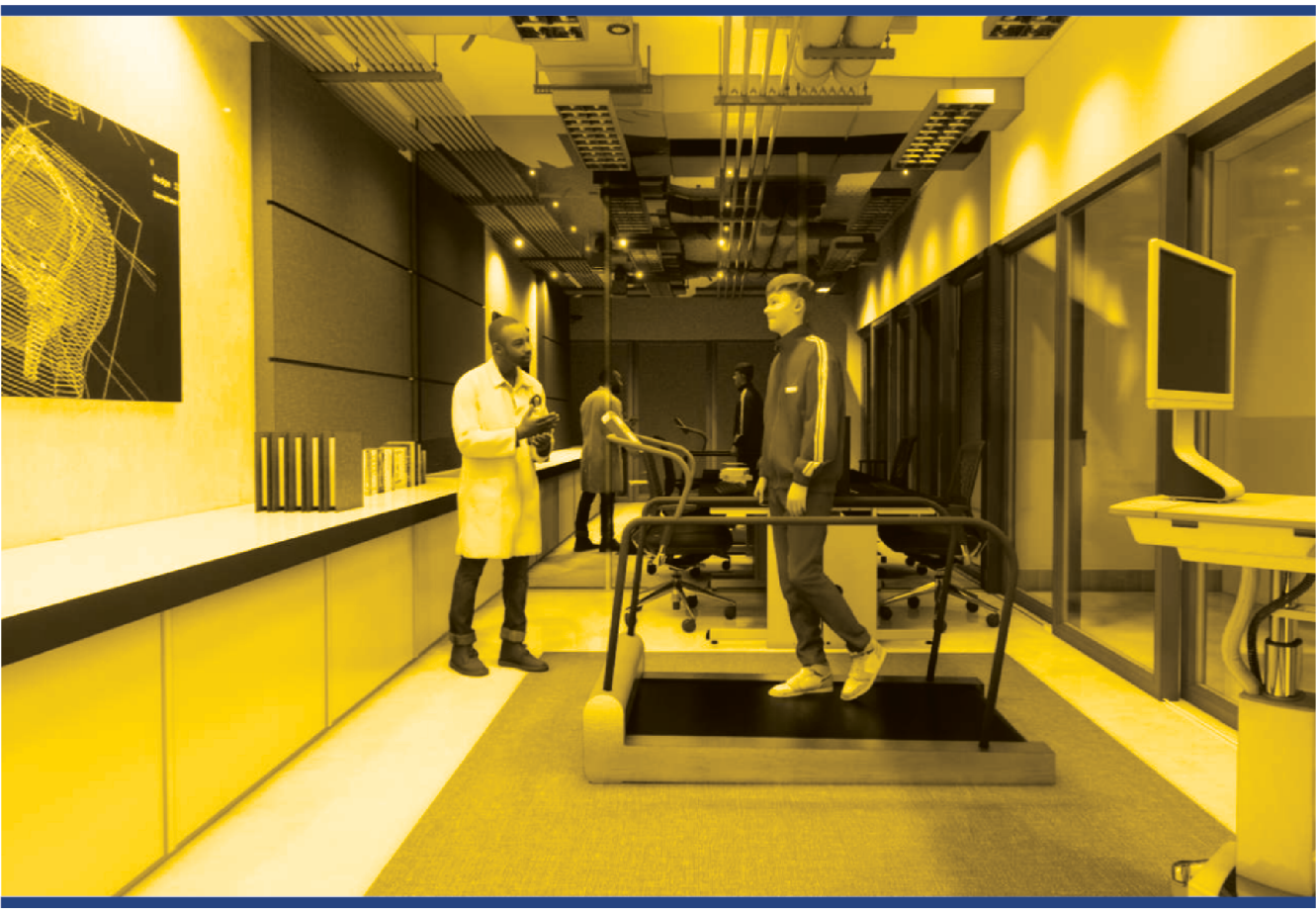
b. For students who did not pass these courses, they can take new compulsory courses or choose elective subjects in the curriculum 2020 to complete 44 credits.

Table of Course Equivalency between Curriculum 2016 and 2020

No	Course Name in 2016 Curriculum	Credits 2016	Course Name in 2020 Curriculum	Credits 2020
1	Research Methodology	3	Research Methodology	2

CHAPTER 6

DOCTORAL PROGRAM



Doctoral Program

FTUI holds Doctoral Program for the seven 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 Specifications

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 Architecture Doctoral Program in Chemical Engineering 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: 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 A from BAN-PT Industrial Engineering Doctoral Program: Accreditation A from BAN-PT	
7.	**Language(s) of Instruction**	Bahasa 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**	Programmed for 3 years	
	Type of Semester	Number of Semester	Number of weeks / semester
	Regular	6	14-17
	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 fields of specialization: • 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 several research focus areas: 1. Manufacturing Systems Engineering • Industrial Policy and Analysis • Value Chain and Logistics • Quality and Reliability • Product/Process Design and Innovation 2. Service Systems Engineering • Product - Service - System • Service Design • Service Quality & Improvement • Decisions, Uncertainty & Risk 3. Optimization and Data Analytics • Operations Research • Data analytics and Forecasting • Real-time optimization
11..	**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.

12..	**Graduates Competencies:** 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.
13.	**Course Composition (Course & Research)**

No.	Classification	Credit Hours (SKS)	Percentage
i	Course Component	16	32%
ii	Research Component	34	68%
	Total	50	100%

14. Classification of Subjects. (Research)

No.	Classification	Credit Hours (SKS)	Percentage
i	Course Component	0	0 %
ii	Research Component	50	100 %
	Total	50	100%
	Total Credit Hours to Graduate	50 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, ENIE for Industrial Engineering

The FTUI Doctoral Program is held in two program: Course and Research and Research.

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

Code	Subject	SKS
	1st Semester	
ENGE901001	Advanced Research Method	6
ENXX900001	Special Subject I	3
	Sub Total	**9**
	2nd Semester	
ENGE902002	Qualitative & Quantitative Analysis	4
ENXX900002	Special Subject II	3
ENXX900004	Research Proposal	6
	Sub Total	**13**
	3rd Semester	
ENXX900006	Publication – International Conference	4
	Sub Total	**4**
	4th Semester	
ENXX900008	Research Result Examination	10
	Sub Total	**10**
	5th Semester	
ENXX900010	Publication International Journal	8
	Sub Total	**8**
	6th Semester	
ENXX900012	Promotion Examination	6
	Sub Total	**6**
	Total	**50**

The Lecture Component includes four subjects:

a. Advanced Research Method, 6 sks
b. Qualitative and Quantitative Analysis, 4 sks
c. Special Subject I, 3 SKS.
d. Special Subject II, 3 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

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

Code	Subject	SKS
	1st Semester	
ENXX900003	Research Group Periodic Seminar	6
	Sub Total	**6**
	2nd Semester	
ENXX900005	Research Proposal	6
	Sub Total	**6**
	3rd Semester	
ENXX900007	Publication I – International Conference	6
	Sub Total	**6**
	4th Semester	
ENXX900008	Research Result Examination	10
	Sub Total	**10**
	5th Semester	
ENXX900009	Publication II – National Journal	8
	Sub Total	**8**

	6th Semester	
ENXX900011	Publication III – International Journal	8
ENXX900012	Promotion Examination	6
	Sub Total	**14**
	Total	**50**

Description of Subjects

Advanced Research Method

ENGE901001
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:

1. Haryono Imam R dan C. Verhaak, Filsafat Ilmu Pengetahuan, Gramedia, Jakarta, 1995
2. Willie Tan, "Practical Research Methods", Prentice Hall, 2002.
3. R. Kumar, *Research Methodology, A Step-by-step Guide for Beginner*, 3rd ed., Sage Pub, 2012

Qualitative and Quantitative Analysis

ENGE902002
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:

1. Miles M & Huberman M, Qualitative Data Analysis, London Sage Publications, (1994)
2. Montgomery, D.C., & Runger, G.C, Applied Statistics and Probability for Engineers 3rd Ed., John Wiley and Sons, Inc., New York, (2003)
3. Kirkup, L, Experimental Method: An Introduction to the Analysis and Presentation, John Wiley and Sons, Australia, Ltd., Queensland, (1994)
4. Montgomery, D.C, Design and Analysis of Experiments 6th Ed., John Wiley and Sons, Inc., New York, (2005)
5. Hair, J.F., B.Black, B.Babin and R.E Anderson, Multivariate Data Analysis 6th Ed., Pearson Education Inc., New Jersey, (2006)

Special Subject 1

ENXX900001
4 SKS

Special Subject 2

ENXX900002
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:

1. 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.
2. 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.

3. 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
4. In the event where neither conditions is viable for the students, the Academic Advisor is allowed to conduct a class of said course.

Research Group Periodic Seminar
ENXX900003
6 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.

Research Proposal
ENXX900005
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.

Research Result Examination
ENXX900008
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.

Publication – International Conference
ENXX900006
4 SKS

Publication I – International Conference
ENXX900007
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.

Publication II – International Journal
ENXX900009
8 SKS

Publication III – National Journal
ENXX900011
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.

Promotion Examination

ENXX900012
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.

Secretariate
FTUI Dean's Building 2nd Floor
Depok Campus, Depok 16242
Phone: +62217863504
Fax: +6221 7270050

Public Relation Office
Faculty Administration Center Building (PAF)
Depok Campus, Depok 16242
Phone: +622178888430, Fax: +6221 78888076
Email: humas@eng.ui.ac.id/