

DESCRIPTION OF EEE COURSES

| Year | Course Code | Course Title | Acad Units | Pre-Requisite | Contact Hours | Course Descriptions |
|------|-------------|-------------------------|------------|-----------------------------|----------------------------------|--|
| 1 | BS1004 | LIFE SCIENCES | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Organization of life. Chemical basis of life. Molecular basis of life. Cell biology. Medical microbiology and virology. Continuity of life: genetics & human diseases. Bioinformatics. Bioprocessing and bioremediation. Biomedical engineering. Biotechnology I. Biotechnology II. Biology and society. |
| 1 | FE1001 | PHYSICS I | 4.0 | 'A' Level Physics or FE0001 | Lec: 39 hrs Tut: 13 hrs | Equilibrium and elasticity. Kinematics of particles. Kinetics of particles. Kinematics of rigid bodies. Kinetics of rigid bodies. Fluids. Temperature and ideal gases. Laws of thermodynamics. |
| 1 | FE1002 | PHYSICS II | 4.0 | 'A' Level Physics or FE0001 | Lec: 39 hrs Tut: 13 hrs | Electricity. Magnetism. Optics. Quantum physics. Nuclear structure. |
| 1 | FE1005 | MATERIALS SCIENCE | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Introduction. Bonding between atoms. Building blocks of materials. Crystal defects and diffusion. Structural properties of materials. Functional properties of materials. Phases and microstructures |
| 1 | FE1006 | MATHEMATICS 1 | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Complex numbers, vectors and matrices. Limits and continuity of functions. Derivatives. Applications of derivatives. Integration. Integration methods. Applications of integration. |
| 1 | FE1007 | MATHEMATICS 2 | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Partial differentiation. Multiple integrals. Sequences and series. First order differential equations. Second order differential equations. |
| 1 | FE1008 | COMPUTING | 3.0 | Nil | Lec: 26 hrs Tut & Lab: 24 hrs | Introduction to computers. C language fundamentals. Flow of control. Functions and libraries. Arrays. Basic file processing. Structured programming and quality of programs. Case studies in engineering Applications. |
| 1 | FE1071 | LABORATORY 1A | 1.0 | Nil | | Laboratory experiments related to: Physics, Chemistry and Materials Science. |
| 1 | FE1072 | FE1072 | 1.0 | Nil | | Laboratory experiments related to: Physics, Chemistry and Materials Science. |
| 1 | HW110 | EFFECTIVE COMMUNICATION | 2.0 | Nil | Tut: 24 hrs | Communication process. Written communication. Oral presentation skills. Interpersonal skills. |
| 2 | EE2001 | CIRCUIT ANALYSIS | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Circuit theorems. Energy storage and transient response. Alternating current circuits. Laplace transforms in circuit analysis. Network functions and two-port networks. |
| 2 | EE2002 | ANALOG ELECTRONICS | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Diode circuit analysis. Bipolar junction transistors. MOSFET devices. Small-signal amplifiers. Differential and multistage amplifiers. Frequency response. Operational amplifiers. |

DESCRIPTION OF EEE COURSES

| Year | Course Code | Course Title | Acad Units | Pre-Requisite | Contact Hours | Course Descriptions |
|------|-------------|--------------------------------|------------|-----------------|----------------------------|--|
| 2 | EE2003 | SEMICONDUCTOR FUNDAMENTALS | 3.0 | FE1002 | Lec: 26 hrs Tut: 13 hrs | Basic semiconductor concepts. Semiconductor in equilibrium. Carrier transport phenomena. Semiconductor in non-equilibrium. PN junction. Metal-Semiconductor contacts. Introduction to Bipolar Junction Transistors. |
| 2 | EE2004 | DIGITAL ELECTRONICS | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Number systems and logic gates. Boolean algebra and logic minimization. Combinational logic design and msi digital devices. Sequential logic elements. Synchronous sequential logic circuits. Programmable logic devices and memories. |
| 2 | EE2005 | AC CIRCUITS AND MACHINES | 3.0 | EE2001 | Lec: 26 hrs Tut: 13 hrs | Three-phase Circuits. Electromagnetism. Transformers. Rotating machines. |
| 2 | EE2006 | ENGINEERING MATHEMATICS I | 4.0 | FE1007 | Lec: 39 hrs Tut: 13 hrs | Fourier analysis. Laplace transform. Partial differential equations. Numerical methods. probability. Mathematical statistics. |
| 2 | EE2007 | ENGINEERING MATHEMATICS II | 4.0 | FE1007 | Lec: 39 hrs Tut: 13 hrs | Linear Algebra. Complex variables. Vector differential calculus. Vector integral calculus. |
| 2 | EE2008 | DATA STRUCTURES AND ALGORITHMS | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Introduction. Principles of algorithm analysis. Data structures. Searching. Sorting. Algorithm design techniques. |
| 2 | EE2010 | SIGNALS AND SYSTEMS | 3.0 | FE1006 & FE1007 | Lec: 26 hrs Tut: 13 hrs | Signals and systems. Linear time-invariant systems. Fourier series and fourier transform. Discrete-time fourier transform. Sampling. Modulation. |
| 2 | EE2071 | LABORATORY 2A | 1.0 | Nil | Lab: 39 hrs | Laboratory experiments to provide practical application and understanding of theories relating to electrical engineering fundamentals. |
| 2 | EE2072 | LABORATORY 2B | 1.0 | Nil | Lab: 39 hrs | Laboratory experiments to provide practical application and understanding of theories relating to electrical engineering fundamentals. |
| 2 | EE2079 | DESIGN AND INNOVATION PROJECT | 3.0 | Nil | 5 weeks (FT) | A five-week full-time practical training program designed to exercise creativity, stimulate innovation and cultivate technopreneur capabilities. The program focuses on an in-depth project covering the design, prototyping, testing and documentation of innovative electrical, electronic or IT products. Each project is carried out by students of group size of about twenty. It is supported by seminars on relevant issues in engineering innovation and design. It culminates in a project competition where the best projects vie for attractive prizes. |
| 2 | EE2090 | BASIC ENGINEERING MATHEMATICS | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Differentiation and integration. Ordinary differential equations. Partial differentiation. Multiple integrals. Infinite sequences and series. Vectors. |
| 2 | EE2091 | ENGINEERING PHYSICS | 4.0 | FE0001 | Lec: 39 hrs Tut: 13 hrs | Rotational dynamics. Oscillations and wave motion. Optics. Quantum physics. Electricity. Magnetism. |

DESCRIPTION OF EEE COURSES

| Year | Course Code | Course Title | Acad Units | Pre-Requisite | Contact Hours | Course Descriptions |
|------|-------------|--------------------------------------|------------|-----------------------|----------------------------|---|
| 2 | FE0001 | FOUNDATION PHYSICS | 3.0 | GCE 'O' Level Physics | Lec: 26 hrs Tut: 13 hrs | Kinematics. Dynamics. Oscillations and waves. Physics of fluids. Temperature and heat. Electricity. Magnetism and electromagnetism. |
| 2 | HW210 | TECHNICAL COMMUNICATION | 2.0 | Nil | Tut: 24 hrs | Principles of technical communication. Conveying technical information in writing and orally. Types of technical reports. Technical writing style. |
| 3 | EE3001 | ENGINEERING ELECTROMAGNETICS | 3.0 | EE2007 (Co-Req.) | Lec: 26 hrs Tut: 13 hrs | Static electric and magnetic fields. Maxwell's equations. Wave equation and uniform plane waves. Electromagnetic energy transfer. Reflection of electro-magnetic waves. Transmission lines. |
| 3 | EE3002 | MICROPROCESSORS | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Microprocessor fundamentals. Assembly language programming. I/O interfacing. Protected mode operation. |
| 3 | EE3003 | INTEGRATED ELECTRONICS | 3.0 | EE2002 | Lec: 26 hrs Tut: 13 hrs | Feedback amplifier. Voltage reference and current sources. Operational amplifier circuits. Applications of operational amplifiers. Power supplies. CMOS logic circuits. CMOS flip-flops and memories. |
| 3 | EE3011 | MODELLING AND CONTROL | 3.0 | EE2006 | Lec: 26 hrs Tut: 13 hrs | Introduction to control systems. System modelling. Time domain analysis. Performance of Feedback control systems. Root-locus technique. Frequency domain analysis. Relative stability and design specifications. System compensation and pid control. |
| 3 | EE3012 | COMMUNICATION PRINCIPLES | 3.0 | EE2010 | Lec: 26 hrs Tut: 13 hrs | Review of signal analysis and noise representations. Linear modulation. Frequency and phase modulation. Digital communication principles. |
| 3 | EE3013 | SEMICONDUCTOR DEVICES AND PROCESSING | 3.0 | EE2003 | Lec: 26 hrs Tut: 13 hrs | Fundamentals of bipolar devices. MOS devices. Crystal growth and wafer preparation. Deposition techniques. Diffusion and thermal oxidation. Ion implantation. Lithography. Etching. |
| 3 | EE3014 | DIGITAL SIGNAL PROCESSING | 3.0 | EE2010 | Lec: 26 hrs Tut: 13 hrs | Introduction. Discrete fourier transform (DFT) and fast fourier transform (FFT). Z-transform. Digital filter design. |
| 3 | EE3015 | POWER SYSTEMS AND CONVERSION | 3.0 | EE2005 | Lec: 26 hrs Tut: 13 hrs | Fundamentals of power systems. System operation and protection. Power conversion. Electromechanical power conversion systems. |
| 3 | EE3017 | COMPUTER COMMUNICATIONS | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Introduction to computer communications. Data communications fundamentals. Data link control. Local area networks. Internetworking. |
| 3 | EE3018 | INTRODUCTION TO PHOTONICS | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Geometrical Optics. Wave Optics. Propagation of light in Matters. Photon Optics. Laser Optics. Applications of Photonics. |

DESCRIPTION OF EEE COURSES

| Year | Course Code | Course Title | Acad Units | Pre-Requisite | Contact Hours | Course Descriptions |
|------|-------------|--------------------------------------|------------|--|----------------------------|--|
| 3 | EE3071 | LABORATORY 3 | 1.0 | Nil | Lab: 39 hrs | Laboratory experiments to provide practical application and understanding of theories relating to electrical engineering fundamentals. |
| 3 | EE3072 | PROJECT | 1.0 | Nil | Lab: 39 hrs | This course teaches the essential techniques for solving specific implementation problems either in control, communications, electronics, programming, or microprocessor systems for applications/implementation in a mobile robot platform. Each of the project modules is used to extend or enhance one aspect of the mobile robot's capabilities/functionality. In addition to tackling the individual projects, various issues and problems pertaining to the integrated engineering project of developing an intelligent mobile robot are also examined. |
| 3 | EE3079 | INDUSTRIAL ATTACHMENT | 10.0 | Year 3 Standings | 22 Weeks (FT) | <p>Industrial Attachment is a learning process which by exposing the students in real life engineering environment as part of an academic curriculum helps the students to develop and enhance academic, personal and professional competencies.</p> <p>Every participating organisation is required to provide an initial proposal of an attachment programme for each of the students. The attachment programme should have emphasis on applications, management and hands-on experience for the student.</p> |
| 4 | EE4001 | SOFTWARE ENGINEERING | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Introduction to software engineering. Software project management. Software requirements and specifications. Software design. Software testing and maintenance. |
| 4 | EE4040 | ENGINEER AND SOCIETY | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | The course comprises 4 main topics: Evolution of Modern Singapore; Technology & Society; Ethics and Professionalism and The Environment. The students are made aware of "Current Issues" at the time of their study. |
| 4 | EE4041 | HUMAN RESOURCE MANAGEMENT | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Using case studies and current events to: understanding individual and group behavior in organizations; the impact of globalization, continuous learning, work values and corporate culture; visionary and transformational leadership strategies: motivation, teambuilding and talent development, ethical behavior and integrity; Managing work groups: organizational communications and conflict resolution strategies, leveraging on diversity; Quality and excellence concepts: stakeholders awareness, customer-centred mindset, people-centred management approaches, innovative adaptation to continuous change, learning organization, global talent search; Trade unions, collective bargaining and labour-management relations challenges and prospects. |
| 4 | EE4079 | FINAL YEAR PROJECT | 10.0 | Year 4 Standings. 86/59 AUs (excluding GER AUs) | - | Projects may include, but are not limited to, one or more of the following areas: Design, product development, Software development, Laboratory investigation, Computing and analysis, Field testing and instrumentation and Feasibility studies. Besides project proposals generated by its own academic staff, the School also works with outside partners including the A*STAR Research Institutes and industrial companies to propose relevant projects. |
| 4 | EE4105 | CELLULAR COMMUNICATION SYSTEM DESIGN | 2.0 | Nil | Lec: 13 hrs Tut: 26 hrs | The students will be involved in the planning and design of cellular and wireless personal communication systems at the system level. Issues such as the choice of modulation and channel coding schemes as well as multiple access methods will be dealt with. Fundamentals of digital signal processing will be briefly introduced. DSP techniques used in the design of baseband digital signal transmission and reception will be covered. Carrier-modulated signals, such as AM, QAM and PSK signals, used for transmission through band-pass channels will be discussed. Channel equaliser design for compensation of channel distortions and inter-symbol interference (ISI) will be dealt with. |

DESCRIPTION OF EEE COURSES

| Year | Course Code | Course Title | Acad Units | Pre-Requisite | Contact Hours | Course Descriptions |
|------|-------------|-------------------------------------|------------|---------------|----------------------------|--|
| 4 | EE4109 | MICROWAVE CIRCUIT AND SYSTEM DESIGN | 2.0 | Nil | Lec: 13 hrs Tut: 26 hrs | Students will be involved in the design of advanced wireless communication systems as well as microwave planar components. It will include the analysis, design and simulation of wireless communication and radar systems as well as the analysis, design and simulation of microwave integrated circuits. |
| 4 | EE4110 | OPTICAL COMMUNICATION SYSTEM DESIGN | 2.0 | Nil | Lec: 13 hrs Tut: 26 hrs | Students will be involved in the design of fibre optic communication systems. Issues such as light propagation, fibre characteristics and classification, fibre cables, connectors and splices, optical transmitters and receivers, optical amplifier and filter, optical coupler and wavelength converter, nonlinear effects in WDM systems, and system design methodology are covered. |
| 4 | EE4151 | RF AND MICROWAVE ENGINEERING | 3.0 | EE3001 | Lec: 26 hrs Tut: 13 hrs | RF and microwave circuit analysis. Planar transmission lines and discontinuities. Planar couplers and filters. |
| 4 | EE4152 | DIGITAL COMMUNICATIONS | 3.0 | EE3012 | Lec: 26 hrs Tut: 13 hrs | Digital communication principles. Information theory. Error correcting codes. Optimum signal detection. |
| 4 | EE4153 | TELECOMMUNICATION SYSTEMS | 3.0 | EE3012 | Lec: 26 hrs Tut: 13 hrs | Telecommunication networks. Switching and signaling. Line transmission. Microwave communication systems. Optical fibre communication systems and applications. |
| 4 | EE4188 | WIRELESS COMMUNICATIONS | 3.0 | EE3012 | Lec: 26 hrs Tut: 13 hrs | Types of wireless systems. Radio frequency spectrum. Performance calculations. Cellular radio systems. |
| 4 | EE4189 | SPREAD SPECTRUM COMMUNICATIONS | 3.0 | EE3012 | Lec: 26 hrs Tut: 13 hrs | Advanced signal analysis and noise. Generation of spreading sequences. Fundamentals of spread spectrum. Analysis of spread spectrum systems. Applications of spread spectrum systems. |
| 4 | EE4207 | CONTROL ENGINEERING DESIGN | 2.0 | Nil | Lec: 13 hrs Tut: 26 hrs | Discrete-time control systems. Z-transform. Root locus method. Frequency response method. State space design. Pole placement. State observers. Servo systems. |
| 4 | EE4208 | INTELLIGENT SYSTEM DESIGN | 2.0 | Nil | Lec: 13 hrs Tut: 26 hrs | This module covers the design of intelligent systems such as intelligent automation systems, neurofuzzy systems and intelligent vision systems. Currently, the focus is on the design of computer vision systems. |
| 4 | EE4265 | PROCESS CONTROL SYSTEMS | 3.0 | EE3011 | Lec: 26 hrs Tut: 13 hrs | Introduction. Process models. Feedback control systems. Complex control structures. Feedback controller design for time delay systems. Advanced control techniques. Process control applications. |
| 4 | EE4266 | COMPUTER VISION | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Image representation. Preprocessing techniques. Segmentation and representation. Recognition and machine intelligence. Machine vision applications. |
| 4 | EE4268 | ROBOTICS AND AUTOMATION | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Introduction to robotics. Coordinate transformation and kinematics. Trajectory planning. Control techniques. Sensors and devices. Robot applications. |

DESCRIPTION OF EEE COURSES

| Year | Course Code | Course Title | Acad Units | Pre-Requisite | Contact Hours | Course Descriptions |
|------|-------------|--|------------|---------------|----------------------------|---|
| 4 | EE4273 | DIGITAL CONTROL SYSTEMS | 3.0 | EE3011 | Lec: 26 hrs Tut: 13 hrs | Signal conversion and reconstruction. Analysis and design of digital control systems. State variable techniques and implementation issues. |
| 4 | EE4285 | COMPUTATIONAL INTELLIGENCE | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Introduction. Fundamental concepts and models of artificial neural systems. Neural network learning paradigms and architectures. Applications of artificial neural networks. Fuzzy sets. Fuzzy inference mechanisms, applications of fuzzy logic. Genetic algorithms and its applications in optimization. |
| 4 | EE4303 | MIXED-SIGNAL IC DESIGN | 2.0 | EE3003 | Lec: 13 hrs Lab: 26 hrs | Mixed-Signal design. Design practice. |
| 4 | EE4304 | RADIO FREQUENCY INTEGRATED SYSTEM DESIGN | 2.0 | EE3003 | Lec: 13 hrs Lab: 26 hrs | RF integrated systems. Design and simulation of RF circuits. |
| 4 | EE4305 | DIGITAL DESIGN WITH HDL | 2.0 | EE2004 | Lec: 13 hrs Lab: 26 hrs | Digital design using hardware description language. Design practice. |
| 4 | EE4340 | VLSI SYSTEMS | 3.0 | EE2004 | Lec: 26 hrs Tut: 13 hrs | VLSI system architecture and memory management. Parallel processing. High speed synchronous and asynchronous design. System noise consideration. VLSI system verification and testability. System reliability. |
| 4 | EE4341 | ADVANCED ANALOG CIRCUITS | 3.0 | EE3003 | Lec: 26 hrs Tut: 13 hrs | Wide-bandwidth amplifiers. Low noise circuits. Power amplifiers. Current-mode circuits. Active filters. |
| 4 | EE4343 | RADIO FREQUENCY CIRCUITS | 3.0 | EE3003 | Lec: 26 hrs Tut: 13 hrs | Radio-frequency input-circuits and impedance matching. Small-signal radio-frequency amplifiers. Mixers. RF power amplifiers. Oscillators. Phase-locked loop circuits. |
| 4 | EE4344 | ANALYSIS AND DESIGN OF INTEGRATED CIRCUITS | 3.0 | EE3003 | Lec: 26 hrs Tut: 13 hrs | CMOS device modelling. Current mirrors: operation and design considerations on impedances, accuracy and matching. Layout considerations. Voltage references: voltage and current mode techniques. |
| 4 | EE4413 | DSP SYSTEM DESIGN | 2.0 | Nil | Lec: 26 hrs Tut: 13 hrs | This course introduces the basic rules, procedures, techniques and components for designing a DSP system. The course also includes an assignment for the students to apply the knowledge and techniques learnt. DSP architectures, addressing mode, DSP fixed-point programming style, real-time implementation issues, DSP integrated development environment. |
| 4 | EE4455 | EMBEDDED SYSTEMS | 3.0 | EE3002 | Lec: 26 hrs Tut: 13 hrs | Introduction to embedded system and embedded processors. Hardware of embedded systems. Software of embedded systems. Real-Time embedded system. Embedded media processing components design. Standards. |
| 4 | EE4475 | AUDIO SIGNAL PROCESSING | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Fundamentals of human hearing. Room acoustics. 3-D sound synthesis. Sound compression. |

DESCRIPTION OF EEE COURSES

| Year | Course Code | Course Title | Acad Units | Pre-Requisite | Contact Hours | Course Descriptions |
|------|-------------|--|------------|---------------|----------------------------|---|
| 4 | EE4476 | IMAGE PROCESSING | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Digital image fundamentals. Image transforms. Image enhancement. Image restoration. Image compression. Nonlinear image processing. Applications. |
| 4 | EE4478 | DIGITAL VIDEO PROCESSING | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Fundamentals of digital video. Block-matching motion estimation and fast algorithms. Video coding basics. Video coding standards. Video streaming and processing. Applications. |
| 4 | EE4483 | ARTIFICIAL INTELLIGENCE AND DATA MINING | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Problem solving techniques. Machine learning and applications to data mining. |
| 4 | EE4490 | MULTIMEDIA SYSTEMS | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Fundamentals of multimedia systems. Overview of digital image and video coding standards. Overview of digital audio coding standard. Multimedia communications. Multimedia applications. |
| 4 | EE4503 | POWER ENGINEERING DESIGN | 2.0 | EE3015 | Lec: 13 hrs Lab: 26 hrs | In this design course, the students will apply the concepts of various power system analysis techniques and system performance criteria in designing a medium/low voltage transmission system and protection schemes for some typical industrial distribution networks. Students are required to carry out the detailed design with hands-on exercise and extensive use of computer simulation software. Students are also required to verify the results of the final design to meet specifications. |
| 4 | EE4504 | DESIGN OF CLEAN ENERGY SYSTEMS | 2.0 | EE3015 | Lec: 13 hrs Lab: 26 hrs | Clean and renewable energy sources. Wind energy turbines and systems. Solar photovoltaic devices and systems. System-level designs. Analytical design and analysis. Modelling and simulation. Hands-on sessions using commercial software. Comprehensive case studies of wind and solar energy systems. |
| 4 | EE4530 | POWER SYSTEM ANALYSIS AND CONTROL | 3.0 | EE2005 | Lec: 26 hrs Tut: 13 hrs | Power flows. Active power and frequency control. Reactive power and voltage control. Power system stability. |
| 4 | EE4532 | POWER ELECTRONICS AND DRIVES | 3.0 | EE2005 | Lec: 26 hrs Tut: 13 hrs | Introduction to power electronic systems and devices. Uncontrolled and controlled rectifiers. Hard switching power converters. Principles and control of motor drives. |
| 4 | EE4533 | POWER APPARATUS AND SYSTEM PROTECTION | 3.0 | EE2005 | Lec: 26 hrs Tut: 13 hrs | Power apparatus and transients. High voltage testing and maintenance. Fault analysis. Protection of distribution systems. Protection of power apparatus. |
| 4 | EE4534 | MODERN DISTRIBUTION SYSTEMS WITH RENEWABLE RESOURCES | 3.0 | EE3015 | Lec: 26 hrs Tut: 13 hrs | Operation of distribution systems. Power quality. Solar power systems. Wind power systems. |
| 4 | EE4613 | CMOS PROCESS & DEVICE SIMULATION | 2.0 | EE3013 | Lec: 13 hrs Lab: 26 hrs | Virtual Wafer Fabrication. Virtual Device Characterization. Virtual Process Integration. |

DESCRIPTION OF EEE COURSES

| Year | Course Code | Course Title | Acad Units | Pre-Requisite | Contact Hours | Course Descriptions |
|------|-------------|---|------------|---------------|----------------------------|---|
| 4 | EE4614 | DEVICE PARAMETER EXTRACTION AND LAYOUT IMPLEMENTATION | 2.0 | Nil | Lec: 13 hrs Lab: 26 hrs | Virtual Device Characterization. Transistor Parameter Extraction. Circuit Simulation and Mask Layout Design. |
| 4 | EE4645 | MICROFABRICATION ENGINEERING | 3.0 | EE3013 | Lec: 26 hrs Tut: 13 hrs | Crystal growth and wafer preparation. Vacuum science and plasma. Rapid thermal processing. Advanced deposition techniques. Process integration. Semiconductor characterization techniques. IC manufacturing. |
| 4 | EE4646 | VLSI TECHNOLOGY | 3.0 | EE3013 | Lec: 26 hrs Tut: 13 hrs | Advanced MOS structures and process technology. Advanced bipolar transistors and process technology. MOS scaling rules and small geometry effects. CMOS latchup and isolation. |
| 4 | EE4647 | MICROELECTRONIC DEVICES | 3.0 | EE2003 | Lec: 26 hrs Tut: 13 hrs | Bipolar devices. MOS physics. MOSFET device characteristics and modelling. Introduction to heterojunction devices. |
| 4 | EE4648 | FLAT PANEL DISPLAY TECHNOLOGIES | 3.0 | EE2003 | Lec: 26 hrs Tut: 13 hrs | Overview of display technologies. Ergonomics of displays. Liquid crystal cell. Liquid crystal display technologies. Electroluminescent devices. Plasma displays. Field emission displays. Thin film transistors. Recent advances in display technologies. |
| 4 | EE4694 | IC RELIABILITY AND FAILURE ANALYSIS | 3.0 | EE3013 | Lec: 26 hrs Tut: 13 hrs | Basic reliability engineering concept. Statistical aspect of reliability and data handling. Microelectronic device failure mechanisms. Failure analysis techniques and instrumentation. |
| 4 | EE4695 | SEMICONDUCTOR PHYSICS | 3.0 | EE2003 | Lec: 26 hrs Tut: 13 hrs | Elements of quantum mechanics. Crystal structure and diffraction. Thermal properties of semiconductor crystals. Outline of statistical mechanics and quantum theory of electrons in periodic lattices. Optical and transport properties of semiconductors. |
| 4 | EE4705 | OBJECT-ORIENTED PROGRAMMING | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Introduction. C++ fundamental. Object-oriented programming in C++. Graphical user interface programming. |
| 4 | EE4706 | OBJECT ORIENTED SOFTWARE ENGINEERING DESIGN | 2.0 | Nil | Lec: 13 hrs Lab: 26 hrs | This course consists of four parts: classroom lessons, laboratory sessions, project assignment, and open-book examination. The classroom lessons cover the basic concepts and techniques. The laboratory sessions provide a hands-on opportunity to digest the lessons in the classroom. The exercises and assignment provide an opportunity to put the all lessons learned into practice, it also serves as a part of the final assessment together with the written examination. The content covers an introduction to OOP, OOAD, OO Software Development. Design and development of a mini software project. |
| 4 | EE4717 | WEB APPLICATION DESIGN | 2.0 | Nil | Lec: 13 hrs Lab: 26 hrs | This design course will equip students with principles, knowledge and skills for the design and construction of web-enabled Internet applications. It deals with challenges raised in wide-area distributed computing, including persistence, concurrency and transaction, as well as technologies for creating, managing, and tracking web-interaction state in the environments where the connections are inherently unreliable and protocols are inherently stateless. |

DESCRIPTION OF EEE COURSES

| Year | Course Code | Course Title | Acad Units | Pre-Requisite | Contact Hours | Course Descriptions |
|------|-------------|-------------------------------------|------------|---------------|----------------------------|---|
| 4 | EE4718 | ENTERPRISE NETWORK DESIGN | 2.0 | EE3017 | Lec: 13 hrs Lab: 26 hrs | This course covers network technologies and protocols, network planning and design methodologies. Besides acquiring the theoretical background in enterprise networking, students will learn to set up, configure and interconnect an IP network in the lab sessions. Network monitoring and management tools will also be introduced to the students. |
| 4 | EE4756 | COMPUTER ARCHITECTURE | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Fundamental of Computer Design. Instruction Set Architecture. Memory-system Architecture. Buses, Storage Devices and I/O System. RISC Design. Pipelining. |
| 4 | EE4757 | COMPUTER SYSTEM SOFTWARE | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Assemblers, Loaders, Linkers. Introduction to Compilers. Principles of Operating Systems. Implementation Examples of Operating Systems. |
| 4 | EE4758 | COMPUTER SECURITY | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Introduction. Secret / public-key cryptosystems. Secure protocols. Electronic election and digital money. Intrusion detection and database security. |
| 4 | EE4761 | COMPUTER NETWORKING | 3.0 | EE3017 | Lec: 26 hrs Tut: 13 hrs | Computer network architecture and services. Internetworking protocols and routing. Transport protocols. Application services and multimedia networking. |
| 4 | EE4762 | WEB SERVICES | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Introduction. Web services architecture. Infrastructure support for web services. Web services standards and protocols. Web services development platforms and tools. |
| 4 | EE4791 | DATABASE SYSTEMS | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Introduction to Database and Data Modelling. Logical Database Design and The Relational Model. The Structured Query Language (SQL). Physical Database Design. Database Administration. Client/Server Database. Data Warehousing. |
| 4 | EE4815 | OPTICAL DESIGN | 2.0 | EE3018 | Lec: 13 hrs Lab: 26 hrs | This course teaches some of the key concepts relating to optical design. The course discusses the requirements of optical elements in photonic systems. Based on this information, two design exercises are carried out. In the first design module, the students will design and test diffractive optical elements. In the second, commercial software is introduced and used to develop and optimise an imaging lens system. |
| 4 | EE4816 | PHOTONIC DEVICES AND SYSTEMS DESIGN | 2.0 | Nil | Lec: 13 hrs Lab: 26 hrs | This course teaches the principles and advanced concepts relating to photonic device performance, characterization, and their implementation in photonics systems. Students will study device characterisation techniques and will characterise the performance of optoelectronic devices. This course will also teach the principles and advanced concepts of optical fibres and components and their integration with optical communications systems. Students will learn the techniques involved in the design of optical communication systems. Exercises will also be carried out in the design of lasers and fibre optic communication systems. |
| 4 | EE4836 | SEMICONDUCTOR OPTOELECTRONICS | 3.0 | EE2003 | Lec: 26 hrs Tut: 13 hrs | Semiconductor Photonic Materials. Photodetectors. Light Emitting Diodes. Semiconductor Lasers. Modulation and Amplification. |

DESCRIPTION OF EEE COURSES

| Year | Course Code | Course Title | Acad Units | Pre-Requirement | Contact Hours | Course Descriptions |
|------|-------------|--|------------|-----------------|----------------------------|--|
| 4 | EE4838 | LASER ENGINEERING AND APPLICATIONS | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Laser Theory. Cavity Design. Laser Techniques. Design of Laser Systems. Applications in Various Areas. |
| 4 | EE4839 | FIBRE OPTIC COMMUNICATIONS | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Introduction to Fibre Optic Communications. Optical Fibre Characteristics. Light Sources, Transmitters, Receivers, Regenerators and Amplifiers. Passive and Active Components. System Concepts and System Design. Optical Networks. |
| 4 | EE4840 | BIOPHOTONICS | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Fundamentals of Biophotonics, Bioimaging Principles and Techniques, Optical Biosensors, Laser-Photomedicine, Applications of Biophotonics. |
| 4 | EE4901 | BIOMEDICAL CONTROL SYSTEM DESIGN | 2.0 | Nil | Lec: 13 hrs Lab: 26 hrs | This design course is an introduction to biomedical system modeling and control, focusing on the synthesis of control techniques for biomedical systems. The musculoskeletal and cardiovascular systems will be used as illustrative examples. |
| 4 | EE4902 | DESIGN OF MEDICAL INFORMATION PROCESSING SYSTEMS | 2.0 | Nil | Lec: 13 hrs Lab: 26 hrs | This module is on the design of software/hardware systems for biomedical signal and image processing and analysis. |
| 4 | EE4903 | PHYSIOLOGICAL SYSTEMS ANALYSIS | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | System Modelling, Control and Analysis. The Respiratory System. The Cardiovascular System. The Neuromuscular System. The Renal System. |
| 4 | EE4904 | BIOMEDICAL INSTRUMENTATION | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Introduction to Biomedical Instrumentation. Biopotential Electrodes. Electrocardiography. Blood Pressure, Heart Sounds and Blood Flow. Respiratory System Measurements. Instrumentation for Medical Imaging. Therapeutic Devices. Electrical Safety in Hospitals. |
| 4 | EE4905 | BIOMEDICAL SIGNAL PROCESSING | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Introduction to Biomedical Signals. Acquisition and Modelling of Biomedical Signals. Digital Filters with Applications to Biomedical Signals. Power Spectral Density (PSD) Estimation. Non-Stationary Biomedical Signal Processing. Case Study. |
| 4 | EE4906 | MEDICAL IMAGING SYSTEMS | 3.0 | Nil | Lec: 26 hrs Tut: 13 hrs | Fundamentals of Medical Imaging. Medical Image Processing. X-ray Imaging and Computed Tomography (CT). Magnetic Resonance Imaging (MRI). Ultrasound Imaging. |
| 4 | HW310 | PROFESSIONAL COMMUNICATION | 2.0 | HW001 | Lec: 12 hrs Tut: 12 hrs | Business writing. Career strategies: résumés, cover letters, interviews. Oral presentation skills. Intercultural communication. Meetings and conflict management. |
| GER | EE8061 | INNOVATION AND TECHNOLOGY MANAGEMENT | 3.0 | Nil | 36 hrs | The course aims to provide a broad understanding of the dynamics of technological development through innovation and the related management issues and practices. <u>Contents:</u> Overview. Patterns of Technology Development. External Environment. Internal Environment and Processes. Financial Fundamentals, Funding and Risk Management. |

DESCRIPTION OF EEE COURSES

| Year | Course Code | Course Title | Acad Units | Pre-Requisite | Contact Hours | Course Descriptions |
|------|-------------|---|------------|---------------|---------------|--|
| GER | EE8084 | CYBER SECURITY | 3.0 | Nil | 26 hrs | <p>The objective of this course is to provide students with basic appreciation and understanding of the underlying security issues and implications of the use of various networked systems and electronic devices in the modern cyber-society from a user perspective. Topics to be covered include overview of information systems and devices in a global network environment, threats to information systems and devices, security models, and concepts for secrecy, integrity and availability. Other topics of security concerns will also be explored: evaluations of secure information systems, security requirements analysis, security management policies, security trends and emerging technologies.</p> <p><u>Contents:</u> Introduction to Cyber Crimes and Security Issues in a Cyber-environment. System Perspectives of Information Security: Issues and Solution Approaches. Concepts for Secrecy, Integrity and Availability. Security Solutions and Models. Security Planning & Management. Security Cases and Technology Trends.</p> |
| GER | EE8085 | ELECTRICITY FOR MODERN SOCIETY | 3.0 | Nil | 39 hrs | <p>The objective of this course is to impart to students knowledge pertaining to the generation and distribution of electricity, and how electricity usage impacts on a modern society. Essential aspects of power system technology, electricity utilization and recent developments on electricity industry restructuring would be discussed. Energy conservation and safety issues will also be covered.</p> <p><u>Contents:</u> Conventional sources of electricity generation, transmission and distribution systems. Clean/green power and renewable sources. Liberalization of electricity industry and energy procurement. Electricity utilization and quality. Energy conservation. Safety.</p> |
| GER | EE8086 | ASTRONOMY – STARS, GALAXIES AND COSMOLOGY | 3.0 | Nil | 39 hrs | <p>The basic goal of this course is to give students a fundamental understanding of astronomy. Through the course, the students will learn about the birth of the universe, the origin of galaxies, the evolution of stars and the formation of planets. Our solar system will be one of the main topics to be studied. Some unanswered mysteries of the universe and mankind will be discussed and hopefully lead the students to further their own exploration. During this course, the diverse facts that form the context of a science will be delivered. During the course, students will also have opportunities to participate in various practical sessions and trips may be organized where appropriate.</p> <p><u>Contents:</u> The origin of modern astronomy – an introduction, Learn to read the stars, Overview of the solar system, The beginning and life of stars, The mysteries ahead, The future of space exploration.</p> |
| GER | EE8087 | LIVING WITH MATHEMATICS | 3.0 | Nil | 26 hrs | <p>Mathematics plays a fundamental role in everyday life. The purpose of this course is to explore the various topics of mathematics, e.g. algebraic equations, trigonometry, conic sections, functions, differentiation and integration, which have direct applications in real world problems. Students will learn (i) how to translate real life problems into appropriate mathematical context and (ii) skills and techniques for solving these problems.</p> <p><u>Contents:</u> Solving algebraic equations and applications. Trigonometry with applications. Conic sections: straight line, circle, hyperbola, parabola, ellipse. Planets of the universe. Functions in daily life. Applications of differentiation and integration. Personal finance.</p> |
| GER | EE8091 | SOUND IN OUR DAILY LIFE | 3.0 | Nil | 39 hrs | <p>To teach the students some basic knowledge of sounds and some of their applications in daily life.</p> <p><u>Contents:</u> Preliminary acquaintance of sound; Sound sources and radiation; Wave motion and some useful phenomena; Sound in a room, environment noise, hearing, speech, psychoacoustics and measurement of sound; Underwater sound, ultrasound and applications; History and future of sound research.</p> |

DESCRIPTION OF EEE COURSES

| Year | Course Code | Course Title | Acad Units | Pre-Requisite | Contact Hours | Course Descriptions |
|------|-------------|--------------------------------------|------------|---------------|---------------|--|
| GER | EE8092 | DIGITAL LIFESTYLE | 3.0 | Nil | 39 hrs | iPod and MP3 players, 3G mobile phones, Multi-megapixel digital cameras, Spy cameras, 3CCD video camcorders, Intel Pentium Core-Duo Processors, Xbox/Playstation, LCD/Plasma/HD TVs, and Dolby Digital Surround Sound play a big part in our lives today, but do you really know how these digital gadgets and technologies work? Do you know how to choose among the various brands and features that best suit your budget and requirements? Enroll into this course, and you won't be baffled by salespersons, advertisements and terminologies. The digital gadgets and lifestyle covered in this course include: Home Entertainment Systems, Game Consoles, Digital Audio Players and Systems, Digital Cameras and Video Camcorders, Personal Computers, Mobile Phones and PDA. <u>Contents:</u> Home Entertainment Systems and Game Consoles. Digital Audio Systems. Digital Cameras and Video Camcorders. Personal Computers. Mobile Phones and PDA. |
| ICT | IC0101 | INTERNET FUNDAMENTALS | 3.0 | Nil | 26 hrs | Internet Perspective. Internet Applications. Transport and Network Layers. Local Area Network Infrastructure. Network Security. |
| ICT | IC0102 | WEB-BASED INFORMATION SYSTEMS | 3.0 | Nil | 26 hrs | Introduction. Enabling technologies. Development of web based information systems. Case study. Impacts and non-technical issues. |
| ICT | IC0103 | E-COMMERCE TECHNOLOGY | 3.0 | Nil | 26 hrs | Introduction to electronic commerce. Electronic commerce infrastructure. Information security technology. Electronic payment technology. Electronic commerce applications and technology trends. |
| ICT | IC0204 | INTRODUCTION TO SOFTWARE ENGINEERING | 3.0 | Nil | 26 hrs | Introduction. Project management. Requirements specification and analysis. Software design. Software testing and maintenance. |
| ICT | IC0205 | DATABASE SYSTEMS | 3.0 | Nil | 26 hrs | Introduction to Database and Data Modelling. Logical Database Design and The Relational Model. The Structured Query Language (SQL). Physical Database Design. Database Administration. Client/Server Database. Data Warehousing. |
| ICT | IC0206 | WIRELESS NETWORKS | 3.0 | Nil | 26 hrs | Basic Concepts of Wireless Communications. Basic Cellular Concepts and Infrastructures. Wireless Local Area Networks. Wireless Network Protocols. |