CURRICULUM OF INTERNATIONAL PROGRAM ELECTRICAL ENGINEERING

KODE	Course	SKS
	1st Semester	
ENEE611001	Fund. of Digital Systems + Lab	3
ENEE611002	Academic Writing	2
ENGE610003	Calculus	4
ENGE610007	Physics (Electricity, MWO)	3
ENGE610008	Physics (Electricity, MWO) Lab	1
ENEE611003	**Intro to Electrical Engineering**	**2**
ENEE611004	Electric Materials	2
	Subtotal	**17**
	2nd Semester	
ENEE612005	Basic Computer and Laboratory	3
ENEE612006	Semiconductor Devices	2
ENGE610004	Linear Algebra	4
ENGE610005	Physics (Mechanics and Thermal)	3
ENGE610006	Physics (Mechanics and Thermal) Lab	1
ENEE612007	**Engineering Mathematics**	**4**
ENEE612008	Electric Circuit 1	3
	Subtotal	**20**
	3rd Semester	
ENEE613009	Electric Circuit 2	3
ENEE613010	Algorithm and Programming	4
ENEE613011	Vector Analysis Complex Variable	2
ENEE613012	Electric Circuit Laboratory	1
ENEE613013	Electrical Power Engineering	3
ENEE613014	**Electrical Power Engineering Laboratory**	**1**
ENEE613015	Telecommunication Engineering	3
ENEE613016	Telecommunication Engineering Lab.	1
ENEE613017	Probability and Stochastic Process	3
	Subtotal	**21**
	4th Semester	
ENEE614018	Control Engineering	3
ENEE614019	Control Engineering Laboratory	1
ENEE614020	**Electronics Circuits**	**3**
ENEE614021	Electronics Circuits Laboratory	1
ENEE614022	Electromagnetics	4
ENEE614023	Electric Measurements	2
ENEE614024	Electric Measurements Lab.	1
ENEE614025	Numerical Computation	2
ENEE614026	Signal and Systems	3
	Subtotal	**20**

	5th Semester	
ENEE615027	Microprocessor and Microcontroller	4
ENEE615028	**Microprocessor and Microcontroller Lab.**	**1**
UIGE610004	**Integrated Character Building B**	**6**
ENEE615029	Digital Control Systems	3
ENEE615030	Communication Networks	3
ENEE615031	Power Electronics and Laboratory	3
	Subtotal	**20**
	6th Semester	
ENEE616032	Internship	2
ENEE616033	Modelling and Simulation	2
UIGE600010 - UIGE600015	Religion	2
UIGE610001	Integrated Character Building A	6
ENEE616034	Introduction of Nanoelectronics	3
ENEE616035	Communication System Devices	3
	Subtotal	**18**
	7th Semester	
UIGE600020 - UIGE600048	Sports/Arts	1
ENGE610012	HSE Protection	2
ENEE617036	**Seminar**	**2**
ENEE617037	Engineering Enterpreneurship	2
ENEE617038	Electric Power System and Lab	3
ENEE617039	Process Control Systems	3
ENEE617040	Photonic Devices	3
NEW	Electives	2
	Subtotal	**18**
	8th Semester	
NEW	Electives	6
ENEE618041	Bachelor Thesis	4
	Subtotal	**10**
	Total	**144**

Electives:

ENEE617101 Object Oriented Programming + Lab 3
ENEE618102 Software Engineering 3

THE SYLLABUS
UNIVERSITY COURSES

UIGE600001
MPKT A
Learning Outcomes:
Capable of critical thinking, creative, innovative; have the intellectual curiosity to solve problems at the individual and group level.
Able to provide problem-solving alternative against various problems arising in the environment, society, nation, and country.
Topics:
The power and primacy of the character, the basics of philosophy, logic, foundations of ethics, whether it's human, individual and group, society and culture
Prerequisites: none
Textbook:
1. Evita e. Singgih, Miranda D.Z., Ade Solihat, Jossy p. Moeis, " Buku Ajar I Kekuatan dan Keutamaan Karakter, Filsafat, Logika dan Etika ", University of Indonesia
2. Evita e. Singgih, Miranda D.Z., Ade Solihat, Jossy p. Moeis, " Buku Ajar II Manusia sebagai Individu, Kelompok dan Masyarakat ", University of Indonesia

UIGE600002
MPKT B
Learning Outcomes:
Capable of critical thinking, creative, innovative; have the intellectual curiosity to solve problems at the individual and group level.
Able to provide problem-solving alternative against various problems arising in the environment, society, nation, and country.
Topics:
The power and primacy of the character, the basics of philosophy, logic, foundations of ethics, whether it's human, individual and group, society and culture
Prerequisites: none
Textbook:-

UIGE600003
ENGLISH
Learning Outcomes:
Able to use spoken and written English well for both academic and non-academics activities.
Topics:
Study skills: active learner, vocabulary building, word formation and using the dictionary, listening strategies, extensive reading
Grammar: Basic grammar of sentences, clause. Reading: reading skills: skimming, scanning, main ideas, supporting ideas; Note taking reading popular science article, reading an academic text
Listening: short conversation, lecture and note-taking, news broadcast, short story
Speaking: discussion, giving presentation
Writing: summary of short articles, self-describing graphs and tables, academic paragraphs, essays
Prerequisites: none
Textbook:

UIGE600020 – UIGE600048
SPORTS/ARTS
See the academic guidebook of Faculty of Engineering

UIGE600010 - UIGE600015
RELIGION
See the academic guidebook of Faculty of Engineering

FACULTY COURSES

ENGE600003
CALCULUS (4 CREDITS)

Learning Outcomes:
Able to apply advanced mathematical concepts for electrical engineering; Able to apply mathematical concepts of functions and limits, derivative (single/multivariable) and its applications, integrals (single/multifold) and its applications, Taylor series, and Maclaurin series
Topics:
Functions and limits, Derivative (single/multivariable) and applications, integrals (single/multifold) and its applications, Taylor and Maclaurin series
Prerequisites: none
Textbook: none

ENGE600004
LINEAR ALGEBRA (4 CREDITS)
Learning Outcomes:
Able to apply the concept of Linear equations systems, Determinants, vector spaces, the space Results In Time, value and Eigen Vectors, as well as a Linear transformation
Topics:
The concept of Linear equations System, Determinants, vector spaces, the space Results in Time, value and Eigen Vectors, Linear transformation
Prerequisites: none
Textbook: none

ENGE600005
PHYSICS (MECHANICS AND THERMAL) (3 CREDITS)
Learning Outcomes:
Able to apply the concepts of basic physics, mechanics and thermodynamics in understanding nature and engineering phenomena including its applications.
Topics:
Mechanics of motion, gravity, the potential energy of the particle dynamical, works and energy, momentum, rotational motion, collision, kinematics and dynamic, angular momentum Physics Heat-Sound, temperature, heat, laws of thermodynamics I and II, kinetic gas theory I and II, Modern Physics-Quantum
Prerequisites: none
Textbook:
Haliday, Resnick, Walker, and *Principles of Physics 9th Edition,* Wiley, 2011.

ENGE600006
PHYSICS (MECHANICS AND THERMAL) LAB
See the academic guidebook of Faculty of Engineering

ENGE600007
PHYSICS (ELECTRICITY, MWO) (3 CREDITS)
Learning Outcomes:
Able to apply the concepts of basic physics, electricity, magnetism, optics, and waves in understanding nature and engineering phenomena including its applications.
Topics:
A static electric charge, Coulomb, electric field, Gauss law, electric potential, Capacitor and dielectric. Dynamic power, current, and prisoners, Ohm's law, electrical, electrochemical potential difference, the electric circuit. Field magnetism, magnetic motive force and flow, the effects of Hall, law ampere, the intensity of the magnetic field B, Biot-Savart's law, the law of Faraday, inductance, electromagnetics, oscillations, Maxwell's equations.
Prerequisites: none
Textbook:
Haliday, Resnick, Walker, and *Principles of Physics 9th Edition,* Wiley, 2011.

ENGE600008
PHYSICS (ELECTRICITY, MWO) LAB
See the academic guidebook of Faculty of Engineering

ENGE600012
HSE PROTECTION
See the academic guidebook of Faculty of Engineering

ELECTRICAL ENGINEERING COURSES

ENEE611003
ENEE601001
INTRO TO ELECTRICAL ENGINEERING (2 CREDITS)
Learning Outcomes:
Able to explain the basic concepts of electrical engineering and its application in everyday life.
Topics:
Basic concepts and its applications of: Electronics Engineering, telecommunications engineering, Control Engineering, electric engineering and energy, and biomedical engineering.
Prerequisites: none
Textbook:
Diktat Pengantar Teknik Elektro UI

ENEE612008
ENEE602002
ELECTRIC CIRCUITS 1 (3 CREDITS)
Learning Outcomes:
Able to calculate the electric charge, current, and voltage in a series basis; Able to explain voltage source, current source (free/bound), resistors, and capacitors; Being able to compute the independent circuit using the superposition theorem, the transformation of the source, and Thevenin-Norton; Able to calculate the electric circuit analysis using the variables node (current series), mesh, super-node (circuit voltage), super-mesh; Being able to analyze the response time a series order and order-1-2;
Topics:
Concept: current, voltage, power, and energy; Voltage source, current source (free/bound), resistors, and capacitors; Resistive circuit of series and parallel; Analysis of node, super-node, mesh, super-mesh; Superposition theorem, the transformation of the source, and Thevenin-Norton; Response time-order series 1 and 2
Equipment:
Prerequisite: Calculus, Physics (electricity, mwo).
Textbook:

1. David e. Johnson, Johnny r. Johnson, John l. Hilburry, Peter d. Scott, “Electric Circuit Analysis”, 3rd Edition, Prentice Hall International, Inc., 1997. (Chapter 1-9)
2. James w. Nilsson, Susan a. Riedel, “Electric Circuits”, 6th Edition, Prentice Hall International, Inc., 2000. (Chapter 1-10)

ENEE613009
ENEE603003
ELECTRIC CIRCUITS 2 (3 CREDITS)
Learning Outcomes:
Being able to make a simple electric circuit design; Able to analyze a 3-phase circuit; Able to analyze electric circuit of frequency response order-1 and order-2; Able to analyze basic circuits shared ideal transformer and inductance; Able to make design of passive and active filter circuits by utilizing basic circuits; Able to analyze a 4 poles circuit.
Topics:
3 phase circuits; Laplace transform; frequency response; shared inductance circuits; 1 order filter circuits passive and active; 4 poles circuits.
Prerequisite: Electric Circuits 1, Vector Analysis and Complex Variables.
Textbook:

1. James w. Nilsson, Susan a. Riedel, “Electric Circuits”, 6th Edition, Prentice Hall International, Inc., 2000 (Chapter 11-18).
2. David e. Johnson, Johnny r. Johnson, John l. Hilburry, Peter d. Scott, “Electric Circuit Analysis”, 3rd Edition, Prentice Hall International, Inc., 1997 (Chapter 10-17).

ENEE613012
ENEE603004
ELECTRIC CIRCUIT LABORATORY (1 CREDITS)
Learning Outcomes:
Able to calculate the electric charge, current, and voltage in a series basis; Able to explain voltage source, current source (free/bound), resistors, and capacitors; Being able to compute the independent circuit using the superposition theorem, the transformation of the source, and Thevenin-Norton; Able to analyze circuit ammeter, voltmeter, ohmmeter, and wheat-stone bridge; Able to calculate the electric circuit analysis using the variables node, super-

node, mesh, super-mesh;
Topics:
Basic electricity; linearity analysis-mesh and knot; analysis of superposition; Thevenin and Norton; poles series circuits; alternating current circuits; three phases circuits;
Prerequisite: Electric Circuits 1
Textbook: Modul Praktikum Rangkaian Listrik – Laboratorium Tegangan Tinggi dan Pengukuran Listrik.

ENEE613011
ENEE603005
VECTOR ANALYSIS COMPLEX VARIABLE (2SKS)
Learning Outcomes:
Able to apply advanced mathematical concepts to the field of electrical engineering that includes the complex variable, Cauchy-Riemann equation, Integral Cauchy; Able to apply basic vector differential, integral vector (line, surface and volume), Green's theorem, the Divergence theorem, Gauss and Stokes '; Able to apply the concept of Vector calculus, Complex numbers and functions
Topics:
Complex variables, complex numbers and functions, polar form, powers and roots, de Moiv're theorem, dot and cross products, limit. The derivatives, the analytic function. The Cauchy-Riemann equations, Laplace equation, exponential, trigonometric and hyperbolic functions, logarithm and general power. Complex integration, line integrals in complex plane, the Cauchy integral theorem and formula, derivatives of analytic functions. Laurent series, singularities, zeros and infinity, residue integration method and residue, integration of real integrals. With a conformal mapping, Complex analysis and potential theory. Vector differential calculus, vector in 2-space and 3-space. The inner (dot) Product and vector (cross) product, vector and scalar functions and fields. Derivatives, the gradient of scalar fields. Directional derivatives. The divergence and the curl of the vector field. Line integral, the path independence of line integrals. Double integrals, Green's theorem in the plane, the Surfaces for surface integrals, Triple integrals. Divergence theorem of Gauss, Stokes's theorem.
Prerequisite**:** Calculus, Linear Algebra
Textbook:
1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley Publishers.
2. Glyn James, "Advanced Modern Engineering Mathematics", 2nd Edition, Prentice Hall Publishers, 1999.

ENEE613017
ENEE603006
PROBABILITY AND STOCHASTIC PROCESSES (3 CREDITS)
Learning Outcomes:
Able to apply the concepts of probability and stochastic processes in the field of electrical engineering.
Topics:
The distribution function of a random variable, probability, discrete probability distributions, and continuous, normal, Poison, gamma, Chi-squared, Beta logarithm Weibull, the transformation of the probability distribution, the sampling distribution of one and two sample Estimation, hypothesis tests one and two sample, linear regression and stochastic models, its correlation, Autoregressive Moving Average Model, Autoregressive Moving Average models, Markov chains.
Prerequisite: Calculus, Linear Algebra
Textbook:
1. r. d. Yates and d. j. Goodman, "Probability and Stochastic Processes: A Friendly Introduction for Electrical and Computer Engineers", 2nd Edition, Wiley, 2004.
2. j. a. Gubner, "Probability and Random Processes for Electrical and Computer Engineers", Cambridge, 2006.
3. Ronald e. Walpole, Raymond h. Myers, Sharon l. Myers, Keying Ye, and "Probability & Statistics for Engineering & Scientists, 7th Edition, Pearson Education International, USA, 2002

ENEE603009
ENEE611001
Fund. of Digital System & Lab (3 SKS)
Learning Outcomes: In this course, students will learn all design phases and implementations of a digital system. At the end of the course, students will be able to analyze simple digital circuits, and able to design digital systems using combinational and simple sequential building blocks. This lecture also involves several practical work in the laboratory to design, implement and verify digital logic systems using digital circuit simulation software.
Topics: Boolean Algebra Principles and applications; Interface Logic Families; Number System & Data Encoding; Basic Logic Circuits; Basic Modular Design of Combinational Circuits; Basic Modular Design of Sequential Circuits.
Practical work: Module 1-Introduction and introduction to Digital Circuit Basics, Module 2 - Boolean Algebra and

Elementary logic gates, Module 3 – Karnaugh Map, Module 4 – complex logic gate, Module 5 - Decoder and Encoder, Module 6 - Multiplexer and De-multiplexer, Module 7- Digital Arithmetic Circuit, Module 8 - Flip-Flop and Latch, Module 9-Registers and Counters, Module 10 – Group Project
Prerequisite: none.
Textbook:
1. M. Morris Mano, r. Charles r. Kime, Tom Martin, Logic & Computer Design Fundamentals, 5th ed., Prentice Hall, 2000
2. Ronald j. Tocci, Neal s. Widmer, and Gregory l. Moss, Digital Systems: Principles and Applications, 11th ed., Prentice Hall, 2010
3. Basics of Digital System Lab. Practice Modules

ENEE612007
ENEE603007
ENGINEERING MATHEMATICS (4SKS)
Learning Outcomes:
Able to apply differential equations and several transformation functions for solving problems in the field of electrical engineering.
Topics:
Ordinary Differential Equations (and Constant Coefficient is not constant), Partial Differential Equations, Difference Equations, Laplace transform, Fourier series, Fourier transform, Z Transformation
Prerequisites : Calculus, Linear Algebra
Textbook:
1. Erwin Kreyszig, "Advanced Engineering Mathematics," 9th Edition, Wiley Publishers, 2006.
2. Glyn James, "Advanced Modern Engineering Mathematics," Second Edition, Prentice Hall Publishers, 1999.

ENEE612006
ENEE603008
SEMICONDUCTOR DEVICES (2 CREDITS)
Learning Outcomes:
The student is able to apply the concept of physical Bonds were able to apply the concept of physical semiconductor material in electronics; An extension of the metal-semiconductor; An extension of p-n; An extension of current in p-n; Bipolar transistor: basic characteristics; The system of metal-oxide-semiconductor; Metal-Oxide-Semiconductor Field-Effect Transistors; 8 the development of the Electronic Device
Topics:
The Concept of Bonding, Electronics semiconductor material; An extension of the metal-semiconductor; An extension of p-n; An extension of current in p-n; Bipolar transistor: basic characteristics; The system of metal-oxide-semiconductor; Metal-Oxide-Semiconductor Field-Effect Transistors; 8 the development of the Electronic Device
Prerequisites : No
Textbook:
1. Howe, r. t., and c. g. Sodini, " *Microelectronics: An Integrated Approach* ". Upper Saddle River, NJ: Prentice Hall, 1996.
2. Fonstad, C. G. " *Compatible Devices and Circuits* ", New York, NY: McGraw-Hill, 1994.

ENEE603009
FUND. OF DIGITAL SYSTEM & LAB (3 CREDITS)
Learning Outcomes:
Able to analyze a simple digital system circuit; Able to make digital system design using a simple sequential and combinational block.
Topics:
The principles of Boolean and its application; Interface Logic Families; Number System & Data Encoding; Basic Logic Circuits; Basic Modular Design of Combinational Circuits; Basic Modular Design of Sequential Circuits.
Practical work: module 1-Introduction and basic introduction to Digital Circuit, module 2-Boolean Algebra and Elementary logic gates, module 3 – Karnaugh Map, module 4 – logic gate complex, module 5-Decoder and Encoder, Multiplexer and De-multiplexer 6-module 7-Series Digital Arithmetic Module 8-Flip-Flop and Latch, Module 9-Registers and counters, Module 10-Basic Practical Digital System Project
Prerequisite: none.
Textbook:
1. M. Morris Mano, r. Charles r. Kime, Tom Martin, Logic & Computer Design Fundamentals, 5th ed., Prentice Hall, 2000
2. Ronald j. Tocci, Neal s. Widmer, and Gregory l. Moss, Digital Systems: Principles and Applications, 11th ed., Prentice Hall, 2010
3. Basic Practical Digital systems Module

ENEE612005
ENEE604010
BASIC COMPUTER AND LABORATORY (3 CREDITS)
Learning Outcomes:
Able to explain types and function of computer hardware; Able to make the draft algorithms to solve the problem of computation and manipulation of data; Able to make the draft algorithms: Pseudocode, Flowcharts, Looping, selection/Branching; Able to implement the algorithm into a high level programming language and low level; Able to implement the Matlab Script; Able to implement the structure and control in the language of C; Able to implement modular programming in C language.
Topics:
The history of the computer, computer hardware Components, operating systems, computer networks; Pseudocode; Flowchart; Looping; Selection/Branching; Matlab Script; Structure and control in the C language.
Prerequisite: Basic System digital and Practical.
Textbook:
1. Alan Evans, Kendall Martin, Mary Anne Poatsy, "Technology in Action (TiA)," Second Edition, Prentice-Hall, 2006.
2. Gary b. Shelly Misty e. Vermaat and, "Discovering Computers 2011: Living in a Digital World," Course Technology, Cengage Learning, 2011.
3. Deitel & Deitel, "C How to Program," 5th Edition, Pearson Education, 2007.

ENEE614020
ENEE604011
ELECTRONIC CIRCUITS (3 CREDITS)
Learning Outcomes:
Able to apply the basic concepts of electronics; Able to analyze basic electronics circuits; Able to compose electronic circuits by using electronic devices

Topics:
Series diode transistor circuits, the circuit configuration of power supply transistors, transistor applications; Frequency Response, a series of *amplifiers*
Prerequisite: Semiconductor device, Power Series 1, Series 2 Electric
Textbook:
Boylestad R, Nashhelsky L (2006), Electronic Devices and Circuit Theory, 9th Edition, Prentice Hall, New Jersey, USA.

ENEE614021
ENEE604012
ELECTRONIC CIRCUITS LABORATORY (1 CREDITS)
Learning Outcomes:
Able to apply the basic concepts of electronics; Being able to practice the workings of a diode, transistor, circuit configuration, frequency response, *amplifiers;* Able to use electronic measuring instrument
Topics:
Series diode transistor circuits, the circuit configuration of power supply transistors, transistor applications; response frequency, the circuit *amplifier*.
Prerequisites : Electronic Circuit.
Textbook:
Electronic Circuit Teaching Modules – Electronic Laboratory.

ENEE614022
ENEE604013
ELECTROMAGNETICS (4SKS)
Learning Outcomes:
Able to apply physical concept for electrical engineering; Able to apply Maxwell's equations on solving the problem of time variation in the form of an integral and differential, energy storage, and quasi static field and analysis of wave in time domain.
Topics:
Electrostatic, Magneto-static, Electromagnetic dynamic, Plane Waves, Maxwell's Laws, Electromagnetic Interference, transmission line
Prerequisite: Complex Variables and Vector analysis
Textbook:
1. Stuart m. Wentworth, "Fundamentals of Electromagnetics with Engineering Applications", John Wiley, 2005.
2. Fawwaz T Ulaby, "Fundamentals of Applied Electromagnetics", Prentice Hall Publications, 2001.

ENEE614026
ENEE604014
SIGNAL AND SYSTEMS (3 CREDITS)
Learning Outcomes:
Able to apply physical concept for electrical engineering; Able to apply the concept of linear systems for signal processing and digital filter design

Topics:
Other types of signals and linear systems, the characteristics of the system time fixed (LTI), review of the Fourier transform, the discrete time Fourier transform, digital Fourier transform, Laplace, sampling and reconstruction of discrete time signals, the transformation of analog filter design, Z.

Prerequisite: Engineering Mathematics
Textbook:
1. Simon Haykin & Barry Van Veen, "Signals and systems", 2nd Edition John Wiley & Sons publishers, 2003.
2. Alan v. Oppenheim, Alan s. Willsky, s. Hamid Nawab, "Signals and Systems", Prentice Hall; 2nd Edition, 1996.

ENEE611004
ENEE604015
ELECTRIC MATERIAL (2 CREDITS)
Learning Outcomes:
Able to explain the classification of electric materials; Being able to analyze the problems of electrical material;
Topics:
Description of the electrical material, bonds of the molecule, the arrangement of atoms in the solid, dielectric polarization, electric material classification
Prerequisites:-
Textbook:
Rudy Setiabudy, "Material Teknik Listrik", UI Press, 2007
R. e. Hummel, "Electronic Properties of Materials", Third Edition, Springer, 2000

ENEE614025
ENEE605016
NUMERICAL COMPUTATION (3 CREDITS)
Learning Outcomes:
Able to apply numerical methods in the form design computing algorithms and data manipulation;
Topics:
The design of algorithms for numerical Methods: a search for roots, numerical methods for the resolution of systems of linear equations, numerical methods a search of curve fitting, numerical methods for differential and integral, numerical methods for ordinary differential equations; The Concept Of Interpolation
Prerequisite: Engineering Mathematics, Basic Computer

Textbook:
Steven Chapra, Canale Raymond. "Numerical Methods for Engineers 7th Edition", McGraw Hill. 2014.

ENEE613015
ENEE605017
TELECOMMUNICATION ENGINEERING (3 CREDITS)
Learning Outcomes:
Able to apply the basic concept of telecommunications engineering; Able to apply the concept of global communication systems; Capable of analyzing analog and digital modulation; Able to explain telephony system; Able to calculate the PCM and TDM, Digital Line Coding; Able to analyze telecommunications network: a basic Phone, the technique of grafting, signaling techniques, the concept of Queuing, a communications network radio, *microwave*, and fiber optics
Topics:
Global communication systems; analog and digital modulation; telephony system; PCM and TDM; Digital Line Coding; telecommunications network: a basic phone, connection, signaling, and the concept of the queue; communications network radio, *microwave*, and fiber optics

Prerequisites : Probability and stochastic processes, mathematical techniques, and Electromagnetics
Textbook:

1. Simon Haykin, "Communication Systems", 5th Edition, John Wiley & Sons, Inc., 2008.
2. Roger l. Freeman, "Telecommunication Systems Engineering", 4th Edition, John Wiley & Sons, Inc., 2004.

ENEE605018
ELECTRIC POWER ENGINEERING (3 CREDITS)
Learning Outcomes:
Able to explain the concept of electric that includes generation, transmission and distribution; Being able to compute the parameters of electric machines.

Topics:
The basic Mechanical and electromagnetic, circuit of Three phase transformer, the basics of Machine Flow back and forth, Synchronous Machine, Parallel Operation of Synchronous Generators, Induction Motors, direct current Motors, transmission line, equation and Representation system, introduction of a power Flow Study, disturbance of symmetric and Asymmetric

Prerequisite: Electrical Circuits.
Textbook:
S. j. Chapman, "Electric Machinery and Power System Fundamentals," McGraw-Hill Science/Engineering/Math, 2001.

ENEE605019
ELECTRIC POWER ENGINEERING LAB (1 CREDITS)
Learning Outcomes:
Capable of testing characteristics of electric machines; Being able to classify the electrical machines
Topics:
Direct Current Machines, Transformers, Synchronous Machines, Induction Machines

Prerequisite: Electrical Circuits.
Textbook:
Electric Power Engineering Teaching Modules-Power Energy Conversion Laboratory

ENEE614018
ENEE605020
CONTROL ENGINEERING (3 CREDITS)
Learning Outcomes:
Able to apply the basic concept of control; Able to apply the concept of block diagrams, Time Response, system stability and steady-state error, root locus, frequency response; Capable of designing controllers with the bode diagram, and is able to analyze the state-space, capable of governing designing state-space,.
Topics:
Block diagrams; Time Response; The stability of the system; Steady-state error; Root locus; Frequency response; Design controllers with root locus; Design of controller with bode diagram; The state-space model analysis; Governing state-space design; Design Observer
Prerequisite: Engineering Mathematics
Textbook:
1. Nise, n. "Control Systems Engineering", 4th Edition, Wiley, 2005.
2. Katsuhiko Ogata, "Modern Control Engineering" 4th Edition, Prentice Hall, 2002.

ENEE614019
ENEE605021
CONTROL ENGINEERING LABORATORY (1 CREDITS)
Learning Outcomes:
Able to use the device data acquisition; Able to apply the response time, system stability and steady error, root locus design, frequency response, controllers with root locus, Bode's diagram with controller design, the introduction of PLC, state-space.
Topics:
Response time, system stability and steady error, root locus design, frequency response, controllers with root locus, Bode's diagram with controller design, the introduction of PLC, state-space
Prerequisite: Engineering Control
Textbook:

Laboratory Workbook – Control Systems Laboratory.

ENEE613010
ENEE605022
ALGORITHM AND PROGRAMMING (4 CREDITS)
Learning Outcomes:
Able to make the draft algorithms to solve the problem of computation and manipulation of data; Able to apply the concepts: Modular; Iteration and Recursion; Sorting; Searching; Array; Pointers; Linked List
Topics:
Modular; Iteration and Recursion; Sorting; Searching; Array; Pointers; Linked List; Static and dynamic data structures in C language
Prerequisites : Basic of computer
Textbook:
1. Thomas h. Cormen, "Introduction to Algorithms", 3rd Edition, MIT Press, 2009
2. Robert Sedgewick & Kevin Wayne, "Algorithms", 4th ed., Addison-Wesley Professional, 2011

ENEE616033
ENEE606024
MODELLING AND SIMULATION (3 CREDITS)
Learning Outcomes:
Able to establish mathematical model system, capable of performing the analysis of mathematical models of the system, able to build simulations based on mathematical models,
Capable of analyzing simulation system.
Topics:
Basic modelling and simulation, methods of modeling of physical systems, analysis of the model of non-linear dynamical systems, dynamical models of simulation with Matlab/Simulink,
Data modeling, system identification, data exploration methods, methods of optimization of the smallest squares model, validation, data modeling with Matlab/Simulink.
Prerequisite: Numerical Computing
Textbook:
1. Harold Klee, Randal Allen, "Simulation of Dynamic Systems with MATLAB and Simulink", CRC Press, 2011
2. William j. Palm III, "System Dynamics", 2nd Edition ", McGraw-Hill, 2005.
3. John a. Sokolowski, Catherine m. Banks, "Modeling And Simulation Fundamentals", John Wiley & Sons, 2010

ENEE613016
ENEE606025
TELECOMMUNICATIONS ENGINEERING LAB (1 CREDITS)
Learning Outcomes:
Able to put into practice the basic concept of telecommunications engineering; Being able to practice the communication system globally; analog and digital modulation; telephony system; PCM and TDM; Digital Line Coding; telecommunication network: telecommunications network: a basic Phone, the technique of grafting, signaling techniques, the concept of Queuing, a communications network radio, *microwave*, and fiber optic; Able to use the measure of telecommunications.
Topics:
Global communication systems; analog and digital modulation; Telephony system; PCM and TDM; Digital Line Coding; FIR Filters; the parameters of the antenna and wireless communication and channel simulation using software radio mobile; optical communication systems.
Prerequisite: Telecommunications Engineering
Textbook:
Laboratory Workbook – Telecommunication Engineering Laboratory.

ENEE615027
ENEE606026
MICROPROCESSOR AND MICROCONTROLLER (4 CREDITS)
Learning Outcomes:
Able to implement the algorithm into a high level programming language and low level; Able to implement Microprocessors and programming addressing mode in Assembly language for Microprocessors.
Topics:
Microprocessor's Addressing Modes; Programming Assembly language for Microprocessors

Prerequisite: Basic Computer

Textbook:
1. The Intel 8086/8088 Microprocessors, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium IV Architecture, Programming, and Interfacing, Seventh Edition, Brey, Barry, b., PHI Inc., USA, 2006.
2. The 8051 Microcontroller and Embedded Systems, Second Edition, Muhammad Ali Mazidi, Prentice Hall, 2006

ENEE615028
ENEE606027
MICROPROCESSOR AND MICROCONTROLLER LAB (3 CREDITS)
Learning Outcomes:
Able to implement the algorithm into a high level programming language and low level; Capable of practicing Microprocessors and programming addressing mode in Assembly language for Microprocessor.
Topics:
Microprocessor's Addressing Modes; Programming Assembly language for Microprocessors.
Prerequisite: Microprocessor and Microcontroller
Textbook:
1. Practical module Microprocessor and Microcontroller Digital Laboratory, Department of electrical engineering.
2. Barry B. Brey, "The Microprocessors Intel 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium IV Architecture, Programming, and Interfacing," 7th Edition, PHI Inc., USA, 2006.
3. Muhammad Ali Mazidi, "The 8051 Microcontroller and Embedded Systems," Second Edition, Prentice Hall, 2006.

ENEE614023
ENEE606028
ELECTRIC MEASUREMENTS (2 CREDITS)
Learning Outcomes:
Able to explain the philosophy of electric quantity measurement; Able to calculate the threshold quantity of electricity that is safe; able to analyze a series of measurements
Topics:
Introduction of measuring instruments, the fault/error in measurement, the security and safety in Electrical Measurements, Measuring Electrical Quantities in General, measurement of Grounding Prisoners (Grounding Resistance), an Oscilloscope, a Digital gauge
Prerequisite: Electronics Circuits.
Textbook:
1. Rudy Setiabudy, " Pengukuran Besaran Listrik," LP-FEUI, 2007.
2. Klaas b. Klaassen, "Electronic Measurement and Instrumentation," Cambridge University Press, 1996.

ENEE614024
ENEE606029
ELECTRIC MEASUREMENTS LABORATORY (1 CREDITS)
Learning Outcomes:
Capable of measuring electrical quantities; Able to choose the measuring instrument to suit the needs of measurement topics:
Topics:
Gauge 1 phase, 3 phase measurement tool, the tool to measure the energy and power, grounding measuring instrument
Prerequisites:
Measurement of Electrical Quantities
Textbook:
Electric Quantity Measurement lab course modules-high-voltage Laboratory and measurement of electricity.

ENEE617037
ENEE607031
ENGINEERING ENTREPRENEURSHIP (2 CREDITS)
Learning Outcomes:
Able to implement the concepts and skills of entrepreneurship in the field of electrical engineering; Able to perform analysis and make the business plan expertise in innovation/product which corresponds to the development of information technology; Able to implement the concepts and skills of entrepreneurship in the field of electrical

engineering
Topics:
Charging for Expertise, Think, Plan, Act Like an Entrepreneur, Making a Business Successful, Taking the Initiative, Enabling an E-Business, Providing Outsourced Services & Building a Contracting Business, guest lectures
Prerequisites : None
Textbook:
1. New Venture Creation – Entrepreneurship for the 21st Century, 6th Edition, J.A. Timmons and s. Spinelli, Irvin McGraw-Hill, 2004.
2. The material of the lectures given by practitioners of the entrepreneurial

ENEE611002
ENEE607032
ACADEMIC WRITING (3 CREDITS)
Learning Outcomes:
Able to write scientific papers with good structure
Being able to write down the steps with a detailed and structured research; capable of processing data with research tools statistics
Topics:
Systematics of academic writing; experimental variables and set up; statistical analysis tools, the use of the language of Indonesia is good in scientific works; English usage in scientific papers, word processing software; styling; referencing tools
Prerequisites: none
Textbook: -

MAJORING
TELECOMMUNICATIONS ENGINEERING

ENEE606301
CODING TECHNIQUE AND APPLICATIONS (3 CREDITS)
Learning Outcomes:
Capable of outlining the types of encoding; Being able to analyze the techniques used in data compression coding and reliable communications.
Topics:
Information measures, source and channel models, various source coding schemes including Huffman coding, run-length coding, linear predictive coding, transform coding, and various channel coding schemes including cyclic codes, BCH codes and convolutional codes. Trellis Coded Modulation. Application for Speech Coding, Image and Video Coding.
Prerequisite: Probability and stochastic processes
Textbook:
1. Andre Evidence, “Coding Theory: Algorithms, Architectures and Applications, Wiley-Interscience, 2007.
2. Thomas m. Cover & Joy a. Thomas, Elements of Information Theory “, Wiley-Interscience, 2006.
3. Jorge Castineira Moreira & Patric Guy keeps on, “Essentials of Error Control Coding”, John Wiley & Son Pub., 2006.

ENEE615030
ENEE606302
COMMUNICATION NETWORKS (3 CREDITS)
Learning Outcomes:
Able to explain mathematical concepts with regard to the concept of communication networks; Able to explain the concept of circuit switching and packet switching as well as concepts related to communication traffic; Able to explain the concept of queuing and queue theories for communication network; Able to explain concepts and mechanisms of QoS on the network communication
Topics:
Mathematics for the network, the concept of a communication network (layering); Circuit Switched and Packet Switched, the concept of communication traffic (Erlang B, Erlang C, Engset, Bernoulli, etc.); Various theories of the queue (M/M/1, M/M/c, M/G/1, M/G/c, etc.); Markov chain concept for communication networks, QoS assurance mechanism concept and the communication network.
Prerequisite: Telecommunications Engineering.
Textbook:
1. James r. Boucher, “Traffic System Design Handbook,” IEEE Press, 1993
2. Piet Van Mieghem, “Performance Analysis of Communication Networks and Systems,” Cambridge University

Press, 2006, USA
3. Jean Walrand, "An Introduction to Queueing Networks," Prentice-Hall Int'l, USA, 1988

ENEE606303
BROADBAND MULTIMEDIA COMMUNICATIONS (3 CREDITS)
Learning Outcomes:
Being able to analyze the concept of broadband multimedia.
Topics:
The concept of multimedia technologies, TCP/IP, network protocols, ATM, Frame Relay, MPLS, broadband wireless access technologies, metro Ethernet, NGN and IMS, QoS, Resource management, QoS, the mechanisms work and how to guarantee it, a multimedia network model, the component performance throughput capacity.
Prerequisite: Telecommunications Engineering.
Textbook:
1. Lu Guojun, "Communication and Computing for Distributed Multimedia Systems," John Wiley and Sons
2. Luis Correia, "Mobile Broadband Multimedia Networks," Elsevier, UK, 2006

ENEE607304
ANTENNAS AND PROPAGATION (3 CREDITS)
Learning Outcomes:
Able to describe wave propagation and transmission system and its implications on the performance of communication systems; Able to explain various mechanisms of propagation of electromagnetic waves; Able to explain the working principle of antenna and antenna performance parameters; Being able to describe the various types of antenna as a means for transmitting signals; Able to calculate the performance of the simple antenna systems which good in theory or application; Able to calculate the performance of a single element antenna such as a dipole, yagi, antenna loop, funnels, slot antenna and micro-strip antenna; Able to design a simple antenna and measure it; Being able to analyze the types of wave propagation and select the correct antenna for wireless communication system.
Topics:
Working principles of the basic parameters of antenna, the antenna measurement techniques, several types of antennas: dipole antenna, monopole, antenna stacking, aperture antenna and antenna with reflector. Radio wave propagation (ground surface wave, wave, wave, space sky wave, and microwave and millimeter wave);
Prerequisite: Electromagnetics
Textbook:
1. Constantine a. Balanis, "Antenna Theory, Analysis and Design," Third Edition, John Willey and Son, Inc., 2005.
2. Saunders r. Simon, "Antennas and Propagation for Wireless Communication Systems," First Edition, John Wiley and Son, Inc., 1999.
3. IEEE journal transaction Antenna and Propagation

ENEE607305
OPTICAL COMMUNICATIONS (3 CREDITS)
Learning Outcomes:
Able to explain wired transmission media/fiber optic as well as their principles; Able to explain the components of the optical communication system; Able to analyze optical communication systems
Topics:
Structure and optical fiber waveguide, signal degradation in on optical fiber, optical sources, optical components, optical coherent fiber communication; the techniques of modern systems; The techniques and coding theory; Performance analysis of optical communication systems
Prerequisite: Electromagnetics and Telecommunications Engineering.
Textbook:
1. Raat p. Agrawal, "Fiber-Optic Communication Systems", 3rd Edition, Wiley Interscience, 2002.
2. g. Keiser, "Optical Fiber Communications", 3rd Edition, McGraw Hill, 2000.

ENEE608308
MOBILE AND WIRELESS COMMUNICATIONS (3 CREDITS)
Learning Outcomes:
Able to explain the different types of wireless communication, concept of cellular, wireless communication components; Able to explain concepts, techniques and components of wireless mobile communication; Able to analyze performance of wireless mobile communications system.
Topics:
Overview of wireless communications, cellular concept/fundamentals, large scale fading/path loss, small scale fad-

ing, modulation techniques, equalization, diversity, channel coding/error control coding overview, multiple access, emerging wireless technologies: WLAN, 3G and WCDMA, 4G and LTE, mobile ad hoc networks, body area networks and mobile health, future wireless system.

Prerequisite: Telecommunications Engineering
Textbook:

1. t. s. Rappaport, "Wireless Communications: Principles and Practice", Upper Saddle River, New Jersey: Prentice Hall, 2nd ed., 2002.
2. a. Goldsmith, "Wireless Communications," Cambridge University Press, 2005.
3. w. Stallings, "Wireless Communications and Networks", Prentice Hall, 2nd ed., 2005.

ENEE616035
ENEE608307
COMMUNICATION SYSTEM DEVICES (3 CREDITS)
Learning Outcomes:
Able to analyze various subsystem communication devices; Able to analyze transmission line, adjustment circuit, resonator, filter, amplifier, LNA, oscillator, mixer; Able to design the subsystems communication device based on active component for radio wave.
Topics:
Passive Components simple radio waves, the active component is a simple radio waves
Prerequisite: Electromagnetics, Circuit Electronics, Telecommunications Engineering.
Textbook:

1. d. m. Pozar, "Microwave Engineering", Addison-Wesley, 1998.
2. Gonzalez, "Microwave Transistor Amplifiers: Analysis and Design", 2nd Edition, Prentice Hall, 1997.

ENEE607306
SPECIAL COURSEOF TELECOMMUNICATIONS 1 (3 CREDITS)
Learning Outcomes:
Able to follow the development of the telecommunications industry and apply it; Able to follow the development of the latest telecommunications technology aspects;
Topics:
Current issues about aspects of telecommunication technology
Prerequisites: none
Textbook: no

ENEE608309
SPECIAL COURSEOF TELECOMMUNICATIONS 2 (3 CREDITS)
Learning Outcomes:
Able to follow the development of the telecommunications industry and apply it; Able to follow the latest developments in business and telecommunications regulation.
Topics:
Current issues of business and regulation of telecommunications.
Prerequisites: none
Textbook: no

MAJORING
ELECTRIC POWER ENGINEERING

ENEE606102
POWER ELECTRONICS AND LABORATORY (3 CREDITS)
Learning Outcomes:
Able to design simple application field of electric power; Able to explain the philosophy of power electronics equipment; Capable of calculating parameters on power electronics circuits; Able to design simple circuits using power electronics equipment
Topics:
Introduction to power electronics, electronic components, power converter AC-AC converter, AC-DC, DC-DC converter, DC-AC converter, power electronics applications
Prerequisite: Electric Power Engineering, Electronic Circuit
Electricity.

Textbook:
1. Muhammad h. Rashid, “Power Electronics Circuits, Devices and Applications,” Prentice Hall, Fourth Edition, 2013.
2. Power Electronics lab course Modules-Electrical energy conversion Laboratory

ENEE606103
MANAGEMENT AND ENGINEERING ECONOMY (3 CREDITS)
Learning Outcomes:
Being able to classify the energy field; Able to explain the basics of business and management; Able to calculate the economics in electric field; Able to analyses the comparison of alternative technologies; Able to analyze alternative replacement; Being able to analyze the latest technology in the field of energy conversion; Able to calculate the economics source of energy; Being able to analyze the potential source of energy.
Topics:
The basic concept of management, organization type, organization resources, economic concepts, and the correlation value is money and time, comparative studies, analysis of replacement, the basics of energy management, energy costs, and calculation of potential energy
Prerequisite: none
Textbook:
1. William g. Sullivan, Elin M Wicks, James t. Luxhoj, “Engineering Economy,” 3rd Edition, Pearson Education International, 2006.
2. Andrew c. Paine, John Chelsom, Lawrence v. R.P. Reavill, “Management for Engineers,” John Wiley and Sons, 1996.

ENEE617038
ENEE607104
ELECTRIC POWER SYSTEM AND LABORATORY (3 CREDITS)
Learning Outcomes:
Being able to analyze the magnetic and electric field high on power system; Able to explain the philosophy of power system; Able to calculate the parameters of power network; Capable of analyzing system of electric power network; Being able to find a solution to the problem of the quality of electric power; Being able to analyze the source of disturbance in the generation, transmission, and distribution of electricity; Capable of minimizing the effects of disturbance on electric power systems.
Topics:
The phenomenon of electric field and magnetic field on the electric power system, the effects of magnetic field and electric field on electric power systems, mitigation of effects of magnetic field and electric field.
Sources of disturbance on electric power systems, the effects of disturbance on mitigation of the effects of power system disturbances in electric power systems
Prerequisite: Engineering Mathematics, Electrical Power Engineering
Textbook: B. M. Weedy, B. J. Cory, “Electric Power Systems,” 4th Edition, John Wiley and Sons, 2001.

ENEE606101
ELECTRIC ENERGY CONVERSION (3 CREDITS)
Learning Outcomes:
Being able to classify the energy field; Being able to decipher the various types of energy as electric generators; Able to calculate the range of potential energy as electricity generation; Being able to analyze the process of converting electric energy;
Able to apply the principles of electrical energy conversion; Being able to analyze the latest technology in the field of energy conversion.
Topics:
Basic conversion of energy, sources of energy, new energy Conversion Technology, and renewable power plants, Thermal power plants, non-thermal power plant.
Prerequisite: Electric Power Engineering.
Textbook:
1. Djiteng Marsudi, “Pembangkitan Energi Listrik,” Penerbit Erlangga, 2005.
2. Abdul Kadir, “Pembangkitan Tenaga Listrik,” Penerbit UI, 1996.
3. D. Yogi Goswami, ▫Frank Kreith, “Energy Conversion,” Penerbit CRC Press, 2007.
4. Bent Sørensen, “Renewable Energy Conversion, Transmission and Storage,” Penerbit Elsevier, 2007

ENEE607106
Building Electric Installation
Learning Outcomes:
Able to make the planning of the electrical installation of the building; Able to calculate the magnitudes of the

electrical installation parameters on the building; Able to itemize those parts of the electrical installation of the building
Topics:
Basic electrical installation, the components of the electrical installation, the requirements of the electrical installation, electrical installation technology, security lighting, security and safety, as well as the procedures for electrical installation of buildings
Prerequisite: Electric Power Engineering
Textbook:
1. William K Y Tao R, Richard Janis, "Mechanical and Electrical System in Building," Prentice Hall, 1997.
2. Brian Scaddan, "Electrical Installation Work". Elsevier Publishing, 2005.

ENEE607105
HIGH CURRENT & VOLTAGE ENG + LAB (3 CREDITS)
Learning Outcomes:
Being able to analyze the magnetic and electric field high on power system; Able to explain the phenomenon of electric field and magnetic field is high; Capable of testing electric power equipment; Able to analyze about the occurrence of interference due to the phenomenon of the high terrain.
Topics:
The concept of a high-voltage, high-voltage test, high voltage generation, impulse generators, direct current testing and flow back and forth, testing electrical equipment
Prerequisite: Electromagnetics, Electric Power Engineering
Textbook:
1. Artono Arismunandar, "Teknik Tegangan Tinggi," Pradnya Paramita, Jakarta, Cetakan ke-7, 1994.
2. E. Kuffel, W.S. Zaengl, "High Voltage Engineering Fundamentals," Pergamon Press, 1984.
3. Modul Praktikum Teknik Arus dan Tegangan Tinggi - Laboratorium Tegangan Tinggi dan Pengukuran Listrik.

ENEE608109
ELECTRIC POWER SYSTEM PROTECTION (3 CREDITS)
Learning Outcomes:
Able to explain the philosophy of electric power system protection; Able to calculate the electrical protection system; Able to evaluate the protection system of electric power; Able to design protection system of electric power.
Topics:
Electrical protection philosophy, types of relay protection, the principle of relay protection, setup relay protection, the coordination principle of protection.
Prerequisite: Electric Power Engineering
Textbook:
1. the G.E.C. Alsthom, "Protective Relays Application Guide," U.K., 2015

ENEE608108
ELECTRIC POWER TRANS. & DISTRIBUTION (3 CREDITS)
Learning Outcomes:
Able to explain the philosophy of the distribution and transmission of electric power systems; Able to calculate the parameters of the transmission and distribution; Being able to analyze the transmission and distribution of electric power systems.
Topics:
The introduction of transmission and distribution of electrical power, the circuit of three phase motors, Inductance, Capacitance and Resistance on the transmission network, transmission network performance characteristics, the distribution Transformer, electric power distribution network.
Prerequisite: Electric Power Engineering
Textbook:
1. Luces m. Faulkenberry, Walter Coffer, "Electric Power Distribution and Transmission," Prentice Hall, 1996.
2. Iwa Garniwa, "design of electric power Distribution Equipment," Publisher – high-voltage Laboratory and measurement of electricity, Electrical Engineering Department, FTUI, 2008.
2. Iwa Garniwa, "design of Power transmission equipment," Publisher – high-voltage Laboratory and measurement of electricity, Electrical Engineering Department, FTUI, 2008.

ENEE607107
SPECIAL COURSEOF ELECTRICAL POWER 1 (2 CREDITS)
Learning Outcomes:
Able to design a simple application in the field of energy and power system.

Topics: customized to class' needs about power system technological development, and can be given by several guest lecturers
Prerequisite: Electric Power Engineering
Textbook: None

ENEE608110
SPECIAL COURSEOF ELECTRICAL POWER 2 (2 CREDITS)
Learning Outcomes:
Able to design a simple application in the field of energy and power system.
Topics: customized to class' needs about power system technological development, and can be given by several guest lecturers
Prerequisite: Electric Power Engineering
Textbook: None

MAJORING
ELECTRONICS ENGINEERING

ENEE617040
ENEE606202
PHOTONIC DEVICES (3 CREDITS)
Learning Outcomes:
Able to explain the working principle of passive and active photonic
Able to apply the principles of physics and mathematics to calculate the variable change device photonic
Being able to determine the independent device photonic
Able to explain passive: photonic device and optical, lattice (grating), polarization; and active photonic device: laser, LED, and photodetector
Being able to compute using Photonic device variables theory of light: the law of Snell, Fresnel equation, Fermat's law, polarization
Able to determine variables NA, attenuation, dispersion, mode sense, dispersive power, Registrar, power, free spectral range, coherence, vector and matrix Jones
Topics:
The theory of light: the law of Snell, the law of Fresnel, Maxwell's equation, Fermat's law, polarization, diffraction, NA, attenuation, dispersion, mode sense, dispersive power, Registrar, power, free spectral range, the coherency matrix, vector, Jones,
Photonic passive devices: optical, as well as lattice (grating), polarization; Active photonic device: laser diode, an LED and a photodetector.
Prerequisite: a Semiconductor Device
Textbook:
1. B.E.A. Saleh and M.C. Teich, "Fundamentals of Photonics," New York, NY: John Wiley and Sons, 1991. ISBN: 0471839655.
2. d. Griffiths, "Introduction to Quantum Mechanics," Second Edition, Upper Saddle River, NJ: Prentice Hall, 1995, ISBN: 0131118927.
3. Modul Praktikum Pilihan - Laboratorium Elektronika

ENEE607205
VLSI (3 CREDITS)
Learning Outcomes:
Able to design VLSI circuit
Topics:
Review of CMOS semiconductor device fabrication, the rules of design, Scale of Lambda, Asynchrony, designing logic gates, Inverter, NAND, NOR, Full custom design, Semi-custom design, validation, Packaging/IO, design for manufacturing, testing and design of fault modeling, Coding for synthesis, characteristics and Estimate the performance series, the high level design Optimization, Programmable logic arrays, subsystem Design, Properties of CMOS Logic: Area, Power, Delay, time Optimization Engine, sequential, and the structure of the regular VLSI.
Prerequisite: Electronics Circuit, semiconductor device Fabrication
Textbook:
N. Kamran Eshraghian, & Weiste "Principles of CMOS VLSI Design: A perspective", Second Edition, Addison Wesley, 2002.

ENEE606201

ADVANCED ELECTRONICS CIRCUITS (3 CREDITS)
Learning Outcomes:
Able to analyze: integrated circuits, digital circuits with bipolar digital circuits, MOSFET, power amplifier, high-order active filter, oscillator circuit, Schmidt Trigger, voltage regulators; Able to design: integrated circuits, digital circuits with bipolar digital circuits, MOSFET, power amplifier, high-order active filter, oscillator circuit, Schmidt Trigger, voltage regulators.
Topics:
Integrated circuits, digital circuits with bipolar digital circuits, MOSFET, power amplifier, high-order active filter, oscillator circuit, Schmidt Trigger, voltage regulator
Prerequisite: Electronics Circuits
Textbook:
Boylestad R, Nashhelsky L, "Electronic Devices and Circuit Theory, 9th Edition," Prentice Hall, New Jersey, USA, 2006.

ENEE616034
ENEE607204
INTRODUCTION OF NANOELECTRONICS (3 CREDITS)
Learning Outcomes:
Able to analyze recent developments in the field of electronics and photonic; Being able to analyze the workings of the Nano-electronic and Nano-photonic device.
Topics:
Nano technology and its application in the field of electronics, from the micro to the Nano, the miniaturization of electronics device, scaling the dimensions of transistor, the workings of the single electron transistors, molecular electronics work, fabrication, and characterization of Nano-devices, Nano-technology and its application in the field of photonic, the workings of the single-photon detector, the workings of the OLED
Prerequisite: A Semiconductor Device, Semiconductor Device Fabrication
Textbook:
1. Massimiliano Di Ventra, et al. Introduction to NST ch. 11 Kluwer ACAD. Publishers, 2004.
2. Vladimir v. Mitin, Viatcheslav a. Kochelap, Michael a. Stroscio, "Introduction to Nanoelectronics", Cambridge University Press, 2008

ENEE606203
SEMICONDUCTOR DEVICE FABR + LAB (3 CREDITS)
Learning Outcomes:
Able to explain the process of fabricating semiconductor devices; Capable of making a semiconductor fabrication process design on microelectronics devices; Able to use the device fabrication process design.
Topics:
The history of the semiconductor industry, semiconductor, wafer preparation and Crystal growth, contamination control, lithography, oxidation, diffusion, ion implantation, etching, deposition, application usage Supreme ver. 4.
Prerequisite: Device Electronics.
Textbook:
1. Peter Van Zant, "Microchip Fabrication," 8th Edition, International Edition, McGraw-Hill, 2004.
2. Practical semiconductor device Fabrication Module-Electronics Laboratory

ENEE608207
SOLAR CELLS (3 CREDITS)
Learning Outcomes:
Able to identify work areas devices to solar cells; Being able to compute the parameter limit efficiency, loss-power loss in a solar cell device; Being able to analyze the way of working and the solar cell performance, design and fabrication of silicon solar cells.
Topics:
The workings of the solar cell, the Parameter limit efficiency, loss-power loss in a device the solar cell, solar cell device work area, the design of silicon solar cells, and fabrication of silicon solar cells
Prerequisite: Electronics Circuit, Semiconductor Device Fabrication
Textbook:
Marten a. Green, "Solar Cells Operating Principles, Technology and System Applications", UNSW, 1998.

ENEE608309
MEMS (3 CREDITS)
Learning Outcomes:

Able to design MEMS circuits;
Topics:
Background the development of MEMS, electronics and materials processing, MEMS and microelectronics technology, preparation of standard silicon micromachining, bulk, and the surface of silicon micromachining, MEMS, micro stereo lithography micro-sensor, the SAW, the SAW on a solid object, the measurement parameter micro-sensor IDT, IDT micro-sensor Fabrication Micro-sensor, IDT, smart sensors and MEMS.
Prerequisite: Electronics Circuit, Semiconductor Device Fabrication
Textbook:
Julian w. Gardner, Vijay k. Varadan, and Osama o. Awadelkarim, "Microsensors, MEMS and Smart Devices," Wiley; 1 edition (December 15, 2001), ISBN-10:047186109X, ISBN-13:978-0471861096.

ENEE60730 6
SPECIAL COURSE OF ELECTRONICS 1 (2 CREDITS)
Learning Outcomes:
Being able to analyze the development of technology devices and photonic systems; Able to analyze basic photonic system for certain functions
Topics:
Current topics of development of technology devices and systems photonic
Prerequisite: Electronics Circuits
Textbook: none

ENEE607309
SPECIAL COURSEOF ELECTRONICS 2 (2 CREDITS)
Learning Outcomes:
Able to analyze recent developments in the field of electronics;
Topics:
The topics of the current technological development of electronic systems and devices
Prerequisite: Electronics Circuits
Textbook:-

MAJORING
CONTROL ENGINEERING

ENEE607405
ADAPTIVE & PREDICTIVE CONTROL SYSTEM (3 CREDITS)
Learning Outcomes:
Able to identify the model and application of predictive and Adaptive; Capable of analyzing discrete control system, the stability of non-linear system using Lyapunov method; Capable of designing discrete adaptive and predictive control; Able to evaluate the performance of predictive and adaptive control systems.
Topics:
The basic concept of predictive and adaptive control, recursive parameter estimation, method of pole placement method, minimum variance, dynamic matrix control, model algorithmic control, generalized predictive control, predictive control room situation.
Prerequisite: Control Engineering
Textbook:
1. P.E. Wellstead and M.B. Zarrop, "Self-tuning Systems: Control and Signal Processing", John Wiley and Sons, 1991.
2. J.M. Maciejowski, "Predictive control with constraints", Prentice Hall, 2000

ENEE615029
ENEE606401
DIGITAL CONTROL SYSTEM (3 CREDITS)
Learning Outcomes:
Capable of analyzing discrete control system; Able to explain the characteristics of discrete systems; Capable of analyzing the stability of discrete systems; Able to design a simple discrete controller; Able to make discrete controller design method: root locus, and pole placement; Able to make the design of state observer of discrete Full order observer, and Reduced order observer
Topics:
The basic concept of a digital control system, a review of z-transforms, discrete time transfer functions, methods of realization of discrete control system, Transient and steady state response, analysis of stability of discrete systems, discrete root locus method, design the root locus method control discrete, discrete state space models,

canonical forms, discrete state space model analysis (Eigen values, controllability, observability), pole-placement method of discrete, observer design of discrete.
Prerequisite: Control Engineering
Textbook:
Ogata, k. "Discrete Time Control Systems", Prentice Hall, 2002.

ENEE617039
ENEE606402
PROCESS CONTROL SYSTEM (3 CREDITS)
Learning Outcomes:
Able to identify the model of dynamical systems of industrial processes; Able to explain measurement techniques of dynamical systems of industrial processes; Able to explain the characteristics of industrial processes; Able to describe systems of industrial processes; Able to identify industrial process modeling method
Topics:
Process and characteristics of the problem, the process of measurement methods, sensors and transmitters, signal conditioning and installation, industrial process modeling, PID controllers, tuning PID control, cascade control, feedforward control, smith predictor, a variation on another controller.
Prerequisite: Control Engineering
Textbook:
1. Curtis d. Johnson, "Process Control and Instrumentations", 8th Edition, Prentice Hall Inc. 2005.
2. Carlos a. Smith and Armando Corripio, b. "Principles and Practice of Automatic Process Control", 3rd Edition, John Wiley & Sons, Inc. 2005.

ENEE607404
ROBOTICS (3 CREDITS)
Learning Outcomes:
Able to identify the needs of the components of Robotics; Being able to analyze the kinematics of the robot; Able to evaluate the drive systems Robotics; Integrated control system capable of designing on simple robotics systems; Able to design kinematics robotics.
Topics:
Robotics Automation system components (sensors, actuators, controllers), the principle of work of system of robotics, kinematics of robots, robotics control systems (position control) robot kinematics-based interconnection system components, robotics, engineering the design of robots, robot programming, simulation with OpenGL, the introduction of a high level of robots.
Prerequisite: Engineering control, algorithms and programming.
Textbook:
1. Robotics: design, control, and artificial intelligence, Andi Publisher by Endra Pitowarno, 2006.
2. Introduction to Robotics: mechanics and control, 3rd Edition, John Craig, Pearson, 2009.

ENEE606403
ELECTRIC DRIVE CONTROL SYSTEM (3 CREDITS)
Learning Outcomes:
Being able to analyze the component controller and electric drive system components; Able to evaluate the performance of the electric drive system with simulation; Able to evaluate simple motor drive systems.
Topics:
Electric drive systems, modeling of electric motors (DC, PMSM, IM), power transfer circuit (PWM 3 phase inverter), the servo motor DC brushless speed controller, and position, the concept of reference frame, vector control, simulation of electric drive system.
Prerequisite: Engineering Control.
Textbook:
1. Peter vase, "Electrical Machines and Drives: A Space-Vector Theory Approach", Oxford University Press, UK, 1993.
2. Peter vase, "Sensor-less Vector and Direct Torque Control", Oxford University Press, 1998.

ENEE608407
MECHATRONICS (3 CREDITS)
Learning Outcomes:
Being able to analyze the components of the controller; Capable of analyzing the limitations of Mechatronics system components; integrated control system capable of designing in Mechatronics system is simple; capable of designing system of Mechatronics Robotics with applications to accommodate the limitations of the components.
Topics:
Introduction to Mechatronics systems, characteristics and limitations of Mechatronics system

Method of improvement reliability of Mechatronics system components, Mechatronics system design, electromechanical system modeling, design and development of application software, control compliant, tele-robotic, bilateral control.
Prerequisite: Robotics
Textbook:
Robert Bishop, “Mechatronics and Introduction”, 2006.

ENEE608408
KNOWLEDGE BASED SYSTEMS (3 CREDITS)
Learning Outcomes:
Able to identify the model of knowledge-based dynamical systems; Being able to analyze the performance of artificial neural network; Able to implement algorithms in programming language for knowledge-based systems.
Topics:
the working system of neurons, cells, artificial neural network architecture (JST); the learning method is JST; back propagation neural networks (BPNN); algorithms and analysis of programming error, function of BPNN in Matlab; optimization of parameters; application of BPNN program as the system identifier of the pattern, the system control based neural network: an analysis of the use of methods of control, as a system of BPNN identification of neural network-based systems: representation of data and the use of BPNN as identification system, program development system identification using the BPNN full-based system, the development of BPNN and analysis theory and its application, program development system control using the BPNN full system integration based BPNN.
Prerequisite: control Engineering, Algorithms and programming
Textbook:
1. Lefteri h. Tsoukalas, and Robert e. Uhrig, “Fuzzy and Neural Approaches in Engineering”, John Wiley & Sons, Inc., Singapore, 1997.
2. John Yen and Reza Langari, “Fuzzy Logic, Intelligence, Control and Information”, Prentice Hall, Inc. New Jersey, 1999.

ENEE607406
SPECIAL TOPIC OF CONTROL ENGINEERING 1 (2 CREDITS)
Learning Outcomes:
Able to follow the development of the control technology and its implementation; Able to follow the development of current aspects of control technology.
Topics:
Current issues about control technological aspects
Prerequisites: none
Textbook: none

ENEE608409
SPECIAL TOPIC OF CONTROL ENGINEERING 2 (2 CREDITS)
Learning Outcomes:
Able to follow the development of the control technology and its implementation; Able to follow the latest development of the control technology business.
Topics:
Current issues about control business technology.
Prerequisites: none
Textbook: none

MAJORING
BIOMEDICAL ENGINEERING

ENEE606502
MEDICAL COMMUNICATION SYSTEM (3 CREDITS)
Learning Outcomes:
-Able to explain some of the technology of communication system for medical applications
-Able to explain the system of e-healthcare and telemedicine
-Able to explain the process of designing the system wired/wireless medical communication
Able to make the design through simulation design of medical devices
Topics:
Introduction to medical communication system, e-healthcare and telemedicine. Several special course will be delivered include body-centric wireless communications, electromagnetic properties and modeling of the human body,

portable wearable devices, medical implant communication systems, e-healthcare infrastructure, wireless body area network, mobile-based telemedicine system, and wireless power technology in medical devices.
Communication systems on and off, in the body and how to model the via simulation
Prerequisites: none
Textbook:
1. E-Healthcare Systems and Wireless Communications: Current and Future Challenges, Mohamed k. Watfa, Publisher: IGI Global.
2. Antennas and Propagation for Wireless Communications Centric Body, P. Hall, Publisher: Artech House, 2006.

ENEE607504
MEDICAL IMAGING TECHNOLOGY (3 CREDITS)
Learning Objective:
After getting the courses the student is expected to:
1. Able to understand some basic concepts in medical imaging technology
2. Able to explain and analyze the basic method of medical image processing in reconstructing, improving the quality of the image, making the image segmentation, image analysis, visualization of image data, and manage medical imagery in order to support the process of imaging/medical imaging in the field of health
Able to apply the methods in environmental biology and basic science to medical applications system
Able to integrate circuit and electronic device to device/instrument of biomedicine
Able to make simulations of imaging methods in medical devices
Being able to make a report of the results of the simulation of a small project
Being able to analyze the signals in the medical system to process the signal with the signal processing technique of medical
Topics:
Introduction to Medical Imaging Technologies (x-ray and Ultrasound, MRI, CT, PET and SPECT, Electrical Impedance Tomography), Image formation and Reconstruction (Acquisition, Digitization, Image Reconstruction Methods), Image Enhancement (Fundamentals of enhancement techniques, Image enhancement with linear, nonlinear, adaptive, and fixed, pixel-based methods), Image Segmentation and Analysis (Fundamentals of Medical Image Segmentation, Image acquisition and preprocessing artefacts, Thresholding, Edge-based techniques, Region-based segmentation, Classification , Morphological Methods for Biomedical Image Analysis), Image Visualization (2-dimensional visualization, 3-dimensional visualization methods: surface rendering, volume rendering, Algorithm for 3-d visualization), Image Management (Fundamentals of Compression Standards, Storage and Communication, Image archive and retrieval, three-dimensional compression).
Medical image processing, artifact acquisition, thresholding, Edge-based techniques, Region-based segmentation, Classification,
The methods of image formation process and its analysis
Image formation, medical imaging tools
Formation of the image of medical signals and image analysis, visualization
Prerequisites: None.
Textbook:
1. Handbook of Medical Imaging: Processing and Analysis Management, Isaac Bankman, Academic Press 2000, CA, USA.
2. Handbook of Medical Imaging, vol. 2: Medical Image Processing and Analysis, M. Sonka & J.M. Fitzpatrick, SPIE Press, 2009, Washington, USA.

ENEE606501
BIOLOGY AND ANATOMY (3 CREDITS)
Learning Objective:
Give the basic knowledge of the mechanisms of biology and anatomy of engineering.
Instructional Objectives:
a. Able to explain the basic concepts of cell biology, molecular, biochemical and genetic engineering
b. Have the knowledge about the essential components and the various functions of the system of molecular cell.
c. Have the knowledge of the techniques and approaches that are commonly used in molecular biology of the cell.
d. Apply the knowledge of biology to biomedical engineering and health sciences.
Able to explain the phenomenon in the medical field with the approach to biology and anatomy of human organs
Able to make reports papers
Able to explain the phenomenon in the medical world with the approach to biology and anatomy of human organs

Topics: constituent molecules of the cell, structure and function of proteins within the cell, metabolism, changes in the cells; Molecular design of biochemical constituents of life, and the genetic revolution, DNA, linkages with biodiversity, biochemical protein synthesis of nucleic acids into a sequence of amino acids-RNA polymerase 2, until the Ribosome for protein synthesis, eukaryotic and prokaryotic differences; Catalytic reactions in cells: nucleoside

monophosphate kinases, proteases; Mechanical chemical in cells: how protein motors to convert chemical energy into mechanical work.
Understanding human anatomy, Cytology and Histology, Osteology, Arthrologi, Miologi, digestive system, respiratory system, circulatory system.
Constituent molecules of the cells and organs of human body Anatomy

Prerequisites: None
Textbook:
1. Alberts, 2003, Molecular Biology of the cell.
2. Lodish, Molecular cell biology, 2004.
3. G.W. Jenkins, C.P. Kemnitz, G.J. Tortora, Anatomy and Physiology: From Science to Life, John Wiley & Sons: 2nd Ed. 2010.

ENEE607505
MEDICAL SYSTEM MODELLING (3 CREDITS)
Learning Outcomes:
Learning Objective:
Understand the components of the medical system, understand the mathematical model of the medical system, understand the modeling method of the medical system, Able to perform simple modelling medical systems and able to simulate.
Able to apply the algorithm for a device/instrument of biomedicine
Able to report the results of the coding program

Topic: Introduction to signal and system of medical models, mathematical modeling and signal system in General, analytic modeling of medical system, analysis of analytical models, methods of identification of the medical system, the method of parameter estimation model, the simulation model of the medical system.
Analytic modeling of medical system
Analysis of analytical models, methods of identification of the medical system, the method of parameter estimation model, the simulation model of the medical system.
Prerequisites: None.
Textbook:
1. David T. Westwick, Robert E. Kearney, “Identification of Nonlinear Physiological Systems,” John Wiley & Sons, 2003.
2. Willem van Meurs, “Modeling and Simulation in Biomedical Engineering: Applications in Cardiorespiratory Physiology,” 1st ed., McGraw-Hill Education, 2011

ENEE608508
MEDICAL INFORMATICS (3 CREDITS)
Learning Objective:
After getting the courses the student is expected to:
1. Able to understand the basic concepts of information technology to be applied in the field of health
2. Able to apply the basic methods of Informatics with the use of basic knowledge of programming to acquire, organize, combine, and analyze health data sources
Able to apply the algorithm for a device/instrument of biomedical engineering
Able to apply the basic principles in biology in the concept of medical technology
Able to explain the basic biomedical engineering

Able to apply concepts of basic science into principles in biomedicine

Topic: Introduction to Medical Informatics, Controlled Medical Terminology, The Electronic Health Record (EHR), Health Information Systems in Clinical Settings, Health Information Systems in Public Health, Informatics Issues in Virtual Healthcare, Telemedicine, and Expert Systems, Medical Informatics and Clinical Decision Making, Future Technologies, Fundamental Algorithms & Methods of Medical Informatics, Medical Data Resources: Acquisition, Processing, and Classification.
Introduction to medical informatics and its method
Algorithms and methods of medical informatics

Prerequisites: None.
Textbook:
1. Biomedical Informatics: Computer Applications in Health Care and Biomedicine (Health Informatics) 4th ed., 2014 Edition.

2. Method in Medical Informatics: Fundamentals of Healthcare Programming in Perl, Python, and Ruby, Jules Berman, CRC Press.

ENEE606503
INTRODUCTION TO BIOMEDICAL TECHNOLOGIES (3 CREDITS)
Learning Objective:
After completion of the following courses, students are able to:
1. Understand biomedical technology systems
2. Explain the concept of system engineering applications to the problems of human biology
3. Illustrate the concept of detection, measurement, and monitoring of human physiological signal
4. Explain the concept of the diagnosis interpretations through the techniques of signal processing bioelectric data
5. Explain the concept device-device for therapy and rehabilitation
6. Make computer data analysis based on data from patients in the framework of decision making in clinical
7. Explain the concept of device for artificial organs
8. Reviewing the concept of medical imaging techniques
Able to apply the basic principles in biology in the concept of medical technology
Able to explain the basic biomedical engineering
Able to apply concepts of basic science into principles in biomedical engineering
Topics: Physiologic Systems, Bioelectric Phenomena, Introduction to Biomechanics & Biomaterials, Introduction to Biomedical Sensors, Biomedical Signal Analysis, Introduction to Medical Imaging, Medical Instruments and Devices.
Prerequisites: None.
Textbook:
1. The Biomedical Engineering Handbook, D.R. & Bronzino J.D. Peterson, 4th ed., CRC Press, 2000.
2. Standard Handbook of Biomedical Engineering and Design, M. Kutz, McGraw-Hill, 2003.
3. Handbook of Biomedical Engineering, J. Kline, Academic Press, 1988.

ENEE608507
BIOMEDICAL INSTRUMENTATIONS + LAB (3 CREDITS)
Learning Outcome:
After following this course, students are able to:
1. Understand the biomedical measurement system
2. Understand and apply various kinds of cardiovascular system measurement
3. Understand and apply various kinds of respiration system measurement
4. Understand and apply various kinds of nervous system
5. Understand patient safety factors that must be considered in the measurement
Able to apply the basic principles in biology in the concept of medical technology
Able to explain the basic engineering science biomedicine

Able to apply concepts of basic science into the principles of biomedical engineering
Able to operate medical equipment
Able to integrate circuit and electronic device to device/instrument of biomedicine
Able to make the design through simulation design of medical devices
Topic: Introduction to biomedical instrumentation; Basic transducer principle (active and passive transducer, the transducer for biomedical application; the source of bioelectric potensials; electrodes; the cardiovascular system; cardiovascular measurement; measurement in respiratory system; non invasive diagnostic instrumentation; measurement in nervous system; sensory and behavioural measurements; electrical safety of medical equipment; role of laser in healthcare.

Prerequisites: None.
Textbook:
1. Biomedical Instrumentation and Measurement, Leslie Cromwell, Fred J. Weibel and Erich A. Pleiffer, Prentice Hall, New Jersey.
2. Handbook of Biomedical Instrumentation, RS Khanpur, Tata McGraw-Hill Education, 2003.

ENEE608509
SPECIAL COURSEOF BIOMEDICAL 1 (3 CREDITS)
Learning Outcome:
This course provides an understanding of physical principles on the biological mechanisms and process (movement, design, structure, materials and transport).
At the end of the study, students are expected to:

- Apply biomechanical principles to resolve problems in human movement and musculoskeletal such as ergonomic, rehabilitation and training.
- Use of the effective and safe biomechanics instrumentation and equipment for the acquisition/assessing human movement.
- Understand the trend of future problems of biomechanics.

Able to explain the phenomenon in the medical with the approach of biology and anatomy human organs
Topics:
Newton's laws, fluid mechanics: Bernoulli, Drag forces, Reynold number, Mechanics of static systems and moving system, Kinetics and force on the body as well as the influence on the movement and stability, Basic mathematic in motion/movement, analysis and instrumentation on the motion of the body, the basic concept of human body bones muscle mechanics, Ergometry, The basic concept of energy.
Prerequisites: None.
Textbook:
1. N. Ozkaya, and M. Nordin, "Fundamentals of Biomechanics: Equilibrium, Motion and Deformation", 2nd ed., Springer, 1998.
2. E. Okuno, and L. Fratin, "Biomechanics of the Human Body", Springer, 2013.

ENEE618102
SOFTWARE ENGINEERING (3 CREDITS)
Learning Outcomes: In this course, students will learn how to design software with correct steps and able to document them. After following this course, students will able to design software using the stage of the software life cycle with the desired risk level, capable of making design software with the correct stages; capable of documenting the stages of design software
Topics: Hardware and software processes; Requirements analysis and elicitation; System specifications; System architectural design and evaluation; Concurrent hardware and software design; System integration, Software testing and validation; Maintainability, manufacturability, sustainability
Prerequisite: Algorithm and Programming
Textbook:
1. Ian Sommerville, Software Engineering, 10th ed., Pearson, April 3, 2015
2. Robert c. Martin, Agile Software Development, Principles, Patterns, and Practices, Pearson, 2002

ENEE617101
OBJECT ORIENTED PROGRAMMING + LAB (3 CREDITS)
Learning Outcomes: In this lecture, students will study how to create program with object-oriented concepts. After following this course, students are able to implement a software design into object-oriented programming language; able to establish the concept of object-oriented programming (class, constructor, scope of variables); able to outline the Basic objects (arrays, array list, object collection, iterator); able to describe the concept of design class (coupling, cohesion, refactoring, inheritance, polymorph, substitution); able to implement a GUI-based programming, exception handling and multithreading.
Topics: Java Language Elements; Java Language Operation; Defining and Using Class; System, Strings, String Buffer, Math & Wrapper Classes; Array; Classes & Inheritance; Design Graphical User Interface & Event Driven; Exceptions; Collections; Threads and Javadoc
Prerequisite: Algorithm and Programming
Textbook:
1. David j. Barnes, "Objects First with Java: A Practical Introduction Using BlueJ", 5th ed., Pearson, 2011
2. Bart Baesens URet.al., "Beginning Java Programming: The Object-Oriented Approach", Wrox, 2015

SPECIAL COURSES

ENEE616032
ENEE606023
INTERNSHIP (2 CREDITS)
Learning Outcome:
Able to apply technical knowledge that has been acquired during the study; Able to demonstrate work professionalism, work in teams, discipline, responsibility, initiative & interest, leadership, and attitude/behaviour; Able to present the results of the internship in the internship's defense.
Topic: None.
Prerequisite:
Have passed the 90 CREDITS. Internship place are industrial or lab associated with electrical engineering on the

condition there is a supervisor in the internship place. The selection of the internship place is started with the administrative process through the Department of electrical engineering.
Textbook: None.

ENEE617036
ENEE607030
SEMINAR (2 CREDITS)
Learning Outcome:
Able to propose system, component, and process of the research; Able to write research proposal; Able to present the research proposals.
Syllabus: Introduction; Literature studies; Research design.
Prerequisite: Passed the 90 CREDITS.
Textbook:
1. Technical guidelines on the writing of Thesis students of the University of Indonesia.
2. IEEE Citation Reference.
3. Ivan Stojmenovic, "How to Write Research Articles in Computing and Engineering Disciplines," IEEE Transactions on Parallel and Distributed Systems, vol. 21, no. 2, February 2010.

ENEE618041
ENEE608033
BACHELOR THESIS (4 CREDITS)
Learning Outcome:
Able to make the design of the system, component, and process; Able to carry out the research plan; Able to analyze the research results; Able to convey the results of the study in the bachelor thesis defense.
Topic: Design and implementation of experimental research; Data analysis; Conclusions.
Prerequisite: Passed 120 CREDITS
Textbook:
1. Technical guidelines on the writing of bachelor thesis of the Universitas Indonesia.
2. IEEE Citation Reference.
3. Ivan Stojmenovic, "How to Write Research Articles in Computing and Engineering Disciplines," IEEE Transactions on Parallel and Distributed Systems, vol. 21, no. 2, February 2010.