Subject/module information (Overview of Syllabus)
The syllabus content is subject to change to accommodate industry changes. Please note: A more detailed syllabus is available at the department or in the study guide that is applicable to a particular subject. On 19 October 2016, the syllabus content was defined as follows:

A

ADVANCED CONTROL SYSTEMS V (ESI5010)  CONTINUOUS ASSESSMENT
(Subject custodian: Department of Electrical Engineering)
A selection of advanced control system topics, such as fuzzy control, optimal and multivariable control, robust and non-linear control. (Total tuition time: ± 90 hours)

ADVANCED EMBEDDED SYSTEMS V (ESI5011)  CONTINUOUS ASSESSMENT
(Subject custodian: Department of Electrical Engineering)
A selection of advanced embedded system topics, such as multi and co-processor design, real-time and high-speed design. (Total tuition time: ± 90 hours)

B

BIO-SYSTEMS I (BIS101T)  1 X 3-HOUR PAPER
(Subject custodian: Department of Electrical Engineering)
An engineering approach to the human body, with reference to medical terminology and the health care environment. Basic medical terminology. Organ systems: cell structure, movement structures, digestive system, ventilation, control and regulation. Special organ systems (the endocrine system), the thyroid gland. (Total tuition time: ± 70 hours)

C

CLINICAL ENGINEERING TECHNOLOGY MANAGEMENT IV (CTM401T)  1 X 3-HOUR PAPER
(Subject custodian: Department of Electrical Engineering)
Environment, research and development, the manufacturing process, acquisition, commissioning, support, replacement, communication skills, personnel structures, professional ethics. (Total tuition time: ± 70 hours)

COMMUNICATION SKILLS (EXTENDED) I (FPCOS03, FPCOSR3)  CONTINUOUS ASSESSMENT
(Subject custodian: Department of Applied Languages)
Speaking and communication skills, listening skills, reading for academic understanding, academic vocabulary, learning strategies and information gathering, writing, business and life skills. Communication theory. Oral presentation. Technical writing skills. Group communication skills. (Total tuition time: ± 120 hours)

COMMUNICATION SKILLS I (COS101T)  CONTINUOUS ASSESSMENT
(Subject custodian: Department of Applied Languages)
Communication theory, non-verbal communication (body language). Oral presentations, interviews, developing leadership and participation skills. Technical reports and correspondence. (Total tuition time: ± 64 hours)

COMPUTER NETWORKS IV (CNW401T)  1 X 3-HOUR PAPER
(Subject custodian: Department of Electrical Engineering)
Introduction, electrical interfacing, local area networks (LAN), wide area networks (WAN), Internet. (Total tuition time: ± 70 hours)

COMPUTER SKILLS (EXTENDED) I (FPCSK02, FPCSKR2)  CONTINUOUS ASSESSMENT
(Subject custodian: End User Computing Unit)
Students have to acquire theoretical knowledge (computing fundamentals) and practical skills as end-users in operating systems and MS Office Suite applications (MS Word, MS Excel, MS Excel Intermediate, MS PowerPoint, MS Access Essentials and MS Visio Professional), graphic design and dealing with the Internet, networks and how to search for information. Students will do online and computer-based tests. The modules are mapped with SAQA and IC3 Essential Skills for Digital Literacy (international certification). (Total tuition time: ± 80 hours)
COMPUTER SKILLS I (CSK101C) CONTINUOUS ASSESSMENT
(Subject custodian: End User Computing Unit)
Students have to acquire theoretical knowledge (computing fundamentals) and practical skills as end-users in operating systems and MS Office Suite applications (MS Word, MS Excel, MS Excel Intermediate, MS PowerPoint, MS Access Essentials and MS Visio Professional), graphic design and dealing with the Internet, networks and how to search for information. Students will do online and computer-based tests. The modules are mapped with SAQA and IC3 Essential Skills for Digital Literacy (international certification). (Total tuition time: ± 50 hours)

CONTROL SYSTEMS III (CSY321T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Electrical Engineering)
Mathematical modelling of systems, stability of linear feedback systems, steady state error, feedback-control characteristics and the root locus. (Total tuition time: ± 70 hours)

CONTROL SYSTEMS IV (CSY401T) 1 X 3-HOUR PAPER (OPEN BOOK)
(Subject custodian: Department of Electrical Engineering)
State-space analysis of linear systems. Design of compensators using gain adjustment, Lead and Lag compensators. Designs of compensators for linear systems, using state space techniques. (Total tuition time: ± 70 hours)

CONTROL SYSTEMS V (CSY501T) CONTINUOUS ASSESSMENT
(Subject custodian: Department of Electrical Engineering)
System modelling, discrete-time analysis and digital controller design. (Total tuition time: ± 90 hours)

CONVERSION SYSTEMS V (CVS501T) CONTINUOUS ASSESSMENT
(Subject custodian: Department of Electrical Engineering)
Converter theory, electromechanical systems, electric materials, EM field calculation, distribution (non-linear and transient problems, numerical methods, applications), transmission, planning and design. (Total tuition time: ± 90 hours)

DESIGN PROJECT: HEAVY CURRENT III (DPJ30ZT) CONTINUOUS ASSESSMENT
(Subject custodian: Department of Electrical Engineering)
This subject covers the concepts and implementation of the design of power engineering systems. This includes the context of power engineering systems and components design (the technology-based organisation), systems engineering concepts (from problem-solving to design implementation), practical implementation, including circuit or system design, construction and documentation. Assessment is through open-book tests, a practical project, a research topic and a final examination. (Total tuition time: ± 70 hours)

DESIGN PROJECT: LIGHT CURRENT III (DPJ30YT) CONTINUOUS ASSESSMENT
(Subject custodian: Department of Electrical Engineering)
This subject covers the concepts and implementation of the design of light current systems. This includes the context of electronic, telecommunications, digital technology, medical technology, or control technology systems and components design (the technology-based organisation), systems engineering concepts (from problem-solving to design implementation), practical implementation, including circuit design, construction and documentation. Assessment is through open-book tests, a practical project, a research topic and a final examination. (Total tuition time: ± 70 hours)

DIGITAL COMMUNICATION II (DCO201T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Electrical Engineering)
Networks, OSI model, implementation, protocols, services. (Total tuition time: ± 70 hours)

DIGITAL COMMUNICATION V (ESI5001) CONTINUOUS ASSESSMENT
(Subject custodian: Department of Electrical Engineering)
Fourier analysis and filtering, probability and stochastic processes, information theory and entropy, advanced modulation techniques, block and convolutional coding, performance analysis, networking fundamentals, system modelling. (Total tuition time: ± 90 hours)
DIGITAL COMMUNICATIONS V (DCO501T) CONTINUOUS ASSESSMENT
*(Subject custodian: Department of Electrical Engineering)*
Spectral analysis of common electronic signals: Fourier series and Fourier transform application. Source coding. Channel effect on symbol transmission and inter-symbol interference (ISI) control. Bandpass and multi-level digital modulation: generation, detection, probability of error, bandwidth efficiency, and applications. Channel coding and coding for reliable transmission over the channel. (Total tuition time: ± 90 hours)

DIGITAL CONTROL V (ESI5003) CONTINUOUS ASSESSMENT
*(Subject custodian: Department of Electrical Engineering)*
System modelling, discrete-time analysis and digital controller design. (Total tuition time: ± 90 hours)

DIGITAL CONTROL SYSTEMS IV (DCS401T) 1 X 3-HOUR PAPER (OPEN BOOK)
*(Subject custodian: Department of Electrical Engineering)*
Discrete-time models and sampled data systems, difference equations, mathematical representation of the sampling process using the Z-transform, analysis of sampled data systems, stability considerations of sampled data systems, design of compensation for sampled data systems, using transform techniques. (Total tuition time: ± 70 hours)

DIGITAL ELECTRONICS V (ESI5002) CONTINUOUS ASSESSMENT
*(Subject custodian: Department of Electrical Engineering)*
Analysis of advanced digital electronic circuits, best practice design and prototyping principles. (Total tuition time: ± 90 hours)

DIGITAL SIGNAL PROCESSING IV (DSP401T) 1 X 3-HOUR PAPER
*(Subject custodian: Department of Electrical Engineering)*
Introduction to digital signal processing. Sampling analogue signals that are to be converted into their discrete counterparts. The characteristics of discrete-time signals and systems. The three different domains that discrete-time signals are represented in. Time-domain representation and analysis of discrete-time signals and systems (using convolution and difference equations), frequency-domain (Discrete Fourier Transform, Fast Fourier Transform) representation and analysis and the z-Transform. Applications of digital signal processing; for example, digital filter design. (Total tuition time: ± 70 hours)

DIGITAL SYSTEMS I (DSY131T) 1 X 3-HOUR PAPER
*(Subject custodian: Department of Electrical Engineering)*
Basic components of digital circuits, namely NOT, AND and NOR gates. How more complex gates and logic functions can be built from the basic gates. Boolean algebra and Karnaugh maps are used to simplify functions. Combinational logic circuits, including adders, comparators, decoders, encoders, multiplexers, demultiplexers and error control circuits. Binary, octal, decimal and hexadecimal numbers and operations. Basic components of sequential circuits, namely latches and flip-flops. Counters. (Total tuition time: ± 70 hours)

DIGITAL SYSTEMS II (DSY231T) 1 X 3-HOUR PAPER
*(Subject custodian: Department of Electrical Engineering)*
How more complex memory components, such as counters and registers, can be built from the basic components. Different analogue-to-digital and digital-to-analogue converters. Introduction to microprocessor systems and programmable interface control devices (PICs). TTL and CMOS-integrated circuit technologies and electronic display units. Introduction to programmable logic devices (PLD, EPLD, FPGA). (Total tuition time: ± 70 hours)

DIGITAL SYSTEMS III (DSY341T) 1 X 3-HOUR PAPER
*(Subject custodian: Department of Electrical Engineering)*
The emphasis is on computer memory and the application of a micro controller. Characteristics of Read-Only Memories (ROM, EPROM, EEPROM, FLASH and RAM). Expansion of memory such as data bus, memory locations (size) and a combination of both. The microcontroller architecture, memory arrangements of the microcontroller, interrupts and vector addresses, timers/counters and serial communication as well as the connection and control of peripheral devices such as ADC’s, keypads, and LCD displays will be examined. The design and implementation of software and hardware for applications is supported by flow charts, assembly language and C language and forms and important component of the subject. After completion of the subject a student will be able to design and write programs to solve real life problems in industry. (Total tuition time: ± 70 hours)
ECONOMICS AND POLICY V (EYE501T)

E (Subject custodian: Department of Electrical Engineering)

Energy economics aims to give students the essential knowledge that is needed to understand, analyse, assess and manage resources, economic and environmental interactions, the interactions and interrelationship between energy, economic and environmental systems in relation to the challenges of risks reduction from climate change. The subject is expected to equip the students with policy-making, management of sustainability issues and energy modelling. It will focus on issues such as economics and policies affecting the energy industry globally. (Total Tuition time: ± 90 hours)

ELECTRIC MACHINES (EIE301T)

1 X 3-HOUR PAPER

(E Subject custodian: Department of Electrical Engineering)

A variety of electrical motors and generators are used on a large scale in the industry. This subject serves as an introduction to electrical machines and provides exposure to the principles on which such machines operate. Single-phase transformers, induction machines and direct-current machines are discussed in this subject. (Total tuition time: ± 70 hours)

ELECTRICAL DISTRIBUTION III (ELD331T)

1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)

The three major components of a power system: generation, transmission and distribution. Theory and applications: load curves, economics of power generation and tariffs of supply, power factor improvement, power supply systems, design and performance of overhead transmission lines, distribution systems and underground cables. (Total tuition time: ± 70 hours)

ELECTRICAL ENGINEERING (EXTENDED) I (FPEEN01, FPEENR1)

1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)

Module 1: Introduction to engineering, factory safety, measurements, engineering materials, projects. Module 2: Lettering, line work and freehand sketches, geometric constructions, fasteners, dimensioning, methods of projections, sectioning, interpenetration curves and pipe developments, conversions: imperial to metric, terms and abbreviations used in engineering drawing, piping diagrams. The correct use of SI units and their applications, the construction and maintenance of batteries, a network analysis of direct current circuits and AC theory, a study of various measuring instruments. An investigation into the effects of magnetic lines of force, the application and use of magnetic fields, inductance and the factors affecting it, capacitors and their operation. (Total tuition time: ± 140 hours)

ELECTRICAL ENGINEERING I (EEN111T)

1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)

The correct use of SI units and their applications, the construction and maintenance of batteries, a network analysis of direct current circuits and AC theory, a study of various measuring instruments. An investigation into the effects of magnetic lines of force, the application and use of magnetic fields, inductance and the factors affecting it, capacitors and their operation. (Total tuition time: ± 70 hours)

ELECTRICAL ENGINEERING II (EEN211T)

1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)

The analysis of networks by means of different methods, the effect of harmonics, three-phase systems, power factor correction, the operation of motors and transformers. (Total tuition time: ± 70 hours)

ELECTRICAL ENGINEERING III (EEN311T)

1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)


ELECTRICAL MACHINES AND DRIVES V (EEM501T)

CONTINUOUS ASSESSMENT

(Subject custodian: Department of Electrical Engineering)

Electrical machines modelling and analysis, dynamic and transient analysis of electrical machines, design of electrical machines, vector control of asynchronous machines, electronically commutated machines, special electrical machines (switch reluctance motors, permanent magnet machines, electrical actuators, etc.). (Total tuition time: ± 90 hours)
ELECTRICAL MACHINES II (EMA241T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)
Basic and applied knowledge and practical skills in the field of alternating current single-phase transformers and direct current machinery, namely their construction, principle of operation, operational theory, basic control and applications. The performance and applications of the machinery are closely linked with the improvement of their efficiency and general energy saving when applied in an industrial environment. (Total tuition time: ± 70 hours)

ELECTRICAL MACHINES III (EMA341T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)
Basic and applied knowledge and practical skills in the field of alternating current three-phase and single-phase machinery, namely their construction, principle of operation, operational theory, basic control and applications. The performance and applications of the machinery are closely linked with the improvement of their efficiency and general energy saving when applied in an industrial environment. (Total tuition time: ± 70 hours)

ELECTRICAL MACHINES IV (EMA411T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)
A deeper study of the design and maintenance of synchronous, induction and special machines, as well as the different control techniques and uses of those machines. (Total tuition time: ± 70 hours)

ELECTRICAL PROTECTION III (EPC321T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)
Introduction to electrical protection: main components. Symmetrical faults calculation and methods of limiting fault currents. Principle of operation of circuit breakers, fuses. Principle of operation of relays. Implement protective relaying schemes for alternators and transformers and busbars and lines. (Total tuition time: ± 70 hours)

ELECTRICAL PROTECTION IV (EPC401T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)
Symmetrical fault calculation in power systems, and determine their distribution taking into account transient and sub-transient components. Unsymmetrical fault calculation in power systems, and determine their distribution taking into account transformer connections. Select current transformers, circuit breakers, fuses, over-current relays and reclosers based on their characteristics, and evaluate their performance. Implement protective relaying schemes and techniques for unit and line protection. (Total tuition time: ± 70 hours)

ELECTRONIC COMMUNICATION II (ETC221T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)

ELECTRONIC COMMUNICATION III (ETC301T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)

ELECTRONIC COMMUNICATION IV (ETC401T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)
This subject is designed to equip students with the ability to design some components of communication systems that meet some specifications of overall performance, respecting some system constraints which are related to power, channel bandwidth, effect of noise and complexity of the system. ETC401T will give you the foundation needed for digital communication courses taught in higher academic degrees. (Total tuition time: ± 70 hours)
ELECTRONICS (EXTENDED) I (FPELC01, FPELCR1) 1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)
Module 1: Atom theory, electricity, magnetism and electromagnetism, inductors, capacitors, RLC networks.
Module 2: Atoms, molecules and ions, chemical formulas and equations, the periodic table, chemical bonding, nomenclature of inorganic compounds, phases of matter, solutions, the rate of chemical reactions, equilibrium in chemical reactions, acids and bases, oxidation, reduction and electrochemical cells. Introduction to electronic components, analysis and design using measuring instruments, diodes and rectification, simple power supplies, DC operating point of single-stage bipolar junction- and field-effect transistor amplifiers and basic operational amplifier configurations. Theory supported by assessed practical experiments in a laboratory, including soldered and proto-board projects. (Total tuition time: ± 140 hours)

ELECTRONICS I (ELC111T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)
Introduction to electronic components, analysis and design using measuring instruments, diodes and rectification, simple power supplies, DC operating point of single-stage bipolar junction- and field-effect transistor amplifiers and basic operational amplifier configurations. Theory supported by assessed practical experiments in a laboratory, including soldered and proto-board projects. (Total tuition time: ± 70 hours)

ELECTRONICS II (ELC211T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)
Modelling of electronic components and their application in circuit analysis and design. Unregulated and regulated linear power supplies with transistor and operational amplifier error correction, short-circuit protection and heat sink principles. Small-signal modelling of transistor amplifiers. Theory is supported by assessed project and practical experiments in a laboratory. (Total tuition time: ± 70 hours)

ELECTRONICS III (ELC331T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)
Analysis and design of analogue electronic subsystems through multistage amplifier modelling, feedback configurations, time and frequency principles in amplifier systems, oscillator circuits, electromagnetic compatibility and electrical noise principles. The student should demonstrate the principles of analogue circuit design and analysis. Assessment is through a demonstrated project and written examination. (Total tuition time: ± 70 hours)

ELECTRONICS IV (ELC411T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)
Design and analysis of electronic sub-systems by making use of basic building blocks of analogue integrated circuits. The emphasis is placed on transistor circuit design while giving enough information about operational amplifier that would enable the student to intelligent and innovative analogue electronic designs. PSPICE is widely used in this course as a most valuable design tool (student version of circuit maker or Orcad lite) in a practical project that runs through the semester. (Total tuition time: ± 70 hours)

EMBEDDED SYSTEMS V (EDD501T, ESI5004) CONTINUOUS ASSESSMENT

(Subject custodian: Department of Electrical Engineering)
VHDL and FPGA design and real-time DSP implementation. (Total tuition time: ± 90 hours)

ENERGY EFFICIENCY AND DSM V (EF5501T) CONTINUOUS ASSESSMENT

(Subject custodian: Department of Electrical Engineering)
The subject provides an introduction to energy management. Topics related to the design, implementation and assessment of energy management program (EMP) in relation to different environments such as residential, commercial, industrial, mining, transport etc. will be considered. The subject will also consider an introduction of demand-side management concepts for residential, commercial and industrial sectors. An introduction to Measurement and Verification (M&V) concepts will be covered. Corporate governance and good practices applicable to EMPs and M&V programs will also be covered. (Total Tuition time: ± 90 hours)

ENERGY SYSTEMS AND TECHNOLOGY V (EG5501T) CONTINUOUS ASSESSMENT

(Subject custodian: Department of Electrical Engineering)
Modelling of alternative energy sources and corresponding technological options. (Total tuition time: ± 90 hours)
ENGINEERING ANALYSIS V (EAN501T) CONTINUOUS ASSESSMENT
(Subject custodian: Department of Electrical Engineering)
Signal spaces, mappings, deterministic signal theory, stochastic signal theory. (Total tuition time: ± 90 hours)

ENGINEERING MANAGEMENT IV (EGM411T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Electrical Engineering)
The engineer and the manager, the engineering organisation. Total quality management: principles, applications, the human element in engineering management, engineering and construction contracts, professional ethics, the business plan, strategic and financial management. (Total tuition time: ± 70 hours)

ENGINEERING MATHEMATICS IV (EMT451T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Mathematics and Statistics)

ENTREPRENEURSHIP IV (ENT401B) 1 X 3-HOUR PAPER
(Subject custodian: Department of Management and Entrepreneurship)

ENGINEERING SCIENCE (EXTENDED) I (FPESL01, FPESLR1) 1 X 3-HOUR PAPER
(Subject custodian: Department of Physics)
Mathematical concepts, including vectors, mechanics – kinematics in one and two dimensions, Newton’s laws of motion, rotational motion, work, energy and power, static and dynamic fluids, heat: temperature and heat, heat transfer, waves and optics – properties of waves and sound, electromagnetic waves, geometric optics: light, reflection, thin lenses, prisms and dispersion, aberration, combined lenses, optical instruments, interference and diffraction. Laser: simple theory, types and applications, practical work. (Total tuition time: ± 140 hours)

ENGINEERING SCIENCE I (ESL111T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Physics)
Mathematical concepts, including vectors, mechanics – kinematics in one and two dimensions, Newton’s laws of motion, rotational motion, work, energy and power, static and dynamic fluids, heat: temperature and heat, heat transfer, waves and optics – properties of waves and sound, electromagnetic waves, geometric optics: light, reflection, thin lenses, prisms and dispersion, aberration, combined lenses, optical instruments, interference and diffraction. Laser: simple theory, types and applications, practical work. (Total tuition time: ± 70 hours)

FRENCH LANGUAGE SKILLS (ESI5007) CONTINUOUS ASSESSMENT
(Subject custodian: Department of Electrical Engineering)
Conversational French for beginners. (Total tuition time: ± 80 hours)

HIGH-FREQUENCY SYSTEMS V (ESI5005, HFS501T) CONTINUOUS ASSESSMENT
(Subject custodian: Department of Electrical Engineering)
HF system fundamentals and analysis, measurement principles and propagation models. (Total tuition time: ± 90 hours)

HIGH-VOLTAGE ENGINEERING IV (HVE401T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Electrical Engineering)
Electrical insulation: breakdown mechanism in gases, liquids and solids. High voltage testing techniques: High voltage and current generation; alternating voltage, direct voltage, impulse voltage and impulse current. Measurement: high voltages and currents. High voltage testing: non-destructive insulation test techniques, power equipment insulation tests. Over-voltages and insulation coordination: internal and external over-voltages, methods and devices for protection against over-voltages, insulation coordination. (Total tuition time: ± 70 hours)
IMAGE ANALYSIS V (ESI5012) CONTINUOUS ASSESSMENT
(Subject custodian: Department of Electrical Engineering)
Image formation, frequency domain analysis, neighbourhood processing, texture, segmentation, shape, feature extraction, transformation and classification. (Total tuition time: ± 90 hours)

IMAGE ANALYSIS SYSTEMS V (IAS501T) CONTINUOUS ASSESSMENT
(Subject custodian: Department of Electrical Engineering)
Image formation, frequency domain analysis, neighbourhood processing, texture, segmentation, shape, feature extraction, transformation and classification. (Total tuition time: not available)

INDUSTRIAL PROJECT IV (IPR413T/R) PROJECT ASSESSMENT
(Subject custodian: Department of Electrical Engineering)
The industrial project is continued throughout the study period for at least 300 hours. The subject content is handled on a personal basis and is evaluated by a panel of experts. The work may be done in the University environment or in the industry itself. Assessment of the project is based on a written report and its oral presentation before a panel of experts. (Total tuition time: ± 12 months)

LOGIC DESIGN III (LOD311T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Electrical Engineering)
The emphasis in this subject is on communication methods (Electrical standard) and communication protocols as well as the use of additional peripherals apart from those studied in Digital Systems II and III. Communication protocols like Modbus, CANbus, and LINbus will be examined and implemented. Inter Interchangeable Communication (I2C), RS 482, RS 232, SPI will be implemented. Peripherals namely UART’s, Real Time Clock, ADC’s, LCD’s, I/O port expanders, EEPROM memory connection and implementations and FRAM will be investigated. The implementation of the Watchdog Timer and different interrupts will be examined. The design and implementation of software and hardware for applications is supported by flow charts and embedded language programs. After completion of the subject a student will be able to solve real life problems in industry. (Total tuition time: ± 70 hours)

MACHINE INTELLIGENCE V (ESI5013, MII501T) CONTINUOUS ASSESSMENT
(Subject custodian: Department of Electrical Engineering)
Supervised learning (Bayesian classification, linear classifiers, non-linear classifiers, including neural networks and support vector machines), unsupervised learning and special topics, such as genetic algorithms and swarms and ants optimisation. (Total tuition time: ± 90 hours)

MANAGEMENT V (ESI5006) CONTINUOUS ASSESSMENT
(Subject custodian: Department of Electrical Engineering)
Project management, marketing, business strategies, financial planning, new product development and engineering research methodology. (Total tuition time: ± 90 hours)

MATHEMATICS (EXTENDED) I (FPMAT04, FPMATR4) 1 X 3-HOUR PAPER
(Subject custodian: Department of Mathematics and Statistics)
Basic algebra, functions, exponents and logarithm, differential calculus, trigonometry, geometry. Basic mathematics. Differentiation. Integration. Matrices and determinants. Vectors. Data handling. Complex numbers or mensuration. (Total tuition time: ± 120 hours)

MATHEMATICS I (MAT171T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Mathematics and Statistics)
Basic mathematics. Differentiation. Integration. Matrices and determinants. Vectors. Data handling. Complex numbers or mensuration. (Total tuition time: ± 60 hours)
MATHEMATICS II (MAT271B) 1 X 3-HOUR PAPER
(Subject custodian: Department of Mathematics and Statistics)
Revision of differentiation. Differentiation of functions with more than one variable. Further integration. Numerical methods. First-order ordinary differential equations. Matrices (Gauss elimination). (Total tuition time: ± 60 hours)

MATHEMATICS III (MAT351T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Mathematics and Statistics)

MECHANICAL ENGINEERING DRAWING I (MDR101T) CONTINUOUS ASSESSMENT
(Subject custodian: Department of Mechanical Engineering, Mechatronics and Industrial Design)

MECHANICS I (MHC101T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Mechanical Engineering, Mechatronics and Industrial Design)
Moments, centroids, kinematics, forces and Newton's laws, momentum and impulse, work and energy, circular motion, statics. (Total tuition time: not available)

MEDICAL EQUIPMENT II (MEQ211T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Electrical Engineering)
Introduction to electrodes, sensors, transducers and bio-amplifiers used in medical equipment and medical systems: types of measurements, common sensors and transducers, instrumentation amplifier, bio-signals and amplifiers and classification of biomedical instrumentations. (Total tuition time: ± 70 hours)

MEDICAL EQUIPMENT: EQUIPMENT III (MEQ33XT) 1 X 3-HOUR PAPER
(Subject custodian: Department of Electrical Engineering)
Introduction to transducers, detectors and sensors, diagnostic equipment and systems: thermometers, blood pressure measurement, electrocardiography, electro-encephalography, electromyography, lung function and spirometry, cardiac output monitoring, specialised systems, therapeutic equipment and systems: infusion pumps, dialysis machines, ventilation. (Total tuition time: ± 70 hours)

MEDICAL EQUIPMENT: EQUIPMENT IV (MEQ40XT) 1 X 3-HOUR PAPER
(Subject custodian: Department of Electrical Engineering)
Health delivery systems, overview of health policies and systems for treating patients, clinical engineering support systems and environmental hazards: health hazards, sterilisation, quarantine, EMC, gases. Advanced therapeutic equipment: anaesthesia, ventilators, energy transfer instruments, thrombo-elastography. Rehabilitation devices: cardiovascular prosthesis and assist devices, therapy equipment, therapy-supportive equipment, physiological prostheses. (Total tuition time: ± 70 hours)

MEDICAL EQUIPMENT: SYSTEMS III (MEQ33YT) 1 X 3-HOUR PAPER
(Subject custodian: Department of Electrical Engineering)
Electrical safety of medical equipment and systems, testing for performance of systems and fault-finding. Non-ionising radiation: production and detection, introduction to clinical engineering management. (Total tuition time: ± 70 hours)

MEDICAL EQUIPMENT: SYSTEMS IV (MEQ40YT) 1 X 3-HOUR PAPER
(Subject custodian: Department of Electrical Engineering)
Advanced transducers and sensors, advanced measurement and analysis techniques, modern imaging systems, neural assist devices, cardiac output measurements, ion and blood analysers, ultrasound, magnetic resonance imaging systems and computer applications in the medical field. (Total tuition time: ± 70 hours)
Microcontrollers can be seen in action all around us. Although not noticeable, the microcontrollers function in environments not suitable for personal computers. Students learn the advantages and shortcomings of microcontrollers. The practical applications with which the students are confronted stress the importance of microcontroller use. (Total tuition time: ± 70 hours)

The world of the microprocessor and microcomputer is discovered in this subject, taking the i486 as an example. It is covered in fair detail, from register level to the general software design. The i386-EX with its integrated peripherals on the same chip is investigated as a complete microcomputer. (Total tuition time: ± 70 hours)

Maxwell equations, electrical model of a transmission line, response of lines, wave propagation on lines, transmission line losses, impedance matching, and transmission line measurements. Microwave devices-waveguides, passive components, microwave solid state devices, microwave tubes and microwave antennas. Radio wave propagation: ground wave, ionospheric and line-of-sight propagation, terrestrial microwave communication. (Total tuition time: ± 70 hours)

Introduction to electromagnetic field theory. Microstrip design and distributed matching techniques. Microwave filter and resonator applications. Power division and combining techniques. Analyses of microwave systems, including noise. (Total tuition time: ± 70 hours)

This subject introduces the basic concepts and principles of wireless communication. The topics discussed include mobile radio propagation, coverage and capacity of mobile network, spread-spectrum, roaming, handover, wireless LAN and MAN, and emerging networks such as ad hoc and sensor networks. (Total tuition time: ± 20 hours)

Mathematical basics, non-linear equations, ordinary differential equations, interpolation, numerical integration, sampling, descriptive statistics, regression analysis, probability. (Total tuition time: ± 70 hours)

Optical fibre wave guides: introduction, wave guide principles, transmission properties, fibre technology. Optical sources: emission, types, and transmission circuits. Optical detectors: principles, semiconductor transmitter type and semiconductor receiver circuits. Optical fibre systems: applications, measurements, noise and losses. Practicals include learning to polish a fiber and to send audio and data over the link. (Total tuition time: ± 70 hours)

Power flow analysis, stability analysis of power systems, control of power systems. (Total tuition time: ± 90 hours)
POWER ELECTRONICS III (PWE311T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)
Principles of power semiconductor devices. Single-phase rectifiers, basic principles of DC choppers, basic control of inverters, AC voltage controllers and single-phase supplied DC drives. Design principles to protect semiconductor components against overvoltage, overcurrent, overheat, too high dV/dt and dI/dt and also ways to implement them in series and parallel. (Total tuition time: ± 70 hours)

POWER ELECTRONICS IV (PWE411T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)
Revision of theory from PWE311T. Study of three-phase rectifiers. In-depth design of non-isolated DC choppers. Control of inverters. Basic control principles of switch mode DC power supplies. Design of high-frequency transformers and inductors and also of driver circuits. Basic design of high-frequency transformers and inductors and also basic design of driver circuits. Three-phase supplied DC drives. AC and DC drive control principles. (Total tuition time: ± 70 hours)

POWER SYSTEMS IV (PWS401T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)
Theory: transmission line parameters: transmission line design considerations, series impedances, shunt admittances, electric field and voltage, parallel circuit three-phase lines. Transmission lines steady state operation: medium and short line approximations, transmission lines differentials, lossless line, line loadability, reactive compensation techniques. Power systems representations and load flow analysis: node equations, bus admittance, network reduction, Gauss Seidal solution, Newton Raphson solution, DC power flow. Power system controls: generator-voltage control, turbine-governor control, load and frequency control, economic dispatch, optimal power flow. Transient operation of transmission line: travelling waves, Bewley Lattice diagram. Stability: the swing equation, power angle equation, simplified synchronous machine model and system equivalents, multi-machine stability. Energy management systems. Economic tariffs. (Total tuition time: ± 70 hours)

POWER SYSTEMS V (PWS501T) CONTINUOUS ASSESSMENT

(Subject custodian: Department of Electrical Engineering)
Generation theory, transmission and distribution theory, interconnection of power systems. (Total tuition time: ± 90 hours)

PROCESS INSTRUMENTATION II (PCM221T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)
This subject teaches students the required knowledge and skills to understand and apply the basic principles of all the different types of sensors and instruments for process control (flow, temperature, pressure, level), Electronic detectors, transmitters, actuators and their applications and PLC control systems. The knowledge and skills are required to define, design, construct, commission and maintain a process control system. (Total tuition time: ± 70 hours)

PROCESS INSTRUMENTATION III (PCM321T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)
The use of measuring instruments, valves, pumps, tanks, piping, vessels, turbines and motors in various plant operations and systems. Process control diagrams, control strategies and operation of plant units for boilers, heat exchangers, furnaces, cooling towers, and distillation systems. Instrumentation for hazardous environments. (Total tuition time: ± 70 hours)

PROCESS INSTRUMENTATION IV (PCM401T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)
The subject is a source of essential information for students involved or those in need of greater knowledge, in the design and use of process systems that relies on automated machinery. It emphasises on control systems and offers full coverage of other relevant topics, including machine building, manufacturing business systems and job functions in an industrial factory environment. (Total tuition time: ± 70 hours)
PROJECTS I (PJT101T)  
(Subject custodian: Department of Electrical Engineering)  
Basic electricity: measurement of AC and DC current and voltage, breadboard, stripping and insulating of conductors, bending and matching to size, soldering techniques and tools. Electronic measuring instruments: the oscilloscope, function generator and multimeter. Safety and default settings, applications. Electronics; components, size, function and application, reading and understanding basic schematic diagrams. Simple testing of components with measuring instruments. Electronic project: building, construction and testing of the project. Wiring, placing components and soldering. Fitting section: making boxes. Drawing and sheet-metal work. Safety rules of applicable workshop, drawing a plan. The use of manual, marking and measuring tools. (Total tuition time: ± 70 hours)

PROJECTS II (PJT201T)  
(Subject custodian: Department of Electrical Engineering)  
The planning, design, layout, construction, testing, documentation and oral presentation of a complete project. (Total tuition time: ± 70 hours)

RADIO ENGINEERING III (RAE311T)  
(Subject custodian: Department of Electrical Engineering)  
Radio frequency amplifiers. Amplitude and angle modulation, as well as demodulation. Frequency conversion and mixing. Receivers. Basic antenna theory and practical antennae. (Total tuition time: ± 70 hours)

RADIO ENGINEERING IV (RAE411T)  
(Subject custodian: Department of Electrical Engineering)  
Modern wireless communications, frequency reuse, channel assignment strategies, handoff strategies, interference and system capacity, trunking and GOS. Radio wave propagation and propagation models; outdoor propagation models, indoor propagation models, signal prediction in buildings. Doppler shift, impulse response for a multipath channel, small scale multipath measurements. (Total tuition time: ± 70 hours)

REAL-TIME SIGNAL PROCESSING V (ESI5014)  
(Subject custodian: Department of Electrical Engineering)  
Advanced signal processing concepts (adaptive filtering, multirate processing and wavelets, filter banks etc.) with the emphasis on real-time DSP implementation. (Total tuition time: ± 90 hours)

REAL-TIME SYSTEMS V (RTS501T)  
(Subject custodian: Department of Electrical Engineering)  
Advanced signal processing concepts (adaptive filtering, multirate processing and wavelets, filter banks, etc.) with the emphasis on real-time DSP implementation. (Total tuition time: ± 90 hours)

RESEARCH METHODOLOGY (RMD501C)  
(Subject custodian: Department of Electrical Engineering)  
Research methods and approaches, information-gathering approaches, writing research reports. (Total tuition time: ± 45 hours)

RESEARCH REPORT: ENGINEERING: ELECTRICAL CONTROL SYSTEMS V (RCS500T/R, RCS501R)  
(Subject custodian: Department of Electrical Engineering)  
Syllabus content not available. Please contact the Head of the Department.

RESEARCH REPORT: ENGINEERING: ELECTRICAL ENERGY EFFICIENCY V (REE500T/R, REES501R)  
(Subject custodian: Department of Electrical Engineering)  
Syllabus content not available. Please contact the Head of the Department.

RESEARCH REPORT: ENGINEERING: ELECTRICAL POWER ENGINEERING V (RPN500T/R, RPN501R)  
(Subject custodian: Department of Electrical Engineering)  
Syllabus content not available. Please contact the Head of the Department.
SATELLITE COMMUNICATIONS IV (SCO401T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Electrical Engineering)
The objective is to apply fundamental principles of satellite communication theories in order analyse and design satellite communication systems by understanding the fundamental principles of satellite systems, understanding the implementation of satellite services, analysing Orbits, assessing transmission techniques, interference, multiple access and direct broadcasting, analysing satellite signal propagation losses, signal polarisation and satellite antennas types, analysing and designing satellite links, designing Spacecraft subsystems and Earth station. (Total tuition time: ± 70 hours)

SOFTWARE DESIGN II (SFD201T) CONTINUOUS ASSESSMENT
(Subject custodian: Department of Electrical Engineering)
Developing and applying structured programming. The core outcomes focus on basic C programming. This includes basic input/output, conditional execution, statement repetition, functions, libraries and one-dimensional arrays. The subject is very practical, and assessment is based on a number of programming tasks and/or tests completed during the semester. (Total tuition time: ± 70 hours)

SOFTWARE DESIGN III (SFD301T) CONTINUOUS ASSESSMENT
(Subject custodian: Department of Electrical Engineering)
The emphasis is on applications of embedded C language programming for microcontrollers. Memories (ROM, EPROM, EEPROM, FLASH, RAM and NVRAM) as used with a microcontroller will be explained. The microcontroller architecture, memory arrangements, interrupts, timers and serial communication as well as peripheral devices such as ADC’s, keypads, and LCD displays will be examined and implemented. The design and implementation of software and hardware for applications is supported by flow charts and C language and forms an important component of the subject. Structured C programming will be taught, developed and applied. This includes basic input/output, conditional execution, statement repetition, functions and libraries. After completion of the subject a student will be able to solve real life problems in industry. Students will be expected to solve home problems and exercises in order to master the subject. (Total tuition time: ± 70 hours)
SOFTWARE ENGINEERING IV (SFE401T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)
An introduction to software engineering. The principles involved in the design phases of the development cycle of a complete software project from conceptual development to product delivery. Concepts, such as definitions of the software product and process, project planning, risk analysis, tracking, analysis, design, object-orientated analysis and quality control. On completion of the subject, students have to submit a software product developed in a group context. (Total tuition time: ± 70 hours)

SOFTWARE ENGINEERING V (ESI5022) CONTINUOUS ASSESSMENT

(Subject custodian: Department of Electrical Engineering)
Software engineering fundamentals, UML design principles and operating system basics. (Total tuition time: ± 90 hours)

SPECIAL TOPICS I (ESI5023, SEI501T) CONTINUOUS ASSESSMENT

(Subject custodian: Department of Electrical Engineering)
Special topics based on a selection of seminal research papers from a chosen field. (Total tuition time: ± 90 hours)

SPECIAL TOPICS II (ESI5024) CONTINUOUS ASSESSMENT

(Subject custodian: Department of Electrical Engineering)
Special topics based on a selection of seminal research papers from a chosen field. (Total tuition time: ± 90 hours)

SPECIAL TOPICS III (ESI5025) CONTINUOUS ASSESSMENT

(Subject custodian: Department of Electrical Engineering)
Special topics based on a selection of seminal research papers from a chosen field. (Total tuition time: ± 90 hours)

STRENGTH OF MATERIALS II (SMT211T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Mechanical Engineering, Mechatronics and Industrial Design)
Analysis of simple structures. Simple stress and strain. Shearing forces and bending moments. Thin cylinders (stationary and rotating). Torsion of circular shafts. Helical springs. Laboratory work. (Total tuition time: ± 68 hours)

TELECOMMUNICATION NETWORKS V (ESI5008) CONTINUOUS ASSESSMENT

(Subject custodian: Department of Electrical Engineering)
Fixed networks, mobile networks, RF and optical networks. (Total tuition time: ± 90 hours)

TELECOMMUNICATIONS V (TMM501T) CONTINUOUS ASSESSMENT

(Subject custodian: Department of Electrical Engineering)
Fixed networks, mobile networks, RF and optical networks. (Total tuition time: ± 90 hours)

TELEVISION III (TLV311T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)

TELEVISION ENGINEERING IV (TVE401T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)
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<tr>
<th>Course Code</th>
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<tr>
<td>EXP1EEH</td>
<td>WORK-INTEGRATED LEARNING I (Subject custodian: Department of Electrical Engineering)</td>
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<tr>
<td>EXP2EEH</td>
<td>WORK-INTEGRATED LEARNING II</td>
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<tr>
<td>EXP1EYT</td>
<td>WORK-INTEGRATED LEARNING: PRACTICE I (Subject custodian: Department of Electrical Engineering)</td>
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<td>EXP1EWT</td>
<td>WORK-INTEGRATED LEARNING: WORKSHOP I (Subject custodian: Department of Electrical Engineering)</td>
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Industry-related training, as determined by the industry and the University. (Total tuition time: six months)

The aim is to provide the student with the required skills and knowhow to do work-integrated training. This include the following: Safety and first aid. Application of hand tools, power tools and equipment in practical work. Planning, designing marking and building of containers/boxes using sheet-metal work. Reading and understanding of basic schematic diagrams. Wiring techniques as used in houses, panels and electrical systems. Proteus software design package, soldering tools and techniques, measuring instruments and techniques. The planning, design, layout, construction, faultfinding, testing, documentation and presentation of a complete project. (Total tuition time: ± 70 hours)