

Established since 2006,

School of Electrical Engineering and Informatics has since developed. From a merger of two departments - Electrical Engineering department and Informatics/ Computer Science department, SEEI now has six undergraduate programs, two master programs and one doctoral programs, and nine research groups with thriving research projects. This book explains three postgraduate programs of SEEI: curriculum structures, people behind, and details of the programs.

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Electrical Engineering
and Informatics**

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Greetings



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, an has active roles in improvement of national welfare.

Currently, STEI has 3 Postgraduate study programs. They are:

- (i) Master of Electrical Engineering,
- (ii) Master of Informatics,
- (iii) Doctor of Electrical Engineering and Informatics.

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

support the Postgraduate programs.

I do hope that this Postgraduate handbook will be very useful for students and faculty members as well as for the public. I personally express my gratitude toward all STEI community. May Allah bless our efforts.

May Allah bless our efforts!

A large, handwritten signature in black ink, appearing to read "Jaka Sembiring". Below the signature, the text "Dean" is written in a smaller font, followed by "Dr. Ir. Jaka Sembiring, M. Eng".

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:

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.

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.

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.

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*

Our Vision

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



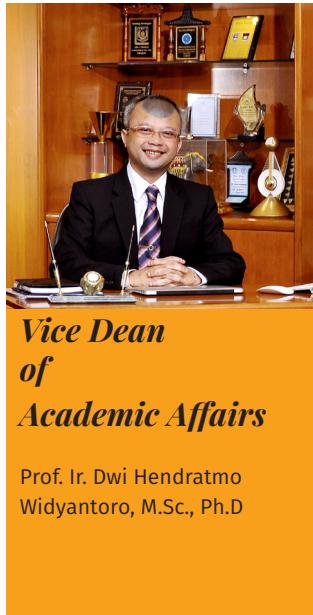
Our Mission

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 toward research:

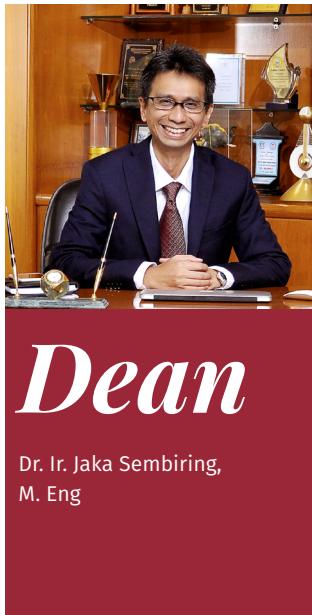
1. To develop and educate graduates who have a high level of integrity, creative, and are able to continuously learn not only to be adaptive in ever changing science and technology but also to apply the knowledge in their profession.
2. To be actively engaged in the development of knowledge in Electrical 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.

SEEI Management Team



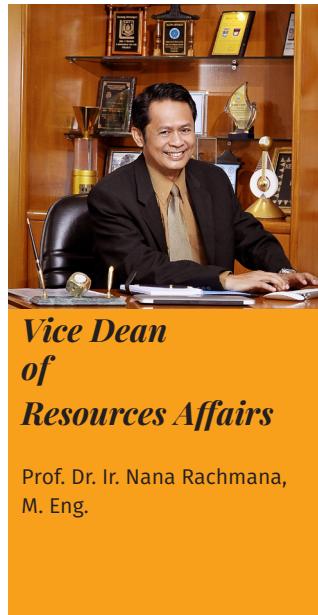
*Vice Dean
of
Academic Affairs*

Prof. Ir. Dwi Hendratmo
Widayantoro, M.Sc., Ph.D



Dean

Dr. Ir. Jaka Sembiring,
M. Eng



*Vice Dean
of
Resources Affairs*

Prof. Dr. Ir. Nana Rachmana,
M. Eng.

Chairman of Postgraduate Programs



**Electrical Engineering
Master Program**
Dr.Ir. Ian Joseph Matheus
Edward, MT.



Informatics Master Program
Dr. Bayu Hendradjaya, ST.,MT.



**Electrical Engineering and
Informatics Doctoral Program**
Dr. Eng. Ayu Purwarianti, ST.,MT.

Postgraduate Program Committee

Chairman

Prof. Dr. Carmadi Machbub

Secretary

Prof. Ir. Dwi Hendratmo W., M.Sc., Ph.D

Prof. Dr. Adang suwandi Ahmad

Prof. Dr. Yanuarsyah Haroen

Prof. Dr. Tati Latifah R. Mengko

Prof. Dr. Gibson Hilman Sianipar

Prof. Dr. Ngapuli Irmea Sinisuka

Prof. Dr. Suhono Harso Supangkat

Prof. Dr. Bambang Riyanto Trilaksono

Prof. Dr. Kuspriyanto

Prof. Dr. Andriyan Bayu Suksmono

Prof. Dr. Iping Supriana Suwardi

Prof. Dr. Benhard Sitohang

Prof. Dr. Ir. Suwarno, MT.

Prof. Dr. Reynaldo Zoro

Prof. Dr. Adit Kurniawan

Prof. Dr. Armein Z.R. Langi

Prof. Dr. Pekik Argo Dahono

Prof. Dr. Ir. Nana Rachmana Syambas, M.Eng.

Dr. Ing.-Ir. Suhardi, MT.

Dr. Iskandar, ST., MT.

Ir. Emir Mauludi Husni, M.Sc., Ph.D

Dr. Eng. Achmad Munir

Trio Adiono, ST., MT., Ph.D.

Ir. Kridanto Surendro, M.Sc., Ph.D

Dr. Ir. Rinaldi, MT.

Dr. Ir. Jaka Sembiring, M.Eng. (Ex Officio Dean)

Ex Officio

Dr. Ir. Ian Josef Matheus Edward, MT

Bayu Hendradjaya, ST, MT, Ph.D

Dr. Eng. Ayu Purwarianti, ST, MT

Informatics Master Program Committee

Curriculum Implementation

Chair

Dr. Bayu Hendradjaya, ST., MT.

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

Yudistira Dwi Wardhana Asnar, ST., Ph.D.

Dr. Masayu Leylia Khodra, ST., MT.

Drs. Judhi Santoso, M.Sc.

I Gusti Bagus Baskara Nugraha, ST., MT., Ph.D.

Dicky Prima Satya, ST., MT.

Doctoral Program Weekly Seminar Team

Coordinator

Dr. Donny Danudirdjo, MT.

Dr. Irma Zakia, ST., M.Sc

Dessi Puji Lestari, ST., M.Eng., Ph.D.

Yudistira Dwi Wardhana Asnar, ST., Ph.D.

IGB Baskara Nugraha, ST., MT., Ph.D.

Dr. Eng. Arwindra Rizqiawan, ST., MT.

Burhanuddin Halimi, ST., MT., Ph.D

Egi Muhammad Idris Hidayat, ST., M.Sc., Ph.D.

Nugraha Proya Utama, ST., MA., Ph.D

Thesis and Seminar

Chair Dr. Ir. Gusti Ayu Putri Saptawati, M. Comm.

Dr. Masayu Leylia Khodra, ST., MT.

I Gusti Bagus Baskara Nugraha, ST., MT., Ph.D.

Administration Office



Head of Office
Fitri Murdiyana, S.Si, MBA



Academic
Titi Ratri Purnomo
Wulan



Finance
Tatin Akadiyah



Human Resources
Neni Nurkumala, SE



Infrastructure
Maman Surahman,
AMd, ST



Information System
Housny M., ST

Academic
<ul style="list-style-type: none">• Ambarwati Retno W.• Dede Bagja S.• Didin Syafruddin Asa• Edi Mulyadi• Lili Sulaiman• Mukhlis• Nurhayati• Sri Rahayu S• Sri Wahyuni• Suranto• Taopik Hidayat• Yati Suyati

Finance
<ul style="list-style-type: none">• Aliza Frida Tsaniyah• Astrid Nurmayangsari• Diana Hermawati• Reni Wijayani• Sofyan Qamaruzzaman• Turisem

Human Resources
<ul style="list-style-type: none">• Lia Juliyanti• Rita Puspawati• Unnike Cawana B.S.
Infrastructure
<ul style="list-style-type: none">• Abdul Hamid• Iman Sukirman• Ridsan Sambadijaya
Information System
<ul style="list-style-type: none">• Idris• M. Rian Noviansyah• Mega Aulia Insani• Mistriana

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



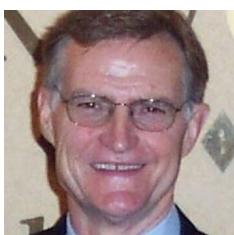
PT PLN (Persero) Tbk
Ir. Nur Pamudji, M.Sc



Bappenas
Dr. Dedi S. Priatna



QIMTronics
Ir. Yana Suryana Rahardja,
MBA



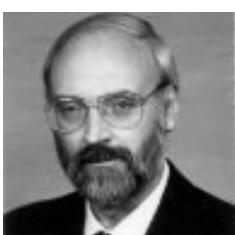
Texas A&M University, USA
Prof. Ronnie Ward



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



SEEI ITB
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 Erawati Rajab

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 telemedicine, 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 diseases.
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.

Enhancement for Dental Equipment, Brain-Computer Interface, Exoskeleton.

4. Kikaku Art Application as a case study for collaboration oriented interactive art & culture 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.

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

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 unmanned vehicle, bipedal robot, humanoid, flying Robot), hybrid and switching control (discrete event control and hybrid systems), control and intelligent systems

(genetic algorithm, artificial intelligence 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. Suworno

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 business, electrical pricing, underseccable 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:

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

Electronics

Chair: Prof. Adang Suwandi Ahmad, Dr. Ing.

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), Algorithm optimization for hardware implementation, 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:

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

Informatics

Chair: Prof. Dr.Ing.Ir. Iping Supriana Suwardi

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.

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.

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

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 agricultural 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. 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 Project:

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.



SEEI

Centers





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.

CSC will host a security master's program and doctoral program. CSC will also coordinate research and development of security technology programs that will ensure the security of information system. Other research activities will focused on information security governance and policy research.

ITB-KOREA Cyber Security Research and Development Center

Micro Electronics Center

Activities

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 etc.

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.

ME also have responsibility to develop electronics techno industrial cluster in Indonesia.

Vision

"Microelectronics (ME) Center – ITB becomes a center of excellence that drives microelectronics technology development for the basis of Indonesia electronics industry development."

Mission

"Through joining industry, research, and university collaboration, ME Center will develop advance microelectronics sciences, technology, systems, and applications to lower local industry entry barrier to develop a high technology based end product."

LanGrid Bandung Operation Center

The idea of LanGrid Bandung Operation Center is to provide free services of natural language processing softwares and conduct researches in and text mining of Indonesian language and regional languages in Indonesia. The main goal is to be a center of NLP in Indonesian and regional languages. LanGrid Bandung Operation Center is also connected to the Language Grid center, located at Kyoto, Japan. (<http://langrid.nict.go.jp/en/index.html>).

This center is now still in preparation phase where the membership is open to anyone who wants to participate in the research of natural language processing and text mining of Indonesian language and regional language of Indonesian. Meanwhile, the members are lecturer staffs of School of Electrical Engineering and Informatics who have research interests in Indonesian language (and regional languages);

and students whose final projects and research thesis are in natural language processing and text mining of Indonesian language.

The research projects include developing basic natural language processing tools for Indonesian and regional language such as morphologically analyzer, POS tagger, parser (rule based parser), semantic dictionary of Indonesian and regional languages; developing corpus of Indonesian and regional languages to support Indonesian text mining such as Indonesian Question Answering, Information Retrieval, Text Summarization, machine translation; and developing text mining application of Indonesian and regional languages such as information extraction application, question answering application, sentiment analysis application, et cetera.

Center for Telematics, Radio Telecommunications & Microwave

This center facilitates the member of the Telecommunication Engineering Scientific and Research Group. It consists of four sub-centers: Telematics, Wireless Communications Technology, Huawei IP Training, and Radar & Microwave Technology.

Telematics

This sub-center undertakes both pure and applied research in the general field of telecommunications networking covering networking technology, services, protocols, security, management, regulatory and policy. Research themes include Communication Protocols, Network Planning, Traffic Modeling and Optimization; Optical Communications, Network Quality of Services; Mobile Networking and Applications; Context and Location Based Information Systems; Network Security and Forensics; Ubiquitous and Ambient Technology; Networked Multimedia Applications, Multimedia Broadcast Multicast Service (MBMS) and Telecommunications Techno-Economic Analysis.

Most of these works is funded through research grants such as ITB grants, RISTEK and supported by industry especially in mobile service development. In addition, members of the group are actively involved in a range of regulatory and public engagement programs which aim to raise awareness of these subjects.

Radar and Microwave Technology

This sub-center focuses its activity on the development of Microwaves Device including antennas, microwave passive and active devices, and radar systems including radar signal processing and radar devices. Supported by the ITB Grants, the ITB-Alumnae Association grant, the Asahi Glass grant and the RISTEK microwave devices such as multiband antennas for wireless communication, waveguide converter, UWB antennas and filter, and some radar prototype such as a compressive-sensing subsurface radar for through-wall and ground-penetrating applications.

The most recent activity is to develop planar reflector using textured surfaces, metamaterial-based dual-band antenna, SOM (Self Oscillating Mixer) for LNB (Low Noise Block), ultra-thin tunable microwave radar absorber based on AMC (Artificial Magnetic Conductor), and frequency-hopping radar based on SDR (Software-Defined Radio).

Some results of the research activities has been published in various national and international journals, including the IEEE transactions and letters.





Media Innovation Center

Objectives and program principles:

1. provide support for ITB to become a centre of excellence for study and industry cooperation in the field of table and cloud computing. Promote innovation and research in the field of Tablet and Tablet based cloud applications in the fields of B2B, B2C, Enterprise mobilization and campus services including but not limited:
2. Near Field Communications, Augmented Reality, Mobile Commerce, E-Books and E-Learning, Workforce Mobility.
3. Support the education and training of aspiring Indonesian students in the field of tablet and cloud computing.
4. Promote the development of wireless campus ecosystem including but not limited to delivery of academic courses, provision of university and student services, and on campus commercial service.

Microsoft Innovation Center

Microsoft Innovation Center ITB (MIC-ITB) is founded as a collaboration between Microsoft & Institute Teknologi Bandung for fostering innovation in Research and Development, Human Resources Development, and Entrepreneurship in the framework of Microsoft Technology.

As an institution located in one of the best engineering higher education institution in Indonesia and in Asia Pacific Region, MIC-ITB technical categorias, i.e.:

1. Research program
2. Product-service system development program
3. Human resources development program
4. Entrepreneurship program

Moreover, MIC-ITB consider Network and

Visibility Program, a program to enhance the reach and extensift the people involved in MIC's activities, as a framework activities.

Naturally, the contribution of support from MIC-ITB's subsidiaries such as academic community of ITB and surrounding campuses, several related institution such as LPIK (Institution of Innovation and Entrepreneurship Development), Microsoft, Microsoft Indonesia, as well as third parties are essential to the success of MIC-ITB's program. At the moment, MIC-ITB has a close collaboration with Master Program in Electrical Engineering ITB, Bachelor Program in Informatics ITB, Bachelor Program in Electrical Engineering ITB, Faculty of Fine Arts and Design, LPIK, Navcore Nextology, etc.

Blackberry Innovation Center

Stimulating long-term, self-fueling growth of the Indonesian economy, by nurturing mobile content and applications from concepts, through development towards commercialization.

Activities

1. Scholarships for undergraduate, master, and doctoral students
2. Research grants for ITB faculty members
3. Competitive grants for innovative projects
4. Short-term internship for students
5. BlackBerry developer training
6. Entrepreneurship training
7. Building start-up companies

Objectives

1. Research and development for mobile computing applications for enterprise and consumer markets
2. To seed new industry and work towards decreasing Indonesia's reliance on imported software
3. Drive-in market exploitation of mobile computing research from concepts through to development and testing
4. Enable rapid knowledge generation and transfer-towards enabling business start-ups
5. Promote business-academic partnership through joint research, education and community engagement
6. Develop and promote entrepreneurial values throughout the national education pipeline and youth developer community via academic institutions and networks, and principally through the BlackBerry Academic Program
7. Develop human capital to support economic development particularly through support for graduate and post graduate research
8. Contributing to discussion and formulation of national ICT strategy, policies and initiatives
9. Stimulating the growth of international research partnerships through the promotion of clustering, collaboration, networking, mentoring, and bilateral people exchange
10. Establish and administer a national scholarship scheme to facilitate wider access to education for both talented and, or underprivileged Indonesian Students, and to promote international student mobility
11. Building on the existing membership of the BlackBerry Academic Program, to establish and coordinate educational programs and curriculum for delivery through an expanded virtual national network





SEEI
Laboratories

Basic of Electrical Engineering Laboratory

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 laboratory 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 Engineering study program and Embedded System laboratory work as well facilitate students in their final projects.

Basic of Informatics / Computer Science Laboratory

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.

Biomedical Engineering Laboratory

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.

Computational Science & Engineering Laboratory

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.

Computer Systems & Control Laboratory

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.

Database Laboratory

The laboratory of Database provides support for educational and research activities related to database computing. Its facility includes several platforms of database server machines connected in a network computer for research in the following topics: data warehouse and business intelligence, data mining, web database, temporal database representation and modeling, metadata application & management, distributed database, database processing, and patterns & pattern language of conceptual data models.

Distributed Systems Laboratory

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.

Electrical Energy Conversion Research Laboratory

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.

Electronics & Component Laboratory

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.

Graphics & Artificial Intelligence Laboratory

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

High Voltage & High Current Laboratory

This lab provides facilities for conducting research on isolation 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.

Information System Laboratory

The laboratory of information systems provides facility for conducting research on Decision Support Systems, Knowledge Management System, Interactivity-based System Design, Virtual Community for Community Development, IS/IT Management, Governance System, IT Service Management, Strategic IS/IT Planning, Enterprise Architecture, IS/IT Risk Management.

Power System & Electrical Distribution Laboratory

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).

Programming Laboratory

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.

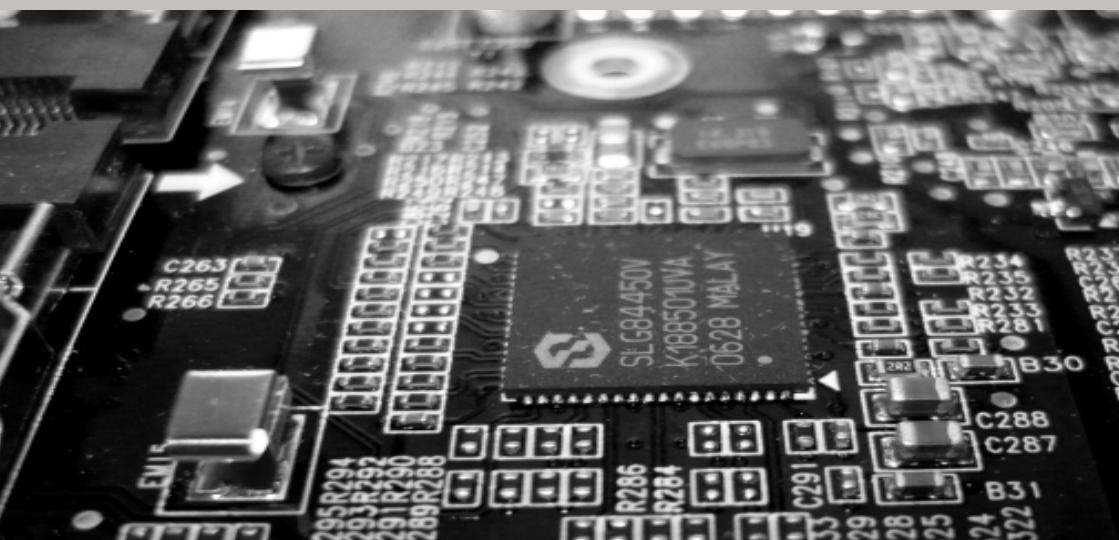
Radio Telecommunications and Microwave Laboratory

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.

Postgraduate Programs



Electrical Engineering Master Program



Introduction

Electrical Engineering Master Program is a Postgraduate on electrical engineering discipline that conducted in the Electrical Engineering Master Study Program of School of Electrical Engineering and Informatics.

The Master applicant have to hold a recognized bachelor degree from (electrical) engineering, physics, mathematics. This Master Program will give the students an opportunity to learn new skill, develop problem solving abilities, considerable contribution of knowledge in electrical power, telecommunication, computer, control, microelectronics, biomedical, information management.

This program has 11 options that as a major course, these options are:

1. Electrical Power Engineering
2. Telecommunication Engineering
3. Telematics and Telecommunication Network
4. Computer Engineering
5. Microelectronics
6. Biomedical Engineering
7. Control and Intelligent Systems
8. Digital Media and Game Technology
9. Chief Information Officer
10. Information Security Engineering and Management
11. Information Technology Services

The program puts a balanced emphasis on theory and industrial application and all the students are encourage to involve in the on going research topics in the laboratory / school

and industry as a part of their Master thesis that the result must be published on International Journal or International Conference.

This Program is mainly supported by the academic 79 staffs that all staffs are doctor /PhD degree and 17 Professors, 9 Research Groups.

Program Educational Objectives

1. Our master graduate have successful careers in electrical engineering in high quality
2. Our master graduate will have strong motivation to be engaged in life-long education such as indicated by their capability to be admitted in and successfully complete master graduate studies.
3. Our master graduate have ability to do research in high quality on electrical and humanity problems
4. Our master graduate will have excellent communication and cooperation skill, supporting to take leadership and an active role in the competitive industry, government or education sectors in Asia Pacific Region especially in Indonesia.

Program Outcomes

The expected program outcomes are:

1. An Ability to apply knowledge of engineering, physics, mathematics and sciences.
2. An ability to design and conduct experimental research, analysis, calculate, interpret data and conclusion.
3. An ability to design a systems, component, synthesis, analysis, and fabrication in industry.
4. An ability to conduct on multi disciplinary team to obtain a good team work in research or fabrication in industry
5. An ability to identify, formulate and engineering problems.
6. An understanding of professional and ethical responsibility

7. An ability to communicate effectively with the other person and team group
8. The broad education necessary to understand the impact of engineering solution in global, economics, environmental and social context.
9. A recognition of need for and an ability to engage in life-long learning.
10. An ability to use the techniques, skill and modern engineering tools necessary for engineering practice.

Career Prospects

Parallel with modernization in industry that use the electrical, electronics, telecommunication, computer, information systems accurately, these job choices are widely available:

1. Research engineer in laboratory, industry, for preparing the new research, make a systems, measurement, compilation, calculation.
2. Practical engineer to implement the skill of electrical, electronic, systems, communication, computers, control, information as a engineer.
3. Electrical technology analysis to make analysis and conclusion of the problems.
4. As a lecturer in university or polytechnics on electrical engineering course
5. To continue study in doctor program

Specializations

Biomedical engineering

Biomedical Engineering is a multidisciplinary field that is the synergy of various engineering concepts in the world of medicine and biology for the improvement of human health.

This field has grown rapidly in developed countries since more than 50 years ago, creating the needs of the labor force with specialized expertise in the field of medical instrumentation and equipment, data processing and medical imagery, to the development of health information systems.

The path of choice follows two areas of interest: path of instrumentation, imaging and telemedicine, and cell lines and biomolecular engineering. The fields of interest in instrumentation, imaging and telemedicine will interact much with electronics such as embedded systems, electronics, electromagnetic fields, biomedical measurements and instrumentation, biomedical signal processing, biomechanics, and biomedical systems design.

Cells and molecular engineering will interact more with biological fields such as quantitative physiology, immunological engineering, biomedical engineering, cell and tissue engineering, bionanotechnology, and cell kinetics and signaling.

Information Security Management

With increasing trend of internet users around the world, various security threats emerging with increasing trend every year. Indonesia itself has a National Cyberspace Resilience Strategy: Ensuring the resilience of information and its support system in order to solve the nation's strategic problems and improve the quality of life of the Indonesian nation. With this specialization, we expect to increase human resources to secure the security of the national information system of the future.

Areas studied in this field include:

1. Engineering
2. Cryptography and its application
3. Secure software & os security
4. Digital forensic and computer crime
5. Management
6. Information Security management
7. Information System Assurance
8. Security Architecture and Design

Telecommunication Engineering

Telecommunication Engineering deals with the generation, processing, distribution and distribution of information signals in a correct and economical way in order to meet the needs of human life. One of the most developed fields in telecommunication engineering is wireless telecommunications.

Indonesia as a large archipelago country clearly needs independence in wireless telecommunication technology and also in radar technology. In such situations, national independence and competitiveness will depend largely on capabilities in the management and utilization of information supported by technology and human resources.

The need for skilled human resources in this field fosters Telecommunication Engineering specialization, with two focal areas, namely wireless telecommunications and radar.

Electrical Power Engineering

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 business, 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).

Telematics Engineering and Telecommunication Network

The Master of Electrical Engineering (MTE) program with specialization in Telematics and Telecommunication Network is a regular master program offered by SEI ITB, especially for undergraduate graduates who are interested to explore Telematics and Network.

The MTE Telematics curriculum is designed to provide an integrated and actual insight in the field of telematics, particularly on network technology and telematics services, including its development in the industrial world, domestic and overseas.

MTE Telematics students are also stimulated to master basic skills relevant to the development of Telematics and Network technology, for example by holding relevant activities such as workshops and / or seminars involving students actively.

In line with the roadmap of STEI ITB, particularly related to the field of Telematics, the focus point of MTE Telematics curriculum is on modern network services and infrastructure to support 5G systems, including Software Defined Networking (SDN) and NFV (Network Function Virtualization) technology.

Information Technology Services

Available through the KEMKOMINFO scholarship program, the program is motivated by tutntutan in the provision of electronic-based government services that are more effective, efficient and targeted. We need to provide solutions for various problems faced by the community.

This program aims to produce qualified and professional human resources in Information and Communication Technology (ICT), to utilize ICT in realizing clean and good governance in central and regional government institutions.

The program focuses on:

1. IT Service
2. Service Computing & Engineering
3. e-Government
4. Smart City
5. Chief Information Officer (CIO)

Control and Intelligent Systems

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 unmanned vehicle, bipedal robot, humanoid, flying Robot), hybrid and switching control (discrete event control and hybrid systems), control and intelligent systems (genetic algorithm, artificial intelligence and expert systems, fuzzy logic, and neural network)

Computer Engineering

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.

Digital Media and Game Technology

Modeling and simulation, Human-content Interaction, Virtual Reality/Mixed Reality, Internet of Things and Robotics, Big DataAnalysis, Artificial Intelligence and Machine Learning, Deep Learning, Computer Graphics and GPU.

Microelectronics

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), Algorithm optimization for hardware implementation, 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.

Electrical Engineering Master Program Structures

Electrical Power Engineering Specialization

No	Code	Subject	Credit
1	EL5000	Advanced Mathematics	3
2	EL5090	Research Methods	3
3	EL5171	Advanced Electrical Power	2
4	EL5172	Operation and Control Power System	2
5	EL5173	Electromagnetic Computing in Power Electrical Engineering	2
6	EL6099	Thesis	6
Elective Courses			Credit
1	Major Electives		18
2	Minor Electives		0
3	Elective Subjects		0
Total Credit = 36			

Information Security Engineering and Management Specialization

No	Code	Subject	Credit
1	EL5000	Advanced Mathematics	3
2	EL5090	Information Security Management	3
3	EL5171	Research Methods	3
4	EL5172	Cryptography and Application	3
5	EL5173	Thesis	6
6	EL6099	Thesis	6
Elective Courses			Credit
1	Major Electives		6
2	Minor Electives		0
3	Elective Subjects		0

Technology Leadership Specialization

No	Code	Subject	Credit
1	EL5000	Advanced Mathematics	3
2	EL6122	Information Technology Investment Management	2
3	EL6099	Thesis	6
4	EL5223	Change Management	2
5	EL5222	Information Technology Project Management & Acquisition Systems	2
6	EL5127	Information Technology Governance and Performance Measurement	2
7	EL5126	Information Technology Strategic Planning	2
8	EL5123	Business Process Engineering	2
9	EL5118	Management of Information Systems and Technology	3
10	EL5090	Research Methods	3
11	MM6015	Business Leadership	3
Elective Courses			Credit
1	Major Electives		6
2	Minor Electives		0
3	Elective Subjects		0

Information Technology Services Specialization

No	Code	Subject	Credit
1	EL5000	Advanced Mathematics	3
2	EL6122	Thesis	2
3	EL6099	Design of Information Technology Services	6
4	EL5223	Information Technology Services Management and Operations	2
5	EL5222	Business Process Engineering	2
6	EL5127	Object-Oriented Application Development	2
7	EL5126	Information Systems and Technology Management	2
8	EL5123	Service Oriented Architecture	2
9	EL5118	Research Methods	3
10	EL5090	Information Technology Risk Management	3
Elective Courses			Credit
1	Major Electives		6
2	Minor Electives		0
3	Elective Subjects		0

Telecommunication Engineering Specialization

No	Code	Subject	Credit
1	EL5000	Advanced Mathematics	3
2	EL5051	Information Sources Encoding and Theory	2
3	EL5052	Advanced Digital Communications	2
4	EL5053	Statistics and Adaptive Signal Processing	2
5	EL5090	Research Methods	3
6	EL6099	Thesis	6
Elective Courses			Credit
1	Major Electives		6
2	Minor Electives		0
3	Elective Subjects		0
Total Credit = 33			

Telematics and Telecommunication Networks Specialization

No	Code	Subject	Credit
1	EL5000	Advanced Mathematics	3
2	EL6140	Network Planning	2
3	EL6099	Thesis	6
4	EL5243	Network Queue	2
5	EL5242	Advanced IP Technology	2
6	EL5241	Information and Network Security	2
7	EL5240	Network Performance and Quality of Service	2
8	EL5143	Modeling and Simulation Network	2
9	EL5142	Broadband Networks	2
10	EL5141	Enterprise Resource Planning	2
11	EL5140	Jaringan Telekomunikasi	2
12	EL5090	Research Methods	3
13	EL62	Mobile Computing and Web Technologies	2
Elective Courses			Credit
1	Major Electives		6
2	Minor Electives		0
3	Elective Subjects		0
Total Credit = 38			

Computer Engineering Specialization

No	Code	Subject	Credit
1	EL5000	Advanced Mathematics	3
2	EL5090	Research Methods	3
3	EL5101	Information Theory and Encoding	3
4	EL5102	Advanced Computer Architecture	3
5	EL5103	Advanced Computer Networks	3
6	EL5201	Digital System Testing and Evaluation	3
7	EL5202	Sequential Machine	3
8	EL6099	Thesis	6
Elective Courses			Credit
1	Major Electives		0
2	Minor Electives		9
3	Elective Subjects		0
Total Credit = 36			

Mechanical Microelectronics Specialization

No	Code	Subject	Credit
1	EL5000	Advanced Mathematics	3
2	EL5090	Research Methods	3
3	EL5104	Nanoelectronics	3
4	EL5105	VLSI for Digital Signal Processing	3
5	EL5208	Advanced IC technology	2
6	EL5209	Radio Frequency Integrated circuit	3
7	EL5210	Design of Analog IC and Mixed Signal	3
8	EL6099	Thesis	6
9	EL6106	Embedded System Design Method	4
Elective Courses			Credit
1	Major Electives		0
2	Minor Electives		6
3	Elective Subjects		0
Total Credit = 36			

Biomedical Engineering Specialization

No	Code	Subject	Credit
1	EL5000	Advanced Mathematics	3
2	EL5090	Research Methods	3
3	EL5114	Biomedical Engineering and Lab Work	3
4	EL5115	Anatomy Physiology and Lab Work	3
5	EL5116	Physics of Living Systems	2
6	EL5219	Biomedical Advanced Design System	2
7	EL5220	Introduction to Transport Phenomena in Biomedical Engineering	2
8	EL6099	Thesis	6
Elective Courses			Credit
1	Major Electives		0
2	Minor Electives		12
3	Elective Subjects		0
Total Credit = 36			

Control Engineering and Intelligent Systems Specialization

No	Code	Subject	Credit
1	EL5000	Advanced Mathematics	3
2	EL5090	Research Methods	3
3	EL5107	Linear Control System	3
4	EL5108	System and Control Engineering	3
5	EL5109	Modeling and Identification System	3
6	EL5212	Advanced Robotics	3
7	EL6099	Thesis	6
Elective Courses			Credit
1	Major Electives		0
2	Minor Electives		12
3	Elective Subjects		0
Total Credit = 36			

Digital Media and Games Technology Specialization

No	Code	Subject	Credit
1	EL5000	Advanced Mathematics	3
2	EL5003	Computer graphics and GPU Programming	3
3	EL5004	Intelligence System	3
4	EL5005	Interaction Design	3
5	EL5006	Interactive Applications Design	3
6	EL5090	Research Methods	3
7	EL6099	Thesis	6
Elective Courses			Credit
1	Major Electives		0
2	Minor Electives		12
3	Elective Subjects		0
Total Credit = 36			

Elective Courses

No	Code	Subject	Credit
1	EL5001	Optimal Control	2
2	EL5002	Mechatronics	3
3	EL5040	Telecommunications Business, Economy, Regulation, and Policy	2
4	EL5041	Multimedia Communication Systems	2
5	EL5042	Non-Linear Optical Communications Systems	2
6	EL5054	Channel Encoding	2
7	EL5055	Electromagnetics	2
8	EL5056	Advanced Radio Frequency Electronics	2
9	EL5057	Sensory Systems	2
10	EL5058	Radar and Navigation Systems	2
11	EL5059	Radar and Navigation Systems	2
12	EL5060	Radar Signal Processing	2
13	EL5061	Wireless Access Network	2
14	EL5062	Wireless Core Network	2
15	EL5063	Wireless Sensor System	2
16	EL5064	Terrestrial Satellite Communication Systems	2
17	EL5065	Broadcasting Systems	2
18	EL5066	Telemetry Systems	2
19	EL5067	VLSI Systems for Digital Communication	2
20	EL5068	System Radar Device	2
21	EL5070	Maintenance and Operation of Electrical Equipment	2
22	EL5074	Advanced Power System Protection	2
23	EL5076	Electric Transportation Systems	2
24	EL5078	Non-Conventional and Renewable Power Generator	2
25	EL5079	Energy Economy	2
26	EL5081	High Voltage Equipment Diagnostic Engineering	2
27	EL5082	High Voltage Equipment Technology	2
28	EL5099	Pre-thesis	2

No	Code	Subject	Credit
29	EL5106	Intelligent Instrumentation/Advanced	2
30	EL5110	Actuators and Sensor Technology	3
31	EL5112	Computer and Network Security	3
32	EL5113	Legal and Ethical Practices in Information Security	3
33	EL5119	Engineering Database	2
34	EL5122	Management Services	2
35	EL5124	Computer Systems Organization	2
36	EL5128	Information Technology System Design	2
37	EL5144	Telecommunications Network Management	2
38	EL5145	IP-Based Infrastructure and Optical Networks	2
39	EL5146	Mobile and Wireless Communication Networks	2
40	EL5150	Electromagnetic Fields II	2
41	EL5151	Analog and Digital Communication Systems	2
42	EL5152	Digital Communications	2
43	EL5155	Processing of Signals in Discrete Time	2
44	EL5156	Radio Frequency Electronics	2
45	EL5157	Antennas and Wave Propagation	2
46	EL5160	Telecommunications Project Management	2
47	EL5174	Direct Current Power Transmission and FACTS	2
48	EL5203	Advanced programming	3
49	EL5204	Fault Tolerant System	3
50	EL5205	Mobile and Pervasive Computing	3
51	EL5206	Multimedia and Multiservices Network	3
52	EL5211	Non-Linear Control System	3
53	EL5213	Mechatronics System Design	3
54	EL5214	Embedded Control Systems	3
55	EL5215	Security Software	3
56	EL5216	Information Security Risk Management	3
57	EL5217	Information Security Audit	3
58	EL5218	Information Security Assurance and Governance	3
59	EL5221	System Design Software	2

No	Code	Subject	Credit
60	EL5226	Information and Social Networking	3
61	EL5227	Enterprise Architecture Design	2
62	EL5228	Operation System Security	3
63	EL5244	Networking Device Programming	2
64	EL5250	VLSI Design for Digital Communications	2
65	EL5251	Microelectronic Radio	2
66	EL5252	Radio Device Programming	2
67	EL5253	Antenna System	2
68	EL5254	Microwave Computation Method	2
69	EL5255	Image and Video Signal Processing	2
70	EL5256	Security Radar Signal Processing	2
71	EL5260	Evolution of Telecommunications Technology	2
72	EL5275	Electromagnetic compatibility	2
73	EL6001	Robust control	2
74	EL6002	Hybrid Control System	2
75	EL6003	Intelligent Game Theory	3
76	EL6004	Mixed Reality	3
77	EL6005	Biomechanics	2
78	EL6006	Electromagnetic and Ultrasonic waves in Advanced Biomedics	2
79	EL6007	Health Information Systems	2
80	EL6008	Biomedical imaging	2
81	EL6009	Biomaterials	2
82	EL6010	Biomedical instrumentation	2
83	EL6011	Information Technology Law and Ethics	2
84	EL6012	Business intelligence and Data Warehouse	2
85	EL6013	Electronic Business	2
86	EL6050	Detection and Estimation	2
87	EL6051	Array Signal Processing	2
88	EL6052	Random Fading Channels	2
89	EL6060	Radar Signal Processing Advanced Topics	2
90	EL6061	Radio Communication System Advanced Topics	2

No	Code	Subject	Credit
91	EL6062	MIMO Systems	2
92	EL6070	Electrical Machine Control	2
93	EL6071	Measurement Instrumentation in Power System	2
94	EL6072	Transient Overvoltage Protection System	2
95	EL6073	Electrical Atmosphere Phenomena	2
96	EL6074	Power Systems Computation	2
97	EL6076	Advanced Power System Planning	2
98	EL6077	Control and Power System Stability	2
99	EL6078	Transformer technology and High Voltage Cables	2
100	EL6079	Dynamic Behavior of Electrical Engineering	2
101	EL6081	High Voltage Diagnostic Lab	2
102	EL6082	Electric Grounding System and Safety	2
103	EL6097	Industry Internship	3
104	EL6098	Final Project	6
105	EL6100	Capita Selecta I	3
106	EL6101	Distributed computer	3
107	EL6102	Advanced Network Programming	3
108	EL6103	Advanced Operating Systems	3
109	EL6104	Network Performance Analysis	3
110	EL6105	Embedded Systems and Real-Time	3
111	EL6107	Cryptography Implementation	3
112	EL6108	Embedded System Design Project	2
113	EL6109	System-on-Chip	3
114	EL6110	Electronic Industry and Manufacture	3
115	EL6112	Digital Forensic dan Computer Crime	3
116	EL6113	Business Continuity Design	3
117	EL6114	Security Design and Architecture	3
118	EL6115	Security Operations and Incident Response	3
119	EL6116	Database security	3
120	EL6117	Security Mobile / Wireless	3
121	EL6118	Information Warfare	3

No	Code	Subject	Credit
122	EL6119	Security Device	3
123	EL6120	Algebra Cryptology	3
124	EL6121	Decision Support System	3
125	EL6124	Application Development Management	2
126	EL6125	Numerical analysis	3
127	EL6141	Engineering Protocols	2
128	EL6142	Multimedia Networking	2
129	EL6170	Advanced Technology for Power System Automation	2
130	EL6171	Electrical Distribution System Planning	2
131	EL6172	Optimization Application in Power System	2
132	EL6173	Distribution and Automation Systems	2
133	EL6174	Power Systems and Reliability of Components	2
134	EL6175	Electromagnetic Influence Towards Life Environment	2
135	EL6200	Capita Selecta II	3
136	EL6201	Parallel systems	3
137	EL6202	Sensor System and Technology	3
138	EL6203	MEMS/Advanced Devices	2
139	EL6204	Web Security and E- Business	3
140	EL6205	Malware	3
141	EL6206	Number theory	3
142	EL6207	Kriptanalisis	3
143	EL6208	Embedded Security	3
144	EL6209	Sensor System and Technology for C4ISR	3
145	EL6210	Integrated Information Systems and C4ISR	3

Course Descriptions

EL5000. Advanced Mathematics (credit 3)

Material reviews which are necessary for Electrical Master Degree Study Program. This course will cover following topics: Linear Algebra, Probabilistic and Statistic, Differential Equation, Fourier Transform, Graph Theory.

EL5001. Optimal Control (credit 2)

Presents the theory and application of optimization, probabilistic modelling, and stochastic control to dynamic systems. Particular attention is given to modelling dynamic systems, measuring and controlling their behaviour, and developing strategies for future courses of action.

EL5002. Mechatronics (credit 3)

Introduction: general framework of mechatronics and control systems; sensor concepts, transducers, measurements; performance characteristics of mechatronics; digital sensors; data acquisition; actuators and power amplifiers; actuator components: mechanical, hydraulic, pneumatic and electric actuators; mechatronics system modelling: block diagram & mathematical modeling; translational and rotational mechanics; fluid and thermal systems. Microcontroller, PLC. Design and mechatronics.

Related: Instrumentation

EL5003. Computer Graphics and GPU Programming (credit 3)

(1) hardware and software components of graphics systems; (2) Output, Data primitives and rasterization; (3) 2D and 3D geometric transformations; (4) Two dimensional viewing: viewing pipeline, clipping, and windowing; (5) Three dimensional viewing: viewing pipeline, viewing parameters, projections, viewing transformations, clipping, visible surface

Prerequisites: Programming, Engineering Math

EL5004. Intelligent System (credit 3)

Bio-inspired computing, evolutionary algorithms, genetic algorithms, genetic programming,

artificial life, cellular automata, cellular computing, self-replication, artificial neural networks.

EL5005. Interaction Design (credit 3)

This course presents theory and application of Interaction design; exploration and manipulation, interaction paradigm, basic cognitive aspects, social mechanism in collaboration and communication, ethnography study, conceptual model, user interactivity, real-life problem design.

EL 5006. Design Interactive Application (credit 3)

Modern digital media interactive application and characteristics: Interactivity, visualization, modeling and simulation, massive data, intelligent system, social media and collaboration, gamification. Digital media interactive application basic aspects, character development, challenges, flow, balance, scripting, reactive behavior, finite state machines, rule-based approaches, motion control aspects.

EL5007. Information Security management (credit 3)

To introduce the student to fundamental principles and practices used in the management of Information Security. The course will provide the student with an understanding of the principles of information security management. It will introduce the student to commonly used frameworks and methods and explore critically the suitability and appropriateness of these for addressing today's organisational security needs. The course comprises the following topics: governance and security policy, threat and vulnerability management, incident management, risk management, information leakage, crisis management and business continuity, legal and compliance, security awareness and security implementation considerations.

EL5070. Maintenance and Operation of Electrical Equipment credit 2	Huffman codes and universal data compression (Lempel-Ziv) codes. Analysis and design of error-control channel codes: Hamming codes, cyclic codes (CRC and BCH codes). A brief introduction to Reed-Solomon codes. Turbo codes.
EL5078. Non-Conventional and Renewable Power Generator credit 2	The course includes material on energy generation unconventional energy such as solar energy, biofuels, hydroelectric, tidal and wave power and other alternative energies.
EL5090. Research Method (credit 3)	EL5102. Advanced Computer Architecture (credit 3) Advances in computer architecture concepts and techniques to improve processor performance. Analyze the architectural design of real processors to find out how architectural concepts can be applied. Apply processor architecture concepts to networked based system design. Advances in low power architecture and embedded processor design.
EL5099. Pre-thesis credit 3	EL5103. Advanced Computer Network (credit 3) This is a graduate level course on computer networking focusing on advanced topics. We will read research papers on most recent topics of computer networking: This class examines the current and emerging research topics in computer networking. Topics covered include network protocols, network measurement, Internet routing, peer to peer networks, network security, wireless and sensor networks. We focus both on the existing technologies also on why some of them are not sufficient because of technology trends or changes in fundamental assumptions. Emphasis of the course is on topics in wide-area networks and measurement methodologies for Internet experiments. Students are expected to carry out a research project including analysis, design, and implementation components when appropriate on a novel subject. Prerequisites: computer network
EL5101. Information Theory and Coding (credit 3)	EL5104. Nanoelectronics (credit 3) History and overview, Concept of MOSFET Scaling approach, Concept of MOSFET Scaling limiting parameter, Quantum phenomenon, Introduction to other nano applications, Extending MOSFET scaling, Nanofabrication and characterization, Electron Tunneling, Quantum confinement, Ballistic transport, Coulomb blockade and Coulomb oscillation, Carbon Nanotubes, Quantum photonics, Spintronics, Quantum

Computing, Quantum Memory, Nano electro mechanical system (NEMS) **Prerequisites:** EL3042 - Semiconductor Devices, EL4041- IC Technology

EL5105. VLSI for Digital Signal Processing (credit 3)

This course has an objective to provide student with the capability 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. The design process includes Architecture Design, Logic Synthesis, Placement and Routing, Design Testing and Verification. The design also involves back annotation and static timing analysis. In order to have complete understanding of design flow, the student will design medium size ASICs as a project.

Prerequisites: EL2095 - Sistem Digital, EL4045 - Analisis dan Perancangan IC Digital

EL5106. Advanced Instrumentation

Introduction: Intelligence, features characterizing intelligence, intelligent instrumentation system; features of intelligent instrumentation; components of intelligent instrumentation system. Block diagram of an intelligent instrumentation system.

EL5107. Linear Control Systems

Introduction to Linear Control Systems ; introduction to optimal control ; dynamic programming; linear quadratic control.

Prerequisites: Multivariable Control System

EL5108. Intelligent Systems and Control

The objective of this course is to learn variety of fuzzy control, and to understand how they employ diversity of heuristic knowledge to achieve control design specifications. Basic concepts and components and their roles in general fuzzy systems are explained to understand how fuzzy controllers work.

Nonlinear analysis is used to analyze stability of fuzzy control systems. Based on the idea of fuzzy control, advanced topics in fuzzy control, including fuzzy identification, supervisory fuzzy

control, neural networks, genetic algorithm are covered. Matlab is used to illustrate how to program fuzzy control and neural networks in software. **Prerequisites:** Control System, Microprocessor system

EL5109. System Modelling and Identification

1) Introduction, 2) Mechanical Systems; 3) Electrical Systems; 4) Fluid Systems; 5) Thermal Systems; 6) Mixed System; 7) Model Representation using BondGraph; 8) Application Software for simulation; 9) Introduction to Stochastic systems; 10) Linear Regression; 11) Identification of time-series models; 12) real-time identification 13) Model Validation 14) Adaptive Control System

EL5110. Sensor and Actuator Technology credit 3

1) Measurement Characteristics.; 2) Sensors and Signal Conditioning for Spatial Variables Measurement; 3) Sensor and Signal Conditioning for time and frequency variable measurement.; 4) Sensor and signal Conditioning for mechanic-solid variable measurement.; 5) Sensor and Signal Conditioning for mechanic-fluid variable measurement.; 6) Sensor and signal Conditioning for thermal variable measurement.; 7) sensor and signal conditioning for chemical variable measurement.; 8) Sensor system calibration.; 9) Sensor Networks 10) Pneumatic Actuators.; 11) Hydraulic actuators.; 12) Electric Actuator and drive

EL5111 Cryptography and its Application credit 3

The aim of this course is to introduce students to concepts of cryptography and its applications. Cryptography is the fundamental building block of any computer security solution. The knowledge gained from this course will enable students to apply these cryptographic algorithms in a better way to design security solutions

EL5112 Computer and Network Security credit 3

This course provides a principled introduction to techniques for defending against hostile adversaries in modern computer systems and computer networks. Topics covered include operating system security; network security, including cryptography and cryptographic

protocols, firewalls and network denial-of-service attacks and defenses; user authentication technologies; security for network servers; web security; and security for mobile code technologies. More advanced topics will additionally be covered as time permits, such as: intrusion detection; techniques to provide privacy in Internet applications; and protecting digital content (music, video, software) from unintended use.

EL5113. Legal and Ethical Practices in Information Security credit 3

This course is intended for managers and practitioners of computer science, and is designed to create awareness of the ethical issues, legal resources and recourses, and policy implications inherent in our evolving on-line society. The course provides an overview of the ethical challenges faced by individuals and organizations in the information age and introduces the complex and dynamic state of law as it applies to behavior in cyberspace. It is intended to sensitize managers and computer professionals to the pitfalls and dangers of doing business in an interconnected world, and to familiarize the student with various organizations and materials that can be turned to for assistance in understanding how to ethically and legally operate and use modern computer systems and networks.

EL5114. Biomedical Engineering and Lab Works 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. **Prerequisites:** Instrumentation, **together:** Anatomy and Physiology

EL5115. Anatomy Physiology and Lab Works 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

EL5116. Physics of Living System credit 2

Introduction. Mechanics and its application: forces in the skeletal system; fluid flow, with examples from the circulatory system. Exponential Growth and Decay. Systems of Many Particles. Transport in an Infinite Medium. Transport Through Neutral Membranes. Impulses in Nerve and Muscle Cells. The Exterior Potential and the Electrocardiogram. Leads to the current dipole model for the electrocardiogram. Biomagnetism. Electricity and Magnetism at the Cellular Level. Feedback and Control: Examples of feedback systems include Cheyne-Stokes respiration, heat stroke, pupil size. **Prerequisites:** anatomy physiology and lab works

EL5117. Service-Oriented Architecture credit 2

Give students knowledge about : SOA Concept, SOA Case Study, SOA and Web Services Fundamentals, SOA and WS-* Extension, SOA and Service Orientation, Building SOA (Planning and Analysis), Building SOA (Technology and Design)

EL5119. Engineering Database credit 2

Give students knowledge about : Database Concept; Evolution of Database Design Methodology; Database Technology: DBMS, Data Modelling, Relational Database; Object Oriented Database; Distributed Database; Multimedia Database Management System; Data Mining, Meta Data, Data Warehouse, Information Quality, Prerequisites: information security

EL5121. Object Oriented Application Development credit 2

Intro to Application Development. App Development Life Cycle and Detail Processes. Object Oriented Concept. Object Oriented Modeling (UML). UML and Detail Description.

EL5124. Computer Systems Organization credit 2

This course will give you an in-depth understanding of the inner-workings of modern digital computer systems and tradeoffs present at the hardware-software interface. You will get an understanding of the design process in the context of a complex hardware system and practical experience with computer-aided design tools. Topics include: Instruction set design, computer arithmetic, controller and datapath design, memory systems, input-output systems, networks interrupts and exceptions, pipelining, performance and cost

analysis, computer architecture history, and a survey of advanced architectures. **Prerequisites:** Digital System

EL5126. Information Technology Strategic Plan credit 2

Introduction of Information Technology Strategy, Information Technology and Competitive Advantage, Assessment, Strategy, Execution, Quality Control, Administration and Organization

EL5172. Operation and Control Power System credit 2

This course presents an introduction to power system operation and control. This course also deals with day to day operation of the power system and the control actions to be implemented on the system in order to meet the minute-to-minute variation of system load demand. Topics include: Energy resources and electric power generation; load frequency control, reactive power and voltage control, unit commitment and economic load dispatch, introduction to power system stability, operating strategies and control; modern power systems and power converters; DC/AC and AC/DC conversion; and introduction to DC transmission.

EL5173. Electromagnetic Computing in Power Electrical Engineering credit 2

This course analyzed the basic techniques for the efficient numerical solution of problems in power system. Topics spanned root finding, interpolation, approximation of functions, integration, differential equations and direct and iterative methods in linear algebra.

EL5201. Digital System Testing and Testable Design credit 3

Part 1: Introduction to testing covers the important of testing, type of testing, economics aspect and fault modeling. Part 2: Test methods cover modeling circuits, algorithms for fault simulation and test generation for combinational circuits. Part 3 Design for testability covers digital DFT and scan design, and built-in self-test.

EL5202. Sequential Machine credit 3

Fault detection of combinational circuits. Representation, equivalents, reduction, decomposition and fault detection of sequential

machines. **Prerequisites:** Sequential Circuit Design

EL5203. Advanced Programming credit 3

Memberikan pengetahuan yang lebih dalam tentang pengertian struktur data dan algoritma, yang mencakup pengertian linked lists, hashing, sorting, searching, stacks, queues, trees, and graphs. Penerapannya dalam pemecahan masalah dan perancangan berorientasi obyek. Mencakup juga definisi rekursif dan algoritmanya.

Prerequisites: IF2030 Algorithm and Data structure

EL5204. Fault Tolerant System credit 3

Computers and networks are increasingly used in critical applications, where system failures can be expensive or even catastrophic. Example applications include aircraft fly-by-wire control, automobile control, computers used in medical systems, spacecraft, and databases in large variety of financial and enterprise applications. The overall reliability expected of a computer system in these applications far exceeds that of any individual computer. This course is about how to build a highly reliable system that continue to function acceptably even after a number of its components (hardware or software) have failed.

EL5205. Mobile and Pervasive Computing credit 3

Design issues for ubiquitous computing; integration and processing of sensor-based input; wireless infrastructures; security and user-interfaces; integrated, multimodal input and output and application areas. Students will read a number of papers on these and related areas, and a required term project will allow students to apply these concepts in a real-world application. Other mobile topics includes: Cellular Networks: Channel allocation, Location management, Handoffs. Wireless Networking: MAC protocols, Routing, Transport, Ad-hoc networking. Applications: Mobility adaptations, Disconnected operations, Data broadcasting, Mobile agents. Others: Security, Energy efficient computing, Impact of mobility on algorithms.

Prerequisites: Advanced Computer Network

EL5206. Multi-Service and Multimedia Network credit 3

Introduction to multimedia networks. Quality of service and traffic characteristics. Traffic scheduling. Multicasting mechanisms. Resource reservation. Multimedia communication protocols. Networked multimedia applications issues. The second part of the course will deal with Introduction to multi-service ; service development, development of multi-service network technology, review of stochastic processes, multi-service traffic model, queue network model, QoS multi-service network, network planning method, multi-service network technology election. **Prerequisites:** Advanced Computer Network

EL5208. Advanced IC Technology Credit 2

Microelectronic processing of solid-state devices and integrated circuits. Process techniques such as lithography, oxidation, diffusion, film deposition, etch, ion implantation, and back-end processing will be discussed. Integration of processes for bipolar, CMOS, BiCMOS, and MEMS fabrication processes. Defining system rules for IC layout. Packaging and yield.

EL5209. Radio Frequency Integrated Circuit Credit 3

This course discuss the design of radio transceiver. The topics include transceiver architecture and its building circuits. These circuits are mixer, low noise amplifier (LNA), and other part of the analog front end transceiver

EL5210. Analog and Mixed Signal IC design Credit 3

This course discusses the basics of analog IC design, A/D-D/A converter, various technique in analog IC design. Basics of radio transceiver design: Transmitter architecture, Receiver architecture, mixer, low noise amplifier, RF power amplifier, distortion and noise, modulation (analog and digital), RF Transceivers Case Studies **Prerequisites:** Electronics 2

EL5211. Nonlinear Control System credit 2

Introduction, describing function analysis, phase plane analysis, sliding mode control,

Lure's problem: anti-windup and constrained model predictive control examples, Kalman-Yakubovich-Popov Lemma and linear matrix inequalities, Lypunov stability theory and applications, feedback linearization

EL5212. Advance Robotics credit 3

1)Introduction.; 2)Robot Manipulator : Independent/Single Joint Control 3) Robot Manipulator : Multivariable Control 4)Force control 5)Vision-based Robot Control/Visual Servo 6) Autonomous Mobile Robot 7) Bipedal Robot 8) Multi-robot System

EL5213. Design of Mechatronics System Credit 3

1) Introduction to System Engineering, 2) Mechatronics design approach 3)System interfacing, Instrumentation and Control system 4) computer/microprocessor based controller 5) fault analysis of mechatronics system, 6) introduction to micro/nanotechnology

EL5214. Embedded Control Systems credit 3

Part I: Embedded systems overview; design challenges: optimization design metrics; processor, IC, and design technologies; Custom single purpose processors: hardware; combinational & sequential logic; custom single-purpose processor design; RT-level processor design; optimizing single-purpose processor design; General purpose processors; application-specific instruction-set processors (ASIPs); general purpose processor design; standard single-purpose processors; memory; interfacing; digital camera example; state machine & concurrent processes; real-time systems; control systems application. Part II: Introduction, digital control system concept; sampling process, signal measurement process; discrete time control analysis using conventional method (Z-transform); discrete-time control analysis using state space model; controller designs: classical and modern approaches; controllability, observability, stability; control implementation: hardware & software; digital controller designs: discrete & continuous time methods

EL5215. Secure Software credit 3

This course will discuss the practice of software security, focusing in particular on some common software security risks, including buffer overflows, race conditions and random number generation, and on the identification of potential threats and vulnerabilities early in the design cycle. The emphasis is on methodologies and tools for identifying and eliminating security vulnerabilities, techniques to prove the absence of vulnerabilities, and ways to avoid security holes in new software and on essential guidelines for building secure software and to integrate analysis and risk management throughout the software life cycle. **Prerequisites:** Information Security Management, Introduction to Cryptography

EL5216. Information Security Risk Management credit 3

This course is designed so that the student can learn to identify and manage risks through the development, implementation and maintenance of appropriate information systems (IS) controls. This course approaches information security as a management problem, where the organization has to decide on how much to spend on information security and how, and trade off information security risks against other risks. Students will learn analytical tools for calculating the costs and benefits of investment security decisions, and how to implement IS control.

EL5217. Information Security Audit credit 3

In this course, you will perform evaluations of organizational policies, procedures, and processes to ensure that an organization's information systems align with overall business goals and objectives. This course presents the fundamental concepts of the IT-security audit and control process that is being conducted in a plethora of environments, including government, the financial industry, and the healthcare industry. The goal of this course is to enable the students to structure and perform audits based on the specifications of Sarbanes-Oxley, HIPAA, and FISMA audit programs. Covers all the CISA certification requirements in depth.

EL5218. Information Security Assurance and Governance credit 3

This course is designed to enable candidates to understand the roles, responsibilities and various focus areas of IT governance. The course is aimed at IT and business professionals who hold substantial positions in management, advisory or assurance related to the governance of enterprise IT.

EL5219. Advanced Biomedical System Design credit 2

Preliminary. Stages of biomedical system design, the use of assistive software design, hardware development and fabrication processes. Criteria for design, biomedical system design process, licensing regulations. biomedical system design case studies. **Prerequisites:** EL5100

EL5220. Transport Phenomena in Biomedical Engineering credit 2

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: Advanced Mathematics: Differential Equations, Linear Algebra

EL5221. System Design Software credit 2

An introduction to the practical problems of specifying, designing, and building large, reliable software systems. Students work in teams on projects for real clients. This work includes a feasibility study, requirements analysis, object-oriented design, implementation, testing, and delivery to the client. Additional topics covered in lectures include professionalism, project management, and the legal framework for software development.

EL5223. Change Management credit 2

A pervasive challenge for all organizations and their leaders/managers is how to initiate, lead, manage, implement, and sustain major change. If anything, contemporary business environments make the ongoing need for organizational change even more critical than earlier. Organizational Change efforts are the lifeblood of management consulting and engage top management attention as well. Thus, this

module is especially useful for students who plan careers in general management, whether in line or staff positions, even though students interested in entrepreneurship, strategy, and human resources will also benefit from the course content.

EL5228. OS Security credit 3

This course covers both fundamentals topics in operating system (OS) security. It will study OS level mechanisms and policies in investigating and defending against real-world attacks on computer systems, such as self-propagating worms and large-scale botnets. Basic OS security techniques such as logging, system call auditing, and memory protection will be discussed. Recent advanced techniques such as honeypots and honeyfarms, system randomization, vulnerability fingerprinting, and virtualization will also be introduced. **Prerequisites:** Computer and Network Security

EL6100 & EL6200. Selected Topics I & II credit 3

This course is intended to cover any other emerging topics that is not currently covered.

EL6001. Robust Control credit 2

History of robust control development; sensitivity & complementary sensitivity in classical control; signal spaces & norms; uncertainty description; LFT (linear fractional transformation) representation; small gain theorem; robustness analysis of multivariable control system; robust performance; robustness analysis using structured singular values μ ; Youla parameterization; $H\infty$ control design; industrial applications.

EL6002. Hybrid Control Systems credit 2

Introduction; the development of hybrid control system; hybrid system modeling; hybrid system dynamics; hybrid system properties; stability concept of hybrid system; controllability concept; observability concept; hybrid system analysis; design and implementation
Prerequisites: Linear Control System, Non-linear Kendall System

EL6003. Intelligent Game Theory credit 3

The theory is a theory that the game will be increasingly important in many fields, especially in the digital interactive media applications. The purpose of this course is to guide students to recognize, analyze, and problem solving in various fields of application of game theory. This course requires extensive quantitative skill. Topic lecture begins with decision making under conditions of uncertainty and risk profile of the user that affect the output of the decision. Then proceed with topics such as efficient societal outcomes and strategies to avoid the most inefficient outcome, Prisoner's Dilemma. The use of intelligent computational methods in modeling and search solutions are also introduced to be able to provide experience and skills in the application of game theory performance digital interactive media applications. Game theory application in various fields e.g. environmental topics and allocation of resources, Principal-Agent Problem, Auction Mechanism Design, etc.

EL6004. Mixed Reality credit 3

This course gives students an opportunity to learn about "Mixed Reality" (MR) (and a specific subset of MR referred to as "Augmented Reality" (AR)) as a technology, a human-computer interaction paradigm, a social media, and an electronic medium. MR refers to computer systems that combine virtual content with the physical environment, allowing users to interact with these combined physical/virtual worlds in situ. Students will use the Argon AR Web Browser technology to experiment with MR and AR, with a particular emphasis on the creation of mobile, social AR experiences.

EL6005. Biomechanics credit 2

Intro to biomechanics, force vector, moment & torque, statics: analysis of equilibrium system & application to biomechanics, intro to deformable body mechanics, stress/strain, multiaxial deformation stress analysis, biological tissue mechanical properties, dynamics, linear angular kinematics, linear angular kinetics, impulse & momentum

Prerequisites: Biomedical Engineering and Lab Work

EL6006. Electromagnetic & Ultrasound in Biomedical Engineering credit 2
Anatomical & Physiological Basis of Bio electromagnetism, Bioelectric Sources/Conductors Modeling, Bio electromagnetism Measurement Methods, Ultrasound Imaging Systems **Prerequisites:** EL5100 Biomedical Engineering & Lab Work

EL6007. Health Information Systems 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.

EL6008. Biomedical Imaging credit 2
Introduction. Review of signal processing, two-dimensional signals, medical imaging systems, radiography systems, x-ray computed tomography, nuclear medicine, Emission computed tomography, various imaging modality, nuclear magnetic resonance, and magnetic resonance imaging. **Prerequisites:** EL5100 Biomedical Engineering

EL6009. Biomaterials credit 2
Introduction, , Biomaterials Metals, Metallic Biomaterials, Ceramic and Related Materials, Ceramic Biomaterials, Polymers, Polimeric Biomaterials, Composite Materials, Composite Biomaterials, Biodegradable Polymeric , Biomaterials, Biologic Biomaterials, Soft Tissue Replacements, Hard Tissue Replacements, Controlling and Assessing Cell-Biomaterials Interaction
Prerequisites: Biomedical Engineering and Lab Work

EL6010. Biomedical Instrumentation credit 2
Introduction. Fundamentals of biomedical instrumentation. Fundamentals of biomedical instruments, bio-electric potential transducers and sensors, biomedical amplifier. Diagnostics and therapeutic tools: clinical laboratory equipment. Biomedical imaging instrumentation. New developments in biomedical instrumentation.

EL6071. Measurement Instrumentation in Power System credit 2
This course covers the basic measurement techniques, instruments, and methods used in everyday practice. It covers in detail both analogue and digital instruments, measurements errors and uncertainty, instrument transformers, bridges, amplifiers, oscilloscopes, data acquisition, sensors, instrument controls and measurement systems. Students will learn how to apply the most appropriate measurement method and instrument for a particular application, and how to assemble the measurement system from physical quantity to the digital data in a computer.

EL6072. Transient Overvoltage Protection System credit 2

This course aims to review the over voltages (or) surges due to the phenomena of switching operations and lightning discharge. Also to study propagation, reflection and refraction of these surges on the equipments their impact on the power system grid.

EL6073. Electrical Atmosphere Phenomena credit 2

To provide the student with an overview and understanding of the electrical nature of the earth's atmosphere. The course material will introduce the two fundamental areas of fair weather and disturbed weather electricity focusing on Ohm's law and the various properties of the lower atmosphere that produce Ohm's law behavior for the fair weather portion. Disturbed weather electricity has two basic, but related topics: thunderstorm electrification and lightning. The student will learn the components making up the lightning flash and their characteristics as well as the physics used as a basis for making measurements with respect to lightning and electrified storms. In the realm of thunderstorm electrification, the history of the development of charge separation theories will be presented along with results from the application of the most current theories in the context of state-of-the-art thunderstorm electrical models, including the parameterization of the lightning process and the production of chemical species by lightning.

EL6074. Power Systems Computation credit 2

This course analyzed the basic techniques for the efficient numerical solution of problems in power system. Topics spanned root finding,

interpolation, approximation of functions, integration, differential equations and direct and iterative methods in linear algebra

EL6076. Advanced Power System Planning credit 2

A study of generation planning, bulk power supply systems, production costing analysis and load forecasting. Dispersed generation. Electric power system reliability and stability.

EL6077. Control and Power System Stability credit 2

Stability concepts in power systems. Synchronous machine modeling. Load-frequency control modeling of synchronous machines. Excitation system types and their dynamic models. Single machine dynamic models. Multimachine dynamic models. Small-signal models and stability of synchronous machines. Computer based simulations of the above developed models. Transient stability and stability margin enhancement.

EL6101. Distributed Computing credit 3

This course focuses on concepts in the design and implementation of distributed computing systems. Models for distributed application development will be discussed. Practical work involves technologies such as TCP/UDP sockets, RPC, multicasting and multi-threaded server design. Topics include introduction to distributed computing, design issues, communication protocols, synchronization in distributed systems, management of time, causality, logical clocks, consistent global states, distributed mutual exclusion, distributed deadlock detection, election algorithms, agreement protocols, consensus, multicast communication, distributed transactions, replication, distributed file systems, fault tolerance, security.

EL6102. Advanced Network Programming credit 3

This course will give a more in-depth treatment of unix network programming. This course will cover using standard UNIX system call API's, network programming, including the client-server paradigm, writing portable application programs, interprocess communications, thread

programming, OpenMP, and MP. **Prerequisites:** Network Programming

EL6103. Advanced Operating System credit 3

This course is intended to give you a broad exposure to advanced operating systems topics. We will be reading about and discussing such topics as protection, security, memory management, operating system kernels, file systems, synchronization, naming, and distributed systems. **Prerequisites:** Operating System

EL6104. Network Performance Analysis credit 3

Internet network layer protocols. User services and source traffic models. Traffic measurement, estimation and forecasting. Performance analysis and simulation tools. Traffic control and resource management. Including: scheduling and buffer management, flow/congestion control, QoS mechanism, routing, applications and middleware.

Probability revision: Probability basics, random variables. Markov chains. Exponential distribution, Poisson process, Markov process. Shared access networks: (Aloha, ethernet, Wifi.) Throughput. Markov and fluid models for retransmission. Signalling, token ring. Allocated bandwidth schemes: (PSTN, Intserv.) Erlang link. Erlang fixed point. Alternative routing. Effective bandwidth. TCP: Windowed flow control, TCP mechanism. Throughput models-naive, Markov, fluid. Fixed point. Optimality and design: Teleology of TCP.

EL6105. Embedded System and Real Time credit 3

In this course, students design and build a microprocessor-based embedded system application requiring integration of sensor/actuator devices, a real-time operating system and application firmware and software. The course includes a theory module covering real-time rate monotonic theory, system resource sizing and management, and implementation process and testing specific to real-time systems.

EL6106. Embedded System Design Methodology credit 4 This course discusses issues and methods of designing an embedded system. Main attention is given to hardware/software co-design	EL6112. Digital Forensic & Computer Crime credit 3 The objective of this course is to provide the foundations and theoretical underpinnings for an understanding of the way in which data that can subsequently be used as evidence is generated, stored, and transmitted. Based on this, methods for the collection and analysis of digital evidence are covered which will not alter the underlying data or potentially trigger destructive mechanisms and which can be reproduced reliably. This course will also complement other information security courses by examining the subject from the criminal angle; investigate the history and causes of computer crime; examine the effects of computer crime through the experiences of victims and law enforcement. Prerequisites: Introduction to Cryptography, Computer and Network Security, Advanced Operating Systems
EL6107. Cryptography Implementation credit 3 This course discusses the design of radio transceiver. The topics include transceiver architecture and its building circuits. These circuits are mixer, low noise amplifier (LNA), and other part of the analog front end transceiver Prerequisites: Electronica 2	
EL6108. Embedded System Design Project credit 2 The Embedded Systems Design Project aims to provide students with the professional skills needed to create innovative embedded systems. This multidisciplinary product development is realized by combining design with electronics- and software engineering, and other required disciplinary skills. In this course, students will be exposed to real-life industrial needs and situations through close cooperation with industrial partners.	EL6113. Business Community Plan credit 3 Addresses the preservation of the business in the face of major disruptions to normal business operations: Business impact analysis, Recovery strategy, Disaster recovery process, Provide training.
EL6109. System on Chip (Soc) credit 3 This course has an objective to provide student with the understanding and capability in designing System on Chip. In this course, learn how to configure an Embedded Processor for different application. Student also learn on how to partition a system into Hardware and software, designing an IP to be attached to SoC. The course covers the SoC design constraint, design flow and design guideline for IP design. The student will design a medium size project to understand and experience the whole design process. Prerequisites: EL2095 Digital System, EL4045 IC Digital Design and analysis	EL6114. Security Architecture and Design credit 3 Contains the concepts, principles, structures and standards used to design, implement, monitor, and secure, operating systems, equipment, networks, applications, and those controls used to enforce various levels of confidentiality, integrity and availability.
EL6110. Electronics Manufacture and Industry credit 3 This course discusses issues on electronics industry and electronics manufacture. The focus will be on the PCB and SMT technology	EL6115. Security Operations and Incident Response credit 3 Used to identify the controls over hardware, media and the operators with access privileges to any of these resources: Resource protection, Incident response, Attack prevention and response, Patch and vulnerability management
	EL6116. Database Security credit 3 Introduction: introduction to Database security. Access control and authentication: access control policies, authentication options, password security, SQL extensions for security.

Securing databases connectivity: secure architectures, schema and policy integration, migration of databases and applications.

Auditing databases: auditing architectures, auditing functions, auditing SQL statements, auditing intrusion detection. **Encryption:** encryption functions, key management, encrypting SQL server data and network traffic, applications.

Prerequisites: Information Security Management, Introduction to Cryptography

EL6117. Mobile/Wireless Security credit 3

At the completion of the course, student should be able to Identify security mechanisms in wireless networks and cellular systems, Identify sources of security threats in WLAN, WPAN, GSM, and 3G, and Evaluate the strength of various data security protocols. Design standard authentication and secrecy mechanisms for wireless and cellular mobile communication environments. **Prerequisites:** Introduction to Cryptography, Computer and Network Security

EL6118. Information Warfare credit 3

This course is a study of the emerging area of Information Warfare (IW). Stress will be on developing and then comparing and contrasting two themes: IW in support of traditional counter C4I doctrine and IW as a new type of cyberspace conflict involving computers and networks.

EL6119. Security Devices credit 3

Although security is prevalent in PCs, wireless communications and other systems today, it is expected to become increasingly important and widespread in many embedded devices. For some time, typical embedded system designers have been dealing with tremendous challenges in performance, power, price and reliability. However now they must additionally deal with definition of security requirements, security design and implementation. Given the limited number of security engineers in the market, large background of cryptography with which these standards are based upon, and difficulty of ensuring the implementation will also be secure from attacks, security design remains a challenge. This book provides the foundations

for understanding embedded security design, outlining various aspects of security in devices ranging from typical wireless devices such as PDAs through to contactless smartcards to satellites.

EL6120. Algebra for Cryptology credit 3

To provide the student with notions of algebraic structures to work in the field of Cryptology and Information Assurance. Linear Algebra: Matrices, Determinants, Linear Systems of Equations, Vector Spaces, Linear Codes. Group theory: Definition of a group, Examples: cyclic, dihedral, symmetric, matrix groups, Homomorphisms, Subgroups and quotient groups, Cosets, Conjugacy classes, Normal subgroups, Lagrange's theorem The isomorphism theorems, Symmetric group and alternating group. Field theory: Basic definition of Field, Binary Finite Field. Primitive polynomials: Definition and Construction.

EL6121. Decision Support Systems credit 3

Decision-support systems (DSS) support management decision-making in a business environment. Its focus is to provide viable alternatives for managers rather than replacing judgment with an optimized solution. General topics covered include theories of organization, decision theories, inferential process, information systems, DSS software and hardware and model building.

EL6201. Parallel System credit 3

This course provides an in-depth study of the design, engineering, and evaluation of modern parallel computers. It begins with an overview of the field focusing on the convergence of many diverse architectural approaches around the communication architecture. It extracts fundamental design issues: naming, replication, synchronization, latency, overhead, and bandwidth and explores these across the spectrum of modern machines. A sound basis is built up in workload-driven evaluation, with a brief overview of parallel programming. It studies small-scale shared memory multiprocessors in some detail to lay a groundwork for understanding large-

scale designs. It then examines scalable multiprocessors thoroughly, including realizing programming models via network transactions, directory-based cache coherence, interconnection network design, software-based virtual shared memory, COMA techniques, and latency tolerance through multithreading and other means.

EL6202. Sensor Technology and System credit 3

Overview on sensor technology and system; transducers; sensor performance; mechanical and thermal sensors; radiant, magnetic and chemical sensors; sensor materials and fabrication process; data acquisition system; interface electronic circuits; wireless sensor networks

EL60203. MEMS/Advanced Devices credit 2

This course is an introduction to MEMS intended for graduate and senior students. Silicon-based integrated MEMS promise reliable performance, miniaturization and low-cost production of sensors and actuator systems with broad applications in data storage, biomedical systems, inertial navigation, micromanipulation, optical display and microfluid jet systems. The course covers such subjects as materials properties, fabrication techniques, basic structure mechanics, sensing and actuation principles, circuit and system issues, packaging, calibration and testing.

EL6204. Web and E-Business Security credit 3

Introduction: Web Architecture, Network Security Vs. Application Security, SSL and secure connections, proxy servers and application firewalls Web Server Security: Server-side structure, Web Authentication, Session management Content Security: database drivers and connectivity, efficient database access E-Business Security: lifecycle of electronic transactions, electronic payment systems, interoperability Digital Certificates: digital identification techniques, certificate authorities, client-side digital certificates, code signing E-Business Continuity: auditing and penetration testing, incident response, disaster recovery, contingency planning Legal and Privacy Issues of

E-Business.

EL6205. Malware credit 3

This course provides students with an effective immersion into the realm of Malware Analysis and Reverse Engineering. It follows a progressive approach that introduces relevant concepts and techniques while preparing students to become effective Malware analysts that can use a standard methodology for detecting, analyzing, reverse engineering and eradicating Malware

EL6206. Number Theory credit 3

Number Theory: Properties of Integers, Divisibility, Prime Numbers, Factorization, Congruence, Wilson Theorem, Fermat Theorem, Diophantine Equations, Euler's Theorem, Quadratic Residue, Discrete Logarithm.

EL6207. Cryptanalysis credit 3

Introduction: Review of Cryptanalysis of Classical ciphers (Transposition, Substitution, Vigenere etc.). Linear Cryptanalysis: Attack on DES. Differential Cryptanalysis: Attack on DES. Fast Correlation attacks: Attacks on Combiner Models. Algebraic attacks: Attack on AES. Factoring: Attack on RSA. Trial Division, Quadratic Sieve, Number Field Sieve. Attacks on DLP: Index Calculus. Side Channel Attacks Prerequisites: Introduction to Cryptography, Algebra for Cryptology

EL6208. Embedded Security credit 3

Introduction: Digital System design, overview of VHDL. Cryptography: Basic building blocks. Mathematical Preliminaries: Binary Finite Field Arithmetic. Arithmetic Blocks: Design of Binary Finite Field computation units. Cryptographic Blocks: Implementation of Hash Functions: SHA. Block Cipher hardware design: AES. Asymmetric cryptographic hardware design: RSA. Prerequisites: Introduction to Cryptography, Algebra for Cryptology

EL6209. Sensor Systems and Technology for C4ISR credit 3

For a domain, the systems architecture view shows how multiple systems link and interoperate, and may describe the internal construction and operations of particular

systems within the architecture. For the individual system, the systems architecture view includes the physical connection, location, and identification of key nodes (including materiel item nodes), circuits, networks, warfighting platforms, etc., and specifies system and component performance parameters (e.g., mean time between failure, maintainability, availability). The systems architecture view associates physical resources and their performance attributes to the operational view and its requirements per standards defined in the technical architecture

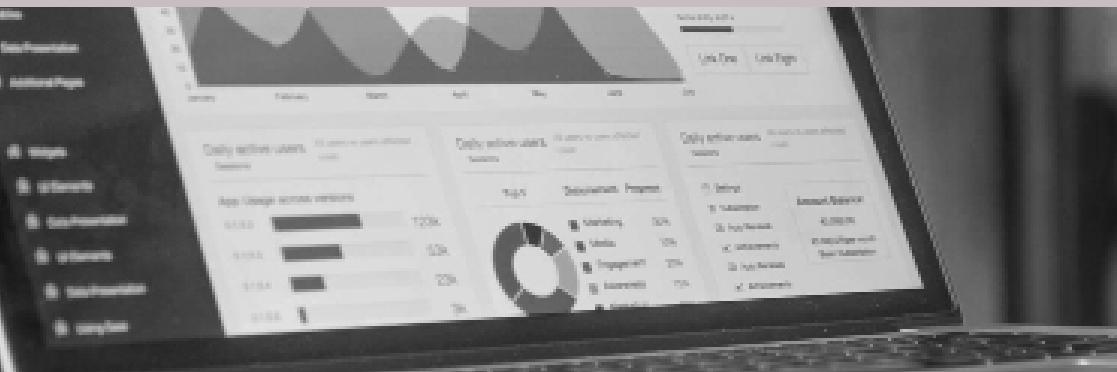
EL6210. Integrated Information Systems and C4ISR credit 3

This course engages you in synthesis thinking which prepares you to build large information systems, those that cross platform, program, service, ... boundaries. We first discuss requirements and technology for the network which can be common to all information systems regardless of specific use. Then we discuss concepts dealing with large information system interoperability. Students can expect to go to jobs that deal with 1) requirements articulation and sponsorship, 2) applications development and 3) networking and communications infrastructure. Armed with the necessary skills, you will be able to function in jobs that deal with communications, IT applications (aka C4ISR systems) or writing the requirements for such systems. Prerequisites: Computer Networks

EL6123. Information Technology Risk Management

IT governance and management; IT Risk Assessment; The use of quantitative methods; The use of qualitative methods; Risk Mitigation; Disaster Recovery Plan / Business Management Continuing; Use of reference standards and IT risk; Organisational risk management Prerequisites:/ Co-requisite: EL5126 - Information Technology Strategic Planning, EL6213 - Governance and Audit of Information Technology

Informatics Master Program



Introduction

With the abundant employment opportunities in the field of Informatics and other related disciplines, the Master Program of Informatics provides opportunities for students to enhance and apply their skills to meet the need for professionals in informatics and business fields. The program currently offers the following specialization (options) for graduate student to choose from.

Program Educational Objectives

1. The graduate will be able to compete in new informatics areas with focus on critical thinking and innovative idea. The graduates will be able to communicate ideas effectively and act in ethical and professionally responsible manner.
2. The graduate will have strong motivation to be engage in lifelong learning and to compete in various Informatics disciplines
3. The graduate will have capabilities to conduct research in the various discipline of Informatics.

Program Outcomes

1. An ability to apply and evaluate basic knowledge of computer science
2. An ability to apply the current techniques, skills and tools for computing practices
3. An ability to solve domain specific problem
4. An ability to analyze problems, asses and articulate requirements, design, implementation and evaluation of fundamental computer based system, using specific technology and solution
5. An ability to self-directed learning and engage in continuing professional development
6. An ability to communicate effectively with a range of audiences
7. An ability to innovate and incorporate opportunities to do entrepreneurship in software industries.

Career Prospects

Our program offers graduates to be prepared for careers in various enterprise using different platforms (desktop-based, web-based, or mobile-based platform). The graduates may work as the following jobs but not limited to:

- Research and Development Managers
- System/Software Engineers
- System/Business Analyst
- Business Intelligence Analyst/Managers
- Database/System Administrator
- System Integrator
- Information System Manager
- Game Developer
- Security Specialist or other software security

related jobs

- Information Technology Expert
- Network Managers/Consultants

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.



Specializations

Computer Science

provides the needs to develop theoretical knowledge of computer science and its practical application for solving real-world problems. The courses include Computing Theory, Advance Computer Architecture, Algorithm Analysis, and other electives subjects such as Vision, Natural Language Processing or Speech Processing.

High Performance Computing

provides a thorough grounding in HPC technologies and their practical application such as parallel programming. The courses are Computing Theory, High Performance Computing, Data Visualization, Model and Simulation, Advance Numerical Methods, Parallel Programming and other elective subjects.

Software Engineering

provides skills and knowledge to develop quality software applications for middle to large scale system using proper processes, methods and tools. The courses include Software Requirements Engineering, Software Analysis and Design, Software Construction, Software Evolution, Software Quality, Software Project Management, and other elective courses.

Information System

allows students to learn to develop information resource potentials for the interests of various communities, organizations and businesses. The courses include Enterprise Governance, Information System Project Management, Enterprise Risk Management, Enterprise Modeling, Enterprise Engineering, Enterprise Information Resources and other elective courses.

Mobile Devices and Media Technology

explores crossdisciplinary application of mobile devices and media technologies, such as game development. The courses include Game Domain Software Engineering, Interaction Design, Visualization and Game, Mobile Application Development, Multimedia Data Processing and Management, Interactive Media Application Development.

Specializations

System and Software Security

prepares students with the skills, and knowledge to be security developer capable of developing and managing security in software/system. The courses include Security System and Software, Secure SDLC, Secure Programming, Formal Method, IT Governance and Risk Management.

Intelligent System

provides knowledge and skills that enable students to develop complex cognitive system that can react accordingly in an intelligent manner. The courses provides Advance machine learning, Pattern Recognition, Knowledge Representation and Reasoning, and others electives subjects.

Business Intelligence

provides students to learn various process and techniques to analyze raw data, which may include complex and big data and transform it into useful information for business decision making. The courses include Business Inteligence fundamental, Datawarehouse and Datamining, Management and Organization theory, Business Inteligence System, Operation and Development, Data Visualization, Data and Business Analysis, and other electives courses.

Information Technology

designed to address the application of strategy, planning, implementation and technology deployment of information technology as the enabler for organization for private and government sectors. The courses include Application Management Development, Social and Information management, Information Technology Research and Innovation, Information Security Design, and other electives courses.

Informatics Master Program Structures

High Performance Computing Specialization

First Semester

No	Code	Subject	Credit
1	IF5010	Computer System and Architecture (A)	2
2	IF5020	Algorithm & Programming (A)	2
3	IF5030	Information Management (A)	2
4	IF5110	Computing Theory	3
5	IF5160	High Performance Computing	2
6	IF5170	Data Visualization	2
Total			13

Second Semester

No	Code	Subject	Credit
1	IF5099	Research Method/Thesis 1	3
2	IF5161	Model and Simulation	2
3	IF5162	Advanced Numerical Methods	2
4	IF5163	Parallel Programming	2
5	IF5xxx	Elective Subjects	2
Total			11

Third Semester

No	Code	Subject	Credit
1	IF6099	Thesis	6
2	IF5xxx	Elective Subjects	2
3	IF5xxx	Elective Subjects	2
4		Elective Subjects	2
Total			12

Computer Science Specialization

First Semester

No	Code	Subject	Credit
1	IF5010	Computer System and Architecture A	2
2	IF5020	Algorithm & Programming A	2
3	IF5030	Information Management A	2
4	IF5110	Computing Theory	3
5	IF5210	Elective Subjects (Advanced Operating Systems)	3
			Total 12

Second Semester

No	Code	Subject	Credit
1	IF5099	Research Method/Thesis 1	3
2	IF5112	Advanced Computer Architecture	3
3	IF5111	Algorithm Analysis	3
4		Other Elective Subjects	3
			Total 12

Third Semester

No	Code	Subject	Credit
1	IF6099	Thesis	6
2	IF5xxx	Elective Subjects	2
3	IF5xxx	Elective Subjects	2
4	IF5xxx	Elective Subjects	3
			Total 13

Media Technology and Mobile Devices Specialization

First Semester

No	Code	Subject	Credit
1	IF5010	Computer System and Architecture (A)	2
2	IF5020	Algorithm & Programming (A)	2
3	IF5031	Information Management (B)	2
4	IF5150	Game Domain Software Engineering*)	3
5	IF5151	Interaction Design, Visualization and Game	3
Total			12

Second Semester

No	Code	Subject	Credit
1	IF5099	Research Method/Thesis 1	3
2	IF5152	Mobile Application Development Tool	3
3	IF5153	Multimedia Data Processing and Management	3
4	IF5154	Interactive Media Application Development and Lab Work **)	3
Total			12

Third Semester

No	Code	Subject	Credit
1	IF6099	Thesis	6
2	IF5xxx	Elective Subjects	2
3	IF5xxx	Elective Subjects	2
4	IF5xxx	Elective Subjects	2
Total			13

*) Main topic: Software Engineering with case specific in game , Game Engine issues, and Library Game Engine Utilization

**) Including OpenGL, Game development Studio

Intelligence System Specialization

First Semester

No	Code	Subject	Credit
1	IF5010	Computer System and Architecture A	2
2	IF5020	Algorithm & Programming A	2
3	IF5030	Information Management A	2
4	IF5180	Advanced Machine Learning	3
5	IF5181	Pattern Recognition	3
			Total 12

Second Semester

No	Code	Subject	Credit
1	IF5099	Research Method/Thesis 1	3
2	IF5182	Knowledge Representation and Reasoning	3
3	IF5xxx	Elective Subjects	6
			Total 12

Third Semester

No	Code	Subject	Credit
1	IF6099	Thesis	6
2	IF5xxx	Elective Subjects	2
3	IF5xxx	Elective Subjects	2
4	IF5xxx	Elective Subjects	2
			Total 12

Business Intelligence System Specialization

First Semester

No	Code	Subject	Credit
1	IF5011	Computer System and Architecture (B)	2
2	IF5021	Algorithm & Programming (B)	2
3	IF5030	Information Management (A)	2
4	IF5171	Business Intelligence Fundamentals	2
5	IF5172	Dataware house dan Data Mining	2
6	IF5173	Management and Organization Theory	2
Total			12

Second Semester

No	Code	Subject	Credit
1	IF5099	Research Method/Thesis 1	3
2	IF5174	Business Intelligence System Operation and Development	2
3	IF5170	Data Visualization	2
4	IF5175	Data and Business Analysis	2
5	IF5xxx	Elective Subjects	2
Total			11

Third Semester

No	Code	Subject	Credit
1	IF6099	Thesis	6
2	IF5xxx	Elective Subjects	2
3	IF5xxx	Elective Subjects	2
4	IF5xxx	Elective Subjects	3
Total			13

Security System Software Specialization

First Semester

No	Code	Subject	Credit
1	IF5010	Computer System and Architecture (A)	2
2	IF5020	Algorithm & Programming (A)	2
3	IF5030	Information Management (A)	2
4	IF5190	Security Systems and Software	2
5	IF5191	Secure SDLC	2
6	IF5192	Secure Programming	2
			Total 12

Second Semester

No	Code	Subject	Credit
1	IF5099	Research Method/Thesis 1	3
2	IF5193	Formal Method	2
3	IF5xxx	Elective Subjects	2
4	IF5xxx	Elective Subjects	2
5	IF5194	IT Governance and Risk Management	2
			Total 11

Third Semester

No	Code	Subject	Credit
1	IF6099	Thesis	6
2	IF5xxx	Elective Subjects	2
3	IF5xxx	Elective Subjects	2
4	IF5xxx	Elective Subjects	3
			Total 13

Compulsory Subjects for Security System Software Specializations

No	Code	Subject	Credit
1	IF5190	Security Systems and Software	2
2	IF5192	Secure Programming	2
3	IF5194	IT Governance and Risk Management	2
4	IF5191	Secure SDLC	2
5	IF5193	Formal Method	2
Total			10

Course Descriptions

IF5010 Computer Systems and Architecture A credit 2

Students learn about the current research and technology in Computer Architecture System; Students learn the design of modern computer systems; Students are expected to understand how to analyze computer system performances

IF5011 Computer Systems & Architecture B credit 2

This lecture provides an understanding of the abstraction of computer systems, both from the standpoint of the organization as well as its architecture. Students are expected to understand the concept of computer hardware and software interaction. This subject can help students to become programmers reliable, able to create and analyze the program exactly what and why that occurs on a computer with understanding the organization and architecture.

IF5020 Algorithm & Programming A credit 2

The role of algorithm in computing, Randomized algorithm, Hashing, Red-Black Tree, Amortized analysis, B-tree, Fibonacci Heap, Maximum Flow, Multi-threaded Algorithm, Approximation Algorithm

IF5021 Algorithm & Programming B credit 2

Fundamentals of analysis and software design; key issues in the design of software; architecture and structure of the software; analysis and evaluation of software design; review notation software design; strategies and methods of analysis and software design, analysis and design practice for some cases.

IF5030 Information Management A credit 2

This course describes fundamental theory of database system concepts, emphasizing on data optimization and access. In this course, students will develop database system concepts based on recent research and analyze research results so they can define state of the art of database system.

IF5031 Information Management B credit 2

This course gives Database concepts, Database management and technology, Students are expected to develop database application with good performance, advanced database design system (temporal, spatial, multimedia), and equipped with current technology (data warehouse, data mining and information retrieval)

IF5099 Research Method / Thesis 1 credit 3

This course prepares students for doing the thesis in the following semester. In this course the students were given a briefing on research and its relationship with the thesis, how to do a thesis, writing papers and presentation techniques. Students also get a briefing on the format of the thesis, exercises and presentations to write a thesis proposal. Students are expected to have the research topic and the advisor/s for the topics.

IF5110 Computing Theory / Theory of Computation credit 3

This course consists of the study of language theory, complexity theory and computability theory. In this course, students will expand upon their knowledge of computation through an in-depth and analytical approach that will include readings and sample tests [2].

IF5111 Algorithm Analysis credit 3

Topics discussed in this course: analysis of quicksort, binomial heaps, data structure for disjoint sets, B-Trees, Splay Trees, review of Djikstra's algorithm & Bellman-Ford algorithm, all-pairs shortest path, maximum flow, irrational flow, NP-complete & related problem classes, strong NP-Complete & Pseudo Polynomial Time, Approximation Algorithm, String Matching, Introduction to Number-Theoretic Algorithm, Linear Programming, Polynomial & FFT.

IF5112 Advanced Computer Architecture credit 3

This course describes quantitative and qualitative aspects of designing computer

architecture. A review is conducted to technology in modern processor.	Engineering, Information Vision in Enterprise Engineering, Business Process, Enterprise System Performance, Issues in Enterprise Engineering
IF5120 System and Software Requirement Engineering credit 2	IF5131 Enterprise Modelling credit 2
System engineering, fundamentals of requirement engineering, requirement engineering process, initiation and scope definition, requirement elicitation, requirement analysis, requirement specification, requirement validation, practical considerations.	History of Process, Workflow driven methodology, Process Analysis, Process Design & Process Modeling, business process reengineering, soft system methodology
IF5121 Software Design and Analysis credit 2	IF5132 Enterprise Risk Management credit 2
Fundamentals of analysis and software design; key issues in the design of software; architecture and structure of the software; analysis and evaluation of software design; review notation software design; strategies and methods of analysis and software design, analysis and design practice for some cases.	An understanding of risk management activities associated with systems development life cycle with some risk factors. Risk management activities: identification, threats, vulnerabilities, impacts, recommendation control, mitigation with several risk factors.
IF5122 Software Construction credit 2	IF5133 Information System Project Management credit 2
Review SDLC and software methodology, agile methodology, OOAD, Design principles, Component design, Configuration management, Continuous integration, Service oriented Design, Code Inspection and Code Review	IS Project Management, Project Life Cycle, Project Context, Integration Management, Scope Management, Time Management, Cost Management, Quality Management, Human Resource Management, Communication Management, Risk Management, Procurement Management and Stakeholder Management.
IF5123 Software Quality credit 2	IF5134 Enterprise Information Resources credit 2
Testing fundamentals, test levels, testing techniques, test-related measures, test process, software quality fundamentals, software quality management processes, verification and validation.	Information vision of Enterprise Engineering, Analysis of Enterprise Life Cycle, Enterprise Program & Information Resource, Enterprise Maturity Level, Enterprise Information Resource Management, Evolution of Enterprise Information Resource.
IF5124 Software Evolution credit 2	IF5135 Enterprise Governance credit 2
Configuration management process, configuration identification, configuration control, configuration status accounting, software release management and delivery, software maintenance fundamentals, key issues in software maintenance, maintenance process, techniques for maintenance.	Information resource management and Governance.
IF5130 Enterprise Engineering credit 2	IF5136 Strategy and Policy credit 2
Information (System) Vision in Enterprise, State of Art Enterprise Engineering (EE), "System as a Service", Business System, Fundamental Concept of Enterprise System, Enterprise System	Strategic thinking, predict the future of information technology, adoption of information technology, organizational culture, change management and policy development
IF5140 Enterprise Architecture Design credit 2	The course discusses about the basics in Enterprise architecture supported with

current Frameworks. Enterprise Architecture Introduction, TOGAF Framework, Zachman Framework, Business Architecture, Information System Architecture, Service Based Architecture, Network for Service Based architecture, Data Storage Architecture.

IF5141 Information Security Management credit 2

This course is for individuals who design, implement and manage an enterprise's information security program based on ISACA's Certified Information Security Manager (CISM) BoK and Cybersecurity Nexus BoK

IF5142 IT Risk and Value credit 2

This course provides concepts on Information Technology Value, the model, validation, and various analysis techniques (Cause Effect, Fishbone, Forward Analysis)

IF5143 Information Technology Research and Innovation credit 2

This course gives overview of topics in Information Technology (IT), how to do the modelling in Information System (IS)/IT, including researches in system engineering and related human resources.

IF5144 Information and Social Network credit 2

This course provides concepts on Information and Social Network, Computer Network, DNS, Penetration Testing, Socket Programming, Multimedia Programming and supporting tools.

IF5145 Management of Application Development credit 2

Fundamentals of Application Development Management, fundamentals of application development, application requirement specification, object based programming (fundamentals and object diagram), application development project management (fundamentals, development, quality and testing), problems and challenges in application development.

IF5146 Information Technology Risk Management credit 2

This course gives fundamentals of Information Technology (IT) Risk Management, IT Risk principles, IT Risk Frameworks, Customs in IT Risk and IT Risk Governance.

IF5147 Smart Service Systems credit 2

This course gives overview on smart service system, service engineering, service engineering framework, Information Technology service and Smart service security system (Introduction, network, cyber and forensic).

IF5148 Multimedia Learning credit 2

Learning technologies are discussed in detail, starting from learning theories (form psychology), research methods, statistical methods, various principles in learning, the use of technology, and the state of the art of learning technology, such as simulation and virtualization.

IF 5150 Game Domain Software Engineering credit 3

This course explains software engineering process for game domain. Through this course, students will learn one life-cycle of game development.

IF5151 Mobile Application Development credit 3

This course offers conceptual knowledge and skill in mobile application development. The course covers mobile apps. Intro, categories of mobile apps, development environment, offline apps. Development, UI, mobile apps. Project, Online apps. Development, third party integration, mobile apps. Performance, deployment and maintenance, advanced mobile app. topics

IF5152 Mobile Application Development Credit 3

This course offers conceptual knowledge and skill in mobile application development, from fundamentals of mobile device to software development in mobile application.

IF 5153 Multimedia Data Processing and Management credit 3

This course offers conceptual knowledge and skill in processing and managing multimedia data, including introduction to multimedia data and application, review of signal processing (Discrete Fourier Transform and Fast Fourier Transform), review of multimedia data representation, automatic analysis of multimedia data (preprocess, feature extraction, recognition and similarity retrieval), multimedia data management and indexing methods, case study on multimedia data processing based application.

IF5154 Interactive Media Application Development and Practice credit 3

This course offers students the opportunity in experience and practicing game development. In this course the student will do creative and technical processes in game development plan, design and construction in a team work.

IF5160 High Performance Computing credit 2

This course describes about parallel model and architecture, SIMD, MIMD, and SPMD. Programming model of parallel system: shared memory and message passing, algorithm mapping, suitable application and programming model, as well as performance metrics.

IF5161 Model and Simulation credit 2

The course describes concept and analysis to develop model and simulation for solving complex problem. Simulation development includes discrete and continuous simulation.

IF5162 Advanced Numerical Method credit 2

Error analysis, Solution of linear systems, Solution of nonlinear equation, Newton Raphson, Interpolation Lagrange, Newton and Chebyshev polynomial approximation, Spline function interpolation, Least Squares line and nonlinear regression, Numerical differentiation, Numerical Integration, Solution of differential equations and partial

IF5163 Parallel Programming credit 2

This course describes concepts and practices

of parallel algorithm and programming, PRAM model. PRAM Model, Algorithm Techniques: Balanced Binary Tree, Doubling technique: List Ranking problem, Divide and conquer, Prefix sum, Euler-tour/ graph traversal, Expression Evaluation, Transitive Closure & Max-closure problem, Mesh connected networks & Sorting algorithm.

IF5170 Data Visualization credit 2

This course discusses data visualization principles & techniques, how to process and visualize data aiming at assisting the analysis process or enriching the understanding about the data.

IF5171 Foundation on Business Intelligent cred 2

The course introduces foundations and principles in Business Intelligence. This course also covers how BI fits with the businesses and organization.

IF5172 Data warehouse and Data Mining credit 2

This course covers basic principles, concepts, and techniques on data mining, and the usages of data mining tools. The course materials cover: concept & data mining techniques. These include clustering, classification, frequent pattern, association, sequential pattern, text mining, and graph mining.

IF5173 Management and Organization Theory credit 2

Theory, process, and techniques involved in managing and running an organization. To give a basic knowledge, concepts, techniques on an organization and management. To learn function, structure, and dynamics on an organization. To learn and understand basic principles of management and how business are structured (i.e., goal, indicator, process)

IF5174 Business Intelligence and Operation credit 2

The course will explain methodology for Business Intelligence construction based on Data warehouse & Data Mining. Parameters such as data quality, maintenance, and technology are also explained. The course

is project based, in which theory 35% whilst practice 65%. Theory consists of methodology for Business Intelligence construction, analysis & reconciliation data source, logical modelling & design, design of data staging, and BI documentation

IF5175 Data & Business Analysis credit 2

This course will discuss data and business analysis using statistics. Introduction to Data & Business Analysis, Review of Basic Statistics, Data Collection & Measurement, Assessing the Situation Experiments, Hypotheses Testing, Optimization, Bayesian Statistics and Subjective Probability, Prediction, Correlation and Causation, Error, Various fallacies in statistics.

IF5180 Advanced Machine Learning credit 3

Concept and theory of machine learning, hypothesis evaluation and machine learning applications on learning of various problem domains.

IF5181 Pattern Recognition credit 3

Topics discussed in this course: template matching, statistical method, syntactic method, parameter estimation, component analysis and discriminant, non parametric technique, overview of machine learning algorithm, error rate estimation, bagging, boosting, classifier combination, neural network, implementation of pattern recognition to several cases (project) [1].

IF5182 Knowledge Representation and Reasoning credit 3

The course describes the issues related to symbolic knowledge representation and conducts automated reasoning. The topics are introduction, object oriented representation, structured description, ontology and domain knowledge representation, social context knowledge representation, object and rules combination, default & negation, spatial and temporal reasoning, rule based system, model and case based reasoning, review CSP.

IF5190 Security System and Software credit 2

This course aims at providing basic foundations and principles in information security:

confidentiality, integrity, availability, authenticity, and accountability. The course also gives some illustration on various protection mechanisms to various attacks.

IF5191 Secure Software Development Life Cycle credit 2

This course covers basic principles on managing a secure software system throughout its lifecycle and critical issues to its success. This course illustrates how an existing approaches fail to tackle these issues. This course covers from the starts of a project until the release of the product and during the operation and maintenance of the product in a real setting.

IF5192 Secure Programming credit 2

This covers various practical mistakes, in the security aspect, at programming a software system. In this course, students learn principles to program securely and how attackers exploit such vulnerabilities. Moreover, the course also covers various techniques that can be used to ensure the security of the codes.

IF5193 Formal Method credit 2

This course covers various techniques in formal method to verify designs and to ensure the fulfilment of required design properties.

IF5194 IT Governance and Risk Management credit 2

This course covers the basic aspects on managing security governance and assessment so each security initiatives can always be effective and efficient in practice and does not hinder any business processes.

IF5210 Advanced Operation System credit 3

This course describes advanced issues on modern operating system.

IF5211 Advanced Distributed System credit 2

Advanced concept on distributed system, abstraction and modeling on distributed system, main algorithm of distributed system, failure detector, and group communication.

IF5248 Information Technology Service Engineering credit 2

This is course for students who plan to be an IT service engineer or IT service consultant to engineer IT service in an organization. The IT Service can be divided into 2 categories: IT services as a product and IT service as a support for product delivery. The course goals are development of knowledge and skills.

IF5249 Information Technology Sector Entrepreneurship credit 2

This is a Course for students who plan to be, or work with, entrepreneurs. An entrepreneurial mindset is needed to create or grow economically viable enterprises, be the new companies, new group within companies, or university. This course aims to cultivate an entrepreneurial perspective with particular emphasis on Information Technology (IT) related activities. The course topics will include: business ethics, opportunity assessment, team formation, financing, intellectual property, university technology transfer. This course will feature significant participation and guest instruction experienced practitioners.

IF5280 Computer Vision credit 2

This course provides methods to enable understanding of images/videos, by treating vision as a process of inference from noisy and uncertain data and emphasize on multi-agent inference, knowledge representation, color flood fill, property form, object detection and extraction, multilayer image

IF5281 Speech Recognition credit 2

The course describes the basic theory, algorithms and architecture of speech processing technology, including its main applications: speech recognition, speech synthesis, and speaker recognition. We will explore the state-of-the-art core components of modern statistically-based speech recognition, synthesis, and speaker recognition systems in terms of three tasks: signal modeling; network searching; and language understanding.

IF5282 Natural Language Processing credit 2

This course consists of natural language processing tool of lexical processing (morphologically analyser, tokenization, POS tagger), syntactical (dependency & constituent parser), semantic analyser (dependency and constituent), pragmatic (reference resolution), and text mining tool such as text categorization (spam filtering, topic clustering, plagiarism detection, sentiment analysis), information extraction (named entity tagger and relation extraction), text summarization, question answering, dialogue system and machine translation

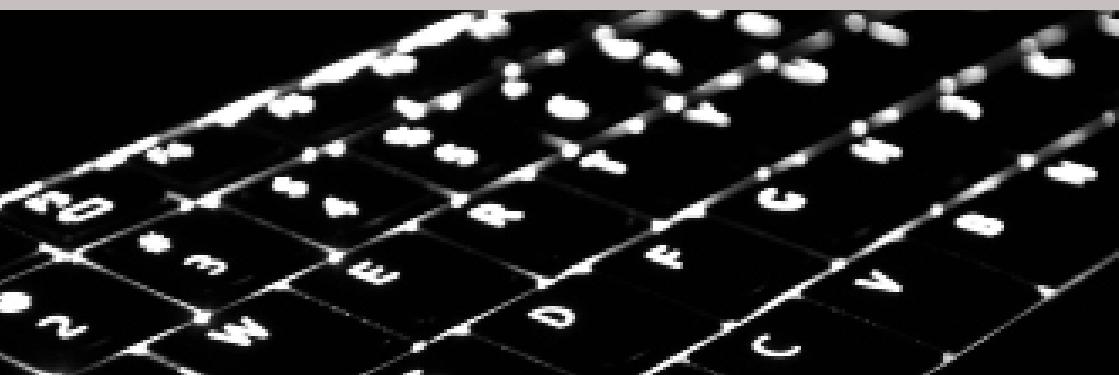
IF6099 Thesis credit 6

This is an individual final project that is intended to integrate materials that have been covered in previous courses. the students are expected to provide an in-depth exploration of special interest topics. Students work closely with an academic advisor and are required to submit a comprehensive written report as well as an oral presentation of the research results in front of an academic panel.

IF6125 Software Engineering Management credit 2

Social, legal, and historical issues, code of ethics and professional conduct, software project planning, risk management, software project organization and enactment, review and evaluation, closure, software engineering measurement, engineering economics.

Electrical Engineering and Informatics Doctoral Program



Introduction

The goal of this program is to prepare students to perform independent research in the area of their interests and to significantly contribute to science within the fields of electrical engineering and informatics. The doctoral degree will be awarded to candidates who demonstrate in-depth understanding of the field and show the ability to perform independent and original research that is publishable in journals.

Below are research concentrations in the program:

1. Biomedical Engineering
2. Computer Engineering
3. Control and Computer System
4. Electronics Engineering
5. Software and Knowledge Engineering
6. Informatics
7. Information Technology
8. Electrical Power Engineering
9. Telecommunication Engineering

The curriculum of this doctoral program is designed to be completed within 6 semesters or 3 years. During the first year, students are expected to pass qualification examination and able to write a research proposal.

The research phase is designed to be conducted in the second and third year of doctoral degree. Each semester, students should pass research progress examination (I, II, III, IV).

After the students pass the IV research progress examination, they have to write final dissertation report and do dissertation defense.

Program Educational Objectives Career Prospects

1. Our graduates will become independent professional researcher in Electrical Engineering & Informatics or related field.
2. Our graduates will able to supervise student research in all high education level for those choosing career in academic.
3. Our graduates will able to develop innovative product and technology in their work places for those choosing career in industry.
4. Our graduates will have leadership in research activity or profession activity in their field.

1. Researcher
2. Academician
3. Research and Development Managers
4. Innovative division in industry

Program Outcomes

An ability to conduct critical thinking:

1. To identify relevant scientific publication in Electrical Engineering and Informatics; and to understand, evaluate and apply the information in it.
2. in deep understanding on the recent theory, technique and tools in their field and to apply creatively in the research activity.
3. An ability to discover research problem:
4. to understand fully the characteristics, development, phase and ethical value of scientific research.
5. to conclude the core and originality of existing researches, and evaluate it critically in Electrical Engineering and Informatics field area.
6. to discover new research problem which solution in his/her knowledge scope.

An ability to run a research program:

1. to write a systematic research plan and to run it in limited time and resources.
2. in deep understanding of research method, the techniques and scientific approach; and able to apply it skillfully in solving problems in Electrical Engineering and Informatics.
3. to improve available technique or develop new technique in solving complex problems.

An ability to communicate the research result:

1. to take active role in academic community, to communicate with colleagues in scientific society and wider society in Electrical Engineering and Informatics field.
2. to organize research results in scientific report and publicize it in well known journal.
3. to become reputable expert in Electrical Engineering and Informatics, especially in their related dissertation field.

Electrical Engineering and Informatics Doctoral Program Structures

First Semester

No	Code	Subject	Credit
1		Graduate Level Courses	6
2	EI7095	Qualifying Exam	3
		Total	9

Second Semester

No	Code	Subject	Credit
1	EI7094	Methods of Research	3
2	EI7090	Philosophy of Science	2
3	EI7096	Research Proposal	3
		Total	8

Third Semester

No	Code	Subject	Credit
1	EI7098	Research & Seminar I	5
		Total	5

Fourth Semester

No	Code	Subject	Credit
1	EI8095	Research & Seminar II	5
		Total	5

Fifth Semester

No	Code	Subject	Credit
1	EI8098	Research & Seminar III	5
		Total	5

Sixth Semester

No	Code	Subject	Credit
1	EI9095	Research & Seminar IV	5
2	EI9099	Dissertation Examination	3
		Total	8

Elective Subjects

No	Code	Subject	Credit
1	EI7091	Advanced Electrical Engineering and Informatics	5
		Total	6

EI7090 Philosophy of Science credit 2

This course provides students the skills necessary to be able to construct systematical and logical thinking using philosophy to learn and extend knowledge in general or for specific field of expertise.

EI7094 Methods of Research credit 3

This course provides students the skills necessary to properly identify research issues, to write a good research proposal and to effectively communicate the research proposal to appropriate audience.

EI7095 Qualifying Exam credit 3

Students conduct literature study on the related works of their doctoral research, under the supervision of their academic supervisor

EI7096 Research Proposal credit 5

Students write background, problem statement, research hypothesis, research steps and research schedule. The proposal is made by the students under the supervision of their supervisor.

EI7098 Research & Seminar I credit 5

Students conduct analysis in order to get the proposed method to solve the research problem.

EI8095 Research & Seminar II credit 5

Students conduct initial experiments in order to analyze the research hypothesis.

EI8098 Research & Seminar III credit 5

Students conduct advanced research as the follow up of the previous research in EI8095. In this course, students should write paper for publication (the minimum is international conference).

EI9095 Research & Seminar IV credit 5

Students define the final conclusion related with their hypothesis based on the experiments that they have conducted. In this step, the paper (resulted in EI8098) has been published and another paper draft has been written for journal publication.

EI9099 Dissertation Examination credit 3

Consists of dissertation book review, and several examinations as the final examinations.

