

## COURSE STRUCTURE INTERNATIONAL UNDERGRADUATE INDUSTRIAL ENGINEERING

KODE	MATA AJARAN	SUBJECT	SKS
<b>Semester 1</b>		<b>1st Semester</b>	
UIGE600002	MPKT B	Integrated Characteristic Building Subject B	6
UIGE600003	Tulisan Akademik	Academic Writing	3
ENGE600001	Kalkulus 1	Calculus 1	3
ENIE601001	Pengantar Teknik Industri	Introduction to Industrial Engineering	2
ENIE601002	Pengantar Ilmu Ekonomi	Introduction to Economics	2
ENIE601003	Pengetahuan Bahan	Material Sciences	2
<b>Sub Total</b>			<b>18</b>
<b>Semester 2</b>		<b>2nd Semester</b>	
	Agama	Religion	2
ENGE600004	Aljabar Linear	Linear Algebra	4
ENGE600005	Fisika Mekanika dan Panas	Mechanics and Thermal Physics	3
ENGE600006	Praktikum Fisika Mekanika dan Panas	Mechanics and Thermal Physics Lab	1
UIGE600001	MPKT A	Integrated Characteristic Building Subject A	6
	Olah Raga/Seni	Sport/Art	1
	Menggambar Teknik	Engineering Drawing	2
<b>Sub Total</b>			<b>18</b>
<b>Semester 3</b>		<b>3rd Semester</b>	
ENGE600007	Fisika Listrik, Optik dan Gelombang	Optics, Electricity and Wave Physics	3
ENGE600008	Praktikum Fisika Listrik, Optik dan Gelombang	Optics, Electricity and Wave Physics Lab	1
ENIE603003	Perancangan Kerja, Metode, dan Standar Kerja	Work Design, Methods, and Standards	3
ENIE603004	Akuntansi Biaya	Cost Accounting	2
ENIE603005	Proses Produksi + Praktikum	Production Process + Lab	3
ENGE600011	Ekonomi Teknik	Engineering Economics	3
ENIE603006	Statistik Dasar	Basic Statistics	3
ENIE603007	Programa Linear	Linear Programming	3
<b>Sub Total</b>			<b>18</b>
<b>Semester 4</b>		<b>4th Semester</b>	
ENIE604008	Pengantar Mekanika dan Elektronika Pabrik	Introduction to Plant Mechanics and Electronics	2
ENIE604009	Faktor Manusia dalam Rekayasa dan Desain + Praktikum	Human Factor in Engineering & Design + Lab	3
ENIE604010	Sistem Pemeliharaan	Maintenance Systems	2
ENIE604011	Statistik Industri + Praktikum	Industrial Statistics + Lab	3
ENIE604012	Perancangan Produksi dan Pengendalian Persediaan + Praktikum	Production Planning and Inventory Control + Lab	3
ENIE604013	Organisasi & Psikologi Industri	Organization & Industrial Psychology	3
ENIE604014	Penelitian Operasi	Operation Research	3
ENIE604015	Praktikum Komputasi	Computation Lab	1
<b>Sub Total</b>			<b>20</b>
<b>Semester 5</b>		<b>5th Semester</b>	
ENIE605016	Perancangan Tata Letak Pabrik	Plant Layout Design	3
ENIE605017	Perancangan Produk + Praktikum	Product Design + Lab	3
ENIE605018	Analisa Kelayakan Industri	Industrial Feasibility Analysis	3
ENIE605019	Sistem Kualitas	Quality Systems	3
ENIE605020	Pemodelan Sistem + Praktikum	System Modeling + Lab	3

# INTERNATIONAL UNDERGRADUATE INDUSTRIAL ENGINEERING

ENIE605021	Sistem Produksi + Praktikum	Production Systems + Lab	3
ENIE605022	Manajemen Proyek Industri	Industrial Project Management	2
		<b>Sub Total</b>	<b>20</b>
	<b>Semester 6</b>	<b>6th Semester</b>	
ENIE606023	Kesehatan, Keselamatan Kerja dan Lindung Lingkungan	Occupational, Health, Safety & Environment	2
ENIE606024	Manajemen Rantai Pasok	Supply Chain Management	3
ENIE606025	Simulasi Industri + Praktikum	Industrial Simulation + Lab	3
ENIE606026	Perancangan Teknik Industri + Praktikum	Industrial Engineering Design + Lab	3
ENIE606027	Sistem Informasi	Information System	3
ENIE606028	Pilihan 1	Elective 1	3
ENIE606029	Pilihan 2	Elective 2	3
		<b>Sub Total</b>	<b>20</b>
	<b>Semester 7</b>	<b>7th Semester</b>	
ENIE607030	Kapita Selekt Industri	Special Topics in Industrial Engineering	2
ENIE600031	Kerja Praktek	Internship	2
	Pilihan 1	Elective 1	3
	Pilihan 2	Elective 2	3
	Pilihan 3	Elective 3	3
	Pilihan 4	Elective 4	3
		<b>Sub Total</b>	<b>16</b>
	<b>Semester 8</b>	<b>8th Semester</b>	
ENIE600032	Skripsi	Final Project in Industrial Engineering	5
ENIE608033	Manajemen Teknologi	Technology Management	2
	Pilihan 5	Elective 5	3
		<b>Sub Total</b>	<b>10</b>
		<b>TOTAL</b>	<b>144</b>

No.	Mata Kuliah	SKS
1.	Data Mining	3
2.	Analisis Multivariat	3
3.	Keterampilan Interpersonal	3
4.	Rekayasa Sistem	3
5.	Analisis Daya Saing Perusahaan	3
6.	Optimasi Lanjut	3
7.	Sustainable Manufacturing and Innovation	3
8.	Product Life Cycle Management	3
9.	Makro Ergonomi	3
10.	Simulasi dan Pemodelan Digital Manusia	3
11.	Sistem Keuangan dan Investasi	3
12.	Innovation Management	3
13.	Customer Relationship Management (CRM)	3
14.	Lean Manufacturing	3
15.	Reconfigurable Manufacturing System	3
16.	Decision Uncertainties and Risk	3
17.	Algoritma dan Pemrograman	3
18.	Rekayasa Proses Bisnis	3
19.	Meotde Heuristik dalam Optimasi	3
20.	Programa Kendala	3

21.	Programa Linear dan Stokastik	3
22.	Teknik dan Aplikasi Numerik	3
23.	Teori Antrian	3
24.	Logistik Maritim	3
25.	Manajemen Energi	3
26.	Berpikir Disain	3

Electives can also be taken at the Partner University starting from 6th Semester. Detail List of Courses will be provided by the Partner Universities as soon as possible.

**Course Syllabus**

**MPKT B / INTEGRATED CHARACTER BUILDING B**

**General Instructional Objective:** Develop students participation to improve awareness of social issues, national state, and the environment that is based on faith and piety, manners, and ethics in the context of academic science and technology development.

**Learning Objectives:** Students are expected to capable of: (1) Understanding, explaining, and analyzing the philosophy and logical science, attitude, social and culture in Indonesia. (2) Understanding academic and nation values from social and cultural diversity in Indonesia. (3) Understanding the problems by applying step learning actively and using information technology (4) Using Bahasa Indonesian in discussion and academic writing as well.

**Syllabus:** Topic which appropriate with target and method learning, problem based learning (PBL), Collaborative Learning (CL) and Computer mediated learning (CML)

**Pre-requisite(s):** -

**Text Book(s):** Appropriated with topic

**ACADEMIC WRITING**

**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 article, 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))

**Pre-requisite(s):** -

**Text Book(s):** Poerwoto, C. et.al. Reading Comprehension for Engineering Students

**INTRODUCTION TO INDUSTRIAL ENGINEERING**

**Learning Objective(s):** Early understanding about the Industrial Engineering Discipline scope and contributions, which includes concepts, methods and tools and how it relates to each other in service or manufacturing industry.

**Syllabus:** History of Industrial Engineering, Scope of Industrial Engineering, Brief introduction and explanation of component system which build Industrial Engineering, Explanation of curriculum structure in Industrial Engineering, Example of contribution of Industrial Engineers in service and manufacturing industry, Development of Industrial Engineering in the future, Professionalism definition and Ethics Engineering, and Cases in Ethics and Professionalism.

**Pre-requisite(s):** -

**Text Book(s):**

1. Maynard Harold B. (ed.), Maynard's Handbook of Industrial Engineering. McGraw-Hill Professional, 2001.
2. Badiru, Adedeji B., Handbook of Industrial and System Engineering, CRC Taylor-Francis, 2006.

**INTRODUCTION TO ECONOMICS (2 SKS)**

**Learning Objective(s):** Introduce the scope of economics science and business as an integral part of human activities to survive.

**Syllabus:** Basic Concepts. Supply, Demand and Market. Workforce, Land and Assets. Trade and Tax. Economic activities and National Income. Consumption and Investment. Money, Financial Market and Moneter. Unemployment, Inflation, and Economic Policy. Growth and Development. The purpose of Business. Business Plan. Start up. Business Operations. Capital. Marketing Principles. Financial Management. Resource Management. Service, Productivity and Information.

**Pre-requisite(s):** -

**Text Book(s):**

1. Samuelson, Paul E. dan William 1. D. Nordhaus. 2005. Economics. Boston: McGraw-Hill.).
2. Griffin, Ricky W. and Ronald J. Ebert. 2002. Business. Upper Saddle River: Prentice Hall.

**INTRODUCTION TO ENGINEERING MATERIALS**

**Learning Objective(s):** 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 basic concept in materials testing.

**Syllabus :** (1) Types of engineering materials and their applications; (2) Structures of engineering materials; (3) Properties of material; (4) Manufacturing and Processing of Metallic Materials; (5) Steel and iron: production and properties; (6) Aluminium: production and properties; (7) Other non-ferrous alloys: production and properties; (8) Polymer: processing and properties; (9) Ceramic: processing and properties; (10) Composite: processing and properties

**Prerequisite :** -

**Textbooks :**

1. Bondan T. Sofyan, Pengantar Material Teknik, Penerbit Salemba Teknik, 2010
2. W.D. Callister, Materials Science and Engineering: An Introduction, 6th ed., John Wiley & Sons, 2003
3. William F. Smith, Introduction to Materials Science and Engineering

### ISLAMIC STUDY

**General instructional objectives:** The cultivation of students who have concern for social, national and country's 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 practice 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)

**Prerequisite(s):** MPKT

**Textbooks:** Adjusted to topics

### CATHOLIC STUDY

**General instructional objectives:**

1. To help deliver students as intellectual capital in implementing lifelong learning process to become scientists with mature personality who uphold humanity and life.
2. 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 these 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. **Prerequisite(s):** MPKT  
**Textbooks:** Adjusted to topics

### **CHRISTIAN STUDY**

**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.

**Prerequisite(s):** MPKT

**Textbooks:** Adjusted to topics

### **BUDHIST STUDY**

**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)

**Prerequisite(s):** MPKT

**Textbooks:** Adjusted to topics

### HINDU STUDY

**Syllabus:** Character, History (Character in 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.

**Prerequisite(s):** MPKT

**Textbooks:** Adjusted to topics

### Linear Algebra

**Learning Objectives:** Students can explain/ understand/apply linear algebra and associate this subject with some other subjects.

**Syllabus:** Introduction of elementary linear algebra, Matrix, Determinant, Vectors in  $R^2$  and  $R^3$ . Euclidean vector space, General vector space, Review of vector space, Product space, Value and diagonalization eigen vector, Linear Transformation, Application on the system of differential equation, Application on the quadratic surface, Decomposition of LU, Least Squares.

**Prerequisite:** -

**Handbook:**

1. H. Anton, Elementary Linear Algebra, 9<sup>th</sup> ed, John Wiley & Sons, 2005.
2. G. Strang, Introduction to Linear Algebra, Wellesley-Cambridge Press, 2007.

### **SPORTS / ARTS**

The Art subject discuss on how to develop the student's participation and appreciation to fully understand, develop awareness, have aesthetic concerns, have imagination, have creativity to create work of art and culture in the form of art works such as: painting, batik, photography, calligraphy, comic or in the form of performance art such as: film appreciation, Bali dance and music, Javanese music, theatre and traditional puppet performance. The Sport subject discuss the general knowledge of sport (history, rules of the games and how to lead a match) and sport skills (physical aspects of movement, technique, tactics and mentality)

### **Mechanic and Thermal Physics + Lab**

**Learning Objectives:** Students understand the concepts and basic laws of mechanic physics and applied in a systematic and scientifically problem solving that influenced by the force, both moving or not moving objects.

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

**Practical of Mechanics:** Measurement, Moment of inertia, Gravity acceleration, Fluid density, Scratch coefficient, Collision, Swing torque, Viscosity of water, Young's modulus, Viscosity of Newtonian fluid, Fluids surface tension, Oscillation, **Practical of Heat:** Coefficient of linear expansion, Heat conductivity, Thermocouple calibration, Calorimeter, Joule Constant, Laplace Constant, Heat Collector, Determining of air  $C_p/C_v$ , Expansion of fluids and water anomaly.

**Prerequisite:** -

**Handbook:**

1. Halliday.D, R Resnick, Physics I, 4th ed Wiley 1991.
2. Ganijanti AS, Mekanika, Penerbit Salemba Teknik, 2000.
3. Tipler PA, Fisika I, ed III, terjemahan Lea Prasetyo, Penerbit Erlangga, 1998.
4. Giancoli D.C, General Physics, Prentice Hall Inc, 1984.
5. Sears-Salinger, Thermodynamics, Kinetic theory and statistical thermodynamics, Wesley, 1975.
6. Giancoli, D.C, Physics: principles with applications, Prentice Hall Inc, 2000



**MPKT A / INTEGRATED CHARACTER BUILDING A**

**General Instructional Objective:** To develop student's participation in raising their awareness towards issues within the society, country, nation, and surrounding environment based on their faith, piety, manners, and academic ethics in order to develop Science and Technology.

**Learning Objectives:** Students are expected to capable of:

1. Understanding, explaining, and analyzing the philosophy and logical science, attitude, social and culture in Indonesia.
2. Understanding academic and nation values from social and cultural diversity in Indonesia.
3. Understanding the problems by applying step learning actively and using information technology.
4. Using Bahasa Indonesian in discussion and academic writing as well.

**Syllabus:** Topic which appropriate with target and method learning, problem based learning (PBL), Collaborative Learning (CL) and Computer mediated learning (CML)

**Prerequisite:** -

**Handbook:** Appropriated with topic

**Engineering Drawing**

**Learning Objective(s):** Course participants are able to transfer geometric component by drawing according to standard draw which is recognized by International Standard Organization (ISO). Students understand the theory and procedure of engineering drawing based on ISO standard. Students are able to read, interpret, and transfer 2D/3D geometric draw from component or construction. Students are able to draw the orthogonal projection based on ISO standard.

**Syllabus:** Illustration: Function and benefit of Engineering Drawing; SAP; Measurement and Evaluation; Introduction to drawing equipment; Basic definition of geometric, paper format, draw regulation, line, field, line configuration, basic geometric form; Visualization geometric: Skew projection and isometric, function and line types, configuration geometric form; Orthogonal Projection: Projection standard, viewing concept, width display principle; Advanced orthogonal projection: Circle region concept, special region concept, trimming concept, display width, refraction.

**Pre-requisite(s):** -

**Text Book(s):**

1. ISO 1101, Technical Drawings, International Organization for Standardization.
2. A.W. Boudy, Engineering Drawing , McGraw-Hill Book Company
3. Colin Simmons & Dennis Maguire, Manual of Engineering Drawing, Edward Arnold

4. Warren J. Luzadder, Fundamentals of Engineering Drawing, Prentice-Hall, Inc.
5. Giesecke-Mitchell-Spencer-Hill-Dygdon-Novak, Technical Drawing, Prentice Hall Inc.

**OPTICS, ELECTRICITY, AND WAVE PHYSICS + LAB**

**Learning Objectives:** Students understand the concept and basic law of Magnet and Electricity physics and apply it systematically and scientifically in solving everyday magnet and electricity physics problem, can understand the concepts and basic law of Optical and Wave physics and apply systematic and scientific problem solving in a natural wave phenomenon or wave that arises due to technical, physical properties of light and geometric optics.

**Syllabus:** Electric charge and Coulomb law, Electric field, Static and Gauss law, Electric potential, Capacitor, Direct electric current and basic circuit analysis, Magnetic field, Induction and electromagnetic, Faraday law and inductance, Material magnetism properties, A series of transient, Alternating current, Waves, Sounds, Polarization, Interference, Diffraction, Optical geometry, Lighting and photometry. Practical of Electricity: Electrolysis, Wheatstone bridge, Kirchhoff law, Earth's magnetic field, Temperature coefficient, Characteristic of series RLC circuit, Ohm law, Transformer. Practical of Optics: Polarimeter, Lens, Photometry, Prisms bias index, Spectrometer, Diffraction grid, Newton's ring.

**Prerequisite:** -

**Handbook:**

1. Halliday, D, R. Resnick, Physics II, 5th ed, Wiley, 2001.
2. Ganijanti AS, Gelombang dan Optik, ed III, Jurusan Fisika FMIPA UI, 1981.
3. Tipler P.A, Fisika II, ed III terjemahan Bambang Sugiyono, Penerbit Erlangga, 2001.
4. D.C.Giancoli, General Physics, Prentice Hall

**METHODS, STANDARDS AND WORK DESIGN +**

**LAB Learning Objective(s):** Course participants are able to measure, analyze, design and increase the effectiveness and efficiency of human work through methods improvements and work standards.

**Syllabus:** Introduction of Human Factors, History of Human Factors and Future Trends, Problem Solving Tools, Operation Analysis, Man Machine Chart and Flow Process Chart, Anthropometry, Time Study, Performance Rating & Allowances, Work Sampling. Standard Data, Predetermined Time Study, Wage Design, Training and Learning Curves.

**Pre-requisite(s):** Statistics and Probability

**Text Book(s):**

1. Method, Standard and Work Design, 11th edition, Benjamin Niebel & Andris Freivalds, McGraw-Hill International, 2003
2. The Ergonomics Kit for general industry, dan Macleod, Taylor & Francis, 2006
3. Motion and Time Study: Design and Measurement of Work, Barnes, Ralph M., John Wiley and Sons, 1980

#### **COST ACCOUNTING**

**Learning Objective(s):** Course participants understand accounting principles and are able to 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:** Accounting Equation. Basic Production Cost of Manufacturing. Cost of Goods Sold (COGS). Profit and Loss Statement. Balance Sheets. Penilaian Persediaan (Perusahaan Dagang). Depresiasi. Working Capital. Profit Planning and Control. Overhead Cost Allocation. Activity Based Costing. Job Order Cost Accounting. Process Cost Accounting.

**Pre-requisite(s):** Introduction to Economics

**Text Book(s):**

1. Lawrence H. Hammer, William K. Carter, Milton F Usry, Cost Accounting, ITP Co., Ohio, 2004
2. Weygrandt, Kieso, Kell, Accounting Principles, John Willey and Sons CO., Canada, 2003

#### **ENIE600005**

#### **PRODUCTION PROCESS + LAB (3 SKS)**

**Learning Objective(s):** Course participants have the knowledge about technology and process to understanding how a product is made through manufacturing processes.

**Syllabus:** Casting and Cost Analysis. Heat Forming. Cold Forming. Plastics, Ceramics and Composite Forming. Pressure forming and cost analysis. Extraction & cost analysis. Gas Flame Process and Arc Process. Resistance Welding and Other Welding Process. Joining and Fastening.

**Pre-requisite(s):** Introduction to Industrial Engineering

**Text Book(s):**

Kalpajian, Serope, Manufacturing Engineering and Technology, 3rd edition, Addison-Wesley, 1995

#### **LINEAR PROGRAMMING**

**Learning Objective(s):** Course participants are

able to implement mathematical model in developing solutions for engineering and management problems.

**Syllabus:** Linear programming model & graphical solutions, Simplex methods, Duality and sensitivity analysis, Transportation models, Assignment model, Integer Programming. Multi-Goal Mathematical Programming, Network.

**Pre-requisite(s):** -

**Text Book(s):**

1. Hamdy A. Taha, Operations Research, 7th ed., Prentice-Hall, Inc. 2006
2. Hellier, Lieberman, Introduction to Operations Research, Mc Graw Hill, 2005

**Introduction to Mechanics and Electronics Factory**

**Learning Objective(s):** Course participants understand basic concepts from engineering mechanics and also can identify various factory facility based on prime movers and electric power.

**Syllabus:** Introduction to engineering mechanics; Introduction to prime movers; Gasoline Ignition Engine; Diesel Ignition Engine; Turbine Principle; Basic definition of electric power system; Electric power system element (Transformer, Machine AC, Machine DC); PLC; Pneumatic System.

**Pre-requisite(s):** Material Sciences

**Text Book(s):**

1. Timoshenko, Strength of Material, Prentice Hall, 1976
2. Popov, Mechanics of Materials, MIR Publisher, 1979

**Human Factor in Engineering & Design + Lab**

**Learning Objective(s):** Course participants are able to analyze and design a human machine interaction and its workplace

**Syllabus:** Introduction to human factors in engineering design, Interface design, Human controls systems, Work tools and hand tools, Workplace layout and design, Applied anthropometry, Interpersonal aspects in Engineering and Design, Climate and Lights, Human Error, Overview of Occupational Health and Safety.

**Pre-requisite(s):** -

**Text Book(s):**

1. Sanders, Mark S. & Ernest J. McCormick. Human Factors in Engineering and Design. McGraw-Hill. New York. 1993
2. Chapanis, Alphonse. Human Factors in Systems Engineering. John Wiley & Sons. New York. 1996
3. Wickens, D Christopher, . An Introduction to Human Factors Engineering, 2nd Edition. Prentice-Hall. 2004

**Maintenance Systems**

**Learning Objective(s):** Course participants understand the important aspects in the maintenance system management and the type of approach that is currently used in the industry.

**Syllabus:** 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

**Pre-requisite(s):** Production Process

**Text Book(s):**

1. Lawrence Mann, Jr., Maintenance Management, Lexington Books, 1978
2. Seiichi Nakajima, Introduction to Total Productive Maintenance, 1988
3. Antony Corder, di alih bahasa oleh Ir. Kusnul Hadi, Teknik Manajemen Pemeliharaan, Erlangga, 1996.
4. Palmer, Doc Richard., Maintenance Planning and Scheduling Handbook 2nd Edition. McGraw-Hill Professional. 2004.

### **Industrial Statistics + Lab**

**Learning Objective(s):** Course participants are able to organize the collection, process, and analysis of data using statistics and engineering principles to support decision making process, within DOE - Design of Experiment.

**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.

**Pre-requisite(s):** Statistics and Probability

**Text Book(s):**

1. Design and Analysis of Experiments, Douglas C. Montgomery. John Wiley & Sons, 2000
2. Design and Analysis of Experiments, Angela Dean and Daniel Voss, Springer-Verlag, 2000
3. Experimental Design with Applications in Management, Engineering, and the Sciences, Paul D. Barger and Robert E. Maurer, Thomson Learning, 2002

### **Production Planning and Inventory Control + Lab**

**Learning Objective(s):** Course participants are able to analyze, design, implement and evaluate an integrated production planning and control system by controlling information flow, scheduling of production resources and internal processes, resulting a high quality product at the right time and the right cost.

**Syllabus:** Production planning system, Master Requirement

Planning (MRP), Material Requirement

Plan, Capacity planning, Inventory control, Lot

sizing, Production scheduling, Sequencing and

evaluation, TOC/DBR concepts, PPIC game.

**Pre-requisite(s):** -

**Text Book(s):**

1. Arnold, J.R. Tony and Chapman, Stephen N.; Prentice Hall; Introduction to Materials Management; 2004
2. Chapman, Stephen N.; The Fundamentals of Production Planning and Control; Pearson - Prentice Hall, 2006

### **Organization & Industrial Psychology**

**Learning Objective(s):** Course participants are able to analyze the influencing factors of design and organizations management in industry including human capital assets.

**Syllabus:** Organizational Design. Culture.. Strategic

Role of HRM & Effective Management of People. Ability Motivation & Opportunity. Job

Analysis & Planning & Recruitment. Testing,

Selection & Interview. Training & Development. Appraising & Managing Performance. Managing Careers & Fair Treatment. Establishing Strategic Pay Plans. Pay for Performance & Incentives. Benefits and Services. Labor Relations & Collective Bargaining. Employee Safety & Health. Linking to Organizational Outcomes. Human Resource Capital Management. Human Resource System for TQM.

**Pre-requisite(s):** -

**Text Book(s):**

1. Strategic Human Resource. Management, Mike Millmore, Philip Lewis, Prentice Hall 2007
2. Human Resource Management, Gary Dessler, Prentice Hall, 10th edition, 2007
3. Human Resource Strategy, Dreher & Dougherty, Mc Graw Hill, 2001

### **PLANT LAYOUT DESIGN**

**Learning Objective(s):** Course participants are able to design the layout of a plant based on constraint and optimum goals.

**Syllabus:** Design function, Design procedure, Process planning, Material flow planning, Analysis technique, Relationship planning between activities, Plant and production support services, Space calculations, Area allocation, Material handling equipment, Plant layout development, Plant location considerations.

**Pre-requisite(s):** -

**Text Book(s):**

1. Richard L. F., Facility Layout and Location, Prentice Hall, 1992
2. Plant Layout and Material Handling, John Wiley & Sons, 1977.
3. Meyers, E Fred, . Plant Layout and Material Handling 1st Edition. Prentice-Hall. 1993

### **PRODUCT DESIGN + LAB**

**Learning Objective(s):** Course participants are able to create new product or service concept ideas according to structural market study based on marketing mix

**Syllabus:** Idea Generation, Description of Marketing Management, Global Marketing, Consumer Behavior, Marketing Mix, Marketing System, Selling Skill, Blue Ocean Strategy, Strategic Brand Management, Market Research, Consumer Needs Identification, Product Specification Determination, Concept Design, Concept Selection and Testing, Product Architecture, Design for Manufacturing, Design for Assembly, Prototyping, Project Presentation.

**Prerequisite(s):** Human Factors in Engineering and Design

**Text books:**

1. Karl. T. Ulrich & Steven D. Epingger. Product Design Development. 3rd Edition. Mc Graw-Hill. 2004
2. Dieter. "Design Engineering", 3rd edition, Mc.Graw Hill 2000
3. James G. Bralla. Design For Excellence. McGrawHill - 1996
4. Milton D. Rosenav, Jr. et. al. The PDMA Handbook of New Product Development, John Willey & Sons. 1996
5. Hamid Noor & Russel Radford. Production & Operation Management. McGrawHill. 1995

### INDUSTRIAL FEASIBILITY ANALYSIS

**Learning Objective(s):** Course participants know the aspects used to analyze industry feasibility and able to identify and analyze investment of facility feasibility

**Syllabus:** Project feasibility study, scope function, market and marketing aspects, engineering and technology aspects, operation management aspect, environment aspect, law aspect, economics aspect, financial aspect

**Prerequisite(s):** Cost Accounting, Engineering Economics

**Text books:**

1. Clifton, Fyffe, Project Feasibility Analysis, John Wiley, 1997
2. Siswanto Sutojo, Studi Kelayakan Proyek, PPM, 1995

### QUALITY SYSTEM (3 SKS)

**Learning Objective(s):** Course participants are able to design a quality improvement system that able to do assurance and improvement of continuous product and process quality based on the fact (number) using mathematical (statistical) method with world's quality standard consideration

**Syllabus:** 3 quality basics: continuous improvement, customer focus and total participation, PDCA concept, 7 tools and 7 new tools, technique of process mapping, standard role, internal standard (SOP, WI, etc), and external standard (ISO, JIS, etc), Lean Six Sigma

**Prerequisite(s):** Statistics and Probability

**Text books:**

1. The Six Sigma Way Team Fieldbook, Peter S Pande et.al. McGraw-Hill, New York, 2002
2. QC Problem Solving Approach: Solving Workplace Problems the Japanese Way, Katsuya Hosotani, 3A Corporation, Tokyo, 1982
3. The Quality Toolbox Taguen Nancy R., ASQ Quality Press. Milwaukee. Wisconsin. 2005

**SYSTEM MODELLING + LAB**

**Learning Objective(s):** Course participants are able to design a computerized model based on discrete-event modeling from micro industrial system, simulating that model to do feasibility analysis and generating recommendation from the model (becoming discrete-event model)

**Syllabus:** Modeling concept, general method of system modeling: conceptualization, development, simulation and analysis, modeling case study, validation and verification of discrete model, user requirement method, technique of report design, and presentation of modeling result

**Prerequisite(s):** Statistics and Probability

**Text books:**

1. Mastering the Requirement Process, Suzanne Robertson & James Robertson, 2nd Edition, Addison Wesley Professional, 2006
2. Scenarios, Stories and Use Cases: Through the Systems Development Life-Cycle, Ian Alexander and Neil Maiden, John Wiley & Sons. 2004
3. Excel® Dashboards & Reports, Michael Alexander and John Walkenbach, Wiley Publishing, Inc. 2010
4. Information Dashboard Design, Stephen Few, O'Reilly, 2006.

**PRODUCTION SYSTEM + LAB**

**Learning Objective(s):** Course participants are able to analyze, design, implement and improve the performance of an operation system, especially with significant impact to the long term strategic goals of the organization to produce the right product for the customer.

**Syllabus:** Production Strategy. Product and Process Development. Location Analysis. Product and Process Layout Analysis. Capacity Analysis. Process Design, Analysis and Performance. Distribution Planning. JIT/Lean Production System. Resource planning, scheduling and allocation Kanban production system (kanban game).

**Pre-requisite(s):** Production planning and inventory control

**Text Book(s):**

1. Chase and Aquilano; Operations Management; Pearson-Prentice Hall; 11th , Edition, 2006
2. Heizer, Jay and Render, Barry; Operations Management; Pearson-Prentice Hall; 2006
3. Kanban for The Shopfloor, The Productivity Press; 2002

**INDUSTRIAL PROJECT MANAGEMENT**

**Learning Objective(s):** Course participants are



able to plan, conduct, and control projects in industry

**Syllabus:** Project management description, system theory, project of PMDA organization, project of human resource, staff organization and project team, time management, special topic of PERT, project graph, cost control

**Prerequisite(s):** Operational Research

**Text books:**

1. Kerzner, Harold T., Project Management : A System Approach to Project Planning, scheduling, and Controlling, John Wiley & Sons, 10th edition, 2009

**Operation Research**

**Learning Objective(s):** Course participants are able to use mathematical optimization model to solve engineering and management problems that could be converted to deterministic and stochastic quantitative model

**Syllabus:** Dynamic Programming. Markov Analysis. Decision Tree. Game Theory. Non-Linear Programming. Queuing theory. Optimization Simulation

**Pre-requisite(s):** Linear Programming

**Text Book(s):**

1. Hamdy A. Taha, Operations Research, 7<sup>th</sup> ed., Prentice-Hall, Inc. 2006  
2. Hellier, Lieberman, Introduction to Operations Research, McGraw-Hill, 2005

**Computation Lab**

**Learning Objective(s):** Course participants are able to use computational language tools, such as flow charts, pseudo codes, and IDEF to make an algorithm. Participants should also be able to solve a problem in the field of Industrial Engineering using computational programs.

**Syllabus:** Design tools, branching, loop, data structure, sorting, and optimization.

**Pre-requisite(s):** Linear Programming

**Text Book(s):**

1. 1 Walkenbach, J. (2007). Excel 2007 Power Programming with VBA.  
2. Robert Sedgewick, Kevin Wayne. (2011). Algorithms 4th Edition Algorithms (4th Edition.  
)

**Occupational, Health, Safety & Environment**

**Learning Objective(s):** Course participants are able to identify various hazard, characterization, propose suitable method for minimizing and mitigating risks, and also designing management system of safety work. Students is also expected to increase their awareness about health and safety in industry, and understand about framework and safety standard regulation and also environment program.

**Syllabus:** Introduction to Regulation and Standards; Risk Perception, Assessment and Management; Machinery Hazards; Noise Hazards; Process Safety Hazard; Fire and Explosion Hazard; Electrical Hazard; Toxicology in The Workplace; Environmental Protection; Environmental Protection Control Processes; Hazard Communication to

Employees; Personal Protective Equipment (PPE):  
Types of PPE and Selection of PPE; Safety Audits,  
Incident and Emergency Planning.

**Pre-requisite(s):** -

**Text Book(s):**

1. Charles A. Wentz, Safety, Health and Environmental Protection, MGH, 1998.
2. Asfahl, C.R., Rieske, D.W., Industrial Safety and Health Management, 6th Ed., Pearson Education, Inc. 2010.
3. National Regulations on Safety and Health Management

### **Supply Chain Management**

**Learning Objective(s):** Course participants are able to understand about concept and application of SCM to analyze and evaluate the role of operators in a whole supply chain

**Syllabus:** Introduction to SCM, Strategy and Planning, Enterprise Resource Planning, Purchasing, Transportation Method, Shortest Path, Traveling Salesman Problem, Vehicle Routing Problem, warehousing management, reverse logistics, location theory, network planning process, SCM development

**Prerequisite:** Quality System

**Text Book(s):**

1. Novack, R.A., Supply Chain Management: A Logistics Perspectives, 2008.

### **Industrial Simulation + Lab**

**Learning objective(s):** Course participants are able to design a complex computerized model from industrial systems and simulate and conduct a simple feasibility study and design a recommendation from model simulation result (becoming a continuous system modeler)

**Syllabus:** Concept of continuous modeling, method of continuous modeling, causal loop diagram, stock and flow diagram, comprehending of behavior overtime, model development based on real case study, technique of scenario development, validation and verification of continuous model, introduction of study concept based on simulation game

**Prerequisite:** System Modeling

**Text books:**

1. Information Dashboard Design, Stephen Few, O'Reilly, 2006.
2. Charles Harrell, Biman K. Ghosh, and Royce O. Bowden, Jr., Simulation Using Promodel, McGraw-Hill Higher Education, New York. 2003
3. SEMS Courses Module, 2011

### **Industrial Engineering Design + Lab**

**Learning objective(s):** Course participants are able to conduct product development process by considering the interaction between material, human resources and production process and able to analyze technical and financial aspects of the NPD project for commercialization.

**Syllabus:** Introduction to NPD Process, Overview

of Stage-Gate Model and Concurrent Engineering, Analysis of Material and Technology Utilization, Design Considerations, Financial Analysis of Project, Market and Functionality Testing, Production Capacity Planning, Commercialization, Implementation of NPD Process, Presentation of NPD Project.

**Prerequisites:** Perancangan Produk, Analisa Kelayakan Industri

**Text Book(s):**

1. George, E.D., *Engineering Design : A Material and Processing Approach*, McGraw-Hill, New York, 2000.
2. Trott, P. (2008). *Innovation Management and New Product Development*, 4th Edition.
3. Cooper, R.G. (2007), *Winning at New Products*, 3rd Edition.

### Information System

**Learning Objective(s):** Course participants understand the role of information system management and technology in the industry to face the globalization era.

**Syllabus:** Introduction to information system. Information system as a competitive advantage. IT and Electronic Commerce, Enterprise Information System (ERP), Electronic Commerce. Database dan Relational Database Management System. System Analysis and Design. Business Process, MIS and its relation with RQM dan QS. CBIS. Accounting Information System. Decision Support System. Executive Information System. Marketing, Manufacturing Information System. Financial, Human Resource Information System.

**Pre-requisite(s):** Organization and Industrial Psychology

**Text Book(s):**

1. McLeod, *Management Information System*, 10th edition, Prentice Hall, 2006
2. Kenneth C. Laudon, *Management Information Systems*, Prentice Hall, 2011

### SPECIAL TOPICS IN INDUSTRIAL ENGINEERING

**Learning Objective(s):** Course participants will have a broad description about the current progress in the service and manufacturing industry, and how industrial engineering could contribute to the enhancement of efficiency and effectiveness.

**Syllabus:** Inviting guest lecturers from various field of expertise

**Pre-requisite(s):** 7th semester or above students

**Text Book(s):** -

### INTERNSHIP (2 SKS)

**Learning Objective(s):** Course participants are able to understand about industrial engineering implementation in industry and implement all the subjects that have been studied in real world

**Syllabus:**

**Prerequisite(s):** Notice the SOP of internship

**Text books: -**

**UNDERGRADUATE THESIS**

**Learning objective(s):** Course participants are able to identify problems and opinion in scientific discussion systematically, clearly, and accurately. Capable of sorting ideas/solutions/opinions in a scientific writing based on scientific writing guideline that integrates a whole knowledge.

**Syllabus:** Industrial Engineering to solve a case in real world

**Prerequisite(s):** Notice SOP of final project

**Text books:** Guideline of Undergraduate Thesis in University of Indonesia

**Technology Management**

**Learning objective(s):** Course participants are able to identify technology development that have an impact to industry, identify that technology, and translate into technology plan for improving organization competitiveness

**Syllabus:** Introduction to technology management, business model concept, innovation and technology, chasm and tornado, competence, introduction to change management, introduction to risk management, patents in Indonesia, sustainability issue in technology, outsourcing, ERP trend

**Prerequisite(s):** Introduction to Industrial Engineering

**Text books:**

1. Burgelman, Maidique and Wheelwright, Strategic Management of Technology and Innovation, 5th Edition, 2009
2. Tarek Khalil, Management of Technology: The Key to Competitiveness and Wealth Creation, McGraw-Hill, 2000

**Multivariate Analysis**

**Learning Objective(s):** Course participants are able to organize the extraction, process & analysis of multivariate data in a right way to make decisions.

**Syllabus:** of Basic Statistical Concepts, Multiple Regression. Manova. Principal Component Analysis. Factor Analysis. Cluster Analysis. Discriminant Analysis. Logit Analysis. Canonical Correlation. Multidimensional Scaling. Structural Equation Modeling.

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

**Text Book(s):**

1. Hair, J.F., B. Black, B. Babin, and R.E. Anderson (2005) Multivariate Data Analysis, Sixth Edition, Prentice Hall.
2. Richard Johnson and Winchern (1998) Applied Multivariate Statistical Analysis, Fourth Edition, Prentice Hall.
3. W.R. Dillon and M. Goldstein (1984) Multivariate Analysis: Methods and Applications, John Wiley & Sons.

**Interpersonal Skills**

**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*, 3rd Edition, De Janasz, Suzanne C, Karen O. Dowd and eth Z. Schneider, McGraw-Hill International Edition. New York. 2009.

### Product Life Cycle Management

**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):** Product Design

**Text Book(s):**

1. Stark, J, (2011). *Product Life Cycle Management, 21th Century Paradigm for Product Realisation*, 2nd Edition. Springer.
2. Grieves, M. (2005). *Product Lifecycle Management. Driving the Next Generation of Lean Thinking*, McGrawHill.

### Macro Ergonomics

**Learning Objective(s):** Course participants are able to understand comprehensively about work system design that consists of interacting variables such as hardware and software within internal and external physical environment, organization structure and process in order to make it better. Ability to understand how to implement ergonomic science.

**Syllabus:** Introduction to macroergonomics, method and tools that are used in work system design and analysis, introduction to organization integration in productivity, safety, health and quality of work life context

**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.

### Finance and Investments

**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. Root, Franklin R. 1978. *International Trade Investment*. Cincinnati: South-Western Publishing Co.

2. Grubel, Herbert G. 1981. *International Economics*, Homewood: Richard D. Irwin Co.
3. Shapiro, Alan C. 2003. *Multinational Financial Management*. Hoboken: John Wiley & Sons Inc.

#### **Innovation Management**

**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. Cooper, R.G. (2007), *Winning at New Products*, 3rd Edition.
2. Schilling, M.A. (2010). *Strategic Management of Technological innovation*, 3rd Edition, McGrawHill.
3. Trott, P. (2008). *Innovation Management and New Product Development*, 4th Edition.
4. Tidd, J., Bessant, J., Pavitt, K. (2001). *Managing Innovation - Integrating Technological, Market and Organisational Change*, Second Edition, John Wiley & Sons Ltd., West Sussex, England.

#### **Customer Relationship Management**

**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. Peppers, D. (2011). *Managing Customer Relationships: A Strategic Framework*, John Wiley & Sons.
2. Francis Buttle (2009). *Customer Relationship Management*, Elsevier.

#### **Lean Operations**

**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**

**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 Programming**

**Learning objective(s):** Course participants could understand the theory and basics of linear and stochastic programming, able to use advance methods in linear and stochastic programming, and could use software to solve problems in linear and stochastic programming.

**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.

**Textbooks:**

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 Ruszczyński. Lectures on Stochastic Programming - Modeling and Theory (SIAM, 2009)

### Queuing Theory

**Learning objective(s):** Course participants are able to understand simple, network and cycle queuing models. Participants are also able to understand methods for solving queuing models and translating real-world problems into a queuing model.

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

**Textbooks:**

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

**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

**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**

**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

**Pre-requisite(s):** Cost Accounting

#### **Text books:**

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**

**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

#### **Text Book(s):**

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.

#### **Sustainable Manufacturing and Innovation**

**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. Seliger, G. (2011). *Advances in Sustainable Manufacturing*, Springer.
2. Jovane, F. (2010). *The Manufuture Road: Towards Competitive and Sustainable High- Adding-Value Manufacturing*, Springer.
3. Allen, D.T. (2012). *Sustainable Engineering: Concepts, Design and Case Studies*, Prentice-Hall.
4. Hermosilla, J.C. (2009). *Eco-Innovation: When Sustainability and Competitiveness Shake Hands*.

### Human Digital Modeling and Simulation

**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.

**Text books:-**

1. Duffy, G V. 2010. *Advances in Applied Digital Human Modelling*. CRC Press.
2. Jack Software Module dari Ergonomic Centre

### Decision Uncertainties and Risk

**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

**Text books:**

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

### Maritime Logistics

**Learning objective(s):** Course participants are able to design, analyze and decrease workflow of a maritime logistic system, container terminal and scheduled shipping (liner).

**Syllabus:** Maritime Economy, Containerization, Scheduled Shipping, Berth Allocation Problem, Quay Crane Allocation Problem, Stacking problem, Stowage Planning, Integration phase, Intermodality, Synchomodality, LPG supply chain, Fuel supply chain, Integration phase.

**Textbooks:**

1. Duinkerken, M., & Günther, H.-O. (2007). *Container Terminals and Cargo Systems*. Berlin: Springer Berlin Heidelberg. <http://doi.org/10.1007/978-3-540-49550-5>
2. Inst, G. (1987). *Indonesia ' s Sea Transport System - A Series of Maps*, 491-502.
3. Ligteringen, H., & Velsink, H. (2014). *Ports and Terminals*. Delft: Delft Academic Press.
4. Meisel, F. (2009). *Seaside Operations Planning in Container Terminals*. <http://doi.org/10.1007/978-3-7908-2191-8>
5. Notteboom, T., & Rodrigue, J. P. (2009). *The future of containerization: Perspectives from maritime and inland freight distribution*. *GeoJournal*, 74(1), 7-22. <http://doi.org/10.1007/s10708-008-9211-3>
6. Stahlbock, R., & Voß, S. (2008). *Operations research at container terminals: A literature update*. *OR Spectrum*, 30(1), 1-52. <http://doi.org/10.1007/s00291-007-0100-9>

### Energy Management

**Learning objective(s):** Course participants are able to understand the energy management principles, including energy supply and demand, which grows sense of the importance of energy and include it in decision making.

**Syllabus:** Energy and civilization, sources of energy and sustainability, energy future, economic and life cycle cost analysis, Life cycle analysis, lighting, ventilation and refrigeration systems, system of sustainable transport, effective energy management program, effective program management of energy, Modeling policy and energy planning

### **Textbooks**

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

### **Design Thinking**

**Learning objective(s):** Course participants could understand design and its implementation; also the advantage of using design thinking in the design process, decision process and problem solving activity.

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

#### **Textbooks:**

1. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, Harper Collins Publisher, 2009
2. Thomas Lockwood, Design Thinking: Integrating Innovation, Customer Experience, and Brand Value, Allworth Press, 2009

### **Numerical Methods and Application**

**Learning objective(s):** Course participants could understand the logic of numerical methods in solving mathematical and physical problems found in the field of engineering, social and economy. Course participants are able to solve difficult problems using dynamic systems which use iteration methods in industrial engineering cases.

**Syllabus:** simple problems in function theory (average rate, effect of linearization of a multi ranked function, roots and zero point of a function, interpolations and extrapolations); calculating the area and volume of an object without any form using numerical approach based on the formula of integration; Solving multi-variables equation system (including simulations on models of the equation system); multi-variables regression models; Eigenvalue and eigenvector problems; Start Value and End Value probles; Partial differential.

#### **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: John Wiley & Sons

### **Business Process Reengineering**

**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.

#### **Textbooks:**

1. Reengineering Corporation , Michael Hammer & James Champy, Harper-London (2006)
2. Business Process Reengineering-Text and Cases, R Radhakrisnan, PHI-New Delhi (2010)
3. The Practical Guide to Business Process Reengineering using IDEF0, Feldmann Clarence.G, (1998), Donet Publishing New York
4. Process Mapping: How to Reengineer your Business Process., Hunt, Daniel.V., (1996), John Wiley and Sons Inc, New York
5. Process Innovation, Reengineering work through information technology, Davenport, Harvard Business School Press 2004.

### **Algorithm and Programming**

**Learning objective(s):** Course participants know and are able to use computer programming techniques. They are able to design and implement algorithms to solve problems in the field of Industrial Engineering. Course participants could analyse how efficient an algorithm is.

**Syllabus:** Introduction to programming language and algorithm; Types, variables, operators; Loops and arrays; Objects and classes; Sorting: Insertion Sort and Merge Sort; Asymptotic Notation; Recurrences; Substitution, Master Method; Divide-and-Conquer: Strassen, Fibonacci, Polynomial Multiplication; Quicksort, Random Number, Randomized Algorithms; Tree, Hashing, Hash Functions; Greedy Algorithms, Minimum Spanning Trees; and Shortest Paths: Dijkstra's Algorithm, Breadth-first Search.

**Prerequisite(s):** Basic Statistics

**Text books:**

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

### **Heuristic Methods in Optimization**

**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 parallel 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, Parallel Metaheuristics.

**Buku Ajar:**

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

### **Constraint Programming**

**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.