Undergraduate Handbook 2020

School of
Electrical Engineering and Informatics

INSTITUT TEKNOLOGI BANDUNG

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Welcome Message from the Dean

Dr. Tutun Juhana, ST., MT.

School of Electrical Engineering and Informatics (SEEI) ITB was established in 2006 as the merger between The Department of Electrical Engineering and The department of Informatics.

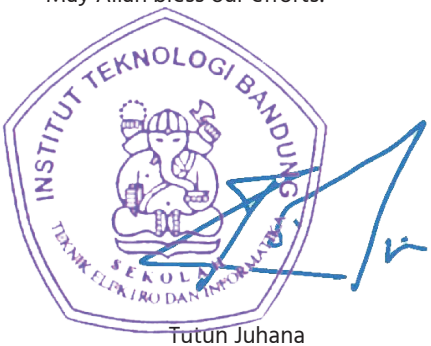
The vision of our school is to be an outstanding and competitive higher education in Electrical Engineering and Informatics in Indonesia and well recognized internationally, and has active roles in improvement of national welfare.

To achieve this vision STEI puts strong efforts to continuously improve the educational process based on international standard. In this point of view, Electrical Engineering program is the pioneer for enrolling international accreditation conducted by ABET (Accreditation Board on Engineering and Technology). We are proud to announce that Electrical Engineering program, Informatics Undergraduate program, Telecommunications Engineering Undergraduate Program, and Electrical Power Engineering Program are ABET accredited.

This undergraduate handbook contains information about vision, mission, undergraduate programs and the 2013 curriculum along with the officers, research groups and laboratories that support the undergraduate programs.

I do hope that this undergraduate handbook will be very useful for students and faculty members as well as for the public. I personally express my gratitude towards all SEEI community.

May Allah bless our efforts!



Tutun Juhana

Vision

ITB shall be an institution of higher education and center of development for science, technology and art, who continuously strives for world excellence, reliability and respectability, and together with other respectable institutions of the nation leads the Indonesian society into unity, sovereignty and prosperity.

Mission

ITB shall guide developments and changes carried out by society through innovative and quality education, research and community service, and be responsive to global development and local challenges.

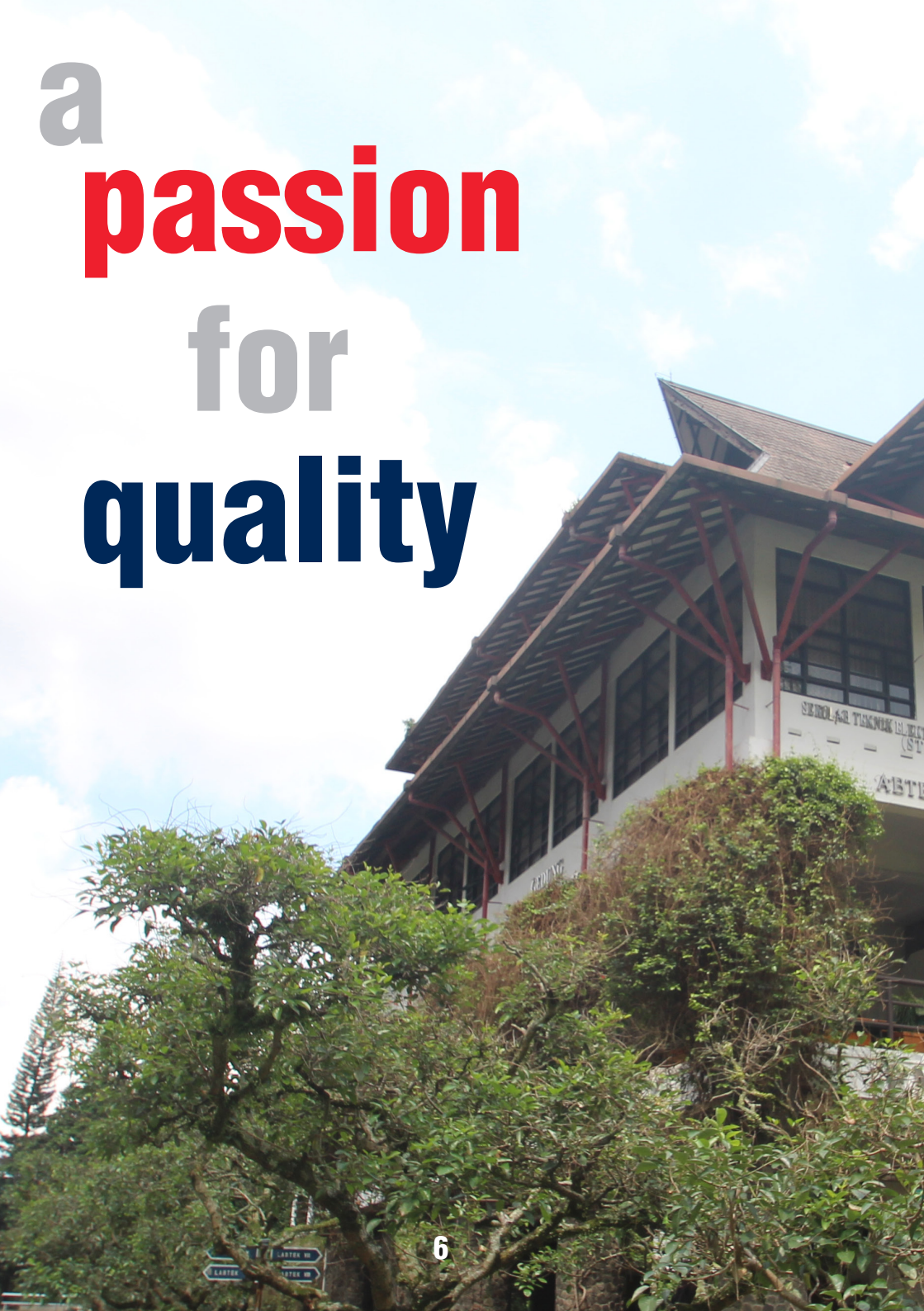
Goals

To make its vision and mission materialized, ITB sets four interrelated goals:

1. To establish a respected global academic society, who has the expertise and ability to improve its competence globally, and to develop academic value system based on scientific truth.
2. To produce quality graduates who have the ability for self-improvement in the global environment, characterized by high moral quality and integrity, intellectuality, emotional maturity, innovativeness and creativity.
3. To be a research and development university, who takes position in front line of science, technology and art, and plays an active role in the global progress of science and development of knowledge required to improve potential quality and uniqueness of the nation.
4. To be an agent of change for the Indonesian society, through the upholding of moral and ethical values, and quality of community services.

INSTITUT TEKNOLOGI BANDUNG

a passion for quality



STEI was founded in 2006, but its history has longer roots. The two branches of science that formed the STEI-ITB began many years ago: electrical engineering education since 1947, and informatics engineering since 1982. As a part of ITB, the School of Electrical and Information Engineering set a milestone on engineering higher education in Indonesia.

6 Undergraduate Programs

9 Research Groups

57 Research Projects in 2018

52 International & National Competition Winnings in 2018

357 Proceedings and Journals in 2018

~17.824 Alumnus

Our Vision

SEEI shall be an outstanding competitive and internationallly recognized higher education in Electrical Engineering and Informatics in Indonesia who has active roles in improvement of national welfare.

Our Mission

1. Providing higher education and continuing education in Electrical Engineering and Informatics by using communication and information technology toward creative communities.
2. Maintaining the state-of-the-art-of Electrical Engineering and Informatics through innovative research activities.
3. Disseminating science, technology and knowledge of Electrical Engineering and Informatics through its alumnae, partnership with and through activities of community service program to form knowledgeable and technological society.

School of Electrical Engineering and Informatics is a higher educational institution oriented towards research:

1. To develop and educate graduates who have a high level of integrity, creative, and are able to continuously learn not only to be adaptive in ever changing science and technology but also to apply the knowledge in their profession.
2. To be actively engaged in the development of knowledge in Electrical Engineering and Informatics to support Indonesia's development.
3. To educate graduates so that they can function as the engine of the nation's prosperity.

management team

Dr. Tutun Juhana, S.T., M.T.

School Dean

Dr.techn. Saiful Akbar, ST,MT.

Vice Dean of Academic Affairs

Dr. Widyawardana Adiprawita, ST., MT.

Vice Dean of Resources Affairs

Chairman of Bachelor Programs

Electrical Engineering
Arif Sasongko, ST., MT., Ph.D.

Informatics/Computer Science
Dessi Puji Lestari, ST., M.Eng., Ph.D.

Electrical Power Engineering
Dr. Umar Khayam, ST., MT.

Telecommunication Engineering
Dr. Effrina yanti Hamid, ST., MT., Ph.D

Information System and Technology
Yudistira Dwi Wardhana Asnar, ST., Ph.D.

Biomedical Engineering
Dr. Ir. Agung W. Setiawan, MT, IPM, ASEAN Eng.

Electrical Engineering

Academic and Curriculum
Arif Sasongko, ST., M.Sc., Ph.D.
Ir. Arief Syaichu Rohman, M.Sc., Ph.D.
Dr. Ir. Amy Hamidah Salman, M.Sc.
Dr. Ir. Eniman Yunus Syamsudin
Dr. Ir. Mervin Tangguar Hutabarat, M.Sc.

Communication & Information
Dr. Ir. Amy Hamidah Salman, M.Sc.
Dr. Waskita Adijarto, ST., MT.
Dr. Reza Darmakusuma, ST., MT.

Final Project/Capstone Design
M. Iqbal Arsyad, ST., MT.
Dr. Kusprasapta Mutijarsa, ST., MT.
Dr.M. Amin Sulthoni, ST., MT.
Egi M. Idris Hidayat, ST., M.Sc., Ph.D.
Dr. Reza Darmakusuma, ST., MT.
Dr. Lenni Yulianti, ST., MT.
Akhmadi Surawijaya, ST., MT.
Habibur Muhaimin, ST., M.Sc.
Yulyan Wahyu Hadi, ST., MT.

Lab and Courses Assistant
Dr. Yusuf Kurniawan, ST., MT.
Dr. Lenni Yulianti, ST., MT.

Internship and Co-Op
Yulyan Wahyu Hadi, ST., MT.
Dr. Ir. Aciek Ida Wuryandari, MT.
Egi M. Idris Hidayat, ST., M.Sc., Ph.D.

Students and Alumnae
Dr.techn. Ary Setijadi P., ST., MT.
Dr. Pranoto Hidaya Rusmin, ST., MT.
Akhmadi Surawijaya, ST., MT.

Quality Assurance
Egi M. Idris Hidayat, ST., M.Sc., Ph.D.
Dr. Reza Darmakusuma, ST., MT.

Informatics/Computer Science

Academic and Curriculum
Dr. techn. Saiful Akbar, ST., MT.
Dr. Nur Ulfa Maulidevi, ST., M.Sc.
Dr. Dessi Puji lestari, ST., M.Eng.
Achmad Imam Kistijantoro, ST., M.Sc., Ph.D.
Muhammad Zuhri Catur Candra, ST., MT.
Yudistira Dwi Wardhana A., ST., Ph.D.
Drs. Judhi Santoso, M.Sc.
Tricya Esterina Widagdo, ST., M.Sc.
Yani Widyani, ST., MT.
Dicky Prima Satya, ST., MT.

Communication & Information
Dr. techn. Wikan Danar Sunindyo, ST., M.Sc.

Final Project/Capstone Design
Dessi Puji Lestari, ST., M.Eng., Ph.D.
Dr. Fazat Nur Azizah, ST., M.Sc.
Nugraha Priya Utama, ST., MA., Ph.D.
Ginar Santika Niwanputri, ST., M.Sc.

Lab and Courses Assistant
Dr. Masayu Leylia Khodra, ST., MT.

Internship and Co-Op
Dra. Harlili S., M.Sc.
Dicky Prima Satya, ST., MT.

Students and Alumnae
Dr. Fazat Nur Azizah, ST., M.Sc.
Dr. Masayu Leylia Khodra, ST., MT.
Dr. Eng. Ayu Purwarianti, ST., MT.
Adi Mulyanto, ST., MT.

Quality Assurance
Dr. Fazat Nur Azizah, ST., M.Sc.
Dessi Puji Lestari, ST., M.Eng., Ph.D.

Electrical Power Engineering

Academic and Curriculum
Dr. Ir. Arwindra Rizqiawan, MT., IPM
Dr. Ir. Nanang Hariyanto, MT.
Dr. Ir. Agus Purwadi, MT.
Dr. Ir. Syarif Hidayat, MT.
Dr. Ir. Agus Purwadi, MT.
Dr. Ir. Umar Khayam, MT., IPM
Rachmawati, ST., M.Eng.
Dr. Fathin Saifur Rahman, ST., MT.

Communication & Information
Rizki Rahmani, ST., MT.

Final Project/Capstone Design
Dr.-Ing. Deny Hamdani, ST., M.Sc.

Lab and Courses Assistant
Dr. Ir. Arwindra Rizqiawan, MT., IPM
Dr. Fathin Saifur Rahman, ST., MT.

Internship and Co-op
Burhanuddin Halimi, ST., MT., Ph.D., IPM

Students and Alumnae
Dr. Tri Desmana Rachmildha, ST., MT.

Quality Assurance
Dr. Ir. Arwindra Rizqiawan, MT., IPM
Dr. Fathin Saifur Rahman, ST., MT.

Telecommunication Engineering

Academic and Curriculum
Dr. Tutun Juhana, ST., MT. (Coordinator)
Prof. Andriyan Bayu Suksmono, MT., Ph.D.
Prof. Dr. Ir. Adit Kurniawan, M.Eng.
Dr. Ir. Hendrawan
Dr. Ing. Eueung Mulyana, ST., M.Sc.
Dr. Effrina Yanti Hamid, ST., MT.
Dr. Irma Zakia, ST., M.Sc.
Ir. Sigit Haryadi, MT.
Rifqy Hakimi, ST., MT.

Communication & Information
Wervyan Shalannanda, ST., MT.
Dyah Rakhma Aryanti, ST., M.Sc.

Final Project/Capstone Design
Dr. Iskandar, ST., MT.

Lab and Courses Assistant
Dr. Ing. Eueung Mulyana, ST., M.Sc.
Dr. Ing. Chairunnisa, ST., MT.

Internship and Co-Op
Dr. Effrina Yanti hamid, ST., MT.
Rifqy Hakimi, ST., MT.

Students and Alumnae
Dr. Mohammad Sigit Arifianto, ST., M.Sc.
Dr. Ir. Mohammad Ridwan Effendi, MA.Sc.
Dr. Ir. Ian Josef Matheus Edward, MT.
Dr. Irma Zakia, ST., M.Sc.

Quality Assurance
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Information System and Technology

Academic and Curriculum
Achmad Imam Kistijantoro, ST., M.Sc., Ph.D.
Ir. Kridanto Surendro, M.Sc., Ph.D.
Dr. Kusprasapta Mutijarsa, ST., MT.
Dr. Ir. Arry Akhmad Arman, MT.
I Gusti Bagus Baskara Nugraha, ST., MT., Ph.D.
Dr. Dessi Puji Lestari, ST., M.Eng.
Dicky Prima Satya, ST., MT.
Dr. Fazat Nur Azxizah, ST., M.Sc.
Dr. Y. Bandung, ST., MT.
Ginar Santika Niwanputri, ST.
Latifa Dwiyanti, ST., MT.

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Andreas Bara Timur, ST., MT.

Final Project/Capstone Design
Dr. Y. Bandung, ST., MT.

Lab and Courses Assistant
Dr. Kusprasapta Mutijarsa

Internship and Co-Op
Dr. Y. Bandung, ST., MT.

Students and Alumnae
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Fadhil Hidayat, S.Kom., MT.
Ginar Santika Niwanputri, ST.

Quality Assurance
I Gusti Bagus Baskara Nugraha, ST., MT., Ph.D.
Fadhil Hidayat, S.Kom., MT.

Biomedical Engineering

Academic and Curriculum
Dr. Widyawardana Adiprawita, ST., MT.
Dr. Ir. Agung W. Setiawan, MT, IPM
Astri Handayani, ST., MT.
Dr. Donny Danudirdjo, MT.

Communication & Information
Prof. Dr. Ir. Tati Latifah Erawati Rajab
Dr. Beni Rio Hermanto, ST., MM.
Allya Paramita Koesoema, ST., MT., M.Sc., Ph.D.

Final Project/Capstone Design
Habibur Muhaimin, ST., M.Sc.
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Dr. Beni Rio Hermanto, ST., MM.
Astri Handayani, ST., MT.
Isa Anshori, ST., M.Eng.
Amanatulhay Pribadi, ST.
Lab and Courses Assistant
Dr. Donny Danudirdjo, MT.
Rizki P. Prastio, ST., MT.

Internship and Co-Op
Amanatulhay Pribadi, ST.
Dr.dr. Yoke Saadia, MT.
Dr. Hasballah Zakaria, ST., M.Sc.
Dr. Beni Rio Hermanto, ST., MM.

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Isa Anshori, ST., M.Eng.

Quality Assurance
Astri Handayani, ST., MT.
Dr. Ir. Agung W. Setiawan, MT, IPM

Administration Office

Head of Office
Lilis Teti Nurhayati, A.Md, S.A.P.

Academic
Heni, S.E.

Finance
Indrayadi, S.E.

Human Resources
Poppy Juhroniah, S.Sos.

Infrastructure
Maman Surahman, A.md., S.T.

Secretarial
Putri Islami

Academic
Ambarwati Retno W.
Dede Bagja S.
Didin Syafruddin Asa
Edi Mulyadi
Lili Sulaeman
M. Mukhlis
Nina Sulastriah
Nurhayati
Satrio Adhi Pramono
Sri Wahyuni
Suranto

Finance
Aliza Frida Tsaniyah
Astrid Nurmayangsari
Gelar Raksagama
Unnike Cawana B.S.
Reni Wijayani
Sofyan Qamaruzzaman

Human Resources
Karya Sumpena
Lia Juliyanti

Infrastructure
Abdul Hamid
Iman Sukirman
Ridsan Sambadijaya
Rifqa Nurul Chasanah
Setiawan
Yustonie

Information System
Mega Aulia Insani
M. Rian Noviansyah
Wahyu Saputra

Advisory Board

Advisory Board in the School of Electrical Engineering and Informatics serves as the School's partners that will provide inputs so that the design and execution of academic programs in the school are of high quality and relevance. In addition, the advisory board facilitates interaction between the school and industry for SEEI development.

Dewan Energi Nasional
Dr. Ir. Herman Darnel Ibrahim

PT. Encona Inti Industri
Ir. Ary Mochtar Pedju, M. Arch

Medco Holding
Ir. Yani panigoro, MM

PT Chevron Pacific Indonesia
Ir. Abdul Hamid Batubara

Tourism and Economic Creative Minister
Ir. Arief Yahya, M.Sc

PT PLN (Persero) Tbk
Ir. Nur Pamudji, M.Sc

Bappenas
Dr. Dedi S. Priatna

QIMTronics
Ir. Yana Suryana Rahardja, MBA

Texas A&M University, USA
Prof. Ronnie Ward

Prof. of Computer Security, Sangmyung University
Prof. John Choi, Ph.D

SEEI ITB
Prof. Dr. Ir. Jaka Sembiring, M.Eng

SEEI ITB
Prof. Adrian Venema

SEEI ITB
Ir. Rinaldi Firmansyah, MBA

research groups

Biomedical Engineering

Chair: Prof.Dr. Ir. Tati Latifah E.R.

Biomedical Engineering is a multidisciplinary field involving various engineering, scientific and technological methods to solve problems in biology and medicine for the improvement of the community healthcare. To study this interdisciplinary field, basic science and engineering are required. This includes basic and advanced electronics and computer, anatomy and physiology, biomedical physics, biomedical transducers and instrumentation, and biomedical system design.

The research areas focus on medical instrumentation, e-health and tele-medicine, biomedical imaging and image processing, as well as biomechanics and medical rehabilitation.

Selected Research Projects:

1. Test Bed for Integrated electronic medical record system in local hospital.
2. Multimedia medical record implementation in public health facilities.
3. Economical 3-channel Electrocardiogram (EKG) design.
4. Propagation model prediction using Ray-tracing method for High Altitude Platform Station (Haps) channel.
5. e-Health Pilot System development for handling tropical deases.
6. Open HER-based multimedia medical record for traditional/ modern treatment.

Computer Engineering

Chair: Prof. Dr. Ir. Kuspriyanto

The computer engineering research areas focus on coding, cryptography and information protection, communication and wireless network, compilers and operating systems, computational science and engineering, computer networks, mobile computing & distributed systems, computer systems (architecture, parallel processing, and dependability), computer vision and robotics, integrated circuits, VLSI design, testing & CAD, signal Image & speech processing.

Selected Research Projects:

1. Core Computer Engineering, Infrastructure & Information Retrieval: 3D Spatial Database System, Set-Top Box for IPTV, Basestation for WiMax, HLMA Chipset of DBTV.
2. Advanced e-Learning System & Entertainment: Virtual Class, Virtual Tutor, Virtual Character.
3. Health and Medical: Micromotor Enhancement for Dental Equipment, Brain-Computer Interface, Exoskeleton.
4. Kikaku Art Application as a case study for collaboration oriented interactive art & cultue development.
5. Computer Supported Collaborative Work system development for animated movie development process.
6. Development of open source-based creative content technology.
7. eduLife.Com, a Collaborative virtual environment for distance learning education platform.

Control and Computer System

Chair: Prof. Dr. Ir. Carmadi Machbub

The control and computer system research area focus on control system methodology (modeling and identification, robust control, adaptive control, nonlinear control and chaos, stochastic control and estimation, multivariable systems, distributed parameter systems, process optimization and scheduling, anti windup systems, model predictive control, sliding mode control), embedded control systems (embedded controller, integrating field level, controller and corporate information, wireless, sensor network and network control), robotics (vision-based robot control/visual-servoing, collaborative robot, aerial unmaned vehicle, bipedal robot, humanoid, flying Robot), hybrid and switching control (discrete event control and hybrid systems), control and intelligent systems (genetic algorithm, artificial intellegence and expert systems, fuzzy logic, and neural network)

Selected research Projects:

1. Game content development as educational and society empowerment of CikapundungNet in Bandung City.
2. A computational intelligence approach for Digital Signal Processing and its application in Software-Defined Radio (SDR) & Active Noise Control (ANC).
3. Dissipative control and linear matrix approach for the design and construction of Networked Control Systems.
4. Hybrid control for three phase induced electrical generator.

Power Engineering

Chair: Prof. Dr. Ir. Suwarno

The electrical power engineering research area focuses on generation system (distributed generation and system, bioenergy, power electronics on distributed generation systems), power system (computation, security, power quality, transmission and distribution automation & monitoring system), power delivery (DSM, wide area protection, reactive power management, FACTS, power economic, electrical power bussiness, electrical pricing, underseecable technology), protection system (material and technology, electromagnetic compatibility, lightning protection technology), power apparatus (instrumentation and measurement, field analysis on power system apparatus, maintenance of high voltage apparatus).

Selected Research Projects:

1. EMPT on minimally reduced power systems.
2. Development of active power filters and boost inverters by using the predictive control to achieve good dynamic response.
3. Partial Discharges in High Voltage Insulations and Their Applications for Diagnosis of High Voltage Equipments.
4. Diagnostics Transformators & Multi Parameter High Voltage Isolator in Tropical Climate.
5. Design & Construction of Low Head PLTM Turbine Prototype.

Electronics

Chair: Prof. Trio Adiono

The electronics research areas focus on Digital IC, Analog IC, IC processing, RF IC, Devices Technology and Embedded System. The research areas cover the electronics system architecture design, System on Chip (SoC), Algo-rithm optimization for hardware imple-mentation, VLSI Design, Hardware-Software Co-Design and Device Design and Implementation. The researches are targeted for various applications such as WiMax, 3GPP LTE, Smart Card, Security Engine, Low Power MIPS/RISC Processor Design, Wireless Sensor Network, Nano wire and sensors. The research utilizes industrial standard Design Tools for Hardware Design and Simulation. Several implementations use standard chip such as FPGA, DSP and Microprocessor. The group also has small scale clean room for developing laboratory experiment devices.

Selected research projects:

1. Media Access Control layer development for Broadband Wireless Access.
2. MIMO STC 2x2 Design for Mobile WiMax IEEE 802.16e.
3. Security of PGP (Pretty Good Privacy) application implementation.
4. LTE Baseband Processor Design.
5. Digital TV System on Chip Design.
6. AD/DA Converter Design.
7. Power Amplifier/Low Noise Amplifier Design.

Informatics

Chair: Prof. Dr. Dwi Hendratmo W.

The informatics research areas focus on search engines, cryptography, multimedia security, integrated messaging engine, knowledge engine, intelligent graphical engine, intelligent agent, natural language processing, text mining, computer vision, distributed computing systems, computer networks, computer networks security, mobile processing, wireless management, next generation networks, information system, data compression, model and simulation, numerical methods.

Selected Research Projects:

1. Prototype System for Search and Markets Competitive Local Products.
2. GPU-based high performance computing.
3. Automatic Summarization for Survey Paper.
4. Intelligent System for Promoting SME Handicraft Development.
5. Spatial Inference Engine.
6. System Monitoring using Embedded Linux.
7. Handwritten Text Recognition based on Spatial Relation.
8. Collaborative System.
9. Governance System.
10. Automatic Scientific Paper Summarization using Rhetorical Doc Profile Representation.
11. Knowledge Management System.
12. Interactivity-based System Design.

Information Technology

Chair: Prof. Dr.Ir. Suhono Harso Supangkat, M.Eng

The information technology research areas focus on information technology and its application, cloud computing, social networking, digital signal processing, human-machine interface, stochastic system, information theory, intelligent system, IT governance, networking technology, optical communication technology, next generation media and robotic instrumentation.

Selected research projects:

1. Cloud computing platform and its applications in health, education and business etc.
2. Quality of service on Cloud, Cloud computing business model.
3. Web-based Multimedia conference system for digital learning of primary education in rural area.
4. Low Cost Thin Client –based multimedia system for language laboratory.
5. e-Farming application development for sustainable food supply planning, monitoring, evaluation and decision support system.
6. Wireless technology and GIS-based ubiquitous-Farming for improving agricultureal products.
7. Rural Information & communication technology-based Smart Village Development.

Knowledge and Software Engineering

Chair: Prof. Dr. Ing.Ir. Benhard Sitohang

The Knowledge and Software Engineering research division focuses on developing new paradigms on software engineering, knowledge discovery and data mining, content management system, mobile application, artifacts & process based software metrics, software project management tools, XML based financial electronic reporting, source code documentation generator, web services, service oriented architecture.

Selected research projects:

1. Indonesian regional languages repository development using web semantic technology.
2. Digital Learning technology for rural villages.
3. Disaster Management Information System.
4. Mini Air Traffic Control System (ATCS) for middle class airport.
5. Content-based Direct Access methods on non alphanumeric database.
6. Integrated Information and Rehabilitation System for Multiple Handicapped Person.
7. Data Mining, Knowledge Extraction on medical data.

Telecommunication Engineering

Chair: Prof.Dr.Ir. Adit Kurniawan, M.Eng.

The Telecommunication Engineering Scientific and Research Group (TESRG) research areas focus on:

1. Telematics: broadband networking, communication protocols, network security, network management, new wave telecom services.
2. Wireless Communications Technology: cellular 3G, 4G beyond, broadband satellite, HAPs communications systems, Radiowave propagation, Digital communications based on SDR.
3. Networking: IP, optical, and software defined networking (SDN).
4. Radar and Microwave Technology: Radar systems, Surface penetrating radar, antennas and microwave devices.
5. Policy and Regulation in Telecommunications: Telecommunication convergence, Spectrum management, Telecommunications Techno-Economic Analysis.

Selected Research Projects:

1. Highspeed Ground Penetrating Radar, The Development of Algorithm and High Speed processing for SFCW radar signal reconstruction
2. Design and Implementation of SOM Prototype with Dielectric Resonator as a part of Low Noise Block in Satellite TV Receiver
3. Design and Implementation of Fixed Broadband Wireless Access WIMAX Repeater FDD at 3.3 GHz, Context Aware Services
4. Tunable Microwave Radar Absorber, Mobile Portal, Interactive Video over Hybrid DVB Broadcast Network and Unicast 3G Network
5. IP Multimedia Subsystem (IMS), MIMO Long Term Evolution Antennas.

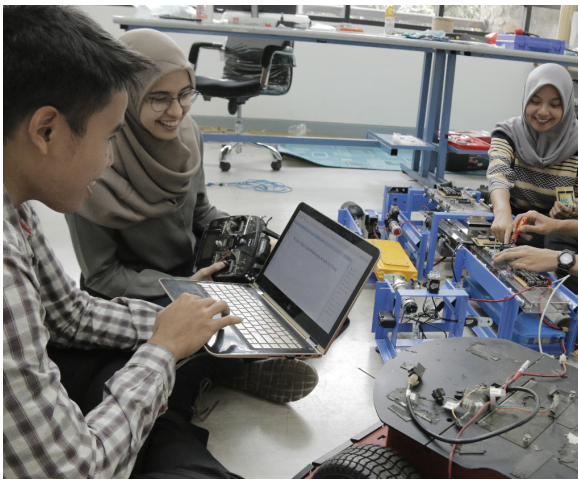
Laboratories

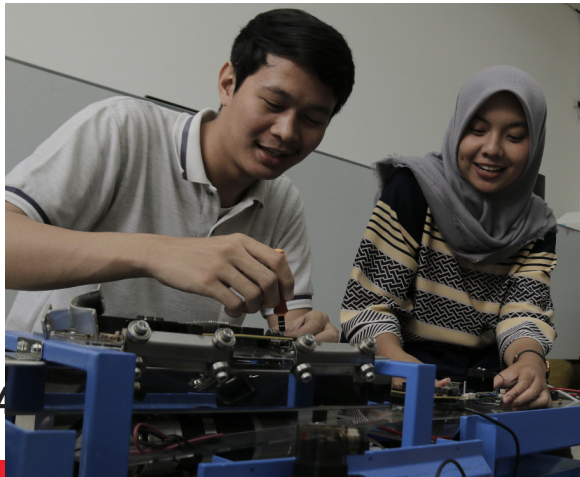
Biomedical Engineering Laboratory

Dr. Donny Danudirdjo, MT.

The Biomedical Engineering Laboratory has strategic position between the disciplines of biomedical instrumentation and biomedical informatics. Research in Biomedical Instrumentation including improved medical imaging construction, fetal sign detectors and systems, Ultrasound hardware and diagnostic software.

Some researchers focus on the application of various technologies for implementing E-health for rural area including mobile telemedicine. There are also research in imaging technology directed toward the application of image processing for diagnostic purpose. Some activities develop softwares for e-health application, including data base for host hospital in the application of medical consultancy.





Electronics & Component Laboratory

Ir. Farkhad Ihsan Hariadi, M.Sc.

The laboratory of electronic and component facilitates research on digital radion SoC, analog VLSI circuits and systems, heterogeneous multicore architecture, wireless sensor networks and embedded systems.

High Voltage & High Current Laboratory

Dr. Umar Khayam

This lab provides facilities for conducting research on insulation material in tropical environment, lighting physical phenomenon and protection for power and electronic systems, grounding problems, electromagnetic compatibility, maintenance and technologies of electrical equipment, and risk analysis of equipment problems.

Graphics & Artificial Intelligence Laboratory

Dr. Nur Ulfa Maulidevi, ST., M.Sc.

This laboratory focuses on intelligent graphical engine, computer vision, intelligent agent & multi-agent systems, natural language processing, text mining, speech processing, expert system, intelligent information system, machine learning, robotics (human computer interaction, vision, and planning).

Computational Science & Engineering Laboratory

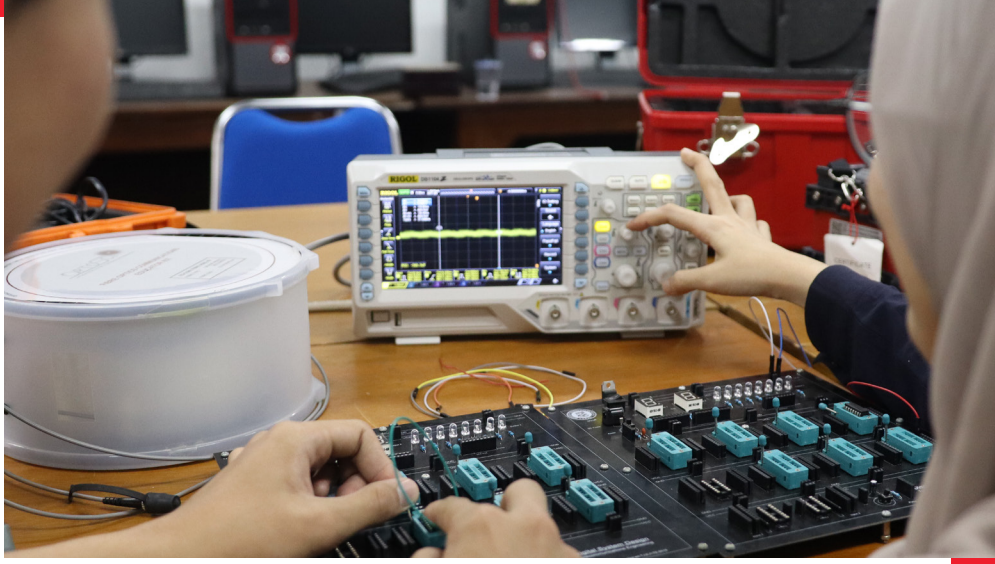
Dr. Judhi Santoso, M.Sc.

The Laboratory of Computational Science and Engineering is facilitating research related to information retrieval and filtering, search-engine, information extraction, recommender systems, document summarization, text processing, computational linguistics, cryptography, coding theory, compression method, computer simulation, computational theory, design and analysis of algorithms, computational complexity, numerical method, formal language and automata, compiler design.

Electrical Energy Conversion Research Laboratory

Dr. Agus Purwadi

Electrical energy conversion research laboratory is a laboratory for research and experiments related to electrical machinery, power electronics, electric drives, power quality, power generation systems, and microgrids. In addition to electrical machines, power converters, and computers for experiments, the laboratory has a facility for mechanical works. The laboratory also has cooperation with many national and international companies and institutions for research on various fields in electrical engineering.



Radio Telecommunications and Microwave Laboratory

Dr. Joko Suryana, ST., MT.

The laboratory provides research facilities in the areas related to radio telecommunications, electromagnetics, satellite and terrestrial communications, mobile communications, wireless communications, antennas and wave propagation, microwave devices, signal processing, radar and navigation, as well as telemedicine and e-Health.

Telematics Laboratory

Dr. Ing. Eueung Mulayana, ST., M.Sc.

Telematics Laboratory provides research and education facilities in the area of: networking and infrastructure, Internet of Things and smart devices/appliances, telecommunication system and services, performance modeling and analytics, application and bussiness studies, and network security.The laboratory is equipped with various facilities and networking labs, occupying around 1,200 meter square floor.

LABORATORIES

Software Engineering Laboratory

Dr.techn. Muhammad Zuhri Catur C., ST., MT.

This laboratory supports research activities in the following topics: web enginering including web services, service-oriented architecture, development of mobile applications, enterprise application technologies, and software development techniques and methods. It also supports teaching activities for software engineering and related courses such as fundamental and Advanced Software Engineering, Software Project, and Object-oriented Software Analysis and Design.

Programming Laboratory

Dr. Fazat Nur Azizah

This laboratory mainly provides services to SEEI students to do their Final Project related to the field of programming. It occupies a 60-meter square room and is equipped with computers with various platforms/operating systems. In addition, this lab provides assistance to programming-related courses.

Basic of Electrical Engineering Laboratory

Dr. Muhammad Amin Sulthoni, ST., MT.

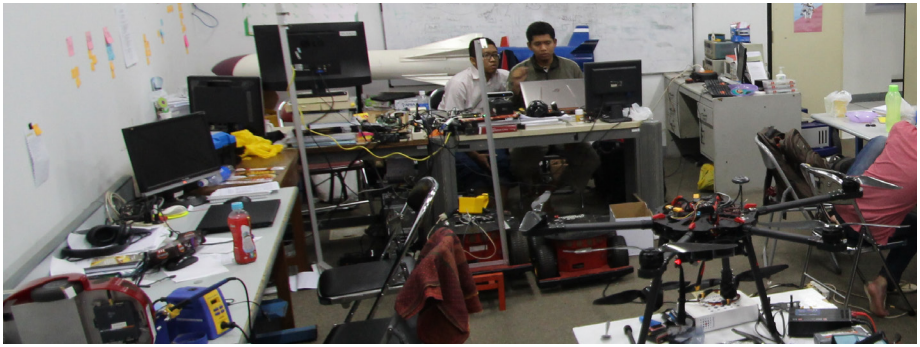
This facility is an educational laboratory particularly for compulsory courses in Electrical Engineering (EE) study program that complies with a quality standard of ABET international accreditation. It supports laboratory works for core EE courses such as Electrical Circuits (EC), Electronics and Digital System (DS), as well as for EE breadth courses such as Digital Signal Processing (DSP) and Microprocessor System (MS).

Each semester the laboratory can handle labortory works for up to 240 students for EC, 380 students for DS, 80 students for DSP and 120 students for MS. In addition, the laboratory also provide services of electronic laboratory work for Industrial Engieering study progam and Embedded System laboratory work as well facilitate students in their final projects.

Basic of Informatics / Computer Science Laboratory

Riza Satria Perdana, MT.

Basic of Informatics/Computer Science Laboratory provides computing services to all students at the School of Electrical Engineering and Informatics (SEEI). It particularly supports laboratory works for basics of programming, algorithm & data structure as well as object-oriented programming courses. This laboratory occupies five rooms, hosting a total of 181 units of networked computers with Internet access. Whenever any of the lab rooms is not used for scheduled laboratory work, SEEI students may use the lab to do their courseworks and access to the Internet.



Power System & Electrical Distribution Laboratory

Dr. Nanang Hariyanto

This laboratory is facilitating research in the area of electrical power system computation, electrical power system delivery (electric distribution planning & management system, AI-based for simultaneous generation and transmission planning, application of FACTS), electrical power system operation and economics (application of game theory and evolutionary computation for power system operation, application of phasor measurement unit for voltage stability & out of phase detection), and SCADA & SMART GRID (adaptive protection for electric distribution, self-healing mechanism).

Information System Laboratory

Ir. Kridanto Surendro, Ph. D.

Information System Lab (ISL) is an academic and research supporting unit to conduct research in information system area. ISL aims to provide enabling technologies for the emergence of an information society and a digital economy. Research in ISL focuses on data management and information analysis to optimize the systematic implementation of the linked digital world. Core topics include information system development, data analytics, information science, and conceptual modeling. Member of ISL teaches information system development; data, information, and IS management and integration; and business-technology integration.

LABORATORIE

Computer Systems & Control Laboratory

Dr. Pranoto H. Rusmin, ST., MT.

This laboratory provides support for research on Optimal Control, Robust Control, Adaptive Control, Nonlinear Control and Chaos, Stochastic Control and Estimation, Multivariable Linear Systems, Distributed Parameter Systems, Modelling and Identification, Control and Intelligent Systems, Process Optimization and Scheduling, Discrete Event Control and Hybrid Systems, Computer Architecture, Parallel and Distributed Computation, Complex Adaptive Systems.

Computer Engineering Laboratory

Dr. techn. Ary Setijadi P, ST., MT.

This lab support RnD activities in Human-Content Interaction, Internet-of-Things, High Performance Computer & Artificial Intelligence especially in graduate level. The lab also has a role to support academic activities in Capstone Final Project at Electrical Engineering Bachelor and Master Program especially Digital Media & Game Technology & Computer Engineering. It is equipped with state-of-the-art Human Content Interaction such as HMD, AR Hololense, IoT Development System, 3D Printer, and Laser Cutting System and also supported by high performance datacenter.

Advanced Computing Laboratory

Dr. Achmad Imam Kistijantoro

Advanced Computing Laboratorium provides various advanced facilities for all study program in School of Electrical Engineering and Informatics. It provides equipments for Internet of Things, Virtual Reality/Augmented Reality, Drone and High Performance Computing facilities, including GPU processing.

Signal & System Laboratory

Dr. Kusprasapta Mutijarsa

This lab supports research on digital signal processing, speech processing, natural language processing and robotics, signal compression, stochastic system, system theory, system analysis and design, optical communication, and information technology.

Distributed Systems Laboratory

Ir. Afwarman, M.Sc., Ph. D.

Distributed Systems Lab (DSL) is an academic and research facility to support research in distributed systems area. Our main interests are gpu-based parallel computing; mobile computing; scalable distributed systems (transactions, application servers, databases); large-scale internet services; group communication; unified messaging systems; middleware and computer architecture. Member of DSL teaches distributed systems, operating systems, parallel & concurrent programming, computer architecture.

LABORATORIES

Honeywell Control Laboratory

Dr. Pranoto H. Rusmin, ST., MT.

Honeywell Control Laboratory was inaugurated on December 1st, 2016 by the President of Honeywell Indonesia, Allex Pollack, the President of ITB, Prof. Dr. Ir. Kadarsyah Suryadi, and the Dean of School of Electrical Engineering and Informatics (SEEI ITB) Dr. Ir. Jaka Sembiring. This laboratory is intended for students to learn industrial process control and other related fields that support Industry 4.0.

Various facility available in this lab are a full set of Mini Refinery Plant (provided by Honeywell) and a Process Instrumentation Trainer that has belonged to Control System and Computer Laboratory since 2010. Both are currently equipped with an Experion Process Knowledge System - a Distributed Control System which employs a C300 controller as its main controller.

Ever since the beginning of its operation, this laboratory has become a residency laboratory for undergraduate students in senior year who are doing their Final Project (Capstone Design) and graduate students who are doing their Thesis research or other research activities related to Cyber-Physical System.

Common topics for research held in this laboratory are Cyber Security, Sensor and Instrumentation, Virtual Reality, and Advanced Control method for Industrial Process. Besides research activities, there are also laboratory experiment activities for undergraduate students, as a part of the compulsory subject EL3015 Control System. The laboratory experiment is intended to familiarize students with industrial process control.

Research Centers

Cyber Security Research & Development Center

Chair: Prof. Dr.-Ing.Ir. Suhardi, MT.

The Indonesian cyber security policy is to protect against the disruption of the operation of information systems for critical infrastructures and, thereby, help to protect the people, economy, and national security of Indonesia. We must act to reduce our vulnerabilities to these threats before they can be exploited to damage the cyber systems supporting our Nation's critical infrastructures and ensure that such disruptions of cyberspace are infrequent, of minimal duration, manageable, and caused the least damage possible.

ITB-Korea Cyber Security Research and Development Center (CSC) was built on grant from the South Korean government as a cooperative effort to support and enhance the capability of Indonesia's cyber security strategy. It is located in ITB-Jatinangor campus and was inaugurated on 27 February 2014 by the Korean Ambassador. CSC will host many activities to support the nation security. Educating our students, strengthening Indonesian security profession, and increasing awareness of the Indonesian people will be the key to enhancing the human capability.

Micro Electronics Center

Chair: Ir. Adi Indrayanto, M.Sc, Ph.D.
http://www.pme.itb.ac.id/

The research in Micro Electronic (ME) center is focusing on Electronics/ Embedded System, Digital and Analog IC Design, Product Design for Manufacturing and Semiconductor Devices Design and Processing such as sensor, transistor etc.

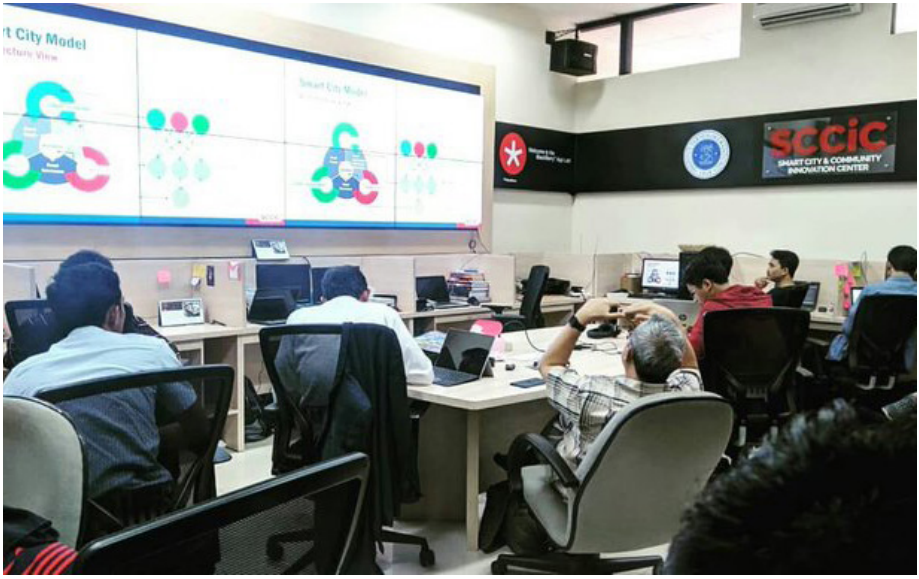
Currently the target application covers 4G Wireless Broadband (WiMax, 3GPP LTE), Digital TV, Wireless Sensor Network, Open Source, Energy Meter, Soft Switch, Internet of Things (IOT), Artificial Intelligent Embeded System, 5G Technology.

The wireless research includes the design of Digital Baseband System on Chip (SoC), Analog to Digital/Digital to Analog Converter, RF, Power Amplifier (PA) and Low Noise Amplifier (LNA), as well as Medium Access Control (MAC) layer design.

The system development utilizes several advanced Industrial CAD Tools and implementation technology such as Applied Specific Integrated Circuits (IC), Field Programmable Gate Array (FPGA), GPU, Multicore DSP, Microcontroller and etc.

The ME Center equips with Advance 3D Printer for fast prototyping, Surface Mount Technology (SMT) machines for small scale productions, Rapid multi-layer PCB Prototyping, Environmental Test Chamber for electronic products, Broadband Wireless Test Instrumentations, Smartphone RF Test Instrumentations, and other Electronics Test Instrumentations.

The ME Center also has responsibility to develop electronics techno-industrial cluster in Indonesia, and helping the Indonesian government in developing the electronics and telematics industrial policies.



Smart City & Community Innovation Center

Chair: Prof. Dr.Ir. Suhono Harso Supangkat, M.Eng.
http://sccic.id/

SCCIC is a smart city innovation community that has a vision to develop innovations to create smart cities. The relatively fast population growth in cities raises various typical urban problems, such as a decrease in the quality of public services, reduced availability of residential land, congestion on the highway, difficulties in getting parking space, swelling levels of energy consumption, garbage accumulation, increased crime rates, and problems other social. These problems will continue to grow with increasing population and all these problems cannot be solved quickly and precisely if they still use conventional solutions that are used today.

Therefore, to solve problems and realize the ideals of the city (safe and comfortable) for its residents, intelligent solutions are needed so that problem solving can be done faster than the growth of the problem itself. The smart solution here is through the application and collaboration of urban ecosystems that fall into the Smart City concept. In the concept of smart city solutions, government, industry, academia, and the community are involved to make the city better.

ITB Bukalapak Innovation Center

Dr.Ir. Gusti Ayu Putri Saptawati S. M.Comm.

This center is intended for the activities of the Development and Use of ITB - Bukalapak Artificial Research Lab and ITB - Bukalapak Cloud Computing Research Lab. The activity referred to the utilization of research capacity, technology development and educational activities owned by STEI ITB and Artificial & Cloud Computing technology owned by Bukalapak. The main areas of research are: Recommendation Systems, Natural Language Processing, and Computer Vision.

Curricula and Programs

Curricula of Undergraduate Programs

Undergraduate students must earn at least 144 credits within at most six years of study to be awarded with Bachelor of Science degree. All new SEEI students must take the same prescribed courses during the freshman (first) year (a total of 36 credits). The freshman year courses cover college level mathematics, basic sciences, sports, scientific writing, information technology, programming fundamental as well as introduction to circuit analysis. All freshman year courses must be completed with a minimum GPA of 2.0 and no grade of "E" within two years of study.

Freshman Year

First Semester

No	Code	Subject	Credit
1	MA1101	Mathematics IA	4
2	FI1101	Elementary Physics IA	4
3	KI1102	Basic Chemistry IB	2
4	KU1101	Introduction to Design and Engineering I	2
5	KU1072	Introduction to Information Technology B	2
6	KU102X	English	2
7	KU1001	Sports	2
		Total	**18**

Second Semester

No	Code	Subject	Credit
1	MA1201	Mathematics IIA	4
2	FI1201	Elementary Physics IIA	4
3	KI1202	Basic Chemistry IIB	2
4	KU1201	Introduction to Design and Engineering II	2
5	KU1011	Scientific Writing in Indonesian	2
6	EL1200	Introduction to Circuit Analysis	2
7	IF1210	Programming Fundamentals	2
		Total	**18**

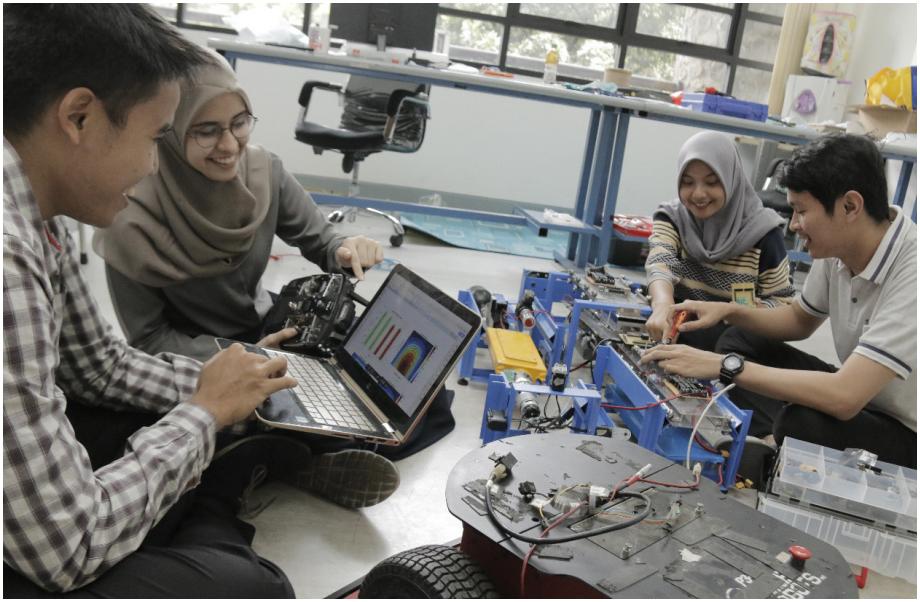
The remaining 108 credits can be completed within the next three years without "D" or "E" grade. The curriculum structures for all undergraduate programs at SEEI are as follows:

Subject Classification	Credit Hours				
	EL	IF	EP	ET	II
Freshman year courses	36				
ITB's compulsory courses	8				
Major Courses	72	70	77	78	71
Elective	17	19	12	11	18
Non Major Elective	3				
Industrial Practice (internship/co-op)	2				
Final Project /Capstone Design	6				
Total Credit Hours	144				

Programs: EE=Electrical Engineering, IF=Informatics/Computer Science
EP=Electrical Power Engineering, ET=Telecommunication Engineering
II=Information System & Technology

The ITB's compulsory courses consist of Religion and Ethics (2 credits) and Pancasila & Civic Education (2 credits) as well as environmental elective (2 credits) and management elective (2 credits). The detail curriculum structures (excluding the freshman year courses) for each study program are described in the corresponding program description chapter.

All undergraduate students are required to take industrial practice in private or government sector for about 10 weeks during the short semester of the third year. The purpose of the training is to provide students with practical technical knowledge and to expose them to working environment in the industry. The curriculum also requires all senior (final year) students to do a research or design project related to their fields of study. This provides students an opportunity to apply the knowledge and skill acquired to solve a significant real world problem. Students must write a formal report and defend it in front of final project examiners.



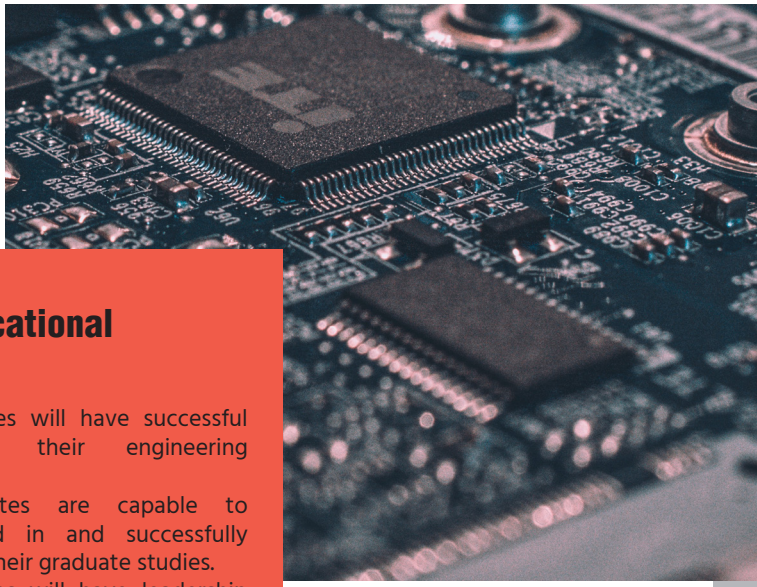
Electrical Engineering Bachelor Program

ABET Engineering Accreditation Commission

Electrical Engineering is among the most significant engineering field which drives the evolution of human civilization in the last centuries. It is expected will continue to be the one in the foreseeable future. A new frontier of human endeavor is opened every moment which are only possible by the technology delivered by electrical engineering.

Electrical engineer undoubtedly become the necessary agent of such transformation by delivering a best engineering practice in every possible aspect i.e. delivering an best practice in maintenance and operation; creating a new product and innovation; pursuing state-of-the-art research etc. The demand for electrical engineer is among the highest in engineering.

The Electrical Engineering Program at SEEI ITB is made up of 53 faculty members who are well respected in their areas of research and education. They engage in research activities encompassing a wide range of areas such as automatic control, biomedical engineering, communications, computer-aided design, machine vision and image processing, computer systems & networking, digital signal processing, electronics, electrical energy, information networking, intelligent systems, parallel and distributed processing, microelectronic materials and devices, microwave engineering and VLSI integrated circuit design.



Program Educational Objectives

1. Our graduates will have successful careers in their engineering professions.
2. Our graduates are capable to be admitted in and successfully completing their graduate studies.
3. Our graduates will have leadership and play active role in industry, government or education sectors in the Asia Pacific region especially in Indonesia.

Student Outcomes

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal context
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
8. an ability to learn advance knowledge in engineering field

Career Prospects

A degree in electrical engineering can qualify you to pursue a job in almost any industry you can think of. After all, nearly everyone uses electricity and electrical devices, so industries demand skilled professionals to build, repair, and improve these devices. Electrical engineers work several key industry sectors such as: Telecommunications, Energy and Electric Power, Computers, Semiconductors, Aerospace, Bio engineering, Manufacturing, Services, Education and Research, Transportation and Automotive.

The following job titles represent only a handful of the choices available:

1. Research engineers work in the lab, testing and inventing. This job requires a high level of creativity on the part of the engineer, as well as a great deal of patience. Whether inventing a new opto-electronic device or simply designing a better electric can opener, research engineers are responsible for the discovery-stage technology behind any new electronic product.
2. Once a new technology is invented, it must be applied. The design engineer uses computer simulations and models to turn innovations like wireless technology into the tiny parts that make up an actual cell phone. Design engineers must visualize how the insides of a future product could look, while inventing several possible scenarios for the applications of new technologies.
3. The project engineer oversees many specialist engineers throughout the construction of a working prototype of a new product or technology. The project engineer must have natural leadership ability, as well as a high proficiency in a variety of electrical engineering disciplines.
4. Test engineers design programs to check the functions of electronic devices and to troubleshoot those devices when things go wrong. They keep technology working properly, and understand which elements to test and in what order. Successful test engineers remain sharp, even after long hours on the job.
5. Power grids, phone lines, and wireless networks all require the skills of a system engineer for proper installation and maintenance. Keen attention to detail is important for graduates who enter this profession. Experienced system engineers rely on their ability to think holistically about the systems they create.
6. Application engineers work with whatever resources are available, adapting existing equipment and technologies to fulfill the needs of their employers. They need to be resourceful, while counting on their deep understanding of the capabilities and the potential modifications of existing equipment.

Program Structures

Freshman Year (First year)

See page 41.

Sophomore Year (Second Year)

Third Semester

No	Code	Subject	Credit
1	EL2001	Electric Circuits	4
2	EL2101	Electric Circuits Laboratory	1
3	EL2002	Digital Systems	4
4	EL2102	Digital Systems Laboratory	1
5	EL2003	Discrete Structures	3
6	EL2004	Probability & Statistics	3
7	MA2072	Engineering Mathematics IA	3
		Total	**19**

Fourth Semester

No	Code	Subject	Credit
1	EL2005	Electronics	3
2	EL2205	Electronics Laboratory	1
3	EL2006	Electromagnetics	3
4	EL2007	Signals & Systems	3
5	EL2008	Problem Solving with C	3
6	EL2208	Laboratory of Problem Solving with C	1
7	MA2074	Engineering Mathematics IIA	3
		Total	**17**

Junior Year (Third Year)

Fifth Semester

No	Code	Subject	Credit
1	EL3009	Electronics II	3
2	EL3109	Electronics II Laboratory	1
3	EL3010	Digital Signal Processing	3
4	EL3110	Digital Signal Processing Laboratory	1
5	EL3011	Computer System Architecture	3
6	EL3111	Computer System Architecture Laboratory	1
7	EL3012	Electrical Engineering Materials	3
8	EL3013	Instrumentation Systems	3
		Total	**18**

Sixth Semester

No	Code	Subject	Credit
1	EL3014	Microprocessor Systems	3
2	EL3214	Microprocessor Systems Laboratory	1
3	EL3015	Control Systems	3
4	EL3215	Control Systems Laboratory	1
5	EL3016	Communication Systems	3
6	EL3216	Communication Systems Laboratory	1
7	EL3017	Electrical Power Systems	3
8	EL3217	Power Systems Laboratory	1
9	EL4018	Professional & Engineering Ethics	2
		Total	**18**

Senior Year (Fourth Year)

Seventh Semester

No	Code	Subject	Credit
1	EL4092	Industrial Experiences	2
2	KU206X	Religion and Ethics	2
3	EL4090	Final Project I (Capstone Design)	4
4	XXMANJ	Management elective	2
		Total	**10**

Eighth Semester

No	Code	Subject	Credit
1	XX4000	Basic Science	2
2	XXLING	Environmental elective	2
3	EL4091	Final Project II (Capstone Design)	3
4	KU2071	Pancasila and Civic Education	2
		Total	**9**

Major Electives for Electrical Engineering

No	Code	Subject	Credit
1	EL4093	Proffessional & Community Development	3
2	EL4113	Instrumentation Systems Laboratory	1
3	EL4120	Computer Networks	3
4	EL4121	Embedded Systems Design	3
5	EL4122	Embedded Systems Design Laboratory	1
6	EL4123	Digital Control Systems	3
7	EL4124	Digital Control Systems Laboratory	1
8	EL4125	Digital Image Processing	3
9	EL4126	Robotics	3
10	EL4128	Operating System Design	3
11	EL4129	Semiconductor Devices	3
12	EL4131	Anatomy & Physiology	3
13	EL4132	Biomedical Engineering	3
14	EL4138	VLSI Systems Design	3
15	EL4242	Elective Topics in Electrical Engineering	2
16	EL4243	Analog-Mixed-Signal Electronics Design	3
17	EL4230	Analysis & Design of Digital IC	3
18	EL4233	Fundamentals of Intelligent Systems & Controls	3
19	EL4234	Multivariable Control Systems	3
20	EL4235	Computer Systems Architecture II	3
21	EL4236	Network Software Engineering	3
22	EL4237	IC Technology	3
23	EL4019	Electric Drive Systems	3
24	EL4094	Industry Internships	9
25	EL4127	Parallel Computing & Architecture	3
26	EL4241	RF & Mixed Signal Microelectronics	3

Non Major Electives for Electrical Engineering

No	Code	Subject	Credit
1	SI2131	Fluid Mechanics and Hidraulics	3 (1)
2	FI2211	Special Theory of Relativity	2
3	FI3103	Thermodynamics	3
4	MS2220	Basic Fluid Mechanics	3
5	BI2102	Animal Anatomy and Physiology	4
6	TL2203	Environmental Microbiology	3

Minor Program

No	Code	Subject	Credit
1	EL1200	Introduction to Circuit Analysis	2
2	EL2001	Electric Circuits	4
3	EL2002	Digital Systems	4
4	EL2005	Electronics	3
5	EL2101	Electric Circuits Laboratory	1
6	EL3014	Microprocessor Systems	3
		Total	**17**

Electrical Engineering Course Descriptions

EL1200. Introduction to Circuit Analysis (Credit 2)
Basic concepts, basic laws, methods of analysis, circuit theorems, operational amplifier, capacitors and inductors, first-order circuits, second-order circuits, sinusoidal & phasors, and sinusoidal steady-state analysis.
Prerequisites: MA1101 Mathematics IA
Corequisites: MA1201 Mathematics IIA, FI1201 Elementary Physics IIA

EL2001. Electric Circuits (Credit 4)
Sinusoidal steady-state analysis, AC power analysis, three-phase circuits, magnetically coupled-circuits, frequency response, Laplace transform and its application to circuit analysis, Fourrier series, Fourrier Transform, two-port networks.
Prerequisites: EL1200 Introduction to Circuit Analysis
Corequisites: EL2101 Electric Circuits Laboratory
Restriction: EB2102 Electric Circuit and Electronics

EL2002. Digital Systems (Credit 4)
Fundamentals of digital logic design. Covers combinational, sequential, and complex logic circuits, programmable logic devices, hardware description languages, and computer-aided design (CAD) tools. Laboratory component introduces simulation and synthesis software and hands-on hardware design
Prerequisites: EL1200 Introduction to Circuit Analysis
Corequisites: EL2102 Digital Systems Laboratory, EL2003 Discrete Structures

EL2003. Discrete Structures (Credit 3)
To provide an understanding of discrete mathematics and its application in the field of electrical engineering and computer engineering
Prerequisites: MA1201 Mathematics IIA

EL2004. Probability & Statistics (Credit 3)
The concept of probability, random variables and their distributions, combinatorial and geometric elements, conditional probability, Bayes theorem, distribution functions, bivirate random variables, functions of random variables, estimation, hypothesis testing. Applications may be from digital communications, signal processing, automatic control, computer engineering, computer science.
Prerequisites: MA1201 Mathematics IIA
Restriction: EP2091 Probability and Statistic

EL2005. Electronics (Credit 3)
Physics, operation, and models of diodes, BJT, MOSFET, and thyristors. Analysis and design of single-stage amplifiers: DC bias, small-signal properties, and frequency responses. Output Stage and Power Amplifier. CMOS logics.
Prerequisites: EL2001 Electric Circuits
Corequisites: EL2205 Electronics Laboratory

EL2006. Electromagnetics (Credit 3)
1.a. Analisis vektor: aljabar vektor, sistem & transformasi koordinat, integrasi vektor b. Medan listrik dan magnet statis: Hukum Coulomb, Biot-Savart, Lorentz c. Persamaan Maxwell bentuk integral 2.a. Diferensiasi vektor: gradien, divergensi, curl b. Persamaan Maxwell bentuk diferensial c. Propagasi gelombang datar dalam ruang bebas 3.a. Karakteristik material: konduktor, material dielektrik, material magnetik b. Persamaan Maxwell untuk ruang bukan ruang bebas c. Propagasi gelombang datar dalam ruang bukan ruang bebas 4.Medan listrik dan medan magnet statik: potensial listrik, kapasitansi, energi elektrostatik, induktansi, energi magnetostatik 5.Pantulan normal gelombang datar: transmisi dan refleksi 6. Saluran transmisi: propagasi gelombang pada kanal transmisi, model rangkaian listrik dari saluran transmisi, impedance matching, VSWR
Prerequisites: FI1201 Elementary Physics IIA, MA2072 Engineering Mathematics IA

EL2007. Signals & Systems (Credit 3)
1)Time-domain analysis of continuous-time signals and systems 2)Frequency-domain analysis of continuous-time signals and systems 3)Laplace-domain analysis of continuous-time signals and systems 4)Case study: filter designs 5) Case study: introduction to linear feedback control system
Pass Prerequisite: EL1200 Introduction to Circuit Analysis
Restriction:EP2094 Signal & System

EL2008. Problem Solving with C (Credit 3)
This course lays the foundation of algorithm analysis and data structures for the electrical engineering curriculum. In this class, students will experience applications of concepts learned in the classroom. They will learn through hands-on experience how to read and understand problem statements and develop the algorithm and implement it using C to solve the problem.
Prerequisites: EL2003 Discrete Structures

EL2101. Electric Circuits Laboratory (Credit 1)
Familiarization with lab instruments. Experiments with basic circuits containing resistors, capacitors, inductors, and op-amps. DC circuits and circuit theorems, circuits with opamps, transient phenomena, impedances, frequency response principles, resonance circuits.
Co-requisites: EL20X1 Electrical Circuit Option

EL2102. Digital Systems Laboratory (Credit 1)
Characteristization of the implementation technology of a digital system. Implementation of a digital system on FPGA. Design of combinational and sequential circuit. Design of controller/digital system with intermediate complexity.
Corequisites: EL2002 Digital Systems

EL2205. Electronics Laboratory (Credit 1)
IV characteristization of the semiconductor devices. Diode circuits. Determination of DC bias. Single transistor amplifiers with BJT and MOSFET. Transistors as switches. Design and implementation of transistor amplifiers on PCB.
Corequisites: EL2005 Electronics

EL2208. Laboratory of Problem Solving with C (Credit 1)
This course provides the foundation of algorithm analysis and data structures for the electrical engineering curriculum. In this class, students will experience applications of concepts learned in the classroom through pratical lab works. They will learn through hands-on experience how to read and understand problem statements and develop the algorithm and implement it using C to solve the problem.
Corequisites: EL2008 Problem Solving with C

EL3009. Electronics II (Credit 3)
Analysis and design of electronic circuits. Integrated-circuits amplifiers: building blocks, differential and multi stage, feedback, opamp circuits. Filter and tuned amplifiers. Circuits for signal generation, voltage regulation,
Prerequisites: EL2005 Electronics
Corequisites: EL3109 Electronics II Laboratory

EL3010. Digital Signal Processing (Credit 3)
History and Overview in Digital Signal Processing, Theories and Concepts, Discrete Time Signals and Systems, Analysis of LTI Systems Using z-Transfoms, Frequency Analysis of Signals and Systems, The Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Spectrum analysis, Implementation of Discrete-Time Systems, Design of Digital Filter
Prerequisites: EL2007 Signals & Systems
Corequisites: EL3110 Digital Signal Processing Laboratory

EL3011. Computer System Architecture (Credit 3)
This course is intended for undergraduate student so that the student will gain a comprehensive knowledge of computer hardware and its interaction with software. The course will also stress on simple MIPS processor design and implementation using VHDL.
Prerequisites: EL2002 Digital Systems
Corequisites: EL3111 Computer System Architecture Laboratory

EL3012. Electrical Engineering Materials (Credit 3)
Introduction: classification : conductor, semiconductor and insulator. Structure of Material ; Crystal Structure, parameters : Lattice constant, Unit cell, Bravais system, Miller index (reciprocal lattice). Lattice vibration : Phonon emission : acoustical and optical phonon Crystal Bonding : cohesive energy, : type of crystal bonding Energy Band Model: Periodic potentials of crystal lattice : Kronnig-Penney model, (simplified) Energy Band Model; Concept of Electron and Hole. Particle Statistics in material : Carrier Statistics (electron (and hole) in material (semiconductor) : Fermi Dirac Statistics, Fermi Dirac function Density of States (DOS), Carrier (electrons and holes) concentration, Fermi level (eF) ; Carrier Scattering phenomenon : Lattice and ionized impurity scattering ; Mobility (□), scattering rate, effective mass ; Mobility relation to temperature, electric field and saturation velocity; Drift current ; Carrier Diffusion Process ; Diffusion Current density ; Continuity equation, carrier Recombination – Generation process mechanism; Physics of P-N Junction Diode : junction diffusion process, space-charge (depletion region) and potential barrier built-up. Origin of Diode current-voltage (I-V) Characteristics : relation to applied potential (forward and reverse bias) ; Diode current components.
Prerequisites:

EL3013. Instrumentation Systems (Credit 3)
This course contains material about the role of instrumentation system in various fields of engineering; the characteristic of system components; the method of measurement, the method of calibration, data processing methods in the measurement. Classification of sensor and transducer: mechanical; thermal; optics; acoustic, LVDT signal conversion, amplification and modulation, analog signal conditioning and digital converter circuit, final controller, mechanical actuator; electric actuator; hydraulic actuator; analog controller circuits; filters, signal recordings, communications, and displays and readings
Prerequisites: EL2005 Electronics

EL3014. Microprocessor Systems (Credit 3)
This course covers topics microprocessor systems and the hardware implementation based on 8-bit microprocontroller, analog & digital interfaces, peripherals & parallel/ serial communication, and the design project of microprocessor systems
Prerequisites: EL2005 Electronics, EL2008 Problem Solving with C
Corequisites: EL3214 Microprocessor Systems Laboratory

EL3015. Control Systems (Credit 3)
The course covers control systems analysis and design for continuous time linier systems. The system's stability or performance are covered. System analysis and design are undertaken in time and frequency domain. Introduction to modern concept of state space and digital control system are also provided in the course.
Prerequisites: EL20X7 Signal and System Option

EL3016. Communication Systems (Credit 3)
Analog Modulation, Random Signals and Noise, Digital Baseband Pulse Transmission, Digital Bandpass Transmission, Capacity Sharing Technique, Introduction to Channel Coding.
Prerequisites: EL20X4 Probability and Statistics Option, EL20X7 Signal and System Option

EL3017. Electrical Power Systems (Credit 3)
This course is an introductory subject in the field of electric power systems and electrical to mechanical energy conversion. The course introduce power electronics and renewable energy.
Prerequisites: EL2001 Electric Circuits
Corequisites: EL3217 Power Systems Laboratory

EL3109. Electronics II Laboratory (Credit 1)
Output stage and power amplifiers; Characteristics of the differential amplifiers and Frequency response of amplifiers. Feedback amplifiers and their properties. Oscillators; Voltage regulators: linear and switch-mode.
Prerequisites: EL2205 Electronics Laboratory
Corequisites: EL3009 Electronics II

EL3110. Digital Signal Processing Laboratory (Credit 1)
Introduction to MATLAB, Simulation of Realtime Finite Impulse Response Filter, Visual DSP++ 5.0, Filter Design and Implementation of DSP Algorithm, Implementation of Advanced DSP Algorithm, Design and Implementation of Infinite Impulse Response Filter using Blackfin DSP Processor
Corequisites: EL3010 Digital Signal Processing

EL3111. Computer System Architecture Laboratory (Credit 1)
This course is intended for undergraduate student so that the student will gain a comprehensive knowledge of computer hardware and its interaction with software. The course will also stress on simple MIPS processor design and implementation using VHDL.
Prerequisites: EL2002 Digital Systems
Corequisites: EL3011 Computer System Architecture

EL3214. Microprocessor System Laboratory (Credit 1)
Using toolchain for programming 8 bit microcontroller. 8 bits microprocessor bus. Digital interface. Analog interface. Serial communication. LCD Display. Using toolchain for programming8 bits microcontroller. Digital inputs and outputs of 32-bits microcontroller. Using the operating system's in 32-bits microcontroller. Make a simple 32-bits applications.
Prerequisites:EL2205 Electronics Laboratory, EL2208 Laboratory of Problem Solving with C
Corequisites: EL3014 Microprocessor Systems

EL3215. Control Systems Laboratory (Credit 1)
Students practice the realization of control systems both on the position and speed control of a DC motor with an analog/digital modular control system. This lab focuses on the analog control system with the introduction of the simple digital control system. Students do the identification process of a DC motor, simulate analog and simple digital control systems, design and build the PID controller, build the position/speed control systems, and then compare the results obtained from calculation, simulation, and direct measurement.Students realize PID control system on DC motor using available kit (modular kit, quanser). Introduce industrial process control using honeywell equipment.
Corequisites: EL3015 Control Systems

EL3216. Communication Systems Laboratory (Credit 1)
It is a companion lab to EL3016. It covers: fundamental elements of communications systems and the hardware usually used: use of measurement instruments typically encountered in communication systems; analog modulation AM/FM; various modulations and channel coding for digital communications; digital baseband pulse transmission; digital bandpass transmission.
Corequisite: EL3016 Communication Systems

EL3217. Power Systems Laboratory (Credit 1)
This laboratory course and EL 3017 is an introductory subject in the field of electric power systems and electrical to mechanical energy conversion. The course introduce power electronics and renewable energy.
Prerequisites: EL2101 Electric Circuits Laboratory
Corequisite: EL3017 Electrical Power Systems

EL4018. Professional & Engineering Ethics (Credit 2)
Ethic theory, Ethic in engineering profession, study cases in engineering ethics, professional organisation.

EL4019. Electric Drive Systems (Credit 3)
Elements of electric drive systems, introduction to solid states devices, introduction to solid state switching circuits, joint speed-torque charactesristics of electric motors and mechanical load, speed-torque characteristics of dc and ac electric motors, speed control of dc motors, speed control of induction motors, braking of dc motors, braking of induction motors, dynamic of electric drive systems

EL4090. Final Project I (Capstone Design) (Credit 4)
The student is planned to do preliminary study / design of her / his final-year project. Under his / her supervisor, the student has to submit the final-year proposal, abstract and finally full paper which should be presented in student's seminar. The student has to work in the laboratory to do his / her research during the semester time.

EL4091. Final Project II (Capstone Design) (Credit 3)
In this individual assignment, the student should continue her/his previous work in EL4090 course under the same supervisor. The work resulted in this project could be in the form of any implementation (software/hardware), even in the form of recommendation of solution to the electrical engineering problems. At the end of this project, the student should write the final report, and then defended in front of 3 examiners (lecturers).
Prerequisite: EL4090 Final Project I (Capstone Design)

EL4092. Industrial Experiences (Credit 2)
Practical work done by students in the work environment, such as in industry, research institutes, etc, is to equip students with industrial experiences and an idea to the students about the real working environment, as well to provide working experience and broaden their horizons. Students are allowed to take this course when they have taken course to the 6th semester. The industrial experience have to be done in a minimum of 2 months duration, a maximum of 1 month of the 2 moth duration may be done in research institutes or laboratories/universities.

EL4093. Proffessional & Community Development (Credit 3)
As part of real training, students may form a team and participate in various national or international competition or create a community-based activities in the fields related to engineering. Such activities of students in the preparations for the competition must be made within a minimum of 4 months in the current semester.

EL4094. Industry Internships (Credit 9)
For the readiness of students to real-world needs, students can engage directly in engineering related industries in a semester duration. During this activity, students should also take EL4092 Industrial Experience and EL4090 Final I (Capstone Design) as part of his assignment in the industry as a trainee. The topic of the final project of the student should come from the industry. Each student must have an on-site internship supervisor.

EL4113. Instrumentation Systems Laboratory (Credit 1)
Characterization and usage of some sensors and optical transducers, sensors and thermal transducers, mechanical sensors and transducers, sensors and acoustic transducer

EL4120. Computer Networks (Credit 3)
OSI 7 and TCP/IP layer models, Circuit and Packet Switching, Medium Access Control, Error Control Techniques (ARQ), Routing and Dijkstra's Algorithm, flow/congestion control, IEEE 802.11 (WLAN), Bluetooth, Wireless Sensor Network (WSN).

EL4121. Embedded Systems Design (Credit 3)
This courses taught about embedded systems, real time systems, real time OS and embedded system design

EL4122. Embedded Systems Design Laboratory (Credit 1)
Mastering the 32-bits ARM toolchain. Make a USB applications Make a real time application without OS Mastering the real time operating system FreeRTOS Make real time applications based on FreeRTOS Mastering multicore embedded toolchain. Create applications based on embedded multicore

EL4123. Digital Control Systems (Credit 3)
This lecture describes the analysis and design of digital control, with a focus on the process of sampling signals at the system, signal processing measurement , analysis of control discrete through conventional model (Z-transform), the analysis of control discrete through state variable model (modern), draft control through classical and modern approach, control implementation using hardware and software

EL4124. Digital Control Systems Laboratory (Credit 1)
Students practiceto build digital control system on a DC motor using digital microcomputers (PC) and microprocessors and digital interfacing. Students doing the identification of DC motors, select the sampling period, simulating the control system analog / digital, design digital PID controller, build the controller using PC uP, then comparing the results of the calculation, simulation, and direct measurements.

EL4125. Digital Image Processing (Credit 3)
Introduction, 2D System and matrix review, Image enhancement, Image restoration, Image Segmentation, Image reconstruction from projection, Image compression, Feature extraction, Pattern Recognation

EL4126. Robotics (Credit 3)
1) Introduction:, 2) Robot Locomotion, 3) kinematics and invers kinematics model, 4) Dynamic Model, 5) Robot Motion Planning : Manipulators and Mobile (wheel and leg), 6) Robot Sensors 7) Robot Control Systems: Design and Implementation

EL4127. Parallel Computing & Architecture (Credit 3)
This is an introductory course for undergraduate students on the broad subject of parallel computing covers the following: an overview of the field focusing on the convergence of many diverse architectural approaches around the communication architecture; parallel methods generally applicable for parallel computers, with software standards

for portable parallel programming. Message Passing Interface (MPI), POSIX threads and OpenMP have been selected as programming models and the application mix of parallel computing is reflected in various examples throughout the course.

EL4128. Operating System Design (Credit 3)
This course is is a programming-intensive OS class. The core experience is writing a small Unix-inspired OS kernel, in C with some x86 assembly language, which runs on a PC hardware. The core topics will stress on design principles which covers abstractions, processes and resources at computer systems. This course will also covers thread, processes, scheduling synchronization, memory allocation, virtual memory, system file, and inter-process communication.

EL4129. Semiconductor Devices (Credit 3)
Review on semiconductor material, PN junction, MOS capacitor, MOSFET, Bipolar Transistor, and application specific semiconductor devices

EL4131. Anatomy & Physiology (Credit 3)
Introduction, Basic Physiology Mechanism, Integration & Control System; Nervous System, Loco-motoric system: skeletal system, muscular system, Exchange & distribution; Cardiovascular System, Respiratory System, Urinary System, wrap up & enhancement

EL4132. Biomedical Engineering (Credit 3)
Introduction. Fundamentals of Biomedical Engineering. Fundamentals of Biomedical System/Instrumentation. Fundamentals of bioelectric. Various biomedical transducer and sensors. Operational amplifier & biomedical amplifier. Patient safety. Introduction to anatomy and physiology.

EL4138. VLSI Systems Design (Credit 3)
This course has an objective to provide student with the capabily in designing Application Specific Integrated Circuits (ASICs). In this course, ASICs implementation is more focus on Semicustom Technology using CMOS Standard Cell. The course covers the introduction of various VLSI Technology Implementation and its design flow.

EL4230. Analysis & Design of Digital IC (Credit 3)
The course includes an introduction to CMOS devices, manufacturing technology, CMOS inverters and gates as well as the understanding of CMOS design parameters and methodology. The course also teaches the student to design and optimize the standard cell of combinatorial and sequential digital circuits

EL4233. Fundamentals of Intelligent Systems & Controls (Credit 3)
Intro to Inteligent Systems/Machines and Intelligent Control, Fuzzy Set Theory, Fuzzy rules, Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Control, Biological Neural Networks, Neuron Model and Computation, Perceptron, Supervised Learning, Adaptive Linear Networks, Multilayer Feedforward Neural Networks, BackPropagation, Applications of Intelligent Systems and Intelligent Control, Matlab Implementation, Robotics

EL4234. Multivariable Control Systems (Credit 3)
Introduction to Multivariable Control System, State Space Representation of System, Solving The Time-Invariant State Equation, Controllability, Observability, Pole Placement, Design of Multivariable Control System with State Feedback, Observer Design, Multivariable Control System Simulation, Implementation of Multivariable Control System with Observer and State Feedback

EL4235. Computer Systems Architecture II (Credit 3)
This course will learn about trade-off and processor design super scalar and parallelism.

EL4236. Network Software Engineering (Credit 3)
This course is a course introducing the concept of programming a computer network architecture and also the introduction of the concept of application programming using sockets; detailed implementation of TCP / IP protocol; making a network application program.

EL4237. IC Technology (Credit 3)
Overview of semiconductor materials, devices, and process; crystal growth; silicon oxidation; photolithography and etching; diffusion and ion implantation; thin film deposition; BJT and MOSFET fabrication process; process integration; process simulation; IC manufacturing

EL4241. RF & Mixed Signal Microelectronics (Credit 3)
Introduction, RF 2-port network: Parameter Z,Y,T (cascade), H(ybrid) and S(catttering), Parameter Conversion : S  parameter Z, Y, H, T, Implementation : Modeling of RF Transistor ; Transmisission Lines : Distributed element, Propagation Constant and Impedance Characteristics, reflection constant,  and VSWR; Bilinear transform : Z = f (), Smith Chart, Impedance Maching Techniques; Design RF Amplifier : Stability, Power Gain and techniques of impedance matching (simultaneous) ; Small signal RF Amplifier Design; Low Noise Amplifier (LNA) Design, Signal Mixing (Mixer) and Oscillator Design ; Baseband Processing (Introduction), Digital Modulation / Demodulation, Digital Coding/Decoding, NCO, Digital Frequency Conversion, Digital Signal Processing  Analog : High Speed DAC/ADC, FIR Filtering

Informatics/ Computer Science Bachelor Program

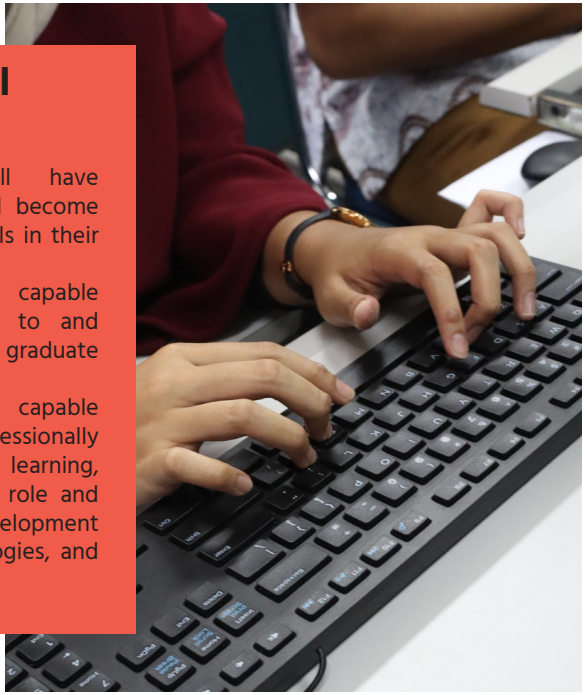
ABET Computing Accreditation Commission

Informatics/Computer Science Program provides education in the area of theoretical foundations of information and computing as well as of practical techniques for their applications in computer systems. Students of Informatics/Computer Science program will also learn a wide range of computer science topics such as algorithm & data structure, theory of computation, programming languages, database & information retrieval, operating system, artificial intelligence, computer visions, computer network, software engineering, computer security & cryptography, machine learning, distributed system, computer graphics & visualization, and other exciting areas.

The program's curriculum is designed to prepare students to enter the rapidly expanding computer field and competitive job markets. Its curriculum development is based on the curricula and courses recommendation by the Institute of Electrical and Electronic Engineer Computer Society and the Association for Computing Machinery.

Program Educational Objectives

1. Our graduates will have successful careers and become productive professionals in their fields.
2. Our graduates are capable of gaining admission to and completing their graduate studies.
3. Our graduates are capable of developing professionally through life-long learning, and playing an active role and leadership in the development of new tools, technologies, and methodologies.



Student Outcomes

The expected program outcomes derived from the Program Educational Objectives are:

1. An ability to analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
2. An ability to design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
3. An ability to communicate effectively in a variety of professional contexts.
4. An ability to recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
5. An ability to function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
6. An ability to apply computer science theory and software development fundamentals to produce computing-based solutions.

Career Prospects

Mainly, our graduates will work as computer scientists or software engineers where their main roles are developing new, improving existing and delivering computer-based technologies, systems, and solutions. We prepare our graduate to work with other professionals (e.g., engineers, business management) in various domains (e.g., industrial control system, safety critical, medical).

Their work title might include (but not limited to) as follows:

1. Software product managers whose lead and manage several products throughout their lifecycle from the inception to the phase-out in order to create customer value and deliver measurable business benefits.
2. Information Technology/Software project managers whose help their teams plan and execute projects to achieve business goals by delivering a computer-based information system.
3. Software developers whose work, together with other professionals, to solve problems, to deliver systems, or to create products in various technologies (e.g., web, mobile, embedded system)
4. Quality assurance engineers whose evaluate & ensure the quality of software products/systems
5. System engineers & administrator whose deliver, operate and maintain computer systems
6. Data(base) engineer & administrator whose design, operate, and maintain data(base) system regardless of relational or non-relation systems
7. Information Technology professionals whose plan, implement, operate, and evaluate computer-based information systems in an organizational context
8. Computer Network/Data Communication engineers whose design, operate, and maintain computer network
9. Game developers whose develop interactive media and game application in various platforms
10. Data scientists whose utilize their analytical and programming skills to collect, prepare, analyze, and interpret large data sets to develop data-driven solutions to business challenges.
11. Machine learning engineers whose uses large data sets to training models using appropriate ML algorithms; and developing machine learning and deep learning systems.

Program Structures

Freshman Year (First year)

See page 41.

Sophomore Year (Second Year)

Third Semester

No	Code	Subject	Credit
1	IF2121	Computational Logic	2
2	IF2110	Algorithm & Data Structure	4
3	IF2120	Discrete Mathematics	3
4	IF2124	Formal Language Theory and Automata	3
5	IF2123	Geometric and Linear Algebra	3
6	IF2130	Computer Organization and Architecture	3
		Total	**18**

Fourth Semester

No	Code	Subject	Credit
1	IF2210	Object Oriented Programming	3
2	IF2211	Algorithm Strategies	3
3	IF2220	Probability and Statistics	3
4	IF2230	Operating System	3
5	IF2240	Database	3
6	IF2250	Software Engineering	3
		Total	**18**

Junior Year (Third Year)

Fifth Semester

No	Code	Subject	Credit
1	IF3170	Artificial Intelligence	3
2	IF3110	Web based Application Development	2
3	IF3130	Computer Networks	3
4	IF3141	Information System	3
5	IF3150	Software Project Management	2
6	IF3140	Database Management	2
7	IF3151	Human Computer Interaction	3
		Total	18

Sixth Semester

No	Code	Subject	Credit
1	IF3210	Platform-based Application Development	3
2	IF3270	Machine Learning	2
3	IF3230	Parallel and Distributed Systems	3
4	IF3250	Software Project	4
5	IF3260	Computer Graphics	3
6	IF3280	Socio-informatics and Professionalism	3
		Total	**18**

Senior Year (Fourth Year)

Seventh Semester

No	Code	Subject	Credit
1	IF4090	Industrial Internship	2 (2)
2	IF4091	Final Project I and Seminar	2 (1)
3	KU2071	Pancasila and Civic Education	2
		Total	**6**

Eighth Semester

No	Code	Subject	Credit
1	IF4092	Final Project 2	4 (3)
2	KU206X	Religion and Ethics	2
3	XXLING	Environmental Elective	2
		Total	**8**

Electives for Informatics/Computer Science

No	Code	Subject	Credit
1	IF3159	Software Construction Fundamentals	1
2	IF4010	Graphical Processing Unit Programming	3
3	IF4033	Information Security and Assurance	3
4	IF4041	Data Science and Data Mining	3
5	IF4050	Advances in Software Engineering	3
6	IF4052	Service Computing	3
7	IF4061	Information and Data Visualisation	3
8	IF4071	Speech Processing	2
9	IF4073	Image Interpretation and Processing	3
10	IF4080	Informatics in Industry	3 (2)
11	IF4150	Domain Specific Software Engineering	2
12	IF4021	Modeling and Simulation	2
13	IF4031	Distributed Application Development	3
14	IF4042	Information Retrieval System	3
15	IF4043	Advanced Information System	3
16	IF4044	Big Data Technology	2
17	IF4051	IoT System Development	2
18	IF4060	Interaction Engineering	3
19	IF4070	Knowledge Representation and Reasoning	3
20	IF4072	Natural Language Processing	2
21	IF4074	Advanced Machine Learning	2
22	IF4081	Informatics for Community	3 (2)
23	IF4020	Cryptography	3
24	IF4040	Advanced Data Modeling	3

Minor Courses: Informatics/Computer Science A

No	Code	Subject	Credit
1	IF2110	Algorithm & Data Structure	4
2	IF2130	Computer Organization and Architecture	3
3	IF2240	Database	3
4	IF2250	Software Engineering	3
		Total	**13**

Minor Courses: Informatics/Computer Science B

No	Code	Subject	Credit
1	IF2121	Computational Logic	2
2	IF2211	Algorithm Strategies	3
3	IF2230	Operating System	3
4	IF3110	Web based Application Development	2
5	IF3140	Database Management	2
		Total	**12**

Informatics/Computer Science Course Descriptions

IF1210. Programming Fundamental (Credit 2)
This course offers the fundamental concepts of programming: abstraction, problem decomposition, modularization, recurrence; skill in small scale programming (coding aspects, through laboratory work); and overview of the big picture of programming and prepares the students to learn programming more deeply in the next stage

IF2110. Algorithm & Data Structure (Credit 4)
This course offers (1) the concepts of algorithms and data structures commonly used in the field of informatics/computer science, (2) skill in designing and using algorithms and data structure for problem solving, and (3) developing programs in procedural paradigm using C programming language.
Prerequisites: IF1210 Programming Fundamental

IF2120. Discrete Mathematics (Credit 3)
Sets, relations and functions, proof techniques, number theory, combinatoric, graphs, trees, and algorithm complexity.

IF2121. Computational Logic (Credit 2)
This course discusses the approach to conduct computer based reasoning, how to entail new fact from given facts.

IF2123. Geometric and Linear Algebra (Credit 3)
matrix, vector space, complex number, quarternion, and geometric algebra.
Prerequisites: MA1101 Mathematics IA

IF2124. Formal Language Theory and Automata (Credit 3)
This course offers supporting knowledge and skill in designing Finite Automata, Regular Expression, Pushdown Automata and Turing Machine.
Corequisite: IF2110 Algorithm & Data Structure, IF2120 Discrete Mathematics

IF2130. Computer Organization and Architecture (Credit 3)
Introduction to computer architecture, data representation, machine level representation, compile, linking and program optimization, memory hierarchy, I/O and interrupts

IF2210. Object Oriented Programming (Credit 3)
This course offers the concepts of OOP and skill in developing programs using OO paradigm using 3 programming languages.
Prerequisites: IF2110 Algorithm & Data Structure

IF2211. Algorithm Strategies (Credit 3)
Algorithm complexity, Brute Force Algorithms, Greedy Algorithms, Divide and Conquer Algorithms, DFS, BFS, Backtracking Algorithms, Branch and Bound Algorithms, Dynamic Programming String Matching, NP Theory
Prerequisites:IF2110 Algorithm & Data Structure, IF2120 Discrete Mathematics

IF2220. Probability and Statistics (Credit 3)
This course discusses probability and statistics as one approach in computer based decision making. Instead of giving explanation and proofing of probability and statistics theory, this course focuses on how to apply probability and statistics in informatics engineering problem.
Prerequisites: MA1101 Mathematics IA, MA1202 Mathematics IIB, IF2120 Discrete Mathematics

IF2230. Operating System (Credit 3)
Operating system concepts, process management, memory management, I/O device and file management, computer system security and protection, operating system for distributed system.
Prerequisites:IF2130 Computer Organization and Architecture

IF2240. Database (Credit 3)
This course discusses database systems in general, including database system architecture, data modeling, design of relational database schema, querying and management of data.
Prerequisites: IF2130 Computer Organization and Architecture, IF2121 Computational Logic, IF2120 Discrete Mathematics

IF2250. Software Engineering (Credit 3)
This course provides an understanding of software engineering and basic skills in developing small scale and simple software, including software requirement analysis and design, the ability to use a variety of software modeling tools, software configuration management, and software testing.

IF3110. Web based Application Development (Credit 2)
This course teaches basic principles of how Internet works. Moreover, the course basic principles of an Internet Application and how to develop one.
Prerequisites: IF2110 Algorithm & Data Structure, IF2210 Object Oriented Programming

IF3130. Computer Networks (Credit 3)
Introductions to computer networks, computer network hardware & data link layer, basic model of switched networks, internetworking protocols, transport layer, congestion control and resource allocation, application layer and network security
Prerequisites: IF2230 Operating System

IF3140. Database Management (Credit 2)
This course discusses about database management, including database performance tuning, security and transaction management, database programming, distributed management of database.
Prerequisites: IF2240 Database

IF3141. Information System (Credit 3)
This course provides explanation, comprehension, and knowledge about information systems concept and its role in improving organization competitive advantage
Prerequisites: IF2240 Database, IF2250 Software Engineering

IF3150. Software Project Management (Credit 2)
This course provides knowledge and understanding about management, project management, software project management processess, and several konowledge areas in software project management
Prerequisites: IF2250 Software Engineering

IF3151. Human Computer Interaction (Credit 3)
This course discusses the Interaction design concepts, human issues, practical & research issues in a wide range of interfaces, data gathering & analysis framework, process of interaction design, and approaches to evaluation of interactive interfaces
Prerequisites: IF2250 Software Engineering

IF3170. Artificial Intelligence (Credit 3)
This course discusses intelligent agent in three levels of "intelligence" which are simple problem solving agent (solve the problem by searching), knowledge based agent, and learning agent which is capable of creating knowledge from a given data. In each level, application that utilized intelligent agent is presented. Introduction to Pattern recognition is also presented in this course.
Prerequisites: IF2121 Computational Logic, IF2124 Formal Language Theory and Automata, IF2220 Probability and Statistics, IF2211 Algorithm Strategies

IF3210. Platform-based Application Development (Credit 3)
This course explains various platform of computing. The course teaches how to design and develop a software application that resides on a specific software platform by taking into account its contraints. In this course, the student swill learn how to do performance measurement and tuning.
Prerequisites: IF2110 Algorithm & Data Structure, IF2130 Computer Organization and Architecture

IF3230. Parallel and Distributed Systems (Credit 3)
introduce basic concepts in parallel and distributed systems, focus on the implementation and performance issues associated with them, parallel and distributed systems models and interfaces, parallel machines architectures, parallel program optimization techniques, synchronization, consistency and coherence, fault tolerant and reliability
Prerequisites: IF3130 Computer Networks

IF3250. Software Project (Credit 4)
This course gives an overview of the complexity and experiences of large-scale software development. Students utilize / use a variety of platforms, frameworks, and tools commonly used for large scale software projects. This course also gives advanced topics in software engineering, including Domain Specific Language (DSL), Domain-oriented Design/Analysis/Architecture, Large Scale Software development, and Performance Engineering.
Prerequisites: IF2250 Software Engineering, IF3150 Software Project Management

IF3260. Computer Graphics (Credit 3)
Image creation, framebuffer, primitive object drawing, Bresenham algorithm, Geometry Transformation, window-view, layering, clipping, object filling, anti-clipping optimization, spatial data structure, hierarchical modeling, Bezier & Spline curve
Prerequisites: IF2110 Algorithm & Data Structure, IF2123 Geometric and Linear Algebra, IF2130 Computer Organization and Architecture

IF3270. Machine Learning (Credit 2)
This course discusses broad introduction to machine learning and pattern recognition. The approach consists of supervised learning and unsupervised learning.
Prerequisites: IF3170 Artificial Intelligence, IF2110 Algorithm & Data Structure

IF3280. Socio-informatics and Professionalism (Credit 3)
This course discusses the social, legal, ethical and cultural issues involved in the deployment and use of computer technology,social Context, Analytical Tools, Professional Ethics, Intellectual Property, and effective communication.

IF3159. Software Construction Fundamentals (Credit 1)
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IF4010. Graphical Processing Unit Programming (Credit 3)
This course discusses parallel programming techniques on GPU and their optimizations.

IF4020. Cryptography (Credit 3)
Introduction, attacks to cryptography, classical cryptography algorithms, cryptanalysis, stream ciphers and block ciphers, public-key cryptography system, hash function and MAC, digital signature, cryptography protocols, public-key infrastructure (PKI), key management, steganography and watermarking, visual cryptography.
Prerequisites: IF2110 Algorithm & Data Structure, IF2120 Discrete Mathematics

IF4021. Modeling and Simulation (Credit 2)
discrete event and continuous simulation, review of statistics, random number generator, queuing system applications , process oriented simulation, complex system, agent based simulation, parallel simulation, web based simulation.
Prerequisites: IF2220 Probability and Statistics

IF4031. Distributed Application Development (Credit 3)
fundamental principles common to the design and implementation of programs that run on two or more interconnected computer systems. Distributed application architectures. Tools and frameworks for developing distributed applications.
Prerequisites: IF3230 Parallel and Distributed Systems

IF4033. Information Security and Assurance (Credit 3)
This course aims at providing basic foundations and principles in information security: confidentiality, integrity, availability, authenticity, and accountability. The course also gives some illustration mechanisms various protection mechanisms to various attacks.

IF4040. Advanced Data Modelling (Credit 3)
This course provides insight and knowledge on advance data modeling, such as including time or space aspect to the data model, the use of rules to deduce new facts from the database, and data modeling using non-relational approach.
Prerequisites: IF2240 Database

IF4041. Data Science and Data Mining (Credit 3)
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IF4042. Information Retrieval System (Credit 3)
Information retrieval system, vector space model, probabilistic model, feed-back, query expansion, thesaurus, evaluation of system performance, search engine
Prerequisites: IF2220 Probability and Statistics, IF2123 Geometric and Linear Algebra

IF4043. Advanced Information System (Credit 3)
Students understand the role of information system to support organization need on non transactional level with its opportunity and risk. Students understand various information systems and be able to analyse organization problem to develop solution in using various application types. Students understand the management of organization information system.
Prerequisites: IF3141 Information System

IF4044. Big Data Technology (Credit 2)
This course will give students knowledge and skill in utilizing big data technology for processing and analyzing big data, focusing on the issues: volume, velocity, variety, veracity, and generating insight (value) for decision making.
Prerequisite: IF2240 Database

IF4050. Advances in Software Engineering (Credit 3)
This course explains various advances in software engineering area. These are ranging from its development process lifecycle: Analysis, design & modeling construction, testing, release and maintenance: and also various important topics such as: privacy & security, large -scale software system, model-driven, quality
Prerequisites: IF3250 Software Project

IF4051. IoT System Development (Credit 2)
This course provides students with the main concepts of Internet of Things (IoT) and the skills to develop end-to-end IoT systems.
Prerequisites: IF3130 Computer Networks, IF3210 Platform-based Application Development

IF4060. Interaction Engineering (Credit 3)
1. Prospect of Interaction Engineering, Usability Engineering Model, Interaction Modelling, Introduction to User Experience (UX), Dialog Modelling, Error Management. 2. Exploration of the prospects of Interaction Engineering.
Prerequisites: IF3141 Information System, IF3151 Human Computer Interaction, IF2250 Software Engineering

IF4061. Information and Data Visualization (Credit 3)
This course explains about how to effectively presenting information using computer-based visual media. The course objective is to provide insight about principle and role of visualization in human interaction with information, and to provide guidance about developing interactive visualization application so that students are able to apply knowledge acquired in class to everyday use. This course is inherently multi-discipline which covers aspects from Biology, Psychology of Visual Communication, and Information Technology.
Prerequisites: IF3151 Human Computer Interaction, IF2220 Probability and Statistics, IF3260 Computer Graphics

IF4070. Knowledge Representation and Reasoning (Credit 3)
The course describe the issues related to symbolic knowledge representation and conduct automated reasoning
Prerequisites: IF2121 Computational Logic, IF3170 Artificial Intelligence, IF2110 Algorithm & Data Structure

IF4071. Speech Processing (Credit 2)
The course describes the basic theory, algorithm, and architecture of speech processing, including speech recognition and synthesis.
Prerequisites: IF3270 Machine Learning

IF4072. Natural Language Processing (Credit 2)
The course describes the basic theory of natural language processing tool, text mining, and dialogue system; including the algorithm and architecture.
Prerequisites: IF3270 Machine Learning

IF4073. Image Interpretation and Processing (Credit 3)
Image formation model, image feature and processing, motion estimation, shape representation and segmentation, object recognition
Prerequisites: IF3260 Computer Graphics, IF3270 Machine Learning

IF4074. Advanced Machine Learning (Credit 3)
-
Pass Prerequisite: IF3270 Machine Learning

IF4080. Informatics in Industry (Credit 3)
-

IF4081. Informatics for Community (Credit 3)
-

IF4090. Industrial Internship (Credit 2)
-
Prerequisites: IF3280 Socio-informatics and Professionalism

IF4091. Final Project I and Seminar (Credit 2)
-

IF4092. Final Project 2 (Credit 4)
-
Pass Prerequisite: IF4091 Final Project I and Seminar

ABET Engineering Accreditation Commission

Electrical Power Engineering Bachelor Program

The Electrical Power Engineering Program provides education on the area of electrical energy generation, delivery, and its application.

Within the program, students will gain the knowledge of electrical power engineering principles along with the required supporting knowledge of mathematics, science, computing, and engineering fundamentals. The students will also develop their abilities to formulate, analyze, and solve complex problem as well as to design a product or system based on real problems, especially in the field of electrical power engineering. Therefore, they will have sufficient breadth-and-depth knowledge for successful subsequent graduate and post-graduate study, or other lifelong learning opportunities.

The program also facilitates active roles in developing electrical power engineering and other related industries. It also embraces the broad spectrum of issues arising in professional world, including teamwork, leadership, safety, ethics, service, economy, environmental awareness, and professional organization.

Program Educational Objectives

Program Educational Objectives of the EPE Program are as following:

1. Our graduates will have successful careers in his/her profession, especially in the field of electrical power engineering
2. Our graduates are capable of pursuing higher education or professional development
3. Our graduates have active leadership and become pioneer for serving his/her community

Student Outcomes

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. An ability to communicate effectively with a range of audiences.
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal context.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goal, plan task, and meet objectives.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions.
7. An ability to acquired and apply new knowledge as needed, using appropriate learning strategies.

Career Prospects

The graduates of Electrical Power Engineering Study Program will have opportunities to develop their professional careers as power system planning engineers, power generation and power system operation and maintenance engineers, electricity utility managements, design engineers, marketing engineers, power engineering and related fields researchers or power engineering educators and trainers in various institutions and companies.

These institutions/companies include: Electricity utility (PT PLN (Persero) and overseas electricity utilities), power generation companies, power transmission companies, power distribution and retail companies, electricity market authority (government body), industries having electricity network such as: government own and private petroleum and mining industries, electrical equipment industries, appliances industries, consultancy services, power contractors, research and development institutions, higher education institutions and training providers, other related industries and institutions.

Program Structures

Freshman Year (First year)

See page 41.

Sophomore Year (Second Year)

Third Semester

No	Code	Subject	Credit
1	EP2091	Probability and Statistic	3
2	MA2072	Engineering Mathematics IA	3
3	EL2001	Electric Circuits	4
4	EL2101	Electric Circuits Laboratory	1
5	EL2142	Digital & Microprocessor Systems	4
6	MS2060	Thermal Engineering and Fluid Mechanics	3
		Total	**18**

Fourth Semester

No	Code	Subject	Credit
1	EP2076	Measurement System	3
2	EP2094	Signal & System	3
3	KU2071	Pancasila and Civic Education	2
4	MA2074	Engineering Mathematics IIA	3
5	EL2005	Electronics	3
6	EL2205	Electronics Laboratory	1
7	EL2006	Electromagnetics	3
		Total	18

Junior Year (Third Year)

Fifth Semester

No	Code	Subject	Credit
1	EP3071	Electric Machines	3
2	EP3073	Numerical Analysis in Electrical Power	3
3	EP3075	Power System Analysis	3
4	EP3095	Electrical Engineering Material	3
5	EP3171	Power Engineering Laboratory I	2 (2)
6	TI3004	Engineering Economics	2
7	EL3015	Control Systems	3
		Total	19

Sixth Semester

No	Code	Subject	Credit
1	EP3272	Power Engineering Laboratory II	2 (2)
2	EP3070	Electric Power Plant	3
3	KU206X	Religion and Ethics	2
4	EP3072	Power Electronics	3
5	EP3074	High Voltage Engineering	3
6	EP3076	Power System Protection	3
		Total	16

Senior Year (Fourth Year)

Seventh Semester

No	Code	Subject	Credit
1	EP4096	Final Project I & Seminar	2
2	XXLING	Environmental Elective	2
3	EP4071	Utilization of Electrical Energy	3
4	EP4073	Selected Topics in Electrical Power	2
5	EP4077	Electric Power Distribution Systems	3
		Total	**12**

Eighth Semester

No	Code	Subject	Credit
1	EP4091	Industrial Experience	2
2	XXMANJ	Management Elective	2
3	EP4099	Final Project II	4
4	EP4070	Electrical Power System Design	2
		Total	**10**

Major Electives for Electrical Power Engineering

No	Code	Subject	Credit
1	EP3000	Telecommunication Elective	3
2	EP4050	Electrical System Project Management	3
3	EP4072	SCADA and Energy Management	3
4	EP4074	System Engineering	3
5	EP4075	Applications of Electrical Motors	3
6	EP4079	Relay Protection	3
7	EP4090	Engineering Ethics	2
8	EP4193	Industrial Cooperative	3
9	EL5076	Electric Transportation System	2
10	EL5078	Non-conventional and Renewable Power Plants	2
11	EL5174	Direct Current Power Transmission and FACTS	2
12	EL5275	Electromagnetic Compatibility	2
13	EP2274	Electrical Power Engineering	2

Minor Program

No	Code	Subject	Credit
1	EP2076	Measurement Systems	3
2	EP3070	Electric Power Plants	3
3	EP3071	Electric Machines	3
4	EP3072	Power Electronics	3
5	EP3074	High Voltage Engineering	3
6	EP3075	Power System Analysis	3
		Total	**18**

Electrical Power Engineering Course Descriptions

EP2076. Measurement System (Credit 3)
Introduction, Units, standard and calibration ; Errors in measurement ; Statistical methods in measurement data processing ; Basic components and characteristics of instrumentation system; Physical phenomenon, stimulus and sensors ; Electrical quantities ; Non-electrical quantities ; Signal conditioning; Data acquisition, processing and transmission ; Review of basic theory of microprocessor ; microprocessor based instrumentations.
Prerequisites: EL2001 Electric Circuits

EP2091. Probability and Statistic (Credit 3)
An introduction to probability theory and mathematical statistics that emphasizes the probabilistic foundations required to understand probability models, statistical methods, and its applications. Topics covered will include Concept of probability, Random Variables, Discrete Probability Distributions, Continuous Probability Distributions, Functions of Random Variables, Statistics of Inference and Estimation Theory.
Prerequisites: MA1101 Mathematics IA, MA1201 Mathematics IIA

EP2094. Signal & System (Credit 3)
Introduction to signal and systems, invariant linear-time systems, Laplace transformation, z transformation, continous-time Fourier analysis, discrete-time Fourier analyses, filtering, sampling, linear-feedback systems
Prerequisites: EL2001 Electric Circuits, MA2072 Engineering Mathematics IA

EP3070. Electric Power Plant (Credit 3)
Introduction to power generation, basics thermodynamics, power plant cycle, fossil fuels, combustion process, steam generator, steam turbine, condensate-feedwater system, nuclear power plant, gas turbine, hydro power plant, electrical system & plant control system, environmental aspects, and power plant planning design, introduction to renewable energy, introduction to nonconventional power generation.
Prerequisites: EP3071 Electric Machines

EP3071. Electric Machines (Credit 3)
This course dealt with performance and analysis of various electric machines and its applications. Starting with the electromagnetic circuits and transformers, the course then dealt with the of electromechanic conversion concept. The DC motors and generators, the AC machines are discussed thoroughly in this course. Its also discussed the modern concept of electric machine types.
Prerequisites: EL2001 Electric Circuits, EL2006 Electromagnetics

EP3072. Power Electronics (Credit 3)
Basic concept of power electronics and power converters. Power semiconductor, ac-ac, ac-dc, dc-dc, dc-ac power converters and its applications. Power converter controls.
Prerequisites: EL2001 Electric Circuits, EL2005 Electronics

EP3073. Numerical Analysis in Electrical Power (Credit 3)
Introduction to numerical methods, general numerical methods, numerical methods for linear algebra, numerical methods for differential equation, application of numerical methods in power engineering
Prerequisites: MA2072 Engineering Mathematics IA, MA2074 Engineering Mathematics IIA

EP3074. High Voltage Engineering (Credit 3)
Introduction, transportation of high voltage energy, industrial application of high voltage engineering, Electric field, calculation methods of electric field, breakdown mechanism on gas, fluid, and solid, High voltage insulation, High voltage generation, measurement and testing.
Prerequisites: EL2001 Electric Circuits, EL2006 Electromagnetics

EP3075. Power System Analysis (Credit 3)
Introduction, per-unit system, representation of power system components, Transmission line parameter, Introduction to HVDC transmission, Network modelling and calculation, Power flow solution, Symmetrical and unsymmetrical faults, Transient stability, System controls, Introduction to economic operation.
Prerequisites: EL2001 Electric Circuits
Corequisite: EP3071 Electric Machines

EP3076. Power System Protection (Credit 3)
Introduction, overvoltage sources, travelling wave, lightning phenomenon, surge impedance of tower and transmission line, overvoltage protection equipment, lightning performance, insulation coordination, three phase system, line and system parameters under short circuit fault condition, review of symmetrical components and current and voltage calculation under short circuit faults, protection relay, relay coordination in protection system.
Prerequisites: EL2006 Electromagnetics, EP3075 Power System Analysis

EP3095. Electrical Engineering Material (Credit 3)
Classical and modern electron theories; atom structure, electron statistics and energy band theory, properties of conductor, superconductor, semiconductor, dielectrics, magnetic and optical materials.
Prerequisites: EL2006 Electromagnetics

EP3171. Power Engineering Laboratory I (Credit 2)
Electric Machinery Practice consists of Synchronous machines, Asynchronous machines, Power Transformer, DC machines. Power System Analysis Practice consists of Preparation of ETAP software, Load flow and Contingency analysis, Symmetrical and Unsymmetrical short circuit analysis, Motor starting analysis and Transient stability analysis. Control system Practice.
Co-requisites: EP3071 Electric Machines, EP3075 Power System Analysis, EL3015 Control Systems

EP3272. Power Engineering Laboratory II (Credit 2)
Power Electronic Practice consists of Static Switching, DC to DC Converter, AC to DC Converter (Rectifier) and DC to AC Converter. High Voltage Engineering Practice consists of DC high voltage generation, Impulse high voltage generation, Voltage distribution on chain insolators, and Gas breakdown. Power System Protection Practice.
Co-requisites: EP3072 Power Electronics, EP3074 High Voltage Engineering, EP3076 Power System Protection

EP4050. Electrical System Project Management (Credit 3)
The application of project management which includes basic project planning, project planning optimization techniques, project planning implementation and monitoring and control of the implementation of projects in the electricity system projects that include project planning and construction of power plant, transmission and distribution.

EP4070. Electrical Power System Design (Credit 2)
Introduction, Products and System design principal on Electric Power System, Design Cycle, Quality management, documentation and technical specification on equipment and power system, Standards and practical of electric installation, HAKI and patent, Economic aspect on design, Safety and environmental aspect on design, Cases study, Group project.
Prerequisite: EP3075 Power System Analysis

EP4071. Utilization of Electrical Energy (Credit 3)
Introduction ; Basic of Heating ; Thermal Insulation ; Electric Heating ; Electric Furnace ; Lighting ; Electric Drive ; Electric Precipitation ; Other industrial electric applications ; District Cooling, Heating and Power ; Energy Efficiency ; Environmental Consideration.
Prerequisites: EP3071 Electric Machines, MS2060 Thermal Engineering and Fluid Mechanics

EP4072. SCADA and Energy Management (Credit 3)
Introduction; Scada concept; Centralized Distributed; Management of energy function; local control component; rtu; master control; communication; the pattern of operation of the system; sensor; signal conditioning; tele control; tele signal dan tele measurement; protocol communication; standar iec; dnp 3; dan modbus; ied interoperability intelegent electronic divices

EP4073. Selected Topics in Electrical Power (Credit 2)
Introduction. Electrical power technologies. World energy outlook, Indonesian energy outlook. Invited speakers from industries and other institution concerning electricity and related topics and softskill.

EP4074. System Engineering (Credit 3)
System theory, microprocessor based controller, real time computer control, reliability concept and application, queing theory and application, engineering optimization, production cosf function, engineering economic, decision making analysis.

EP4075. Applications of Electrical Motors (Credit 3)
Introduction. Characteristic of mechanical load. Modelling and control of DC machines by phase control rectifier and chopper with minimum ripple. Modeling of non salient and

salient electricalmachines, Park dq transformation and complex system (space phasor) by using power invariant and amplitude invariant. Scalar control and vector control of induction motor. Space vector of induction machines. Vector control of synchronous motor and permanent magnet synchronous motor (brushless DC motor).

EP4077. Electric Power Distribution Systems (Credit 3)
Introduction, Basic distribution system functions, Power distribution system loads, Distribution network system, Distribution system modelling and analysis, Power distribution system components (Conductor, Insulator, Fuse, Circuit breaker, Switchgear etc.), Overhead distribution systems, Underground distribution systems, Power quality and distribution power compensation, Reliability Power distribution systems, Distribution automation and SCADA systems.
Prerequisites: EL2001 Electric Circuits, EP3075 Power System Analysis

EP4079. Relay Protection (Credit 3)
System protection, relays and relay systems, short circuit calculation, over current protection, distance protection ,differential protection, symmetrical components, unbalanced faults, scada, instrumentation and measurement, wide area protection, adaptive protection, earthing systems.

EP4090. Engineering Ethics (Credit 2)
Introduction ; Ethic and professionalism, moral reasoning and code of ethics, moral frameworks, engineering as social experimentation, commitment to safety, workplace responsabilities and wrights, honesty, environmental ethics, global issues, engineering and technological progress.

EP4091. Industrial Experience (Credit 2)
Students spend 2 months for internship programs (preferably during a summer break) to gain work experiences related to the field of electrical power engineering in companies/ industries.

EP4096. Final Project I & Seminar (Credit 2)
Introduction to research methodology, procedure of research, scientific writing and presentations, lesson-learned, guidance of final project proposal, preliminary research, seminar and evaluation.
Prerequisites: KU1011 Indonesian Language: Scientific Writing

EP4099. Final Project II (Credit 4)
Students carry out the proposed project in EP4096 Final Project I & Seminar, including an evaluation for assessing the extent to which it has addressed the formulated problem. Students submit project reports & resume paper and defend them at the Final project Exam.
Prerequisite: EP4096 Final Project I & Seminar

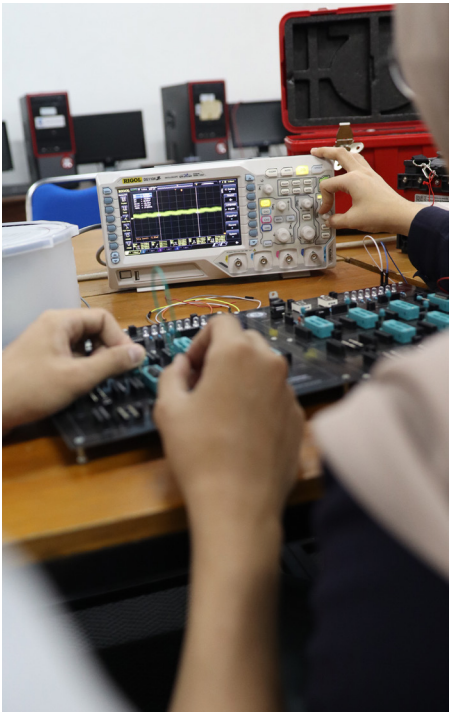
EP4193. Industrial Cooperative (Credit 3)
Students spent 3 months for internship activities in companies/industries who have MOUs with ITB.

ABET Engineering Accreditation Commission

Telecommunication Engineering Bachelor Program

The Telecommunications Engineering Program is interdisciplinary program which blends the areas of Electrical Engineering, Computer Science, Management, Economics &Policy, in addition to Science & Mathematics as the foundation of engineering. Students in this program are given an opportunity to learn and extend their abilities in analyzing and solving problems of telecommunications engineering. They are also prepared to be capable in designing new implementations of technology in order to serve today's needs of society.

The program provides students with an integrated educational experience directed towards the comprehension in applying knowledge and techniques, as well as improving their ability in identifying and finding effective and efficient solutions for practical problems in telecommunications engineering. This program ensures that the student's ability and experience in design and analysis can be achieved by providing them with a sequential and integrated course works and laboratories described throughout the curriculum.



Program Educational Objectives

Graduates of Telecommunication Engineering Program will have the following objective of achievements:

1. Our graduates will have successful careers as professional engineers.
2. Our graduates are capable of successfully completing graduate studies or engaging in professional development activities in their careers
3. Our graduates will have leadership in facing ever-changing, fast-growing and competitive market and industry.

Student Learning Outcomes

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Career Prospects

Graduates of Telecommunications Engineering Program will have broad career prospects because their competency is required by various national and multinational sectors.

They include telecommunication operators and vendors; satellite communications industries; radio, television, broadcasting, multimedia industries; radar and navigation industries; banking industries and financial institutions; oil and mining industries; research and education institutions; government bodies; academic profession and research institutions; entrepreneur and consulting/ contractor companies; creative industries; airline and aircraft industries, armed forces and maritime; electrical power industries; internet service providers; etc.

Freshman Year (First year)

See page 41.

Sophomore Year (Second Year)

Third Semester

No	Code	Subject	Credit
1	ET2101	Discrete Mathematics	3
2	ET2103	Electric circuit	2
3	ET2105	Digital System Design	3
4	ET2107	Programming	3
5	ET2109	Probability and Statistic	3
6	ET2111	Telecommunication Laboratory Works IA	1 (0.9)
7	MA2072	Engineering Mathematics IA	3
		Total	18

Fourth Semester

No	Code	Subject	Credit
1	ET2200	Electromagnetics I	3
2	ET2202	Communication Electronics	3
3	ET2204	Continuous Time Signal Processing	3
4	ET2206	Embedded System	3
5	ET2208	Computer Networks I	2
6	ET2212	Telecommunication Laboratory Works IIA	1 (0.9)
7	ET2214	Telecommunication Laboratory Works IIB	1 (0.9)
8	MA2074	Engineering Mathematics IIA	3
		Total	19

Junior Year (Third Year)

Fifth Semester

No	Code	Subject	Credit
1	ET3100	Electromagnetics II	3
2	ET3101	Communication System I	3
3	ET3103	Computer Networks II	3
4	ET3105	Discrete Time Signal Processing	3 (1)
5	ET3107	Advanced Programming	2
6	ET3111	Telecommunication Laboratory Works IIIA	1 (0.9)
7	ET3113	Telecommunication Laboratory Works IIIB	1 (0.9)
8	KU206X	Religion and Ethics	2
		Total	18

Sixth Semester

No	Code	Subject	Credit
1	ET3202	Communication System II	3
2	ET3204	Antenna and Wave Propagation	3
3	ET3206	Radio Frequency Electronics	3
4	ET3208	Optical Communication Systems	3
5	ET3210	Queueing Network	2
6	ET3212	Telecommunication Laboratory Works IVA	1 (0.9)
7	ET3214	Telecommunication Laboratory Works IVB	1 (0.9)
8	KU2071	Pancasila and Civic Education	2
		Total	18

Senior Year (Fourth Year)

Seventh Semester

No	Code	Subject	Credit
1	XXLING	Environmental Elective	2
2	ET4094	Industrial Placement	2 (2)
3	ET4111	Telecommunication Project Management	2
4	ET4090	Final Works I and Seminar	2 (1.5)
5	ET4103	Professional Ethics	2
6	ET4105	Core and Transport Networks	2
7	ET4107	Connected Services & Cloud Computing	2
8	ET4109	Wireless Access Networks	2
		Total	16

Eighth Semester

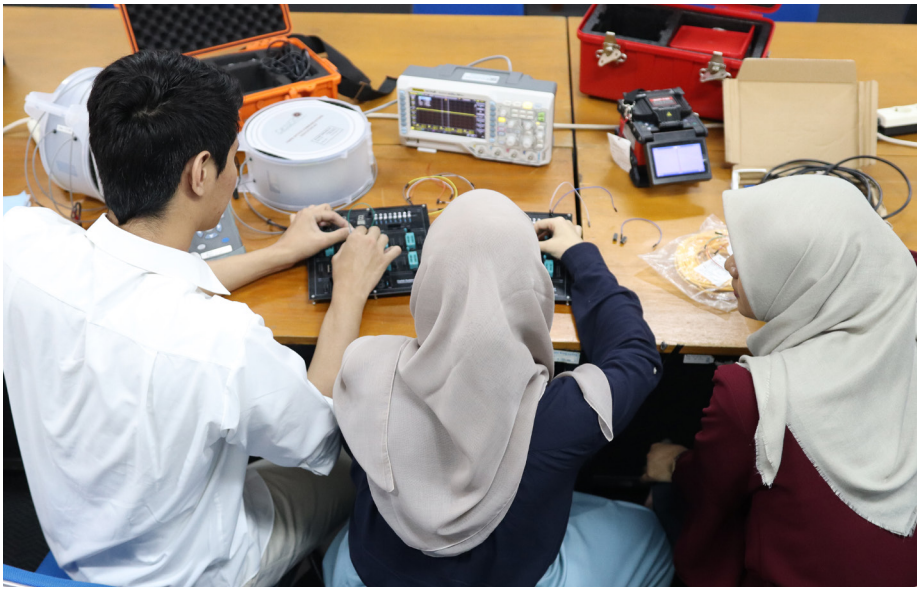
No	Code	Subject	Credit
1	ET4092	Final Works II	4 (4)
		Total	4

Major Electives for Telecommunications Engineering

No	Code	Subject	Credit
1	ET4040	Telecommunication Economy and Regulation	2
2	ET4042	Selected Topics in Telematics	2
3	ET4044	Network Automation and Software-Defined Networking	2
4	ET4046	Named Data Networking	2
5	ET4048	Wireless Devices	3
6	ET4049	Quantum Information Theory	3
7	ET4050	Signal Processing for Software Radio	3
8	ET4052	Radar Systems	3
9	ET4054	Satellite Communication Systems	3
10	ET4091	Development of Profession/Community A	2 (2)
11	ET4093	Development of Profession/Community B	3 (3)
12	ET4095	Development of Profession/Community C	4 (4)
13	ET4047	Artificial Inteligence & Big Data Analysis for Telecommunication	2
14	ET4041	Multimedia Communication Systems	2
15	ET4043	Blockchain Infrastructure	2
16	ET4045	Telecommunication Network Security	2
17	ET4065	Broadcasting Systems	3

Minor Program

No	Code	Subject	Credit
1	ET2208	Computer Networks I	2
2	ET3101	Communication System I	3
3	ET3204	Antenna and Wave Propagation	3
4	ET3206	Radio Frequency Electronics	3
5	ET3210	Queueing Network	2
6	ET4105	Core and Transport Networks	2
7	ET4107	Connected Services & Cloud Computing	2
8	ET4109	Wireless Access Networks	2



Telecommunication Engineering Course Descriptions

ET2101. Discrete Mathematics (Credit 3)
This Lecture make the students study the fundamental principles for understanding and applying Discrete Mathematics to telecommunication engineering: 1. Logic and Sets 2. Function and Sequence 3. Algorithm 4. Numbering Theory 5. Mathematical Reasoning 6. Counting and Probability 7. Relation 8. Graph and Application
Prerequisites: MA1201 Mathematics IIA

ET2103. Electric circuit (Credit 3)
1. second order circuits, forced response and natural response, transient response and steady state response. 2. Alternating current circuits, single and three phase circuits. 3. Magnetically coupled circuit, frequency response, resonant circuit, filter concept. 4. Fourier analysis, filter concepts, four terminal networks, state space applications
Prerequisites: EL1200 Introduction to Circuit Analysis

ET2105. Digital System Design (Credit 3)
1. Introduction to digital systems 2. Number systems 3. Digital Logic Circuits 4. Introduction to CAD tools and VHDL 5. Implementation Technology 6. Implementation of Logic Functions 7. VHDL based logic synthesis, optimization, physical design, and timing simulation 8. Arithmetic Circuits 9. Combinational Logic Circuit Building Blocks 10. Sequential Logic Circuit Building Blocks 11. Synchronous Sequential Logic Circuits 12. Synchronous Sequential Logic Circuit Analysis

ET2107. Programming (Credit 3)
Introduction; Variables, expressions and statements; Functions; Conditionals and recursion; Fruitful functions; Iteration; Strings; Lists; Dictionaries; Tuples; Files; Classes and Objects; Classes and functions; Classes and methods; Inheritance; Debugging; Analysis of Algorithm
Prerequisite: IF1210 Programming Fundamentals

ET2109. Probability and Statistic (Credit 3)
The Concept of Opportunities, Random Variables, Discrete Opportunity Distribution, Continuous Opportunity Distribution, Functions of Random Variables, Estimated Theories, Hypothesis Tests
Prerequisites: MA1201 Mathematics IIA

ET2111. Telecommunication Laboratory Works IA (Credit 1)
1. Introduction to lab work 2. Safety induction 3. Modul for ET2103 Electric Circuit (3 moduls) 4. Modul for ET2105 Digital System Design (3 moduls)
Corequisite: ET2103 Electric circuit, ET2105 Digital System Design

ET2200. Electromagnetics I (Credit 3)
1. Maxwell equations in integral form 2. Maxwell equations in differential form 3. Maxwell equations and wave propagation in materials 4. Static electric and magnetic fields
Prerequisites: ET2103 Electric circuit, MA2072 Engineering Mathematics IA

ET2202. Communication Electronics (Credit 3)
1. Introductio n 2. Semiconduct ors 3. Diodes and diode circuits 4. Bipolar Junction Transistors and Field Effect Transistors 5. Biasing circuits 6. Voltage Amplifiers : CE, CB and CC 7. Power Amplifiers 8. Frequency response and bandwidth 9. Negative Feedback 10. Cascaded Amplifiers 11. Oscillators 12. Power Supply Circuits
Prerequisites: ET2103 Electric circuit

ET2204. Continuous Time Signal Processing (Credit 3)
This course presents basic concepts of continuous-time signals and systems, where the latter is emphasized on Linear Time Invariant (LTI) systems. The signals and systems are represented in time and frequency domains, where those domains are related through the Fourier series, Fourier transform, and Laplace transform. The basic concepts of signals and systems are applied to solve engineering problems in communications, to design analog filters, and to understand briefly the concept of analog linear feedback systems.
Prerequisites: ET2103 Electric circuit

ET2206. Embedded System (Credit 3)
Introduction; Embedded Hardware; Embedded Software; Design and Development
Prerequisites: ET2105 Digital System Design, ET2107 Programming

ET2208. Computer Networks I (Credit 2)
Introduction & Underlying technologies; Network layer; Basic Transport layer , Application layer, and Next generation IP
Prerequisites: ET2101 Discrete Mathematics

ET2212. Telecommunication Laboratory Works IIA (Credit 1)
1. HSE related issues 2. ET2202 Communication Electronics (3 modules) 3. ET2204 Continuous Time Signal Processing (3 modules)
Corequisite: ET2202 Communication Electronics, ET2204 Continuous Time Signal Processing

ET2214. Telecommunication Laboratory Works IIB (Credit 1)
1. HSE related issues 2.ET2206 Embedded System (3 modules) 3. ET2204 Computer Network 1 (3 modules)
Corequisite: ET2206 Embedded System, ET2208 Computer Networks I

ET3100. Electromagnetics II (Credit 3)
1. Normal-incidence plane wave at plane boundaries 2. Oblique-incidence plane wave reflection and transmission 3. Transmission line 4. Waveguide
Prerequisites: ET2200 Electromagnetics I, MA2074 Engineering Mathematics IIA

ET3101. Communication System I (Credit 3)
1. Signal and Spectrum 2. Linear Continuous Wave Modulation 3. Exponential Continuous Wave Modulation 4. Random Process and Noise 5. Noise in Linear and Exponential Modulation 6. Pulse Modulation 7. Digitization Technique for Analog Signal 8. Baseband Digital Transmission

ET3103. Computer Networks II (Credit 3)
1. Introduction 2. Underlying technologies 3. Network layer 4. Transport layer 5. Application layer 6. Next generation IP
Prerequisite: ET2208 Computer Networks I

ET3105. Discrete Time Signal Processing (Credit 3)
Discrete Time Signal and System, Discrete Time Fourier Transform, The z Transform, Sampling and Reconstruction, Discrete Fourier Transform, Implementation of Discrete-Time Systems, FIR Filter Design, IIR Filter Design
Prerequisite: ET2204 Continuous Time Signal Processing

ET3107. Advanced Programming (Credit 2)
Python Review Functions, Classes, & Functional Programming Python Standard Library Python Ecosystem & Third Party Libraries/Tools Python for Data Science Python for Signal Processing
Prerequisite: ET2107 Programming

ET3111. Telecommunication Laboratory Works IIIA (Credit 1)
1. HSE related issues 2. ET3100 Electromagnetics II (3 modules) 3. ET3101 Communication System I (3 modules) 4. ET3105 Discrete time signal processing (3 modules)
Corequisite: ET3100 Electromagnetics II, ET3101 Communication System I, ET3105 Discrete Time Signal Processing

ET3113. Telecommunication Laboratory Works IIIB (Credit 1)
1. HSE related issues 2. ET3103 Computer Network II (3 modules) 3. ET3105 Discreet Time Signal Processing (3 modules)
Corequisite: ET3105 Discrete Time Signal Processing

ET3202. Communication System II (Credit 3)
1. Random process and noise modeling 2. Baseband transmission 3. Signal space analysis 4. Passband digital transmission 5. Synchroniza tion 6. Channel coding 7. Intro. to spread spectrum 8. Intro. to orthogonal frequency division multiplexing
Prerequisites: ET3101 Communication System I

ET3204. Antenna and Wave Propagation (Credit 3)
1. Radio communication and antenna concepts 2. Antenna Array 3. Antenna types and characteristics 4. Antenna measurement 5. Space wave propagation 6. Sky wave and ground wave
Prerequisites: ET3100 Electromagnetics II

ET3206. Radio Frequency Electronics (Credit 3)
1. Two-port Network 2. Analogue Filter 3. Impedance Matching Circuit 4. Waveguide 5. RF Signal Amplifier 6. Oscillator, Mixer and PLL
Prerequisites: ET2202 Communication Electronics, ET3100 Electromagnetics II

ET3208. Optical Communication Systems (Credit 3)
Optical communication system overview, fiber optics, attenuation and dispersion, optical sources, photodetector and receiver, digital link, optical network and WDM, performance measurement and monitoring
Prerequisites: ET3101 Communication System I

ET3210. Queueing Network (Credit 2)
Introduction to Queueing Network; Review Probability & Statistics; Introduction to Stochastic Process; Markov Process: Discrete & Continue; Single Markovian Queue; Semi-Markovian Queue; Open Queueing Networks; Closed Queueing Networks; Markov-Modulated Arrival Process; Queueing Systems & Networks Implementation on Telecommunications
Prerequisites: ET2109 Probability and Statistic

ET3212. Telecommunication Laboratory Works IVA (Credit 1)
1. HSE related issues 2. ET3204 Antenna and wave propagation (3 modul) 3. ET3206 Radio Frequency electronic (3 modul)
Corequisite: ET3206 Radio Frequency Electronics, ET3204 Antenna and Wave Propagation

ET3214. Telecommunication Laboratory Works IVB (Credit 1)
1. HSE related issues 2. ET3202 Communication System II (3 modules) 3. ET3208 Optical Communication System (3 modules)
Corequisite: ET3202 Communication System II, ET3208 Optical Communication Systems

ET4040. Telecommunication Economy and Regulation (Credit 2)
Telecommunication regulations based on economics, law and state administration

ET4041. Multimedia Communication Systems (Credit 2)
Introduction; Data Compression Elements; Compression Technique Principles; Encoder/ Decoder Architecture; Image & Video Compression Standards; Video Distribution and Streaming; Flow Control in Compressed Video Communications; Error Resilience Video Communications; Video Communications Over Mobile IP Networks; Transcoding & Trend
Prerequisite: ET3105 Discrete Time Signal Processing

ET4042. Selected Topics in Telematics (Credit 2)
Discuss the development of Telematics and Telecommunication Network Technology

ET4043. Blockchain Infrastructure (Credit 2)
History, introduction, blockchain types, CAP theorem and blockchain, advantages and disadvantages of the blockchain, decentralization using blockchain, cryptography and technical fundamentals, Bitcoin, alternative coins, smart contracts, Ethereum, Hyperledger, Blockchain alternatives, Blockchain-outside currency, scalability and other challenges, the present and future of the Blockchain

ET4044. Network Automation and Software-Defined Networking (Credit 2)
Networking Overview Network Automation Software-Defined Networking Overview Network Operating Systems Network Function Virtualization Network Virtualization
Prerequisite: ET3103 Computer Networks II

ET4045. Telecommunication Network Security (Credit 2)
Introduction to Cybersecurity; Computer Network Review; Network Security Principles; Network Security Practices; Information Security; The Five Nine Concepts; and Technical and Ethical Aspects of Cybersecurity Specialists
Prerequisites: ET3103 Computer Networks II

ET4046. Named Data Networking (Credit 2)
Introduction, Challenges of Traditional Internet, Anticipated Changes in Future Internet Technologies, Content-Centric Networks, Content, Naming, Interest, Interest Forwarding, Data Retrieval, Security, Applications for NDN

ET4047. Artificial Inteligence & Big Data Analysis for Telecommunication (Credit 2)
This course introduces students to the basic knowledge representation, problem solving, and learning methods of artificial intelligence and big data.
Prerequisite: ET2109 Probability and Statistic, ET3107 Advanced Programming
Pass Prerequisite: ET2101 Discrete Mathematics, ET2107 Programming

ET4048. Wireless Devices (Credit 3)
Electromagnetic, transmission line, transmission line and wave guide, microwave network analysis, impedance matching and tuning, power dividers and directional couplers, microwave filters, theory and design of ferrimagnetic components, non-linear noise and distortion, active RF devices and microwaves, microwave amplifier designs , oscillator and mixer, introduction to microwave systems
Prerequisite: ET3206 Radio Frequency Electronics

ET4049. Quantum Information Theory (Credit 3)
Introduction, Overview of Quantum Physics; Qubits, Review of Matrices and Operators, Theories of Quantum Measurements, Entanglement, Gates and Quantum Circuits, Quantum Algorithms, Quantum Teleportation and Superdense-Coding, Blossom Cryptography, Quantum Sounding and Error Correction, Some aspects of quantum information theory, Adiabatic Quantum Computing
Prerequisite: ET2109 Probability and Statistic

ET4050. Signal Processing for Software Radio (Credit 3)
• Fundamental Theory :Software Radio, Digital Transmission Systems, Multirate Signal Processing, Transceiver Systems, Adaptive Systems, Phase-Locked Loop, Carrier Acquisition and Tracking, Timing Recovery, Channel Equalization, Multicarrier Comunication I : OFDM, Multicarrier Communication II: Filter Bank Multicarrier • Design. Simulation using Octave • Implementation using DSP Platform
Prerequisite: ET3105 Discrete Time Signal Processing

ET4052. Radar Systems (Credit 3)
Fundamental Concepts; Radar Antennas; Pulsed Radar Parameters; Pulse Compression; Radar Detection in Noise; Radar Range Equation; Clutter; Constant False Alarm Rate (CFAR) Detection; CW Doppler Sensing & Frequency Modulation (FM) Ranging ; CW Doppler Radar; Moving Target Indicator (MTI) and Low PRF Pulse Doppler Radar; High PRF Pulse Doppler Radar; Medium PRF Pulse Doppler Radar; Tracking Radar;

ET4054. Satellite Communication Systems (Credit 3)
1.Introduction to Line of Sight Microwave Systems for Terrestrial Link 2. Characteristics of 1□100 GHz Radio Propagation 3. Diagram Blocks and IDU/ODU Modules of Terrestrial Microwave Systems 4. Network Planning of Terrestrial Microwave Radios 5. Introduction to Earth to Space and Satellite Communication Systems 6. Earth and Space Segment of Satellite Communcation Systems 7. Design of Satellite Link and VSAT Network Planning
Prerequisites: ET3204 Antenna and Wave Propagation

ET4065. Broadcasting Systems (Credit 3)
1. Hystory and Development of Broadcasting Technology 2. Digital Broadcasting EncodingTechniques 3. Spectrum Allocation and Broadcasting System Standard 4. Digital Video and Audio Compression 5. Transmission System and Multiplexing of Digital TV 6. RF Consideration of Digital Terrestrial Television 7. Single and Multi Frequency Network 8. Broadcasting Receiver System
Prerequisites: ET3101 Communication System I
Corequisite: ET3202 Communication System II

ET4090. Final Works I and Seminar (Credit 2)
This course introduces the student to independent project research and as the preparation subject for Final Project 2. While the students have to put theory into practice, it is essentially an individual study, topics chosen by the student with the approval of the Final Project 1 and Seminar's lecturer team. The study may be in the field of design, theories, methods, history and philosophy or architecture of telecommunication engineering. The students conduct a thorough research under the supervision of an academic staff. At the end of the session, they have to produce a final research report to the approved standard and give the presentation on a seminar at the end of the semester.

ET4091. Development of Profession/Community A (Credit 2)
1. Insight on professional world of Telecommunication Engineering 2. Hands-on project / Internship

ET4092. Final Works II (Credit 4)
Detailing the design, design implementation, testing, evaluation, improvement, Final Works report preparation and documentation

ET4093. Development of Profession/Community B (Credit 3)
1. Insight on professional world of Telecommunication Engineering 2. Hands-on project / Internship

ET4094. Industrial Placement (Credit 2)
Introduction of Industrial Experience Course Report writing skill Technical Presentation Life long learning skills Profession Ethics

ET4095. Development of Profession/Community C (Credit 4)
1. Insight on professional world of Telecommunication Engineering 2. Hands-on project / Internship

ET4103. Professional Ethics (Credit 2)
Ethical commitment for an engineer in carrying out his profession

ET4105. Core and Transport Networks (Credit 2)
Background and Vision of EPC, Overview of EPS, Key Concepts and Services, EPC, Future of EPS
Prerequisite: ET3103 Computer Networks II, ET3208 Optical Communication Systems, ET3210 Queueing Network

ET4107. Connected Services & Cloud Computing (Credit 2)
1. The Collision of Internet with Telco. 2.The Web Services Ecosystem 3. The Future (Mobile) Services Platform. 4.Big Data and Real-Time Web. 5. Real-Time and Right-Time Web. 6. Modern Device Platforms. 7. Augmented Web. 8. Cloud Computing, SaaS and PaaS. 9. Operator Platform : Network as a Service.
Prerequisites: ET3103 Computer Networks II, ET3107 Advanced Programming

ET4109. Wireless Access Networks (Credit 2)
Introduction to cellular system and concept radiowave propagation Mitigation techniques Modulation techniques Multiple access technique Planning and design of wireless access network Standard and technology
Prerequisites: ET3101 Communication System I, ET3204 Antenna and Wave Propagation

ET4111. Telecommunication Project Management (Credit 2)
1. Project in telecommunication 2. Standard and innovation in telecommunication 3. Project management context 4. Project management process 5. Project integration management 6. Project scope management 7. Project time management 8. Project budget management 9. Project quality management 10. Project human resources management 11. Project communication management 12. Project risk management 13. Project purchasing management 14. Project development
Prerequisites: ET3101 Communication System I, ET3103 Computer Networks II

Information System and Technology Bachelor Program

Information System and Technology program was developed to anticipate the fast growing of the phenomena, problems, needs, and impact of information system to the organization and society, according to development of information technology. This program provides comprehensive knowledge, skill, and way of thinking to be creative, building the abilities to follow advancement of knowledge, technology and the dynamic of social environment.

As one of the academic field in engineering, information system and technology program includes two major academic areas related to:

1. Planning, developing, and evaluating of system in the purpose of information management dedicated to preferred organization or in a global context for a community or society;
2. Planning, developing, and evaluating the management of the technology used to support the system in organization or society.

Nowadays, Information system and technology become a significant and decisive factor in the dynamics of business, organization and community development. Information system and technology has become an important part of daily lives including knowledge, sciences, engineering and design, services development and delivery, operational activities and management. Effective and efficient uses of information system and technology become urgent to achieve business competitive advantage and to take part in acceleration and growing the community, society or even nation. Use of system and technology should be embedded in every live dimensions, business (electronic-commerce), education and learning (e-education and e-learning), medicine and health (e-health), culture, transportation, industry, tourism, collaboration activities, even entertainment.

Program Educational Objectives

1. Our graduates will have successful careers as information systems and information technology professionals.
2. Our graduates are capable of gaining admission to and successfully completing their graduate studies in information system & technology or related fields.
3. Our graduates will have leadership and play an active role for improvement in their community.

Student Learning Outcomes

The expected program outcomes derived from the Program Educational Objectives are:

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
3. Communicate effectively in a variety of professional contexts.
4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
6. Support the delivery, use, and management of information systems within an information systems environment.
7. Identify and analyze user needs and to take them into account in the selection, creation, integration, evaluation, and administration of computing-based systems.

Career Prospects

A wide range of career possibilities are available for graduates of information system and technology program. The following job titles represent only a handful of the choices:

1. As a planner, to plan, develop and manage the governance of information system and technology in order to keep align with organization strategy including government or enterprise in general.
2. As a manager, to plan, develop and manage information system and technology to support the operation management of any organization.
3. As an engineer in software industry, to develop software for information system in corporate-wide level.
4. As researcher in research entities or education institutions.
5. As a creative person with the vision of the future prospects defining information as an asset of the corporate.
6. As a facilitator and emancipator to guide people in the community to build a growing and satisfying community.

Freshman Year (First year)

See page 41.

Sophomore Year (Second Year)

Third Semester

No	Code	Subject	Credit
1	II2130	Computer Architecture and Systems	3
2	II2110	IST Mathematic	3
3	II2111	Probability & Statistic	3
4	TI3005	Organization and Management of Industrial Companies	2
5	IF2140	Database Modeling	3
6	IF2111	Algorithm and Data Structure IST	3
		Total	17

Fourth Semester

No	Code	Subject	Credit
1	II2250	Database Management	2
2	II2260	Embedded Systems	3
3	II2230	Computer Network	3
4	II2220	IST Resource Management	3
5	II2240	System Requirement Analysis	3
6	IF2212	Object Oriented Programming IST	3
		Total	17

Junior Year (Third Year)

Fifth Semester

No	Code	Subject	Credit
1	II3150	Multimedia System	3
2	II3160	Integrated System Technology	3
3	II3120	Information System & Technology Services	3
4	II3131	Human Computer Interaction	3
5	II3121	Enterprise Requirement Analysis	3
6	IF3152	Software Engineering IST	3
		Total	18

Sixth Semester

No	Code	Subject	Credit
1	II3260	Mobile Platform & Application Development	3
2	II3230	Information Security	3
3	II2221	IST Project Management	3
4	II3220	Enterprise Architecture	3
5	II3240	IST Engineering (System Engineering)	3
6	KU206X	Religion and Ethics	2
		Total	17

Senior Year (Fourth Year)

Seventh Semester

No	Code	Subject	Credit
1	II4090	Industrial Practices	2
2	II4091	Final Project 1 & Seminars	2
3	II4370	Information Technology Legal & Ethics	2
4	II4371	IST Capita Selecta	2
		Total	8

Eighth Semester

No	Code	Subject	Credit
1	II4092	Final Project 2	4
2	II4472	Interpersonal Communcations	2
3	KU2071	Pancasila and Civic Education	2
4	BI2001	General Environmental Science	2
		Total	10

Electives for Information System and Technology

No	Code	Subject	Credit
1	IF4041	Data Science and Data Mining	3
2	IF4042	Information Retrieval System	3
3	IF4043	Advanced Information System	3
4	II4021	Decision Support System	2
5	II4022	Information Technology Audit	2
6	II4031	Cryptography and Coding	2
7	II4032	Analysis & Design of System Performance	2
8	II4033	Digital Forensic	2
9	II4034	Natural Language & Speech Processing	2
10	II4035	Intelligent System	2
11	II4037	Internet of Things	2
12	II4038	Cloud Computing	2
13	II4039	Product Management	2
14	II4041	Multimedia Information Retrieval	3
15	II4042	Artificial Intelligence for Business	2
16	II4051	Multimedia System Engineering	2
17	II4062	Data Warehouse & Business Intelligence	2
18	II4071	IST Profession	2

Information System and Technology Course Descriptions

II2110. IST Mathematic (Credit 3)
Understanding of Discrete Mathematic, Proportional Logic, Sets, Predicate Calculus, Relations, Discrete Structure, Numbers, Program/Algorithm
Prerequisites: MA1201 Mathematics IIA

II2111. Probability & Statistic (Credit 3)
The concept of probability, random variables and their distributions, combinatorial and geometric elements, conditional probability, Bayes theorem, distribution functions, bivirate random variables, functions of random variables, estimation, hypothesis testing, application of probability & statistic for computing & electrical engineering
Prerequisites: MA1201 Mathematics IIA

II2130. Computer Architecture and Systems (Credit 3)
Student will gain a comprehensive knowledge about computer systems, its hardware components, software, data and procedures, communications, also the societies

II2220. IST Resource Management (Credit 3)
organization governance, IT governance and information governance for organization information system and technology resource management. The course also discusses IST resource management cycle, IST resource management organization, processes, and risk management
Prerequisites: TI3005 Organization and Management of Industrial Companies

II2221. IST Project Management (Credit 3)
Introduction to PM, PM Framework, Project Life Cycle and Organization, PM Process, PM Knowledge Area: Integration Management, PM Knowledge Area: Scope Management, PM Knowledge Area: Time and Cost Management, PM Knowledge Area: Quality Management, PM Knowledge Area: HR Management, PM Knowledge Area: Communication, Risk and Procurement Management, Case Study and Assignment
Prerequisites: TI3005 Organization and Management of Industrial Companies

II2230. Computer Network (Credit 3)
understanding of computer networks that covers physical layer, datalink layer, network layer, transport layer, and application. Network QoS, security and multimedia services.
Prerequisites: II2130 Computer Architecture and Systems

II2240. System Requirement Analisys (Credit 3)
This course is intended to give knowledge and help students gain understanding about basic of system requirements, and how to analyze system requirements.

II2250. Database Management (Credit 2)
This course provides knowledge and basic skills in database management, including data storage and file structure, database performance tuning, indexing and hashing, query

processing and optimization, database programming, transcation management, database security and integrity, and database system architecture.
Prerequisite: IF2140 Database Modeling

II2260. Embedded Systems (Credit 3)
This course give a foundation skill that apply across embedded computer system application areas. The emphasis is at the layer where hardware meets software. Topics include microcontroller hardware, embedded programming, analog I/O, timers, code optimization, interrupts and concurrency. Real world engineering practices are introduced. Students will be challenged to design and implement embedded system to solve engineering real problems.
Prerequisite: II2130 Computer Architecture and Systems, IF1210 Programming Fundamentals

II3120. Information System & Technology Services (Credit 3)
Concepts of IT service, business services, and service systems; service computing; service computing technologies; service engineering; service systems; and service systems engineering
Prerequisites: TI3005 Organization and Management of Industrial Companies

II3121. Enterprise Requirement Analysis (Credit 3)
Analysis of Business Requirements, Configuration and Change Management, Different Approaches to Implementing Information Systems, High-level System Design Issues, Identification of Opportunities for IT-enabled Organizational Change, Realization of IT-based Opportunities with Systems Development Projects (BoK ACM)
Prerequisites: II2240 System Requirement Analisys

II3131. Human Computer Interaction (Credit 3)
What is Interaction Design, Understanding & Conceptualizing Interaction, Cognitive Aspect, Social Interaction, Emotional Interaction, Interfaces, Data Gathering, Data AnalysisInterpretation, Representation, Process of Interaction Design, Establishing Requirement, Design Prototyping and Construction, Evaluation Framework, Introduction to Speech Processing, Data Capture Technologies, Information Generating Technologies

II3150. Multimedia System (Credit 3)
To describe the methods to capture, process, store, analyzeand deliver multimedia information, and to evaluate its quality both subjectively and objectively.
Prerequisites: II2110 IST Mathematic

II3152. Software Engineering IST (Credit 3)
This course provides an understanding of software engineering and basic skills in building small scale and simple software, and the ability to use a variety of software modeling tools.

II3160. Integrated System Technology (Credit 3)
This course introduces computing technology to build an integrated information systems, including hardware and software, data representation using XML and related format, communication protocols to exchange data, and related technologies to enable system integration.

II3220. Enterprise Architecture (Credit 3)
Enterprise Architecture Frameworks, Component Architectures, Interorganizational Architectures, Processes for Developing Enterprise Architecture, Architecture Change Management, Implementing Enterprise Architecture, Management Controls, Information Systems Strategy, Strategic Alignment, Impact of Information Systems on Organizational Structure and Processes, Information Systems Planning, Role of IT in Defining and Shaping Competition, Financing and Evaluating the Performance of IT Investments and Operations (BoK ACM)
Prerequisites: II3121 Enterprise Requirement Analysis

II3230. Information Security (Credit 3)
This course is intended to help students gain fundamental and comprehensive understanding of information security. We will focus on an overview of major information security issues, technologies, and approaches. Students who successfully complete this course will have a concept and knowledge of security properties, concerns, policies, models, cryptography, PKI, firewalls, security evaluation, and real life security cases. Students will also have handson experience in selected information security technologies through lab sessions.
Prerequisites: II2230 Computer Network, II3131 Human Computer Interaction

II3240. IST Engineering (System Engineering) (Credit 3)
The principles, framework and process engineering of IST. The course also provides cases and tasks to students to conduct case studies of IST engineering during the lectures take place, so that students have the IST engineering skills.
Prerequisites: IF3152 Software Engineering IST

II3260. Mobile Platform & Application Development (Credit 3)
Planning and design mobile applications up to planning a startup company
Prerequisites: IF3152 Software Engineering IST

II4021. Decision Support System (Credit 2)
The course discuss technology to develop Decision Support System application, where decision making is not just based on leader/management intuition but also supported by analysis result of collected data.

II4022. Information Technology Audit (Credit 2)
This course is intended to give knowledge and help students gain understanding about fundamental of audit process and governance toward organisation management of information technology, in theories and in practices.

II4031. Cryptography and Coding (Credit 2)
Techniques to encode and encrypt data in order to secure data or information

II4032. Analysis & Design of System Performance (Credit 2)
understanding of system performance aspects in IT lifecycle

II4033. Digital Forensic (Credit 2)
Forensic investigation process, legal issue related to digital forensic, forensic evidence and searching process of forensic evidence, forensic laborayory, understading of computer based system (including mobile system) for forensic, case study for forensic process, writing forensic report.

II4034. Natural Language & Speech Processing (Credit 2)
Representation of Digital Signal Speech, Characteristics of Speech Signals, Basic Speech Recognition System, Method of Signal Processing and Analysis, Techniques of Pattern Recognition, Hidden Markov Models, Speech Recognition System, Introduction to Text to Speech, Comparison of Techniques of Speech Synthesizer, Mdeling of prosody (Intonation), Introduction to Natural Language Translational Systems, basic of translation process of Natural Language, translational using statistics approach

II4035. Intelligent System (Credit 2)
to learn concepts, intuitions and tools that needed to implement systems that can learn from data

II4037. Internet of Things (Credit 2)
This course aims to provides a comprehensive introduction to IoT, related technologies, and common issues in the adoption of IoT on a large scale. In this course, students will survey recent technological advances and novel solutions for challenges in the IoT environment. Moreover, the students will study and discuss the utilization of IoT and its underlying technologies in critical application areas, such as smart grids, healthcare, insurance, and the automotive industry.

II4038. Cloud Computing (Credit 2)
This course discusses cloud technology, cloud computing components, common API for major cloud computing vendor (Azure & AWS), techniques for building, deploying and maintaining services on cloud infrastructure

II4039. Product Management (Credit 2)
This course discusses topics on product development, product lifecycle, product requirements developments, product development process

II4041. Multimedia Information Retrieval (Credit 3)
This course offers (1) the concepts of algorithms and data structures commonly used in the field of multimedia information retrieval, (2) skill in designing and implementing algorithms and data structure for information retrieval in a program application, and (3) evaluating the performance of a multimedia information retrieval system.

II4042. Artificial Intelligence for Business (Credit 2)
This course discusses the foundation and the applications of artificial intelligence in business context

II4051. Multimedia System Engineering (Credit 2)
The comprehension of multimedia fundamental, system engineering methodology, use of current tools and multimedia standards to create applications related to generation, storing, processing, distributing, and visualizing multimedia.

II4062. Data Warehouse & Business Intelligence (Credit 2)
concepts of business intelligences, especially the use of datawarehouse for business intelligence

II4071. IST Profession (Credit 2)
An understanding of IST profession, Organizational Structure and typical IT department in the company, Know the Labor Law, the Ethic Code (IEEE), Professional Organizations, Campus-Industry Relationships, Alternatives to be enterpreuner, Knowledge Sharing from guest lecturers

II4090. Industrial Practices (Credit 2)
Course done by students in a working environment, such as industry, research institutions, government agencies, etc. Course Objectives is to give an overview to the students about the work environment that will be faced, in addition also to provide work experience and broaden their horizons. Students allowed to take Work Practices are students who have obtained six semesters. Work practice carried out for two months. Students do a Job in the long break between semesters 6 and 7 without taking his credits. In the 7th semester, students take credits and prepare Work Report on the guidance of lecturers and undergo the seminars.

II4091. Final Project 1 & Seminars (Credit 2)
In this course, students define the problem statement for the final project and describe its objectives as well as the impact the final project to its relevant surrounding. Students also conduct literature studies related to the problem, provide the approach to solve the problem as well as the global/general solution on the problem. Student also must write a report for the final project I, and present the results orally in a seminar.

II4092. Final Project 2 (Credit 4)
In this course, students perform analysis of the problem and solution of the final project, design and implementation of the solution, as well as presentation of the solution orally and in writing.
Prerequisites: II4091 Final Project 1 & Seminars

II4370. Information Technology Legal & Ethics (Credit 2)
Introduction To Cyberethics; Ethical Concepts and Ethical Theories; Critical Thinking Skills and Logical Arguments; Professional Ethics; Privacy and Cyberspace; Security in Cyberspace; Cybercrime and Cyberrelated Crimes; Intellectual Property; Regulating Commerce; Social Issues;Converging Technologies, Regulations in Indonesia.

II4371. IST Capita Selecta (Credit 2)
The most uptodate issues in Information System and Technology: (1) Cloud Computing; (2) Payment Systems and Banking System; (3) Roadmap of Mobile Systems; (4) Business Continuity Management; (5) Electricity Systems; (6) Battery Technology; (7) Storage System; (8) Big Data Issues; (9) Future IT Trends; (10) IT Industries in Many Countries; other flexible topics.

II4472. Interpersonal Communcations (Credit 2)
Foundations of Interpersonal Communication; Culture and Interpersonal Communication; Perception and the Self in Interpersonal Communication; Listening in Interpersonal Communication; Verbal Messages; Nonverbal Messages; Emotional Messages; Conversational Messages; Interpersonal Relationships; Interpersonal Conflict and Conflict Management; Interpersonal Power and Influence;

Biomedical Engineering Bachelor Program

Biomedical Engineering is a multi/trans-disciplinary engineering approach aiming to bridge the traditional disciplines of engineering, biology, and medicine. Engineering approach has played an increasing role in the advances of life science and healthcare. Future breakthroughs on these fields are expected to be more and more technology-driven. Biomedical engineering expertise undoubtedly becomes the critical component of such advances, since best engineering practice in this particular setting demands comprehensive understanding of the biological and medical aspects. It essentially applies well-known principles in engineering and physical sciences to study and solve problems in biology and medicine. SEEI ITB foresees the increasing relevancy of educating future engineers with strong affinity to biology and medicine; hence a specialized program in Biomedical Engineering within SEEI is established.

The Biomedical Engineering Program at SEEI ITB is made up of faculty members who are well respected in their areas of research and education. They engage in research activities encompassing a wide range of areas such as electronics and instrumentation, signal processing, computer networks, intelligent system and robotics, machine vision, and biomedical system modeling. The multi/trans-disciplinary nature of the program is demonstrated through the active participation of different faculty and schools at ITB; among others the School of Life Science and Technology, School of Pharmacy, Faculty of Mathematics and Natural Sciences, and the Faculty of Industrial Technology.

Program Educational Objectives

1. Our graduates will have successful careers in their biomedical-related engineering
2. Our graduates will have strong motivation to engage in life-long education, indicated by their capability of being admitted in and successfully completing graduate study.
3. Our graduates will have excellent communication and cooperation skills, take leadership, and play an active role in the competitive industry, government, or education sectors in the Asia Pacific region especially in Indonesia

Student Learning Outcomes

1. an ability to apply knowledge of mathematics, science, and engineering
2. an ability to design and conduct experiments, as well as to analyze and interpret data
3. an ability to design a system, component, or process to meet desired needs
4. an ability to function on multi-disciplinary teams
5. an ability to identify, formulate, and solve engineering problems
6. an understanding of professional and ethical responsibility
7. an ability to communicate effectively
8. an understanding of the impact of engineering solutions in a global and societal context
9. a recognition of the need for, and an ability to engage in life-long learning
10. a knowledge of contemporary issues
11. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Career Prospects

Parallel with the advances in biology and medicine, the demands for biomedical engineering expertise will become increasingly popular in the future. The following job titles represent only a handful of the choices available:

1. Research engineers work in the lab, testing and inventing. This job requires a high level of creativity on the part of the engineer, as well as a great deal of patience in dealing with the complex characteristics of biological and medical systems. Keen attention to detail is important for graduates who enter this profession. Research engineers are responsible for the discovery-stage behind any new biomedical devices.
2. Clinical engineers implement the skills of a system engineer for proper installation and maintenance of healthcare instruments in both pre-clinical and clinical settings. Experienced clinical engineers rely on their ability to think holistically about the technical aspects of the system as well as the foreseeable biomedical and biohazard consequences. Clinical engineers are responsible for routine examination and troubleshooting of medical instruments involved in healthcare facilities.
3. Biomedical technology analysts work in medical technology certifying agencies to assess whether a certain technological advancement is worthwhile to be adopted in clinical practice. Biomedical innovations should only be allowed to become parts of clinical routines when a thorough assessment has established its significant benefits over the corresponding costs and medical risks. This way, unnecessary burden and harm to the patients could be alleviated.

Freshman Year (First year)

See page 41.

Sophomore Year (Second Year)

Third Semester

No	Code	Subject	Credit
1	EB2102	Electric Circuit and Electronics	3
2	EB2103	Anatomy and Physiology I	2
3	EB2101	Fundamentals of Biomedical Engineering	2
4	MA2072	Engineering Mathematics IA	3
5	KI2162	Biochemistry	4 (1)
6	EL2142	Digital & Microprocessor Systems	4
7	EL2101	Electric Circuits Laboratory	1
		Total	19

Fourth Semester

No	Code	Subject	Credit
1	EB2206	Biomedical Electronics	3
2	EB2205	Signals, Systems, and Controls	4
3	EB2207	Anatomy and Physiology II	2
4	EB2200	Biomedical Engineering Laboratory 1	2 (2)
5	MA2074	Engineering Mathematics IIA	3
6	EL2008	Problem Solving with C	3
7	EL2208	Laboratory of Problem Solving with C	1
		Total	18

Junior Year (Third Year)

Fifth Semester

No	Code	Subject	Credit
1	EB3101	Biomedical Physics	3
2	EB3108	Probability and Biostatistics	3
3	KU206X	Religion and Ethics	2
4	EB3105	Biomedical Measurement and Instrumentation	3
5	EB3100	Biomedical Engineering Laboratory 2	2 (1)
6	EB3102	Biomedical Signal Processing	3
7	BI3111	Applied Cell and Molecular Biology	3
		Total	19

Sixth Semester

No	Code	Subject	Credit
1	EB3203	Bioelectromagnetics	3
2	KU2071	Pancasila and Civic Education	2
3	EB3204	Biomechanics	3
4	EB3206	Biomedical Image Processing	3
5	EB3200	Biomedical Engineering Laboratory 3	2 (1)
6	BI4003	Bioethics	2
7	FA3001	Molecular Biodynamics	3
		Total	18

Senior Year (Fourth Year)

Seventh Semester

No	Code	Subject	Credit
1	EB4190	Final Project I and Seminar	2
2	XXMANJ	Mata Kuliah Wajib Manajemen	2
3	EB4103	Selected Topics in Biomedical Engineering	2
4	EB4101	Biomedical System Design	3
		Total	9

Eighth Semester

No	Code	Subject	Credit
1	EB4291	Final Project II (Capstone Design)	4
2	XXLING	Mata Kuliah Wajib Lingkungan	2
3	EB4292	Industrial Experiences	2
		Total	8

Major Electives for Biomedical Engineering

No	Code	Subject	Credit
1	EB4005	Stochastic Biomedical Signal Processing	3
2	EB4006	Biomedical Imaging System	3
3	EB4008	Biomedical Transport Phenomenon	3
4	EB4010	Biomedical System Modeling and Simulation	3
5	EB4011	Pattern Recognition	3
6	FI3151	Physics of Radiology	2
7	EB4004	Biomedical Instrumentation System	3
8	EB4007	Medical Information System	2
9	EB4009	Advanced Biomechanics	3
10	EB4012	Biosensor	3

Biomedical Engineering Course Descriptions

EB2101. Fundamentals of Biomedical Engineering (Credit 2)
Introduction. Fundamentals of Biomedical Engineering. Fundamentals of Biomedical System/Instrumentation. Fundamentals of bioelectric. Various biomedical transducer and sensors. Operational amplifier & biomedical amplifier. Patient safety. Introduction toanatomy andphysiology.

EB2102. Electric Circuit and Electronics (Credit 3)
Sinusoidal steady-state analysis, AC power analysis, transfer function, frequency response and resonance, magnetic coupling circuit, un-ideal op-amp circuitry, diodes and diode circuits, MOSFET as amplifiers and switch, BJT as amplifier, fundamentals of amplifier frequency response

EB2103. Anatomy and Physiology I (Credit 2)
Introduction, Basic Physiology Mechanism, Integration & Control System; Nervous System, Loco-motoric system: skeletal system, muscular system, Exchange & distribution; Cardiovascular System, Respiratory System, Urinary System, wrap up & enhancement

EB2200. Biomedical Engineering Laboratory 1 (Credit 2)
Biomedical Engineering Laboratory I comprises of 2 laboratory courses (each worth 1 credit); i.e. biomedical electronics laboratory (in-line with EB2206 Biomedical Electronics) and anatomy & physiology laboratory (in-line with EB2207 Anatomy & Physiology II).
Corequisite: EB2206 Biomedical Electronics, EB2207 Anatomy and Physiology II

EB2205. Signals, Systems, and Controls (Credit 4)
1) Introduction 2) Mathematical Description of Signals (Continuous) 3) Mathematical Description of Signals (Discrete) 4) Description of System 5) Time Domain Analysis 6) Fourier Series 7) Circuit Analysis with Fourier Series 8) Fourier Transform 9) Laplace Transform 10) Analysis with Laplace Transform 11) Frequency Response Analysis 12) Sampling and Signal Processing 13) The Z Transform 14) State Space representation or Examples of application

EB2206. Biomedical Electronics (Credit 3)
Sources and Properties of Biomedical Signals; Properties and Models of Semiconductor Devices Used in Analog Electronic Systems; The Differential Amplifier; General Properties of Electronic, Single-Loop Feedback Systems; Feedback, Frequency Response, and Amplifier Stability; Operational Amplifiers and Comparators; Introduction to Analog Active Filters; Instrumentation and Medical Isolation Amplifiers; Noise and the Design of Low-Noise Signal;; Digital Interfaces; Modulation and Demodulation of Biomedical Signals; Power Amplifiers and Their Applications in Biomedicine; Wireless Patient Monitoring;
Prerequisites: EB2102 Electric Circuit and Electronics
Corequisite: EB2200 Biomedical Engineering Laboratory 1

EB2207. Anatomy and Physiology II (Credit 2)
Anatomy & physiologiy II focuses on Integrative Physiology which concerns two major themes: the integrative function of major organ systems, and the effect of changes in the internal or external environments to their functions.
Prerequisites: EB2103 Anatomy and Physiology I
Corequisite: EB2200 Biomedical Engineering Laboratory 1

EB3100. Biomedical Engineering Laboratory 2 (Credit 2)
Biomedical engineering laboratory 2 introduces standard practices of biomedical measurement and instrumentation systems together with the specific characteristics of biomedical measurement.
Corequisites: EB3105 Biomedical Measurement and Instrumentation

EB3101. Biomedical Physics (Credit 3)
Fundamentals of Biomedical physics; Terminology, Modelling, and Measurement; Forces on and in the Body; Physics of the Skeleton; Heat and Cold in Medicine; Energy, Work, and Power of the Body; Pressure; The Physics of the Lungs and Breathing; Physics of the Cardiovascular System; Electricity in the Body; Cardiovascular Instrumentation; Application of Electricity and Magnetism in Medicine; Sound in Medicine; Physics of the Ear and Hearing; Light in Medicine; Physics of Eyes and Vision; Physics of Diagnostic X-Rays; Physics of Nuclear Medicine; Physics of Radiation Therapy; Radiation Protection in Medicine
Prerequisites: EB2207 Anatomy and Physiology II

EB3102. Biomedical Signal Processing (Credit 3)
History and Overview in Digital Signal Processing, Theories and Concepts, Discrete Time Signals and Systems, Analysis of LTI Systems Using z-Transfoms, Frequency Analysis of Signals and Systems, The Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Spectrum analysis, Implementation of Discrete-Time Systems, Design of Digital Filter for biomedical applications
Prerequisites: EB2205 Signals, Systems, and Controls

EB3105. Biomedical Measurement and Instrumentation (Credit 3)
This course contains material about the role of instrumentation system in the biomedical engineering; the characteristic of system components; the method of measurement, the method of calibration, data processing methods in the measurement. Classification of sensor and transducer: mechanical; thermal; optics; acoustic, LVDT signal conversion, amplification and modulation, analog signal conditioning and digital converter circuit, final controller, mechanical actuator; electric actuator; hydraulic actuator; analog controller circuits; filters, signal recordings, communications, and displays and readings
Prerequisites: EB2206 Biomedical Electronics

EB3108. Probability and Biostatistics (Credit 3)
Probability, random variables and distributions of random variables, combinatorial dan geomterical elements, conditional probability, Bayes theorem, distribution functions, bivariate random variables, functions of random variable, estimations & hypothesis testings

EB3200. Biomedical Engineering Laboratory 3 (Credit 2)
Biomedical engineering laboratory 3 introduces design, analysis, and troubleshooting of biomedical measurement system
Prerequisites: EB3100 Biomedical Engineering Laboratory 2

EB3203. Bioelectromagnetics (Credit 3)
Vector analysis; Maxwell's equations; Modeling of bioelectric sources and conductors; Theoretical methods in bioelectromagnetism; Electric and magnetic measurement of human body; Effects of external electromagnetic fields; Electric and magnetic stimulation; Electromagnetic imaging.
Prerequisites: EB3101 Biomedical Physics

EB3204. Biomechanics (Credit 3)
This course teaches numerical analysis in molecular systems, cellular and physiological. Students will learn the general techniques to analyse stable and dynamic systems. These techniques will be applied to the MATLAB programming.
Prerequisites: EB3101 Biomedical Physics

EB3206. Biomedical Image Processing (Credit 3)
Introduction, 2D System and matrix review, Image enhancement, Image restoration, Image Segmentation, Image reconstruction from projection, Image compression, Feature extraction, Pattern Recognation
Prerequisites: EB3102 Biomedical Signal Processing

EB4004. Biomedical Instrumentation System (Credit 3)
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Prerequisites: EB3200 Biomedical Engineering Laboratory 3

EB4005. Stochastic Biomedical Signal Processing (Credit 3)
Properties of stochastic signals, classical spectral estimation techniques, adaptive filters, parametric modeling, examples in biomedical signals with Matlab simulations
Prerequisites: EB3102 Biomedical Signal Processing

EB4006. Biomedical Imaging System (Credit 3)
A comprehensive introduction to the major aspects of standard medical imaging systems used today. Topics include xray imaging, computed tomography, image reconstruction and analysis, nuclear medicine, MRI, ultrasound and imaging applications in therapy. The fundamental physics and engineering underlying each imaging modality are reviewed and an performance analysis approach to each system is examined. The class involves site visit to several different imaging systems available at a Medical Center. Evaluation is based upon tests, labs, as well as journal club review of research papers and commercial equipment.
Prerequisites: EB3203 Bioelectromagnetics

EB4007. Medical Information System (Credit 2)
Introduction, Back to the future, Structured Data, Biomedical Databases, Semi structured and weakly structured data, Multimedia Data Mining and Knowledge Discovery, Knowledge and Decision, Biomedical Decision Making, Intelligent Information Visualization and Visual Analytics, Biomedical Information Systems and Medical Knowledge Management, Biomedical Data, Methodology for Information Systems.

EB4008. Biomedical Transport Phenomenon (Credit 3)
The quantitative description of momentum transport (viscous flow) and mass transport (convection and diffusion) in living systems. Application of engineering methods to model and quantify aspects of biomedical engineering.
Prerequisites: EB3101 Biomedical Physics

EB4009. Advanced Biomechanics (Credit 3)
First course in undergraduate biomechanics that provides background in muskuloskeletal anatomy and principles of biomechanics. The course applies and builds on the concepts of Statics and, Dynamics for human activities, and Mechanics of Materials and tissues.
Prerequisites: EB3204 Biomechanics

EB4010. Biomedical System Modeling and Simulation (Credit 3)
A wide variety of biomedical processes behave as dynamic systems where the system states vary in time, often in response to external stimuli or interventions. The aims of this course are to introduce techniques and computer tools for modelling, predicting, analysing and understanding dynamic behaviour in biomedical systems

EB4011. Pattern Recognition (Credit 3)
This course is an advanced pattern recognition course comprising data classification methods, parameter estimation, and state estimation methods
Prerequisites: EB3108 Probability and Biostatistics

EB4101. Biomedical System Design (Credit 3)
Optimation of biomedical system design and implementation according to user specifications. Advanced engineering design methodology.
Prerequisites: EB3200 Biomedical Engineering Laboratory 3

EB4103. Selected Topics in Biomedical Engineering (Credit 2)
Introduction to clinical engineering, technology concept, risk factors & safety issues in Biomedical Engineering, Ethics in Biomedical Engineering, current Biomedical Engineering issues in Indonesia: organization, regulation, social.

EB4190. Final Project I and Seminar (Credit 2)
The student is planned to do preliminary study / design of her / his final-year project. Under his / her supervisor, the student has to submit the final-year proposal, abstract and finally full paper which should be presented in student's seminar. The student has to work in the laboratory to do his / her research during the semester time.

EB4291. Final Project II (Capstone Design) (Credit 4)
In this individual assignment, the student should continue her/his previous work in EB4190 course under the same supervisor. The work resulted in this project could be in the form of any implementation (software/hardware), even in the form of recommendation of solution to the electrical engineering problems. At the end of this project, the student should write the final report, and then defended in front of 3 examiners (lecturers).

EB4292. Industrial Experiences (Credit 2)
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