Subject 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.

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) CONTINUOUS ASSESSMENT
(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) 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) CONTINUOUS ASSESSMENT
(Subject custodian: Department of End-User Computing)
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). Open labs are available for additional practicing. (Total tuition time: ± 80 hours)
COMPUTER SKILLS I (CSK101C)  CONTINUOUS ASSESSMENT
(Subject custodian: Department of End-User Computing)
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). Open labs are available for additional practising. (Total tuition time: ± 50 hours)

CONTROL SYSTEMS III (CSY321T)  CONTINUOUS ASSESSMENT
(Subject custodian: Department of Electrical Engineering)
Mathematical modelling of systems, stability of linear feedback systems, steady state error, feedback-control characteristics, the root locus, compensation of feedback control and frequency response. Programmable Logic Controllers (PLCs). (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, Lag, Lead-Lag and PID 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, ESI5027)  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)  CONTINUOUS ASSESSMENT
(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 series, 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)  
**CONTINUOUS ASSESSMENT**  
*(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)  
**CONTINUOUS ASSESSMENT**  
*(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)  
**CONTINUOUS ASSESSMENT**  
*(Subject custodian: Department of Electrical Engineering)*  
The emphasis is on computer memory and the application of a micro controller. Static and dynamic characteristics of read-write memories (SRAM, DRAM), structure and applications. Read-only memories (ROM, EPROM, FLASH). 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. 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 solve real life problems in industry. (Total tuition time: ± 70 hours)

**E**

ELECTRICAL DISTRIBUTION III (ELD331T)  
**CONTINUOUS ASSESSMENT**  
*(Subject custodian: Department of Electrical Engineering)*  
The principles and operation of different types of power stations and substations. High-voltage transmission lines, switchgear, cables, isolators, line supports, feeders and busbars. (Total tuition time: ± 70 hours)
ELECTRICAL ENGINEERING (EXTENDED) I (FPEEN01)  
(Subject custodian: Department of Electrical Engineering)  
CONTINUOUS ASSESSMENT  
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)  
(Subject custodian: Department of Electrical Engineering)  
CONTINUOUS ASSESSMENT  
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)  
(Subject custodian: Department of Electrical Engineering)  
CONTINUOUS ASSESSMENT  
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)  
(Subject custodian: Department of Electrical Engineering)  
CONTINUOUS ASSESSMENT  

ELECTRICAL MACHINES AND DRIVES V (EEM501T)  
(Subject custodian: Department of Electrical Engineering)  
CONTINUOUS ASSESSMENT  
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)  
(Subject custodian: Department of Electrical Engineering)  
CONTINUOUS ASSESSMENT  
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)  
(Subject custodian: Department of Electrical Engineering)  
CONTINUOUS ASSESSMENT  
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)  
(Subject custodian: Department of Electrical Engineering)  
1 X 3-HOUR PAPER  
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)  
(Subject custodian: Department of Electrical Engineering)  
CONTINUOUS ASSESSMENT  
Faults in power systems and fault calculation. Types of relays according to number of inputs and principles of operation. Transmission line protection. Synchronous generator protection. Power transformer protection. Busbar protection. Protection of electrical motors. Instrument transformers for protection relays. (Total tuition time: ± 70 hours)
ELECTRICAL PROTECTION IV (EPC401T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Electrical Engineering)
A great deal of theoretical knowledge and calculations, as well as tasks and practicals on inrush currents, protections on different types of transformer feeders, motors, generators and feeders, busbar (busbar zone protection) distance and cable differential protection. (Total tuition time: ± 70 hours)

ELECTRONIC COMMUNICATION II (ETC221T) CONTINUOUS ASSESSMENT
(Subject custodian: Department of Electrical Engineering)

ELECTRONIC COMMUNICATION III (ETC301T) CONTINUOUS ASSESSMENT
(Subject custodian: Department of Electrical Engineering)

ELECTRONIC COMMUNICATION IV (ETC401T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Electrical Engineering)
Spectral analysis of common electronic signals: time/frequency representation of signals, Fourier series and Fourier transform application, factors affecting bandwidth occupied by signal. Principles of analogue-to-digital transmission in communications: source coding, PCM, DPCM, delta modulation, bandwidth requirement of PCM, digital signalling format, multi-level signalling. Channel effect on symbol transmission and inter-symbol interference (ISI) control: ISI, eye diagram as a tool, raised cosine filtering, partial response signalling. Bandpass digital modulation: Generation and detection of ASK, FSK, CPFSK, PSK, BPSK, QPSK, MSK, and QAM, multi-level digital bandpass modulation, calculation of probability of error, bandwidth efficiency, applications. Channel coding and coding for reliable transmission over the channel: Linear block codes and cyclic codes, convolutional code. This subject is designed to equip student 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: ± 140 hours)

ELECTRONICS (EXTENDED) I (FPELC01) CONTINUOUS ASSESSMENT
(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) CONTINUOUS ASSESSMENT
(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) CONTINUOUS ASSESSMENT
(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)  
(Subject custodian: Department of Electrical Engineering)  
ContinuouS ASSESSMENT  
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)  
(Subject custodian: Department of Electrical Engineering)  
1 X 3-HOUR PAPER  
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 learner 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)  
(Subject custodian: Department of Electrical Engineering)  
ContinuouS ASSESSMENT  
VHDL and FPGA design and real-time DSP implementation. (Total tuition time: ± 90 hours)

ENERGY SYSTEMS AND TECHNOLOGY V (EGS501T)  
(Subject custodian: Department of Electrical Engineering)  
ContinuouS ASSESSMENT  
Modelling of alternative energy sources and corresponding technological options. (Total tuition time: ± 90 hours)

ENGINEERING ANALYSIS V (EAN501T)  
(Subject custodian: Department of Electrical Engineering)  
ContinuouS ASSESSMENT  
Signal spaces, mappings, deterministic signal theory, stochastic signal theory. (Total tuition time: ± 90 hours)

ENGINEERING MANAGEMENT IV (EGM411T)  
(Subject custodian: Department of Electrical Engineering)  
1 X 3-HOUR PAPER  
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)  
(Subject custodian: Department of Mathematics and Statistics)  
1 X 3-HOUR PAPER  

ENGINEERING SCIENCE (EXTENDED) I (FPESl01)  
(Subject custodian: Department of Physics)  
ContinuouS ASSESSMENT  
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 ppitcs: 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)  
(Subject custodian: Department of Physics)  
ContinuouS ASSESSMENT  
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 ppitcs: 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)

ENTREPRENEURSHIP IV (ENT401B)  
(Subject custodian: Department of Management and Entrepreneurship)  
1 X 3-HOUR PAPER  
### EXPERIENTIAL LEARNING I (EXP1EEH)
**Subject custodian: Department of Electrical Engineering**
Industry-related training, as determined by the industry and the University. (Total tuition time: 6 months)

### EXPERIENTIAL LEARNING II (EXP2EEH)
**Subject custodian: Department of Electrical Engineering**
Industry-related training, as determined by the industry and the University. (Total tuition time: 6 months)

### EXPERIENTIAL LEARNING: PRACTICE I (EXP1EYI)
**Subject custodian: Department of Electrical Engineering**
Industry-related training, as determined by the industry and the University. (Total tuition time: 6 months)

### EXPERIENTIAL LEARNING: WORKSHOP I (EXP1EWI)
**Subject custodian: Department of Electrical Engineering**
The aim is to provide the student with the required skills and knowhow to do experiential 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)

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

### HIGH-FREQUENCY SYSTEMS V (ESI5005, HFS501T)
**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)
**Subject custodian: Department of Electrical Engineering**
Breakdown of solids, liquids and gases: ionisation and decay, breakdown in gases, solid dielectrics, liquid dielectrics. High-voltage generation: alternating voltage, direct voltages, impulse voltages. High-voltage measurement. High-voltage testing: non-destructive insulation test techniques, practical power equipment insulation tests. Corona. (Total tuition time: ± 68 hours)

### IMAGE ANALYSIS V (ESI5012)
**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)
**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)
**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)  
**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 2 and 3. 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, IO 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, MI501T)  
**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)  
**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)  
**Subject custodian: Department of Mathematics and Statistics**


(Total tuition time: ± 120 hours)

MATHEMATICS I (MAT171T)  
**Subject custodian: Department of Mathematics and Statistics**


(Total tuition time: ± 60 hours)

MATHEMATICS II (MAT271B)  
**Subject custodian: Department of Mathematics and Statistics**


(Total tuition time: ± 60 hours)

MATHEMATICS III (MAT351T)  
**Subject custodian: Department of Mathematics and Statistics**


(Total tuition time: ± 70 hours)

MECHANICAL ENGINEERING DRAWING I (MDR101B, MDR101T)  
**Subject custodian: Department of Mechanical Engineering**


(Total tuition time: ± 68 hours)

MECHANICS I (MHC101C, MHC101T)  
**Subject custodian: Department of Mechanical Engineering**

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)  
(Subject custodian: Department of Electrical Engineering)  
Introduction to medical equipment and medical systems. (Total tuition time: ± 70 hours)

MEDICAL EQUIPMENT: EQUIPMENT III (MEQ33XT)  
(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)  
(Subject custodian: Department of Electrical Engineering)  
Health delivery systems, overview of health policies and systems for treating patients, clinical engineering support systems, 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)  
(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)  
(Subject custodian: Department of Electrical Engineering)  
Advanced transducers and sensors, advanced measurement and analysis techniques, modern imaging systems. (Total tuition time: ± 70 hours)

MICRO-CONTROLLER SYSTEMS IV (MCS401T)  
(Subject custodian: Department of Electrical Engineering)  
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)

MICROSYSTEMS DESIGN IV (MSD401T)  
(Subject custodian: Department of Electrical Engineering)  
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)

MICROWAVE COMMUNICATION III (MWC301T)  
(Subject custodian: Department of Electrical Engineering)  
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)

MICROWAVE ENGINEERING IV (MWE401T)  
(Subject custodian: Department of Electrical Engineering)  
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)
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<th>Subject Code</th>
<th>Name</th>
<th>Credit Hours</th>
<th>Format</th>
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<tbody>
<tr>
<td>NSY401T</td>
<td>NETWORK SYSTEMS IV (nSY401T)</td>
<td>1 X 3-HOUR</td>
<td>PAPER</td>
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<td><em>(Subject custodian: Department of Information Technology)</em></td>
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<td>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. <em>(Total tuition time: ± 20 hours)</em></td>
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<td>NMS401T</td>
<td>NUMERICAL METHODS AND STATISTICS IV (NMS401T)</td>
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<td><em>(Subject custodian: Department of Mathematics and Statistics)</em></td>
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<td>Mathematical basics, non-linear equations, ordinary differential equations, interpolation, numerical integration, sampling, descriptive statistics, regression analysis, probability. <em>(Total tuition time: ± 70 hours)</em></td>
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<tr>
<td>OET401T</td>
<td>OPTO-ELECTRONICS IV (OET401T)</td>
<td>1 X 3-HOUR</td>
<td>PAPER</td>
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<td><em>(Subject custodian: Department of Electrical Engineering)</em></td>
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<td>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. <em>(Total tuition time: ± 70 hours)</em></td>
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<tr>
<td>PWN501T</td>
<td>POWER ANALYSIS V (PWN501T)</td>
<td>CONTINUOUS ASSESSMENT</td>
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<td><em>(Subject custodian: Department of Electrical Engineering)</em></td>
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<td>Power flow analysis, stability analysis of power systems, control of power systems. <em>(Total tuition time: ± 90 hours)</em></td>
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<td>PWE311T</td>
<td>POWER ELECTRONICS III (PWE311T)</td>
<td>CONTINUOUS ASSESSMENT</td>
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<td><em>(Subject custodian: Department of Electrical Engineering)</em></td>
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<td>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. <em>(Total tuition time: ± 70 hours)</em></td>
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<tr>
<td>PWE411T</td>
<td>POWER ELECTRONICS IV (PWE411T)</td>
<td>1 X 3-HOUR</td>
<td>PAPER</td>
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<td><em>(Subject custodian: Department of Electrical Engineering)</em></td>
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<td>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. Three-phase supplied DC drives. AC and DC drive control principles. <em>(Total tuition time: ± 70 hours)</em></td>
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<td>PWS401T</td>
<td>POWER SYSTEMS IV (PWS401T)</td>
<td>1 X 3-HOUR</td>
<td>PAPER</td>
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<td>PWS501T</td>
<td>POWER SYSTEMS V (PWS501T)</td>
<td>CONTINUOUS ASSESSMENT</td>
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<td>Generation theory, transmission and distribution theory, interconnection of power systems. <em>(Total tuition time: ± 90 hours)</em></td>
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<td>PCM221T</td>
<td>PROCESS INSTRUMENTATION II (PCM221T)</td>
<td>CONTINUOUS ASSESSMENT</td>
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<td><em>(Subject custodian: Department of Electrical Engineering)</em></td>
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<td>Design procedures and calculations for flow, level, temperature and pressure measurements. Electronic detectors, transmitters, actuators and their applications. Introduction to basic control theory, controllers and programmable logic controllers (PLCs). Laboratory assignments, including distributed control systems and programming of PLCs. <em>(Total tuition time: ± 70 hours)</em></td>
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PROCESS INSTRUMENTATION III (PCM321T)  CONTINUOUS ASSESSMENT
(Subject custodian: Department of Electrical Engineering)
Control and operation of plant units for boilers, heat exchangers, furnaces and distillation columns. Control
strategies for feedback, feed forward, cascade, adaptive, ratio, selective, time cycle and time schedule control.
Instrumentation for hazardous environments. Computer applications and telemetering as used in process
instrumentation. (Total tuition time: ± 70 hours)

PROCESS INSTRUMENTATION IV (PCM401T)  1 X 3-HOUR PAPER
(Subject custodian: Department of Electrical Engineering)
Measurement and control of chemical composition, pollution measurement and control, application of engi-
neering principles, automatic control applications and instrumentation project management. The illustration
of SCADA (Supervisory Control and Data Acquisition) to be used in industry to acquire relevant plant informa-
tion. (Total tuition time: ± 70 hours)

PROJECTS I (PJ101T)  CONTINUOUS ASSESSMENT
(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 (PJ201T)  CONTINUOUS ASSESSMENT
(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)

R

RADIO ENGINEERING III (RAE311T)  CONTINUOUS ASSESSMENT
(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)  1 X 3-HOUR PAPER
(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)  CONTINUOUS ASSESSMENT
(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)  CONTINUOUS ASSESSMENT
(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)  CONTINUOUS ASSESSMENT
(Subject custodian: Department of Electrical Engineering)
Research methods and approaches, information-gathering approaches, writing research reports. (Total tuition
time: ± 45 hours)

RF DESIGN V (ESI5009)  CONTINUOUS ASSESSMENT
(Subject custodian: Department of Electrical Engineering)
RF component design principles and analysis. (Total tuition time: ± 90 hours)
SATELLITE COMMUNICATIONS IV (SCO401T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)

Implementation of satellite services. Orbit analysis. Utilisation of spacecraft resources. Assessment of transmission techniques, multiple access and direct broadcasting. Propagation and interference assessment. Satellite link analysis and design. Earth station design. (Total tuition time: ± 70 hours)

SCIENTIFIC COMPUTING V (ESI5026, SII501T) CONTINUOUS ASSESSMENT

(Subject custodian: Department of Electrical Engineering)

Scientific computing fundamentals, simulation, C++, Matlab, Simulink and Scilab. (Total tuition time: not available)

SIGNAL PROCESSING IV (SPR401T) 1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)

Introduction to signal processing. Analogue signal processing. Signals and systems, and the characteristics of signals and systems. The different domains that continuous-time signals are represented in. Time-domain representation and analysis of continuous-time signals and systems (using convolution and ordinary differential equations), frequency-domain representation and analysis (Fourier series, Fourier Transform) and the Laplace Transform. Applications of signal processing; for example, the design of continuous-time filters. (Total tuition time: ± 70 hours)

SIGNAL THEORY V (ESI5021) CONTINUOUS ASSESSMENT

(Subject custodian: Department of Electrical Engineering)

Signal spaces, mappings, deterministic signal theory and stochastic signal theory. (Total tuition time: ± 90 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, one- and two-dimensional arrays. The subject is very practical, and assessment is based on a number of programming tasks completed during the semester. (Total tuition time: ± 70 hours)

SOFTWARE DESIGN III (SFD301T) CONTINUOUS ASSESSMENT

(Subject custodian: Department of Electrical Engineering)

More advanced programming topics will be presented, while still focusing on core skills. The basic principles of object-orientated programming, such as creation of abstract data types (ADTs), pointers, composite data types, linked lists, File I/O and string manipulation, will be covered. Windows programming may also be covered. The subject is practically orientated, and students are evaluated on a number of programming tasks completed during the semester. (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)  
(Subject custodian: Department of Electrical Engineering)  
CONTINUOUS ASSESSMENT  
Special topics based on a selection of seminal research papers from a chosen field. (Total tuition time: ± 90 hours)

STRENGTH OF MATERIALS II (SMT211T)  
(Subject custodian: Department of Mechanical Engineering)  
CONTINUOUS ASSESSMENT  
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)  
(Subject custodian: Department of Electrical Engineering)  
CONTINUOUS ASSESSMENT  
Fixed networks, mobile networks, RF and optical networks. (Total tuition time: ± 90 hours)

TELECOMMUNICATIONS V (TMM501T)  
(Subject custodian: Department of Electrical Engineering)  
CONTINUOUS ASSESSMENT  
Fixed networks, mobile networks, RF and optical networks. (Total tuition time: ± 90 hours)

TELEVISION III (TLV311T)  
(Subject custodian: Department of Electrical Engineering)  
CONTINUOUS ASSESSMENT  

TELEVISION ENGINEERING IV (TVE401T)  
(Subject custodian: Department of Electrical Engineering)  
1 X 3-HOUR PAPER  