A NODE FOR AFRICANTHOUGHT



HANDBOOK 2023

DEPARTMENT OF ENGINEERIN (

DEPARTMENT OF ENGINEERING HANDBOO

A NODE FOR AFRICANTHOUGHT

HANDBOOK 2023

DEPARTMENT OF ENGINEERING



FOR ADMISSION QUERIES, CONTACT:

STUDENT ADMISSIONS

KWADLANGEZWA CAMPUS: +27 (0)35 902 6790/6030
RICHARDS BAY CAMPUS: +27 (0)35 902 6923
E-MAIL: ADMISSIONS@UNIZULU.AC.ZA
WEBSITE: WWW.UNIZULU.AC.ZA

CENTRAL APPLICATIONS OFFICE

SHARE CALL: +27 (0)86 086 0226 INTERNATIONAL CALLS: +27 (0)31 268 4444 E-MAIL: ENQGENERALCAO.AC.ZA FAX: +27 (0)86 622 8823 OR +27 (0)31 268 4422 WEBSITE: WWW.CAO.AC.ZA

CONTACT INFO

DEPARTMENT OF ENGINEERING





f www.facebook.com/unizulu



WWW@UNIZULU.AC.ZA



TWITTER@UNIZULUONGOYE



POSTAL ADDRESS: UNIVERSITY OF ZULULAND, PRIVATE BAG X1041, RICHARDS BAY, 3900



HTTP://WWW.FCAL.UNIZULU.AC.ZA/



FACULTY OF SCIENCE, AGRICULTURE AND ENGINEERING RICHARDS BAY CAMPUS

ENGINEERING HANDBOOK

Vision

A leading comprehensive African university that thrives on quality and fosters collaborative and innovative cultures with its rural and urban campuses.

Purpose Statement

We believe in educating and producing competitive, globally relevant, high-quality African scientists with future-focused competencies

Values

The FSAE embraces the UNIZULU values, which serve as a foundation for a more equitable and inclusive UNIZULU community. The values are:

- a) **Discovery** and pursuit of excellence through teaching, learning, research, and innovation science
- b) **Community of Belonging:** We embrace all forms of diversity, social inclusion and elimination of social injustices.
- c) **Teamwork:** Working together to accomplish a common goal.

Introduction and Overview

This brochure should be read in conjunction with the 2023 undergraduate handbook for the faculty of Science, Agriculture and Engineering for the faculty and University rules. The brochure contains curriculum and information specific to the professional engineering degree programmes

Entry Requirements

Please note that the achievement of the minimum requirements for admission does not guarantee an applicant admission into the Engineering programmes.

Minimum Entry Requirements

- A full matriculation endorsement, exemption or conditional exemption or its approved foreign equivalent,
- (ii) A minimum of 30 matriculation points,
- (iii) A pass of at least 50 % (D symbol) at the higher grade (HG) or 60% (C symbol) at the standard grade (SG) in English (English Home Language or English First Additional Language),
- (iv) A pass of at least 60 % (C symbol) at the higher grade (HG) or 80% (A symbol) at the standard grade (SG) in Mathematics,
- (v) A pass of at least 50 % (D symbol) at the higher grade (HG) or 70% (B symbol) at the standard grade (SG) in Physical Science.

ENGINEERING DEPARTMENT

ACADEMIC STAFF

Co-Ordinator Dr B Kibirige Tel. no. (035) 9026262

BSC Engineering (Electrical)(MUK), MSC Engineering (Electrical), PHD

Engineering (Electrical)(WITS), MISES, MSAIP

Lecturers Dr C Thiart, BEng (Mechanical)(UP), MEng (Nuclear), Phd Eng.(Supersonic

Gas Dynamics)(UP)

Mr B Khoza, BSc (Éngineering)(UCT), MPhil (Nuclear Power) (UCT) Mr F Silwimba, BSc Statistics, MSc (Applied Mathematics) (UNIZULU) Mr S Jokweni, BSc (Applied Mathematics& Physics), BSc Hons (Applied

Mathematics), MSc (Applied Mathematics) (UNIZULU)

Mr S Khoza, BSc (Chemistry& Mathematics), BSc Hons (Chemistry), MSc

(Chemistry) (UNIZULU)

Degree Module Content for BEng (Electrical Engineering)

Title	Calculus I for Engineers		
Code	4MTH171	Department	Mathematical Sciences
Prerequisites	None	Co-requisites	None
Aim	To introduce differential calculus with necessary prerequisites from logic and general algebra.		
Content	 Elementary Logic and Theory of Sets and subsets, Venn-Euler diagrams, basic set operations, sets of numbers, elementary logic. Inequalities: Definition, order axioms, interval notation, set builder notation, solving inequality equations. Absolute value Functions: elementary functions, graph of a function, combination of functions, inverse functions, exponential and logarithmic functions, relations. Limits, Continuity and Differentiation: definition of limit, continuity and the derivative Algebra: induction, vectors and vector algebra, dot products and cross products, introduction to matrices and matrix algebra, transpose and determinants, the adjoint matrix, invertible matrix and Cramer's rule, complex numbers and De Moivre's theorem 		
Assessment	50% Continuous Assessment Mark 50% Formal end of module exam (3 hours)		
DP Requirement	40% Continuous Assessment Mark 80% Attendance at lectures and tutorials.		

Title	General Physics A for Engineers			
Code	4PHY171 Department Physics			
Prerequisites	None	Co-requisites	None	

Aim	The module is meant for entry level BEng and contains fundamental concepts in Physics and Engineering that prepares the student for later study in more advanced fields in the Physical Sciences. It contains basic concepts in mechanics, waves, optics and thermodynamics.	
Content	 Statistical concepts: Probability, distributions, histograms, standard deviation, propagation of errors. Units and measurement: Dimensions, SI-system of units, basic measurements in physics. Mechanics: Forces, moments, couples, Newton's laws, circular motion, momentum, oscillations, momentum and impulse. Heat and thermodynamics: Mechanisms of heat transfer, heat capacity, phase changes, gases. Waves: Sound waves, light and light sources, laws of refraction, diffraction and reflection. Practical: Laboratory sessions on precision calculations in experimental results, forces, mechanics, optics heat and properties of matter. 	
Outcomes	 An understanding of statistical concepts for data analysis and presentation. An understanding of basic mechanics concepts, laws of Newton and their practical application. The understanding of circular motion, its mathematical representation and solving of problems associated with repetitive circular motion. An understanding of wave concepts, modes of propagation and associated phenomena inside a material medium. Problems. Learners should be able to identify most of laboratory instruments used in the level 1 laboratory and use these properly to obtain meaningful results. Learners must be able to write simple scientific reports commensurate with level 1 B.Sc. 	
Assessment	50% Continuous Assessment Mark 50% Formal end of module exam (3 hours)	
DP Requirement	40% Continuous Assessment Mark 80% Attendance at practical's and Project work	

Title	Introductory Computing for Engineers			
Code	4CPS171	Department	Computer Science	
Prerequisites	None	Co-requisites	Any Mathematics module	
Aim	To provide	To provide an introduction to hardware and software components of		
Content	Introduction representati	ion of data; Asse - Software Develo	nd Digital systems; Machine level mbly level machine organization pment Fundamentals ncepts and Object-Oriented Programming	

Outcomes	At the end of the module, the learners should be able to: Explain the organization of the classical von Neumann machine and its major functional units. Describe the internal representation of data. Represent Boolean logic problems as: truth tables and logic circuits. Design, implement, test, and debug programs that use fundamental programming constructs such as: basic computation, simple I/O, standard conditional and iterative structures, methods, and parameter
Assessment	50% Continuous assessment 50% final practical and theory examination
DP Requirements	40% Continuous Assessment Mark, 80% Attendance at practical's

Title	Engineering Drawing		
Code	5MEC111	Department	
Prerequisites	None	Co-requisites	None
Aim	The aim of this module is to use converted the skill of reading, interpreting and drawing instruments and free hand s	creating engineering dr ketches	awings using
Content	Understand the concepts of scatrue length and shape. Understand and apply the draw communication. Competently use drawing instrue orthographic detailed drawin pictorial views with an emphase sectioned and auxiliary view. Generate free hand sketches of of engineering components. Communicate with a workshop means of notes and dimensions Interpret the information on an orthography.	ing standards for international standards for internationa	ional graphic ents al projections nent by
Assessment	Test 1: Descriptive Geometry Test 2 Test 2: Descriptive Geometry Test 2 Examination 50%		
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's and fie	ldwork	

Title	Engineering Mechanics		
Code	4MTH181	Department	Mathematical
Prerequisites	4MTH171(DP)	Co-requisites	one

Aim Engineering Mechanics is the first module that prepares students to analyze forces and stresses that exist in structures and machines. It is therefore an extremely important foundational module. The central core of the module has to do with equilibrium of rigid bodies and fixed structures such as trusses and beams. This module continues the modelling approach begun in Physics (for particles) and extends it to rigid bodies in static equilibrium. Although not a mathematics module, aspects of mathematics are brought to bear on the formulation and solution of equilibrium problems. The engineer requires skills of both analysis and of modelling. This module, being an introduction, will emphasize the analysis but will begin to develop the modelling ability in students. The module is concerned with developing ways of "seeing" or visualizing equilibrium problems. It is crucial to develop a variety of skills and strategies that will be used in solving problems, but it is also essential that students realize that these are necessary but not sufficient conditions for problem solving. The visual aspect of recognizing equilibrium, simplifying the system, drawing free body diagrams and applying appropriate boundary conditions is what is really important to develop in students. The importance of geometric ability cannot be over-emphasized. The module aims to develop in students an appreciation of forces in their various forms or guises, internal and external, and the way in which they contribute to the equilibrium of an object. The module requires a professional approach that recognizes the need for precision in engineering problem solving, mathematical language, a logical approach to calculations, diagrams that are accurate representations of the physical situation and a layout that is neat. Content Review of vectors Position, displacement and force vectors b. Line of action and transmissibility, addition of forces at a point Adding forces: resultants, components, unit vectors С 2. **Forces** Normal reaction and friction a. b Equilibrium for a particle Connected particles C. Limiting equilibrium: friction, toppling, sliding d. Free body diagrams e. 3. Parallel and non-parallel coplanar forces. Moment of a force, couples, principle of moments b. Addition of a force and a couple Resultant and equilibrium for a rigid body, internal forces. C. toppling and sliding d. Two-force and three-force systems Compound systems e. f. Trusses: methods of nodes and sections Beams: bending moments and shear forces g. Assessment 50% Continuous Assessment Mark

50% Formal end of module exam (3 hours)
40% Continuous Assessment Mark

80% Attendance at lectures and tutorials

DP Requirement

Title	General Chemistry for Engineers		
Code	4CHM172	Department	Chemistry
Prerequisites	None	Co-requisites	None
Aim	The aim of this module is to give lea chemistry for further studies in analyti chemistry		
Content	The nature of matter. Atomic structure and periodicity. Electron configurations and bonding. Types of chemical reactions. Chemical equations and the mole concept. The solid, liquid and gaseous states. Solutions. Thermochemistry. Chemical equilibrium. Chemical Kinetics. Redox equations and basic electrochemistry. Acids, bases and salts. Theory of acid-base titrations, including ph. Basic laboratory skills, including weighing and volume measurements and gravimetric, volumetric, and qualitative analyses		
Outcome	an understanding of the struct bonding which occurs between reactions that occur. an ability to write chemical form the mole concepts in chemical reactions in solution. an understanding of the classifications. a thorough grasp of the basic priequilibrium, chemical kinetics characteristics of acids, bases this knowledge to acid base titre an ability to perform a range weighing and volume meas volumetric, and qualitative ana	ture of the atom, the coatoms and the types of coatoms of matter and the coatom of matter and the doministic of thermochemists, basic electrochemists and salts as well as the coatoms. of basic laboratory skipurements and simple	hemical a, and apply actions and fundamental hases and of stry, chemical try and the application of stry, including
Assessment	50% Continuous Assessment Mark (comprising 25% practical assessment 50% Summative assessment(comprising course work has been completed)		
DP Requirement	40% Continuous Assessment Mark 80	% Attendance at practic	al's

Title	Calculus II for Engineers		
Code	4MTH172	Department	Mathematical
Prerequisites	4MTH171(DP)	Co-requisites	None
Aim	(integration, elementary introduction	The aim of the module is to further develop concepts in calculus (integration, elementary introduction to differential equations) and to apply their techniques in problem solving.	

Content	 Differentiation: some differentiation formulas, the chain rule, implicit differentiation, the mean-value theorem and applications, some curve sketching, applications of derivatives. Integration and Techniques of integration: the fundamental theorem of integral calculus, indefinite integrals, some area problems, Transcendental functions: logarithmic, exponential, inverse trigonometric functions, hyperbolic functions. Elementary Introduction to Differential Equations: First order linear equations. Sequences: properties, limits. 	
Assessment	50% Continuous Assessment Mark	
	50% Formal end of module exam (3 hours)	
DP Requirement	40% Continuous Assessment Mark	
	80% Attendance at lectures and tutorials	

Title	Physics B for Engineers		
Code	4PHY172	Department	Physics
Prerequisites	4PHY171(DP)	Co-requisites	None
Aim	The module is meant for entry level B.Sc. and contains fundamental concepts in Physics and Engineering that prepares the student for later study in more advanced fields in the Physical Sciences. It contains basic concepts in electricity, nuclear physics and modern physics.		
Content	insulators. The electric potential energy, line int dielectrics and propert Magnetic field and mag through magnetic fields, electromotive force, The Magnetic properties of the Magnetic Physics and radial Wien and Stefan's Radioactivity, natural de Nuclear reactions, con proton-induced, neutron-alpha beta- and gamma and fusion. Reactors, nu Cosmic radiation and fun Practical: Laboratory see	oactivity: Quantum theory laws. Planck's radiati cay series. Detectors enservation laws, reaction induced and other reaction-decay. Nuclear binding enclear fuel, breeders.	tial, electrical Capacitance, ric circuits. ges particles law. Induced rcuit. ty, molecular sis. Magnetic of radiation. on formula. of radiation, nn process, ns. Q-values, nergy. Fission

Outcomes	 An understanding of statistical concepts for data analysis and presentation. An understanding of basic in static electricity, natural phenomena such as lightening, and the principles of machines based on static electricity concepts such as Van De Graaf Generators. An understanding of electric current and its effects (such as heating) The generation of electricity (Faraday's law, Lenz's law, etc.) A learner should understand the basic concepts of radioactivity, constituents of the nucleus and the effect of radiation. 	
	 Learners should be able to solve problems related to theory taught. 	
	 Learners should be able to identify most of laboratory instruments used in the level 1 laboratory and use these 	
Assessment	50% Continuous Assessment Mark	
	50% Formal end of module exam (3 hours)	
DP Requirement	40% Continuous Assessment Mark	
	80% Attendance at practical's and fieldwork	

Title	Introduction to Engineering Design		
Code	5MEC112	Department	Engineering
Prerequisites	5MEC111(DP)	Co-requisites	None
Aim	component manufacturing skills needed for docum computer aided methods	information. This mo tenting designs using of graphical commutals of descriptive	mmunicating concepts and dule aims at developing the ng drawings. Manual and nunication will be used to geometry and apply the

Content	Understand the concepts of scales and proportions, lines in space and true length and shape.
	Understand and apply the drawing standards for international graphic communication.
	Competently use drawing instruments to generate:
	orthographic detailed drawings
	pictorial views with an emphasis on isometric views
	sectioned and auxiliary views of engineering components
	 Generate free hand sketches of orthographic and pictorial projections of engineering components.
	5. Communicate with a workshop / manufacturing environment by
	means of notes and dimensions on drawings.
	Interpret the information on an orthographic detailed working drawing.Use 3D computer aided drawing software as a tool to
	 Generate working drawings for manufacturing with design intent.
	Apply dimension standards to drawings.
	Generate assembly drawings applicable to manufacturing.
	8. Understand the fundamentals of Fits and Tolerances
	Calculations and IT tables Understand constraints and degrees of freedom in assembled
	 Understand constraints and degrees of freedom in assembled mechanical components.
Assessment	Tests 30%
Assessment	CAD assignments 20%
	Examination 50%
DP Requirement	40% Continuous assessment mark
	80% Attendance at practical's and fieldwork

Title	Introduction to Engineering		
Code	5EEE112	Department	Engineerin g
Prerequisites	4MTH171(DP)	Co-requisites	None
Aim	 To motivate students and he of engineering and specifica To familiarize students to ele Introduce electrical network t To introduce the concept of and transient response of circ To analyze steady state single 	lly electrical engineering ctrical circuits heorems DC response, steady sta cuits	te AC response

Content	Explanation of the engineering disciplines and some job descriptions for each discipline. Circuit terminology, basic laws of resistive networks, nodal and mesh analysis, further network theorems, energy storage elements, RC and RL circuits, second order circuit analysis, RLC circuits and resonance, introduction to sinusoids and phasors, phasors in steady state AC circuit analysis, AC steady state power in single phase circuits. Introduction to transient analysis of circuits with energy storage elements.
Assessment	Continuous assessment 50% Examination 50%
	Examination 50 %
DP Requirement	40% Continuous assessment mark
	80% Attendance at practical's

Title	Advanced calculus for Engineers		
Code	4MTH271 Department Mathematical		
Prerequisites	4MTH171, 4MTH172	Co-requisites	None
Aim	This module is designed to introduce students to the concepts of series, vector functions, differentiation and integration of vector functions and functions of several variables.		
Content	Intro to infinite series: The intest & the ratio test Absolute and conditional co Taylors polynomial in x; tayl Taylors series in (x-a) Vector equation for a line & Limits, continuity, differentia The evaluation of double int The double integral as the li Triple integrals & Reduction Cylindrical co-ordinates & S Jacobian	vector equation for a plantation of Vector functions tegrals by repeated integrimit of a Reimann sumento repeated integrals	ne
Assessment	50% continuous assessment 50% formal end of semester during the semester.	3hr exam on all mate	rial covered
DP Requirement	40% Continuous Assessment Mark 80% Attendance at lectures and tutorials		

Title	Signals and Systems I		
Code	5EEE211	Department	Engineering
Prerequisites	5EEE112	Co-requisites	None
Aim	The module provides students wit understanding linear systems, and the deterministic signals.		'

Content	 This module provides students with the tools required for understanding linear systems, and the effect that such systems have on deterministic signals. Upon completion, students will be able to characterize and manipulate linear time- Invariant systems in terms of input-output relationships, using both time and frequency domain methods. The module includes concepts related to signal representation, linear convolution, Fourier analysis, and sampling of continuous-time signals. 	
Assessment	Continuous Assessment 50% Examination 50%	
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's	

Title	Analogue Electronic Design		
Code	5EEE221	Department	Engineering
Prerequisites	5EEE112	Co-requisites	None
Aim	Students are introduced to device structures of some of the important Analog Electronic devices, their properties and models, analysis of simple circuits consisting of passive and active devices, operational amplifiers, and analysis of some practical analog electronic circuits.		
Content	 The module is delivered in the forms of lectures. There is a fixed text book for the module, which standardizes the module. After every 2- 3 weeks' lecture, the students are given a set of SPICE based simulation exercises which helps them to grasp the material. The SPICE exercises are so modelled that the students can see the importance of different device parameters and their effect on some basic designs. There are also four tutorials given in the module, and tutors are available on the tutorial classes to help the struggling students. There is an end-of-semester mini project done in groups. With this, the students try to design and analyze a bigger circuit and make a report. This helps them to grasp some of the challenges of designing an electronic circuits. 		
Assessment	Continuous Assessment 50% Examination 50%		
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's	(

Title	Project Management		
Code	5MEC231	Department	Engineering
Prerequisites	All first year modules	Co-requisites	None
Aim	This module deals with the the project management. Opportu understanding of the triangle of Preformance and to use PM to triangle constrains. The application practices is an objective. This take i.e. development of a small scale	nities are provi roject Managemer echniques to ach ion of the theory, ses the form of a r	ded to develop an at (PM) – time, cost and dieve objectives within tools, techniques and multidisciplinary project
Content	 i.e. development of a small scale engineering system. Introduction to Project Management Introduction to Project Planning and Life Cycle Project Scope Management Project Time Planning and Network Costing Project and Financial Statement Managing Project Resources Managing Risk in Projects Project Quality Management Project Human Resource Contracts Trade-off Analysis in a Project Environment Project Closeout Tools include, but are not limited to, WBS, CPM, Gantt Chart, Resource Levelling, Cash Flow Statement, Trade- off analysis and communication techniques 		
Assessment	Continuous Assessment 50% Ex	amination 50%	

Title	Linear Algebra and Differential Equations for Engineers		
Code	4MTH272	Department	Mathematical
Prerequisites	4MTH171, 4MTH172	Co-requisites	None
Aim	This module is designed to introduce students to the concepts of linear algebra, and to methods of finding exact solutions to ordinary differential equations		
Content	Linear algebra: finite and infinite dimensional vector spaces, subspaces, linear transformations and matrices, systems of linear equations, determinants, change of bases, similar matrices, eigenvalues and eigenvectors. Differential equations: study ordinary differential equations such as separable variables, exact equations, linear equations. Solutions of homogeneous differential equations with constant coefficients, Cauchy-Euler equation, systems of linear equations, nonlinear equations, Laplace transforms, homogeneous linear systems with constant coefficients.		
Assessment	50% continuous assessment (two assessment of semester 3hr of during the semester.		
DP Requirement	40% Continuous Assessment Mark 80% Attendance at lectures and tutoria	als	

Title	Introduction to Power Engineering		
Code	5EEE212	Department	Engineering
Prerequisites	5EEE112	Co-requisites	None
Aim	To provide a foundation in power engineering		

Content	Phasor diagrams for resistive, inductive and capacitive loads; transient analysis of circuits, complex power; power factor correction; 3-phase systems; magnetic circuits; the single phase transformer; dc. machines
Assessment	Continuous Assessment 50%
	Examination 50%
DP Requirement	40% Continuous assessment mark
	80% Attendance at practical's

Title	Embedded Systems I		
Code	5EEE222	Department	Engineering
Prerequisites	5EEE112	Co-requisites	None
Aim	This module aims to give students a strong foundation in embedded systems by introducing them to digital system fundamentals, including information representation, Boolean algebra, logic gate behavior, combinational and sequential digital circuits, digital building blocks and algorithmic state machines. The module also provides a basic understanding of what a microcontroller is, how it works inside and what it can be used for. These objectives will be carried out by writing code for a		
Content	The goal in convening this mode and a basic understanding of logic and corunderlying technology that have had ar fundamentals. We also aim to enable the system and finite state machine. At the end of the appreciate the role of digital electronics in compute sequence to bring this about consists mainly of the Digital systems and information Algebra, combinational circuits, corprocedures, arithmetic functions, sequential circuits, procedures. Digital storage and representation of	mputer design and impact on the student to design study, the studer and automation ne following: In representation, Inbinational design combinational design.	application of these a prescribed digital nt must be able to systems. The topic Binary logic, Boolean gn concepts and esign concepts and
Assessment	Continuous Assessment 50% Examination 50%		
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's		

Title	Professional Communications		
Code	5EEE232 Department Engineering		
Prerequisites	All first year modules Co-requisites None		
Aim	The aim of the module is to equ communication, and to give ther communicate more effectively at careers.	n practical skills t t the University a	hat will enable them to nd in their professional
Content	Referential Style and Academic writing and presentation; Planning & Discourse of technical written and oral messages; Reports – investigative/ evaluative; Executive Summaries/ Synopses; Individual presentations; graphics and visual literacy. Module content covers the following areas: Communication theory:		
	Reports: types: investigative and research: citation and redifferent formats for types sections within reports conclusions, recommender preliminary sections such as A	referencing bes of reports (introduction, meth ndations) and their ch as Table of Con	functions

	Summaries:
Assessment	Continuous Assessment 50% Examination 50%
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's

Title	Electromagnetism for Engineers		
Code	4PHY272 Department Physics		
Prerequisites	4PHY171, 4PHY172	Co-requisites	None
Aim	This module is designed to introduce theories applicable to electromagnet		
Content	 electromagnetism Electrostatics, Gauss's law. Dipoles. Dielectric media. Phenomena related to electron levels: Introduction to metals, semi-conductors and insulators. Contact potential. Thermoelectric effects. Electromagnetism: Forces on moving charges in electric and magnetic fields. Magnetic scalar potential and vector potential. Ampere's law. Faraday's law. Self-induction and mutual induction. Alternating current: M L C R circuits and A-C bridges Magnetism: dia, para-and ferromagnetic materials. The magnetic circuit. Applications of concepts and theories of electromagnetism 		
Outcomes	 An understanding of concepts and theories of electromagnetism. Understanding and applications of Gauss law. An understanding of laws governing electrical conduction and circuits. Understanding principles of magnetism and magnetic circuits Understanding applications of electromagnetism. 50% Continuous Assessment Mark 		
DB Beguirement	50% Formal end of module exam (3 hours)		
DP Requirement	40% Continuous Assessment Mark 80% Attendance at practical's and fie	ldwork	
i .	55.5. Moridanos at prastical s and no		

Title	Electromagnetic Engineering		
Code	5EEE311	Department	Engineering
Prerequisites	4PHY272,4MTH271	Co-requisites	None

Aim	To provide an understanding of electromagnetic field and wave theory in the context of applications in electrical engineering. To convey the relationship between electromagnetic field theory described by Maxwell's equations and circuit theory described by Kirchhoff's laws. To cover the concepts of EM wave radiation, propagation, reflection and refraction in linear media. To introduce radiation from simple structures, and basic calculations of EM field parameters at a distance from a radiating antenna, and calculations relating to line-of-sight communications link. To provide the theory required for more specialized EM topics like microwave engineering and antenna design. Visualization of electromagnetic fields.
Content	The module introduces the electrical engineering student to the mechanism of electromagnetic radiation by antennas and the nature of fields produced by antennas. The propagation of plane waves in space and in lossy media is studied and applications are presented. One-dimensional models for TEM transmission lines are constructed. These models are often used as basic elements in design of antennas and other components.
	Simplification to very short lines such as power lines are discussed. A selection of conventional and modern waveguide structures re considered. Finally, an overview of computational methods for the solution of realistic electromagnetic problems are presented.
Assessment	Continuous Assessment 50% Examination 50%
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's

Title	Electronic Devices and Circuits		
Code	5EEE321	Department	Engineering
Prerequisites	5EEE231	Co-requisites	None
Aim	To provide the student with an understanding of basic electronics concepts and also to equip the student with the necessary skills to perform detailed electronics design and analysis		
Content	Operational amplifiers, specifications and limitations and varieties and common configurations. Frequency response of amplifiers; Bodes plot Basic building blocks of analog ICs and circuits; current mirrors. Feedback and its effects in analog circuit design; stability Analog filters: filter design principles; different common ways to implement filters. Signal generators: oscillators and types of oscillators. Power Amplifiers Noise, sources and types. Switched mode power supplies and introduction to power electronics, buck, boost, buck-boost and isolated fly back topologies Safe Operating Area, mixed signal design, circuit layout, decoupling and grounding SPICE based simulations		
Assessment	Continuous Assessment 50% Examination 50%		
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's		

Title	Energy Conversion		
Code	5EEE331	Department	Engineering
Prerequisites	5EEE212	Co-requisites	None
Aim	To introduce students to the fundamentals of AC Electrical Machines and Power Electronics. Two machine types are studied, i.e. induction and synchronous machines. The constructional features, operational differences, capability and characteristics of each machine type are studied. Uncontrolled rectifier circuits and DC-DC converters are also being introduced. Industrial applications of power electronics and electrical machines are analyzed.		
Content	AC machine windings, rotating magnetic field in AC machines, induction and synchronous machine equivalent circuits, determination of equivalent circuit parameters, induction and synchronous machine performance characteristics, uncontrolled rectification, controlled rectification, dc-dc		
Assessment	Continuous Assessment 50% Examination 50%		
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's		

Title	Signals and Systems II		
Code	5EEE341 Department Engineering		
Prerequisites	5EEE221	Co-requisites	None
Aim	To develop skills for the analysis of signals and noise in linear systems, and also some non-linear systems To convey how systems arising in electrical and electronic engineering may be analyzed in the time domain and the frequency domain. To develop concepts such as bandwidth, response time, power spectral density, and signal to noise ratio for quantifying signals and noise in linear systems To gain familiarity with basic modulation schemes used in communication systems and		
Content			
Assessment	Continuous Assessment 50% Examination 50%		
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's		

Title	Statistics for Engineers		
Code	4STT171	Department	Mathematical
Prerequisites	4MTH171, 4MTH172	Co-requisites	None
Aim	This Module aims to introduce engineering students to the basic concepts and tools of Statistics which are of particular relevance in an engineering context, and to enable students to apply these to data collected from engineering experiments.		
Content	Topics include: Random variables, sampling and basic statistical measures; Normal, t, F and Chi-square distributions; Confidence intervals; Statistical models, such as the means and the effects models; t, F and Chi-square tests; Regression and correlation; One-way analysis of variance; Introduction to the design of experiments; Application of statistical tools to experimental data in an engineering setting.		
Assessment	Continuous Assessment 50% Examination 50%		
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's		

Title	Control Engineering		
Code	5EEE312	Department	Engineering
Prerequisites	4MTH271, 4MTH272, 5EEE231	Co-requisites	None
Aim	To train and educate students in cont control problems, including formulation diagrams, analysis of system interception synthesis of feedback control systems space models. To introduce students projects by means of a team project ce	of elementary proconnected system in terms of input- to open-ended co	oblems as block ns, design and output and state- ntrol engineering
Content	Terminology: Open and closed loop dynamic system modelling, transient re System stability: Routh Hurwitz or responses. Nyquist lots, Bode diagran Lead-lag circuits, minor loops, feedfor Sensitivity functions, minimum protot transformation, frequency response space models and design methodynamic systems.	esponse, stead starterion, Root Lons, Nichols Charts orward and three- ype response co- methods. State	ate error criterion. cus. Frequency c. Compensation: eterm controllers. ntrollers, bilinear variables, state
Assessment	Continuous Assessment 50% Examination 50%		
DP Requirement	40% Continuous assessment mark		
	80% Attendance at practical's		

Title	Power Systems		
Code	5EEE322	Department	Engineering
Prerequisites	5EEE212	Co-requisites	None
Aim	To create an interest in power systems engineering, to provide a sound basis of study for those who will continue studies in this subject and, for those who do not continue with power modules, to provide useful information relevant to future needs		
Content	Structure of power system, ac power theory, electrical loads, customer tariffs and power factor correction, introduction to power systems analysis, including: 3-ph transformer representation, Per unit calculations, Load flow and fault calculations; AC and DC power distributors, Transmission efficiency and conductor efficacy; Protection principles and Matlab programming.		
Assessment	Continuous Assessment 50% Examination 50%		
DP Requirement	40% Continuous assessment man 80% Attendance at practical's	k	

Title	Communications and Networks		
Code	5EEE332	Department	Engineering
Prerequisites	5EEE231	Co-requisites	None
Aim	To provide a basic understanding of communication systems and the architecture, technology, and protocols of computer networks		

Comtont	Modulo A
Content	Module A: Introduction to Networks: Internet, protocol, network edge, core network and access networks, circuit switching and packet switching, LAN topology, physical media, layered architecture, performance, protocol model. Application layer: service, client-server paradigm, network applications: web and http, ftp, email, ssh, DNS, p2p file sharing, socket programming. Transport layer: transport layer services, multiplexing/demultiplexing, network layer: Introduction, virtual circuit and datagram networks, router, Internet Protocol datagram, fragmentation, IPv4, Physical layer: Digital information, Digital communication system, Sampling, Pulse modulation, Quantization, Pulse code modulation, Bandpass modulation schemes ASK, FSK, PSK, Phase-shift keying and amplitude phase keying in vector representation, Orthogon
	Module B: Communication system and network design II: Transport layer: UDP, reliable data transfer, TCP, connection management, congestion and congestion control. Network layer: ICPM, IPv6, link-state algorithm, distance vector routing algorithm, routing in Internet, broadcast and multicast routing. data link layer: link layer services, error detection and correction. Multiple access: TDMA, Aloha, CSMA. LAN technologies: IEEE 802 family, MAC, LAN addressing, ARP, Ethernet, Token Rings, hubs and switches, PPP, ATM, MPLS, all IP networks. Physical layer: Information theory and entropy, Channel capacity, Source coding, Probability of error, Eb/n performance, Matched filter detection, ISI and pulse shaping, Equalization, Bandpass demodulation/detection schemes with ASK, FSK, PSK, Probability of Error with bandpass detection, MSK
Assessment	Continuous Assessment 50% Examination 50%
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's

Title	Culture and Society in Africa		
Code	1ANT172 Department Social		Social
Prerequisites	None	Co-requisites	None
Aim	This is a Complementary Studies Module for Electrical Engineering students aimed at broadening student's perspective.		
Content	Culture and Society in Africa provides students from all faculties with background knowledge about the continent on which they live. The module includes an examination of the concepts of culture, race, society, ethnicity and nation-state, a perspective on African worldviews and ways of thought, and a consideration of the role of Africa in a changing world.		
Assessment	Continuous Assessment 50% Examination 50%		
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's		

Title	Electrical Engineering Design	Electrical Engineering Design		
Code	5EEE342	Department	Engineering	
Prerequisites	All second year modules	Co-requisites	None	
Aim	To tackle a design and research projec	To tackle a design and research project in Electrical Engineering		
Content	In this module students will be assigned a design problem relevant to the Electrical Engineering discipline within which they will need to design a prototype and test a sub- system. This will provide insight to understand the intricacies of real-life complex sub system design. Students will be expected to solve an Electrical Engineering problem methodically using the skills they have gathered over the previous semesters of the curriculum, especially from the Design 1 module. Financial constraints required to complete the project and financial decision making will be reported.			
Assessment	Continuous Assessment 50% Examination 50%			
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's			

Title	Process Control and Instrumentation		
Code	5EEE411	Department	Engineering
Prerequisites	5EEE312	Co-requisites	None
Aim	Aims to provide an integrated view of the principles and practice of modern industrial control and its applications		
Content	Various topics will be covered including: Measurement of physical variables, industrial transducers, integration of programmable logic controllers (PLCS), supervisory control and data acquisition (SCADA) systems and management information systems (MIS), signal transmission and conditioning, microcontrollers, computer interfacing, realtime multitasking in computer control, nonlinear and advanced control methods.		

Assessment	Continuous Assessment 50% Examination 50%
DP Requirement	40% Continuous assessment mark
	80% Attendance at practical's

Title	Engineering Systems Design		
Code	5EEE421	Departmen t	Engineering
Prerequisites	5EEE342	Co-	None
Aim	To understand and apply the principles of engineering design		
Content	The pessimistic mind view - worst-case statistical yield. Standards and codes. STEEP analysis economic and political context. EDA and of candidate concepts and selection of a of specifications and user requirement checks; design work; qualification and a Case histories Formal Design Methodology - Commethodologies. IBM's Rational Unified Process. Phelaboration, construction, transition. Disciplines - business modelling, required design, implementation, testing, dep configuration and change management,	Standards and codes. STEEP analysis - social, technical, environmental, economic and political context. EDA and CAD <i>Design methods</i> - Synthesis of candidate concepts and selection of an optimum concept; development of specifications and user requirements; modelling, simulation, reality checks; design work; qualification and acceptance tests; documentation. Case histories Formal Design Methodology - Common features of formal design methodologies. IBM's Rational Unified Process. Phases and iterations -inception, elaboration, construction, transition. Disciplines - business modelling, requirements gathering, analysis and design, implementation, testing, deployment, project management, configuration and change management, environment. Project - Two assignments will be tackled, and a poster will be prepared	
Assessment	Examination 50%		
DP Requirement	40% Continuous assessment mark		
	80% Attendance at practical's		

Title	Engineering Professionalism		
Code	5EEE461	Department	Engineering
Prerequisites	All 3 rd year modules	Co-requisites	None
Aim	This module deals practically with the st The aim is to complement the student's (in some cases) and reinforcing (in other to be encountered in the engineering endeavour to produce a well-rounded consulting and the design environment	s theoretical training rs) the topics and iss g profession. This	by introducing ues most likely is part of the

Content	Professional registration – ECSA, the Washington Accord, code of conduct, due diligence, government certificate of competence, mentorship in industry. Types of engineering employment – details of the options available for graduates, the realities of the workplace and industry training, career path management. Engineering economics – working capital, cash flow, salaries and wages, depreciation, tax considerations, rate of return, payback period. Health and Safety – managing disease and health in the workplace, occupational safety and related legislation, practical HAZOP analysis, safe work permits and lockouts. Industrial law – Overview of employment law, labour relations and employment equity contracts, basis of offer and acceptance. Quality, reliability and maintenance management and their importance in the engineering profession. Environment – legislation, ISO140001, aspects of engineering operations
	the engineering profession.
Assessment	Continuous Assessment 50% Examination 50%
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's

Title	Power Electronics and Machines		
Code	5EEE431	Department	Engineering
Prerequisites	5EEE331	Co-requisites	None
Aim	To develop an understanding of electric motor speed control principles and to develop an understanding of power electronics and its practical applications		
Content	Electrical Machines: Introduction to Motor Drives, DC Motor Characteristics and Speed Control Principles, Class-A Chopper Drive, Induction Motor Drives, Unbalanced Operation of Induction Motors, Switch Reluctance Motors Power Electronics: Switching and Conduction Losses of Power Semiconductor Devices, Uncontrolled and Controlled rectifiers, Dc to Dc Converters: Buck, Boost, Chuck, Flyback and Full Bridge, Unipolar and Bipolar Pulse with Modulation Schemes, Space-Vector Pulse Width Modulation		
Assessment	Continuous Assessment 50% Examination 50%		
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's		

Title	Power Systems Engineering		
Code	5EEE441	Department	Engineering
Prerequisites	5EEE322	Co-requisites	None
Aim	To develop an understanding of power systems and protection		

Content	Distribution and transmission systems, protection systems, steady state operation of transmission lines, high voltage engineering, electricity pricing, microgrids and smart grids. Topics include: Loads - Electrical load characteristics (PIR, transient, statistical distribution and probabilistic load model), Non Linear Loads, non- active power, unbalance, Load data collection, Data analysis, Time series, parametric, sectoral and spatial load forecasting High Voltage Engineering - Introduction and fields, Gas discharges, solids, liquids; Over voltages, insulation coordination Branches – Cables, LV feeders voltage drop calculations, Herman Beta spread sheet, Overhead lines: design, safety, electric machinery regulations, 3-ph overhead lines: types of structures and conductors, conductor selection, load capacity, line parameters; 3- ph overhead lines: cost, MV voltage drop and losses – radial feeder with point loads, minimum route length; Mechanical design of overhead lines, 2-ph and SWER lines: capacity, design, safety/reliability, unbalance; Comparison of alternative overhead lines, HVDC transmission.; Nodes - Small substations; Large substations; Unconventional: CCS, Captap, SWS; DG: Energy resources, environment and cost,: Voltage rise constraints Protection - Protection philosophy, switchgear and surge arresters, instrument transformers, , OC and DOC relays, Relay settings grading, Protection testing and commissioning, protection lab, , Unit feeder protection (circulating current ,pilot wire), Distance protection, Transformer protection delivery processes and policy - Delivery processes: planning design, construction, O&M (incl condition monitoring), EIA, QA,standards; Logframe for planning and evaluation of electrification; Electrification in SA, NEP, future electrification, EDI restructuring, Power Quality/Quality of Supply; Reliability; Financial evaluation of projects (IRR, NPV, inflation, losses, economics of pf correction); Pricing policy, rationalization, residential tariffs, BEST/
Assessment	Continuous Assessment 50% Examination 50%
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's

Title	Telecommunications				
Code	5EEE451	Department	Engineering		
Prerequisites	5EEE332	EEE332 Co-requisites None			
Aim	To enhance an understanding of and compe wireless communication systems to specified properties of communication to extend your study of principles of communication topics.	erformance criter	ia.		

Content	Selected topics in (1) digital communication systems (24 lectures) and (2) radio frequency & wireless systems (24 lectures). <u>Digital Communication Systems Content:</u> Any topics from: <i>Digital Modulation</i> : highlights; <i>Formatting and Source Coding</i> ; <i>Synchronization</i> ; <i>Reducing Signal Degradation</i> : signals, spectra and noise, communications link analysis, coding and interleaving to mitigate fading effects, main parameters of <i>Fading Channel Models</i> , applications. <i>Modulation and Coding</i> trade-offs; <i>Error Performance</i> of communication systems corrupted by noise. <u>RF & Wireless Systems Content</u> : Any topics from: Microwave and RF components and transmission lines; Mobile communication systems; Radar systems; Noise and distortion in microwave systems; Frequency planning; Regulatory aspects of Spectrum usage; Antenna technology; Satellite communication systems; Global Positioning Systems (GPS); Use of microwave test equipment.
Assessment	Continuous Assessment 50%
	Examination 50%
DP	40% Continuous assessment mark
Requirement	80% Attendance at practical's

Title	Professional Communication Studies		
Code	5EEE412 Department Engineering		
Prerequisites	5EEE241	Co-requisites	None
Aim	Professional Writing including: Business Proposals; Graphic Communication and Readability; Posters; Group presentations with Power-point		

Content	Referential and Academic writing and presentation; Persuasive argument; Formats for business plans and proposals; group presentations; graphics and visual literacy. Module content covers the following areas: Group theory and Team work:
	Ethics: definitions and schools reasons for codes and rules professional practice as defined by ECSA corporate governance and King III report Business Plans and Proposals: solicited and unsolicited proposals requests for proposals functions of SWOT and PESTEL
	 Table of Contents of a Business Proposal Summaries: purpose of an executive summary structure and components of a good executive summary style and language for a persuasive and comprehensive summary CVs and Covering letters formats for and choice and ordering of content
	 traditional and non-traditional CVs covering letters for responding to an advertisement or tender and for direct approach. Poster Design: difference between stand-alone posters and accompanied posters fundamental principles of well-designed posters. Group presentations:
	 criteria for giving an effective group oral presentation vocal delivery techniques for good cohesion, transitioning and handover to the next person in the group types of visual aids that support and enhance a good presentation visual literacy and creating PowerPoint slides.
Assessment	Continuous Assessment 50% Examination 50%
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's

Title	New Venture Planning and Management		
Code	5EEE422 Department Engineering		
Prerequisites	All third year modules	Co-requisites	None
Aim	Learning Business skills involved in starting entrepreneurial businesses from products designed: feasibility analysis, business plan, presentations		
Content	The entrepreneurial perspective; dever feasibility plan? Product concept and description; market marketing plan; operations, development plans and	assessment; indu	ıstrial analysis;
Assessment	Continuous Assessment 50% Examination 50%		
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's		

Title	Industrial Ecology			
Code	5EEE442	Department	Engineering	
Prerequisites	All third year Modules Co-requisites None			
Aim	The module is an introduce Industrial Ecology and its "industrial ecology" is interprindustrial society with the nation of industrialization. A more rename it "the Ecology of Insystems perspective of industrialization of the natural systems (list atmosphere) There are however, two print to do with the content and the tobecome aware of the prototo the industrial impact on a You are expected to den knowledge and understant arguments, quizzes, project communication hint at the accomplish a limited kind professional manner. Stude have acquired in their profe opportunity to improve those side of the skills but also to ask critical questions, seek argue a case in discussion.	ction and overview of the relation and overview of the relation and overview of the relation and every expectation and overview of the total environment as well as the appropriate way of thinking about the appropriate way of thinking about the second with the process. Studies are expected to put into process, an exam and a term paper second set of outcomes that refer the expected to put into process. Studies are expected to put into process and the expected to put into process. These do not only related the exploratory and critical aspectations are expected to put into process. These do not only related the exploratory and critical aspectations are expected to put into processional communication module as skills. These do not only related the exploratory and critical aspectations are expected to put into processional communication module as well as in a formal written bate and a willingness to be personal to the process.	tively new 'field' of the total tota	

	Ecosystem deterioration, pollution Resource depletion: Fossil fuels, water, uranium, rare earth metals Climate change Systems thinking, thermodynamics Sustainability; the limits to growth Industrial Ecology concepts and tools Material Flow Analysis Life Cycle Assessment; the circular economy Design for Environment Eco-Industrial Parks: industrial symbiosis Ethics: economic paradigms, consumption Energy, Mobility,
Assessment	Continuous Assessment 50% Examination 50%
•	40% Continuous assessment mark 80% Attendance at practical's

Title	Final Year Research Project			
Code	5EEE432	Department	ent Engineering	
Prerequisites	Depends on the topic	None		
Aim	To give individual students the opportunity to tackle a real engineering project within a limited period under the guidance of a supervisor and submit a project report on the results.			
Content	The final year research project is an import the end of the degree programme, to tackle a real expected to work on the project both ind supervisor. An engineering project involve principles to the solution of a technic description or research hypothesis supervisor, reviewing the topic in detail carefully, confirming an understanding of searching for, selecting and justifying the solving the problem or testing the hypothable to analyze, design, build, integrate specific project. This could include the simulation. Students are also required success criteria and design objectives, at the findings, and any recommendations an oral presentation and prepare an exh	engineering project. ividually and under the sthe creative applicated all problem. It invocedeveloped in consumand defining the bout the requirements of the most appropriate the sis. It also requires and test as is applied use of hardware to evaluate the project of the write a report at the addition, student	The student is a guidance of a ation of scientific lives a problem ultation with a ndaries (scope) the supervisor, approaches to a student to be propriate for the country, software and ject against the bout the project,	
Assessment	Thesis 100%			
DP Requirement	Meeting the ELO requirements			

Degree Module Content for BEng (Mechanical Engineering)

	Department Co-requisites	Mathematical Sciences
To introduce diffe	Co-requisites	NI
		None
To introduce differential calculus with necessary prerequisites from logic and general algebra.		
 from logic and general algebra. Elementary Logic and Theory of Sets: sets and subsets, Venn-Euler diagrams, basic set operations, sets of numbers, elementary logic. Inequalities: Definition, order axioms, interval notation, set builder notation, solving inequality equations. Absolute value Functions: elementary functions, graph of a function, combination of functions, inverse functions, exponential and logarithmic functions, relations. Limits, Continuity and Differentiation: definition of limit, continuity and the derivative Algebra: induction, vectors and vector algebra, dot products and cross products, introduction to matrices and matrix algebra, transpose and determinants, the adjoint matrix, invertible matrix and Cramer's rule, complex numbers and De Moivre's theorem. 		
50% Continuous Assessment Mark 50% Formal end of module exam (3 hours)		
t 40% Continuous Assessment Mark		
	Inequalities builder nota substitute in the products an and matrix a adjoint matrix complex nut. The products A substitute in the products and matrix	Inequalities: Definition, order axioms, builder notation, solving inequality eq. Functions: elementary functions, grap combination of functions, inverse functions and logarithmic functions. Limits, Continuity and Differentiation: continuity and the derivative Algebra: induction, vectors and vector products and cross products, introduction and matrix algebra, transpose and deadjoint matrix, invertible matrix and C complex numbers and De Moivre's these solutions. 50% Continuous Assessment Mark 50% Formal end of module exam (3 hours)

Title	General Physics A for Engineers		
Code	4PHY171	Department	Physics
Prerequisites	None	Co-requisites	None
Aim	The module is meant for entry level BEng and contains fundamental concepts in Physics and Engineering that prepares the student for later study in more advanced fields in the Physical Sciences. It contains basic concepts in mechanics, waves, optics and thermodynamics.		
Content	standard measure measure Mechani motion, Heat and capacity Waves: diffraction Practica experime	d deviation, propagation ement: Dimensions, SI-sements in physics. ics: Forces, moments, momentum, oscillations d thermodynamics: Me, phase changes, gases Sound waves, light and and reflection.	system of units, basic couples, Newton's laws, circular s, momentum and impulse. chanisms of heat transfer, heat

Outcomes	 An understanding of statistical concepts for data analysis and presentation. An understanding of basic mechanics concepts, laws of Newton and their practical application. The understanding of circular motion, its mathematical representation and solving of problems associated with repetitive circular motion. An understanding of wave concepts, modes of propagation and associated phenomena inside a material medium. Problems. Learners should be able to identify most of laboratory instruments used in the level 1 laboratory and use these properly to obtain meaningful results. Learners must be able to write simple scientific reports commensurate with level 1 B.Sc. 	
Assessment	50% Continuous Assessment Mark	
	50% Formal end of module exam (3 hours)	
DP Requirement	40% Continuous Assessment Mark	
	80% Attendance at practical's and Project work	

Title	Introductory Computing for Engineers		
Code	4CPS171	Department	Computer Science
Prerequisites	None	Co-requisites	Any Mathematics module
Aim	To provide an introduction to hardware and software components of computer systems.		
Content	Section A – Computer Architecture Introduction to Digital logic and Digital systems; Machine level representation of data; Assembly level machine organization Section B – Software Development Fundamentals Fundamental Programming concepts and Object-Oriented Programming		
Outcomes	At the end of the module, the learners should be able to: Explain the organization of the classical von Neumann machine and its major functional units. Describe the internal representation of data. Represent Boolean logic problems as: truth tables and logic circuits. Design, implement, test, and debug programs that use fundamental programming constructs such as: basic computation, simple I/O, standard conditional and iterative structures, methods, and parameter passing.		
Assessment	50% Continuous assessment 50% final practical and theory examination		
DP Requirements	40% Continuous Assessment Mark, 80% Attendance at practical's		

Title	Engineering Drawing			
Code	5MEC111	Department	Engineering	
Prerequisites	None	Co-requisites	None	
Aim	The aim of this module is to use conventional drawing techniques to develop the skill of reading, interpreting and creating engineering drawings using drawing instruments and free hand sketches			
Content	1. Understand the concepts of scales and proportions, lines in space and true length and shape. 2. Understand and apply the drawing standards for international graphic communication. 3. Competently use drawing instruments to generate: • orthographic detailed drawings • pictorial views with an emphasis on isometric views • sectioned and auxiliary views of engineering components 4. Generate free hand sketches of orthographic and pictorial projections of engineering components. 5. Communicate with a workshop / manufacturing environment by means of notes and dimensions on drawings. 6. Interpret the information on an orthographic detailed working			
Assessment	Test 1: Descriptive Geometry Test 25% Test 2: Descriptive Geometry Test 25% Examination 50%			
DP Requirement	40% Continuous assessment n 80% Attendance at practical's a			

Title	Engineering Mechanics				
Code	4MTH181	Department	Mathematical Sciences		
Prerequisites	4MTH171(DP)	Co-	None		
•		requisites			
Aim	analyze forces and stresses It is therefore an extremely in	Engineering Mechanics is the first module that prepares students to analyze forces and stresses that exist in structures and machines. It is therefore an extremely important foundational module.			
	bodies and fixed structures module continues the mod particles) and extends it to rig not a mathematics module, bear on the formulation and engineer requires skills of module, being an introduction	The central core of the module has to do with equilibrium of rigid bodies and fixed structures such as trusses and beams. This module continues the modelling approach begun in Physics (for particles) and extends it to rigid bodies in static equilibrium. Although not a mathematics module, aspects of mathematics are brought to bear on the formulation and solution of equilibrium problems. The engineer requires skills of both analysis and of modelling. This module, being an introduction, will emphasize the analysis but will begin to develop the modelling ability in students.			
	visualizing equilibrium proble skills and strategies that wil also essential that students sufficient conditions for precognizing equilibrium, sim diagrams and applying appreally important to develop ir	The module is concerned with developing ways of "seeing" or visualizing equilibrium problems. It is crucial to develop a variety of skills and strategies that will be used in solving problems, but it is also essential that students realize that these are necessary but not sufficient conditions for problem solving. The visual aspect of recognizing equilibrium, simplifying the system, drawing free body diagrams and applying appropriate boundary conditions is what is really important to develop in students. The importance of geometric ability cannot be over-emphasized. The module aims to develop in students an appreciation of forces in their various forms or guises, internal and external, and the way in which they contribute to the equilibrium of an object. The module requires a professional approach that recognizes the need for precision in engineering problem solving, mathematical language, a logical approach to calculations, diagrams that are accurate representations of the physical situation and a layout that is neat.			
	their various forms or guises which they contribute to the requires a professional ap precision in engineering prological approach to calcu				
Content	Review of vectors				
		placement and for n and transmissibil point			
		resultants, compo	nents, unit vectors		
		Forces a. Normal reaction and friction			
		tion and friction for a particle			
	c. Connected	•			
	d. Limiting equ	ilibrium: friction, to	ppling, sliding		
	e. Free body d		_		
	6. Parallel and non-para a. Moment of a		s, inciple of moments		
		b. Addition of a force and a couple			
			rigid body, internal		
	forces, toppl	ling and sliding	ome		
		d. Two-force and three-force systems e. Compound systems			

	f. Trusses: methods of nodes and sections g. Beams: bending moments and shear forces		
Assessment	50% Continuous Assessment Mark		
	50% Formal end of module exam (3 hours)		
DP Requirement	40% Continuous Assessment Mark		
	80% Attendance at lectures and tutorials		

Title	General Chemistry for Engineers			
Code	4CHM172	Department	Chemistry	
Prerequisites	None	Co-requisites	None	
Aim	The aim of this module is to give learners the necessary grounding in chemistry for further studies in analytical, inorganic, organic and physical chemistry			
Content	The nature of matter. Atomic structure and periodicity. Electron configurations and bonding. Types of chemical reactions. Chemical equations and the mole concept. The solid, liquid and gaseous states. Solutions. Thermochemistry. Chemical equilibrium. Chemical Kinetics. Redox equations and basic electrochemistry. Acids, bases and salts. Theory of acid-base titrations, including ph. Basic laboratory skills, including weighing and volume measurements and gravimetric, volumetric, and qualitative analyses			
Outcome	Learners must be able to demonstrate: an understanding of the structure of the atom, the chemical bonding which occurs between atoms and the types of chemical reactions that occur. an ability to write chemical formulas, balance equations, and apply the mole concepts in chemical calculations to mass reactions and reactions in solution. an understanding of the classification of matter and the fundamental properties of matter in the solid, liquid and gaseous phases and of solutions. thermochemistry, chemical equilibrium, chemical kinetics, basic electrochemistry and the characteristics of acids, bases and salts as well as the application of this knowledge to acid base titrations. an ability to perform a range of basic laboratory skills, including weighing and volume measurements and simple gravimetric, volumetric, and qualitative analyses			
Assessment	50% Continuous Assessment Mark (comprising 25% practical assessments plus 25% Interim assessments.) 50% Summative assessment(comprising a 3 hour assessment after the course work has been completed)			
DP Requirement	40% Continuous Assessm practical's			

Title	Calculus II for Engineers			
Code	4MTH172	Department	Mathematical Sciences	
Prerequisites	4MTH171(DP)	Co-requisites	None	
Aim	The aim of the module is to further develop concepts in calculus (integration, elementary introduction to differential equations) and to apply their techniques in problem solving.			
Content	Differentiation: some differentiation formulas, the chain rule implicit differentiation, the mean-value theorem and applications, some curve sketching, applications of derivatives.		and	
	 Integration and Techniques of integration: the fundamental theorem of integral calculus, indefinite integrals, some area problems, 			
	Transcendental functions: logarithmic, exponential, inverse trigonometric functions, hyperbolic functions.			
	Elementary Introduction to Differential Equations: First order linear equations.		: First	
	Sequences: properties, limit	S.		
Assessment	50% Continuous Assessment Mark 50% Formal end of module exam (3 hours)			
DP Requirement	40% Continuous Assessment Mark 80% Attendance at lectures and tutorials			

Title	Physics B for Engineers		
Code	4PHY172	Department	Physics
Prerequisites	4PHY171(DP)	Co-requisites	None
Aim	The module is meant for entry I concepts in Physics and Enginee study in more advanced fields in t concepts in electricity, nuclear ph	ring that prepares the stud he Physical Sciences. It co	ent for later ntains basic

Content	 Electricity and Magnetism: Coulomb's law, conductors and insulators. The electric field. Gauss' law. Potential, electrical potential energy, line integral of electric field, Capacitance, dielectrics and properties of dielectrics, Electric circuits. Magnetic field and magnetism, motion of charges particles through magnetic fields, the cyclotron. Ampere's law. Induced electromotive force, The R-L circuit and the L-C circuit. Magnetic properties of matter, materials, permeability, molecular theory. Magnetization and susceptibility. Hysteresis. Magnetic field of the earth. Magnetic circuits. Atomic Physics and radioactivity: Quantum theory of radiation. Wien and Stefan's laws. Planck's radiation formula. Radioactivity, natural decay series. Detectors of radiation, Nuclear reactions, conservation laws, reaction process, proton-induced, neutron-induced and other reactions. Qvalues, alpha beta- and gamma-decay. Nuclear binding energy. Fission and fusion. Reactors, nuclear fuel, breeders. Cosmic radiation and fundamental principles. Practical: Laboratory sessions on precision calculations in experimental results, forces, mechanics, optics heat and properties of matter.
Outcomes	 An understanding of statistical concepts for data analysis and presentation. An understanding of basic in static electricity, natural phenomena such as lightening, and the principles of machines based on static electricity concepts such as Van De Graaf Generators. An understanding of electric current and its effects (such as heating) The generation of electricity (Faraday's law, Lenz's law, etc.) A learner should understand the basic concepts of radioactivity, constituents of the nucleus and the effect of radiation. Learners should be able to solve problems related to theory taught. Learners should be able to identify most of laboratory instruments used in the level 1 laboratory and use these properly to obtain meaningful results Learners must be able to write simple scientific reports commensurate with level 1 B.Sc.
Assessment	50% Continuous Assessment Mark 50% Formal end of module exam (3 hours)
DP Requirement	40% Continuous Assessment Mark 80% Attendance at practical's and fieldwork

Title	Introduction to Engineering Design			
Code		5MEC112 Department Engineering		
Prerequisites	5M	EC111(DP)	Co-requisites	None
Aim	the s comp introd	Engineering graphics is the medium for communicating concepts and component manufacturing information. This module aims at developing the skills needed for documenting designs using drawings. Manual and computer aided methods of graphical communication will be used to introduce the fundamentals of descriptive geometry and apply the concepts of basic design for manufacturing.		
Content	1.	Understand the con and true length and	ncepts of scales and proper shape.	ortions, lines in space
	2.	Understand and a graphic communica	pply the drawing standation.	ards for international
	3.	Competently use dr	rawing instruments to gen	erate:
		 orthographic de 	tailed drawings	
		 pictorial views v 	vith an emphasis on isom	etric views
		 sectioned and a 	auxiliary views of engineer	ing components
	4.	Generate free hand sketches of orthographic and pictorial projections of engineering components. Communicate with a workshop / manufacturing environment by means of notes and dimensions on drawings. Interpret the information on an orthographic detailed working drawing.		raphic and pictorial
	5.			
	6.			
	7.	Use 3D computer aided drawing software as a tool to		
		Generate wo intent.	rking drawings for manu	facturing with design
		 Apply dimension standards to drawings. 		
		Generate ass	embly drawings applicabl	e to manufacturing.
	8.		damentals of Fits and Tol	erances
		Calculations a		
	9.	mechanical compor	aints and degrees of fre nents.	eedom in assembled
Assessment	CA	Tests 30% CAD assignments 20% Examination 50%		
DP Requirement		6 Continuous assess 6 Attendance at prac		

Title	Introduction to Engineering		
Code	5EEE112	Department	Engineering
Prerequisites	4MTH171(DP)	Co-requisites	None
Aim	 To motivate students and scope of engineering and s To familiarize students to e Introduce electrical network To introduce the concept of and transient response of c To analyze steady state diagrams 	pecifically electrical en lectrical circuits theorems DC response, steady ircuits	gineering state AC response
Content	Explanation of the engineering deach discipline. Circuit terminology, basic laws analysis, further network theore RL circuits, second order circuit introduction to sinusoids and phaanalysis, AC steady state power transient analysis of circuits with	of resistive networks, ms, energy storage el analysis, RLC circuits asors, phasors in stead in single phase circuit	nodal and mesh lements, RC and s and resonance, ly state AC circuit is. Introduction to
Assessment	Continuous assessment 50% Examination 50%		
DP Requirement	40% Continuous assessment n	nark	
,	80% Attendance at practical's		

Title	Advanced calculus for Engineers		
Code	4MTH271	Department	Mathematical
Prerequisites	4MTH171, 4MTH172	Co-requisites	None
Aim	This module is designed to introduce students to the concepts of series, vector functions, differentiation and integration of vector functions and functions of several variables.		
Content	 Intro to infinite series: The integral test The comparison test, The root test & the ratio test Absolute and conditional convergence Taylors polynomial in x; taylors theorem in x Taylors series in (x-a) Vector equation for a line & Vector equation for a plane Limits, continuity, differentiation of Vector functions The evaluation of double integrals by repeated integrals The double integral as the limit of a Reimann sum Triple integrals & Reduction to repeated integrals Cylindrical co-ordinates & Spherical co-ordinates Jacobian 		
Assessment	50% continuous assessment 50% formal end of semester 3hr exam on all material covered during the semester.		
DP Requirement	40% Continuous Assessment Ma 80% Attendance at lectures and		

Title	Signals and Systems I		
Code	5EEE211	Department	Engineering
Prerequisites	5EEE112	Co-requisites	None
Aim	The module provides students understanding linear systems, and deterministic signals.	the effect that such s	systems have on
Content	 This module provides students valinear systems, and the effect that signals. Upon completion, students will label linear time- Invariant systems in terms of inpand frequency domain methods. The module includes concepts convolution, Fourier analysis, and sampling of 	such systems have be able to characterize out-output relationships related to signal repre	on deterministic e and manipulate s, using both time esentation, linear
Assessment	Continuous Assessment 50% Exa	mination 50%	
DP Requirement	40% Continuous assessment mark	80% Attendance at	practical's
Title	Analogue Electronic Design		
Code	5EEE221	Department	Engineering
Prerequisites	5EEE112	Co-requisites	None
Aim	Students are introduced to device Analog Electronic devices, their pro- circuits consisting of passive and act analysis of some practical analog ele	perties and models, a tive devices, operationa ectronic circuits.	nalysis of simple al amplifiers, and
Content	 The module is delivered in the forms of lectures. There is a fixed text book for the module, which standardizes the module. After every 2- 3 weeks' lecture, the students are given a set of SPICE based simulation exercises which helps them to grasp the material. The SPICE exercises are so modelled that the students can see the importance of different device parameters and their effect on some basic designs. There are also four tutorials given in the module, and tutors are available on the tutorial classes to help the struggling students. There is an end-of-semester mini project done in groups. With this, the students try to design and analyze a bigger circuit and make a report. This helps them to grasp some of the challenges of designing an electronic circuits. 		
Assessment	Continuous Assessment 50% Examination 50%		
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's		

Title	Mechanics of Solids I		
Code	5MEC211	Department	Engineering
Prerequisites	4MTH172, 4MTH181	Co-requisites	None
Aim	A student who successfully completes this Module will have a thorough grounding in the essential principles of Mechanics of Solids. He or she will also have the understanding and capability to formulate and undertake problem solving in the areas of (i) simple direct stress and strain, (ii) shearing force and bending moment, (iii) bending stress, (iv) deflection, (v) torsion, and (vi) analysis of complex stress and strain (in 2 dimensions). In addition, they would be aware of the limitations of the mathematical modelling, (e.g. St Venant's principle, "point" loads, stress concentrations, symmetric sections, isotropic materials) as well as the value of free body diagrams, and the range of applicability of the formulations (e.g. Only 2 dimensions, statically determinant structures, axi-symmetric sections for torsion).		
Assessment	 Simple Stress and strain: Understanding of material ter and Poisson's ration. Formulation of solving of dire and temperature induced load Shearing of force and bending more induced. Determination of reactions and diagrams for loaded structure. Accurate drawing up of shear the exploded structure. Bender in the exploded structure. Clear understanding of the remoment of area I, stress, distended in the exploded structure. Calculation of second mome symmetrical sections as well stress under various loads. Defection of beams: Calculation of beam deflection method and moment area textoresion: Strong understanding of the moments of J, shear stress, it wist, for round sections. Cate determination of torsional strincluding power transmission. Analysis of complex stress and stem Understanding of shear stress of calculation of stresses on principal stresses and planes. Continuous Assessment 50% 	ct stress problems, included by the component of the comp	luding pre-stress ng up free body nent diagrams on ment M, second roung's modulus etrical and non- Determination of tion, Macaulay's Torque T, polar s G, and angular ents of area, and sional behaviour, wo dimensions. Determination of
Assessment	Examination 50%		
DP Requirement	40% Continuous assessment mar 80% Attendance at practical's	k	

Title	Materials Science in Engineeri	ng	
Code	5MEC221	Department	Engineering
Prerequisites	4MTH172, 4MTH181	Co-requisites	None
Aim	Any design engineer should know how to select materials which best fit the demands of a particular design – economic and aesthetic demands, as well as demands of strength and durability. This Module is intended to give a broad introduction to these properties and limitations. It cannot make you a materials expert, but it can teach you how to make a sensible choice of material, how to avoid mistakes that have led to embarrassment or tragedy in the past, and where to turn to for further, more detailed assistance.		
	embarrassment or tragedy in the past, and where to turn to for further,		
Assessment	Continuous Assessment 50% Examination 50%		
DP Requirement	40% Continuous assessment ma 80% Attendance at practical's	ark	

Title	Linear Algebra and Differe	ential Equations for	Engineers
Code	4MTH272	Department	Mathematical sciences
Prerequisites	4MTH171, 4MTH172	Co-requisites	None
Aim	This module is designed to linear algebra, and to meth ordinary differential equation	ods of finding exact	
Content	Linear algebra: finite and infinite dimensional vector spaces, subspaces, linear transformations and matrices, systems of linear equations, determinants, change of bases, similar matrices, eigenvalues and eigenvectors. Differential equations: study ordinary differential equations such as separable variables, exact equations, linear equations. Solutions of homogeneous differential equations with constant coefficients, Cauchy-Euler equation, systems of linear equations, nonlinear equations, Laplace transforms, homogeneous linear systems with constant coefficients.		
Assessment	50% continuous assessment (two assessments during the semester) 50% formal end of semester 3hr exam on all material covered during the semester.		
DP Requirement	40% Continuous Assessment Mark 80% Attendance at lectures and tutorials		

Title	Thermofluids I		
Code	4MEC212	Department	Engineering
Prerequisites	4MTH172, 4MTH181	Co-requisites	None
Aim	The aim of this Module is to intro and fluid mechanics sciences. Ir understanding of the 1st law of t transfer, as well as hydrostatic for associated with fluid flow.	ı particular, students w hermodynamics, mech	rill gain an nanisms of heat

Content	The subject will be covered by presenting both the theory as well as solving examples related to the individual topics. The Module will cover principles and examples of: The fundamentals of pressure, temperature and forms of energy. The origin and calculation of hydrostatic forces and pressure and their application. The First Law of Thermodynamics and its application to closed systems and control volumes. Property Tables and Equations of State. Equations of continuity and momentum and their applications.	
Assessment	Continuous Assessment 50%	
	Examination 50%	
DP Requirement	40% Continuous assessment mark	
	80% Attendance at practical's	

Title	Dynamics I		
Code	5MEC222	Department	Engineering
Prerequisites	4MTH172, 4MTH181	Co-requisites	None
Aim	The objective of this Module is to review and extend the fundamental principles and formulations of the kinematics and kinetics of Newtonian mechanics in the context of problems involving the dynamics of particles and rigid bodies.		
Content	Particle Kinematics: Rectilinear, plane and curvilinear motion Relative and constrained motion Particle Kinetics: Newton's 2nd law Work, kinetic energy and potential energy (power and efficiency) Linear and angular impulse-momentum and impact D'Alembert's principle Rigid Body Kinematics:		
	Rotation and absolute motion Instantaneous centres of zero velocity Relative velocity and acceleration Motion relative to rotating axes (Coriolis acceleration)		
Assessment	Continuous Assessment 50% Examination 50%		
DP Requirement	40% Continuous assessment n 80% Attendance at practical's	nark	

Title	Mechanical Engineering Machine Element Design I				
Code	5MEC232 Department Engineering				
Prerequisites	5MEC112 Co-requisites None				
Aim	The aim of this module is to introduce students to the design process for Mechanical Engineering Machine elements.				

Content	This Module introduces the basic engineering design process, applied to selection of simple machine components and development of basic machine assemblies. It draws on basic engineering science (Solid Mechanics, Materials Science, Dynamics) and applied engineering topics (Manufacturing Processes) to understand how machine components are selected and sized, depending on the required application and function. Computer Aided Modelling and Design (CAD) principles, which are introduced in first year, are developed further in the modelling and analysis of more realistic and complex machine assemblies. Topics to be covered during the Module will include: Elementary Design Process; manufacturing processes; tolerances of size and geometry; bearing type selection and sizing; gear type selection and kinematics; flexible drive selection and kinetics; fasteners and sealing; and design for static strength and stiffness.
Assessment	Continuous Assessment 50% Examination 50%
DP Requirement	40% Continuous assessment mark
2. Roquiromont	80% Attendance at practical's

Title	Introduction to Power Engineering			
Code	5EEE212 Department Engineering			
Prerequisites	5EEE112	Co-requisites	None	
Aim	To provide a foundation in power of	To provide a foundation in power engineering		
Content	Phasor diagrams for resistive, inductive and capacitive loads; transient analysis of circuits, complex power; power factor correction; 3-phase systems; magnetic circuits; the single phase transformer; dc. machines			
Assessment	Continuous Assessment 50%			
	Examination 50%			
DP Requirement	40% Continuous assessment mark	(
	80% Attendance at practical's			

Title	Mechanics of Solids II		
Code	5MEC311	Department	Engineering
Prerequisites	5MEC211	Co-requisites	None
Aim	Solid Mechanics is the study of lo deformations, and stability. The n will allow students to understa conditions.	nain objective is to dev	elop the skills that

		Strain Energy and Theories Understanding combined load failure. Failure theories includir maximum shear stress theory, shear strain energy theory, Col Determination of component fa	ing conditions and formung maximum principal sta maximum principal strai ulomb-Mohr shear stress	ress theory, n theory, maximum s theory.
		Deflection using Castigliano Calculation of beam deflection conditions.		for different loading
		Thin and thick cylinders Understanding and calculation pressure, shrink fits and compo		ed in vessels under
	Strains beyond the elastic limit Understanding of material behaviour beyond its yield stress where deformation is permanent and non-reversible. Calculation of additional loa capacity when considering plasticity.			
		Rotating discs Understanding the stresses de	•	•
		Two laboratory sessions on	tensile testing and loa	iding of structures.
Assessment		Continuous Assessment 50% Examination 50%		
DP Requirem	ent	40% Continuous assessment 80% Attendance at practical's		
Title	·			
Code	5MEC			
Prerequisites 5MEC212 Co-requisites None		None		
Aim	The Module consists of two topics, Thermodynamics and Fluid Dynamics. The main objectives are to develop the skills that will allow students to solve engineering problems and also to communicate the outcomes of a laboratory			

Content	Different types of flow.		
	 Application of the conservation of mass in fluid flow. 		
	 Application of the conservation of momentum in fluid flow. Application of the conservation of energy in fluid flow. 		
	 Application of the conservation of energy in fluid flow. Application of dimensional analysis and similarity for reduced 		
	Experimentation and scaling.		
	The velocity of pressure waves in fluids.		
	Revision of bascic concepts:		
	○ Eenergy		
	O properties of pure substances		
	energy analysis of closed systems		
	mass and energy analysis of control volumes.		
	Constant volume and constant pressure processes		
	o enthalpy		
	Second Law of Thermodynamics, heat source and sink, thermal efficiency,		
	perpetual motion machines, reversible and irreversible processes,		
	Carnot efficiency, Carnot heat engine, Carnot refrigeration cycle,		
	entropy, isentropic processes.		
	Efficiency of compressors, steady flow devices, isothermal, polytropic		
	and isentropic processes, isentropic efficiencies for turbines, compressors,		
	pumps and nozzles.Gas cycles:		
	O Otto,		
	O Diesel,		
	O Stirling,		
	O Ericsson,		
	Brayton and jet-propulsion		
	cycles. Vapour and combined cycles:		
	O Rankine cycle:		
	■ reheat,		
	■ regeneration,		
	■ co-generation,		
	Refrigeration cycles:		
	vapour-compression cycles,		
	heat pumps, absorption refrigeration (basic concept)		
	Gas and vapour mixtures, psychrometric charts. (basic concept)		
	0 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
Assessment	Continuous Assessment 50%		
	Examination 50%		
DP	40% Continuous assessment mark		
Requirement			
	2070 / Moridanico de practical o		

Title	Mechanical Engineering Machine Element Design II			
Code	5MEC331 Department Engineering		Engineering	
Prerequisites	5MEC232	Co-requisites None		
Aim	To introduce students to mach	nine design methods.		
Content	This Module aims to facilitate the development of knowledge and skills that will allow students to address design problems with both creativity and rigor, by generating concept designs, designing machine components and assemblies that will perform and can be produced in accordance with appropriately specified development requirements, and the creation of suitable engineering drawings for parts and assemblies. Topics include: Concept generation, machine component design and basic machine system design, CAD modelling and creation of part and assembly drawings including tolerances. Specific knowledge areas are static and fatigue failure theories; standard machine design for joints (welding, threaded and non-threaded fasteners), and power screws and includes basic design projects on the machine level.			
Assessment	Continuous Assessment 50% Examination 50%)		
DP Requirement	40% Continuous assessment	mark		
	80% Attendance at practical's			

Title	Statistics for Engineers		
Code	4STT171	Department	Mathematical
Prerequisites	4MTH171, 4MTH172	Co-requisites	None
Aim	This Module aims to introduce engineering students to the basic concepts and tools of Statistics which are of particular relevance in an engineering context, and to enable		
Content	Topics include: Random variables, sampling and basic statistical measures; Normal, t, F and Chi-square distributions; Confidence intervals; Statistical models, such as the means and the effects models; t, F and Chi-square tests; Regression and correlation; One-way analysis of variance; Introduction to the design of experiments; Application of		
Assessment	Continuous Assessment 50%		
	Examination 50%		
DP Requirement	40% Continuous assessme		
	80% Attendance at practical	ll'S	

Title	Experimental Methods		
Code	5MEC341 Department Engineering		
Prerequisites	All second year modules	Co-requisites	None
Aim	This Module aims to develop and case studies, which will a engineering experiments, interpretation		form successful

Content	The Module covers topics such as: basic concepts in experimental methods and taking measurements; safety and risk assessment; uncertainty analysis; basic electrical measurements; sensing and data management; temperature, pressure, force, strain
Assessment	Continuous Assessment 50% Examination 50%
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's

Title	Project Management		
Code	5MEC231	Department	Engineering
Prerequisites		Co-requisites	None
Aim	This module deals with the theory, tools, techniques and practices in project management. Opportunities are provided to develop an understanding of the triangle of Project Management (PM) – time, cost and performance and to use PM techniques to achieve objectives within triangle constrains. The application of the theory, tools, techniques and practices is an objective. This takes the form of a multidisciplinary project i.e. development of a small scale engineering		
Content	multidisciplinary project i.e. development of a small scale engineering Introduction to Project Management Introduction to Project Planning and Life Cycle Project Scope Management Project Time Planning and Network Costing Project and Financial Statement Managing Project Resources Managing Risk in Projects Project Quality Management Project Human Resource Project Contracts Trade-off Analysis in a Project Environment Project Closeout Tools include, but are not limited to, WBS, CPM, Gantt Chart,		
Assessment	Continuous Assessment 50% Examination 50%		
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's		

Title	Mechanical Engineering Mach	ine Element Desig	n III
Code	5MEC312	Department	Engineering
Prerequisites	5MEC331(DP)	Co-requisites	None
Aim	This Module aims to facilitate the further development and skills that will allow students to address complex design problems with creativity and rigor.		
Content	The aims will be achieved by ger performing etailed design of mac will perform and can be produspecified development requirement process with design reports incovered in the Module.	chine components and ced in accordance ents. The communic	nd assemblies that with appropriately ation of the design
Assessment	Continuous Assessment 50%		
	Examination 50%		

DP Requirement	40% Continuous assessment m	nark	
	80% Attendance at practical's		
Title	Dynamics II		
Code	5MEC322	Department	Engineering
Prerequisites	5MEC222	Co-requisites	None
Aim	This Module provides an introduction to engine balancing, kinematic analysis of gear trains, energy storage in flywheels and single-degree-of-freedom models in vibration analysis. Students will learn to analyze the dynamic behaviour of common engineering systems and components, for example gear trains, rotating and reciprocating machinery, flywheels and gyroscopes		
Content	Gears: Gear types: spur, bevel efficiency; epicyclic gears and di Vibrations: Free and forced degree-of-freedom systems Rese Rotating Unbalance: Static ba of balancing in Practice Engine Balancing: Compone unbalanced forces and couples, engines V- engines Flywheels: Energy storage; fluctuations, Crank- effort diagran operations Gyroscopes: Gyroscopic motio Laboratory Sessions: Epicyclic	fferentials vibration, viscous onance lancing, Dynamic ba ints of an engine, Single cylinder eng pulse smoothing to ns, applications - en n; steady precession	damping, Single- alancing, examples Determination of ines, Multi-cylinder orque and speed gines and pressing in only
Assessment	Continuous Assessment 50% Examination 50%		
DP Requirement	40% Continuous assessment m 80% Attendance at practical's	nark	

Title	Thermofluids III		
Code	5MEC332	Department	Engineering
Prerequisites	5MEC321(DP)	Co-requisites	None
Aim	This Module aims to develop an thermofluids.	advanced und	erstanding of
Content	Topics include: Boundary layer theory; (laminar and turbulent flow along plates in pipes; rotodynamics machines.; gas p measures of performance; properties of conditioning; combustion chemistry; air/fus sources and composition; energy of combustion; adiabatic flame tempera availability	and tubes); com ower cycles, eng gas and vapour uel ratio and stoic reacting syste	npressible flow ine cycles and mixtures; air- chiometry; fuel ems; heat of
Assessment	Continuous Assessment 50% Examination 50%		
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's		

Title	Materials under stress		
Code	5MEC342	Department	Engineering
Prerequisites	5MEC221 Co-requisites None		
Aim	This Module in materials under stress aims to develop an advanced understanding of elasticity and the importance of modulus in engineering design.		
Content	Topics include: the influence of bond strength and crystal structure; plastic flow in crystals and polycrystals by dislocation movement; strengthening mechanism in metals and alloys; annealing and heat treatment procedures; design for safety; stress concentration and residual stress considerations; failure in metals; ductile and brittle fractures; critical flaw size for crack propagation; fracture toughness of materials; stress conditions for fatigue and creep deformation; fracture mechanics; and failure analysis and failure case studies.		
Assessment	Continuous Assessment 50% Examination 50%		
DP Requirement	40% Continuous assessment mai	' k	
	80% Attendance at practical's		

Title	Culture and Society in Africa		
Code	1ANT172	Department	Social
Prerequisites	None	Co-requisites	None
Aim	This is a Complementary Studies Module for Electrical Engineering students aimed at broadening student's perspective.		
Content	Culture and Society in Africa provides students from all faculties with background knowledge about the continent on which they live. The module includes an examination of the concepts of culture, race, society, ethnicity and nation-state, a perspective on African worldviews and ways of thought, and a consideration of the role of Africa in a changing world.		
Assessment	Continuous Assessment 50%		
	Examination 50%		
DP Requirement	40% Continuous assessment mark		
	80% Attendance at practical's		

Title	Professional Communications		
Code	5EEE232	Department	Engineering
Prerequisites		Co-requisites	None
Aim	The aim of the module is to equip written communication, and to give them to communicate more effective professional careers.	hem practical skills	that will enable

Content	Referential Style and Academic writing and presentation; Planning & Discourse of technical written and oral messages; Reports – investigative/ evaluative; Executive Summaries/ Synopses; Individual presentations; graphics and visual literacy. Module content covers the following areas: Communication theory:
	 structure and components of a good executive summary style and language for a persuasive and comprehensive summary Graphic and PowerPoint Design: fundamental principles of visual literacy for text documents and presentations
	types of graphics types of visual aids that support and enhance a good presentation visual literacy and creating PowerPoint slides. Individual presentations: criteria for giving an effective oral presentation vocal delivery
	techniques for planning and balance in a presentation audience reach managing questions
Assessment	Continuous Assessment 50% Examination 50%
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's

Title	Mechanical Vibrations		
Code	5MEC411	Department	Engineering
Prerequisites	5MEC322	Co-requisites	None
Aim	This Module aims to introduce studen machines and structures. This will inc freedom models; analytical and nume applications. Formulation of equations degrees of freedom by Newton's laws techniques for equations of motion via modal analysis; application of techniq continuous systems.	clude single- and multi erical solution techniques of motion for single- s and energy methods a analytical and nume lues to analysis and d	- degree of les; and practical and multi- ; solution rical methods;
Assessment	Single degree of freedom syster 1.1 Formulation of the equation a) Newton's Law b) Energy Method(s) 1.2 Solution of equation of model a) Analytical solutions b) Numerical method 1.3 Applications: Rotating understand the measurement 2. Multi degree of freedom systems a) Analytical solutions b) Numerical method system a) Analytical solutions b) Numerical method 2.2 Solutions of equations of methods a) Modal analysis b) Numerical methods c) Application: Vibration mechanisms 2.3 Continuous Systems (Tim 3. Formulation of equations of moth vibration absorbers Continuous Assessment 50% Examination 50%	on of motion of linear solution by: s s s nbalance, vibration is s ation of motion of li s s motion for free and for ion absorbers, com	olation, vibration nearized DMOF red systems by plex structures,
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's		

Title	Product Design		
Code	5MEC421	Department	Engineering
Prerequisites	5MEC322	Co-requisites	None
Aim	To facilitate the development of knowledge and skills that will allow candidates to design a conventional engineering device working in a team and individually. The design is to be performed holistically, duly considering market opportunities and product architecture, needs identification, requirement formulation, planning and managing the process, concept generation and selection, detail design and drawing, financial and technical performance analysis and communicating the design solution.		
Assessment	The Design Process (Ulrich & E Opportunity identification (Ulrich Product planning and architectu Customer needs and requirer Chapters 5 & 6) Concept generation and selectic Managing projects (Ulrich & Epp Product development economice Design for Environment, Manuf Chapters 12 & 13) Prototyping and modelling (Ulrich Patents and Intellectual Property Industrial design (Ulrich & Epping Robust design (Ulrich & Eppinge Design project (Afternoon session Continuous Assessment 50% Examination 50%	a & Eppinger, Chapter re (Ulrich & Eppinger, ments specification of the condition of the co	Chapters 4 & 10) (Ulrich & Eppinger, Chapters 7 & 8) Chapter 17) (Ulrich & Eppinger,
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's		

Title	System Design		
Code	5MEC431	Department	Engineering
Prerequisites	5MEC322	Co-requisites	None
Aim	The objective of the Module is to a high level system design and development specifications. Stru according to the life cycle model a decomposition and allocation to har subsystem requirements by means creation of a system verification materials.	to generate system cturing of the devi- cortrayed by the V-d dware. Determination of system modelling	n and subsystem elopment process iagram. Functional n of the system and
Content	This Module marks the final chapter years of undergraduate engineering sengineering problems that stretch involve complexity that is beyond the world of Systems Engineering ware used to make a seemingly imposifier the previous design Module component or product design. Now tackle systems containing several iskills from mathematics, physic therm be essential for students to master the train of this Module is to give stimethodologies used when developin plants, aircraft, vehicles, space static	studies. Students are a beyond disciplinary e mastery of a single here various process sible problem manage as students have lead it is time to broader interrelated products, sofluids, dynamics and le subject of System and udents an appreciation glarge and complex significant in the subject of su	now ready to tackle boundaries, and e engineer. This is sees and techniques eable and solvable, arned the skills of a the horizons and. The fundamental dother subjects will Design.
Assessment	Continuous Assessment 40% Examination 60%		
DP Requirement	40% Continuous assessment mark		
	80% Attendance at practical's		
Title	Fundamentals of Control Systems	5	
Code	5MEC441	Department	Engineering
Prerequisites	All third year modules	Co-requisites	None
Aim	The objective of this Module is to pre in control systems engineering: Mathematical modelling of ele converting governing linear of Laplace transform; transfer functions and block differed for stability analysis; for stability analysis; for the effect of proportional, integrated in the effect of proportional, integrated in the effect of proportional integrated	mentary systems; differential equations agram algebra; the ro requency response o ops; gral and derivative co quations for digital co	by means of the pot locus technique f systems;

Content			
	Basic control loops, benefits	of feedback, transfer fun	ctions
	Block diagram algebra		
	Laplace (s-) transforms		
	Z-transforms		
	Accurate and approximate s	-z relations	
	 Simulations 		
	 Delays in control loops, com 		ers
	Bandwidth, Time constant, 0		
	Importance and meaning of demonstration by simulation	•	es and
	,		hing computer
	Root Locus analysis – manu generated		ning, computer
	Comparing Root Locus and		
	Bode Plot analysis and desi	• • • • •	p
	Optimal compensator position		
	From analogue to digital – recommendation	•	
	From digital to implementati	•	
	Bode Plot design – digital / a		
	Quantization effects, stiction		
	Noise filtering, especially an	ti-aliasing	
	Scaling		
	Modelling of DC motors, gearboxes and sensors		
	Examples of complete systems – specifying, modelling, simulation,		
	design		
Assessment	Continuous Assessment 50%		
	Examination 50%		
DP Requirement	40% Continuous assessment mai	k	
	80% Attendance at practical's		
Title	Aeronautical Engineering		
Code	5MEC451	Department	Engineering
Prerequisites	5MEC311	Co-requisites	None
Aim	The objective of this module is to		
	Engineering by introducing the his		
	propulsion, aerospace systems a		
	covered in detail, including: aerod structures, control and instrumenta		oropulsion,
	J Sa dotales, control and mondifient	auoii.	

Content	T1 1:4 60:14		
	 The history of flight, aerodyr systems. 	namics, aircraft prop	ulsion, aerospace
l l	 Aspects of aerodynamics ar 	nd aircraft design	
	Aerodynamic loads, Mach n	•	s number
	Develop a broad understand	,	
	 2D/3D aero foil flow characte 		
	effects, high lift devices		, ,
	 Understanding of the aerody 		ated on wings and
	bodies in incompressible flo		
	 Evaluate the mechanism of 	U	
	Flows over aero foils, wings.		ircraft components
	(e.g flaps, controls etc.) at low speed Concepts in aircraft stability and control		
	 Concepts in aircraft stability Provide an understanding of 		concrticual integral
	and derivative controllers	the properties of pr	oportional, integral
	 Analysis of the stress distrib 	ution in aircraft com	nonents with the
	aid of experimental tests	ation in allorait com	pononio with the
	 Understand the basic principal 	oles of propellers, ax	kial and centrifugal
	compressors and axial flow	turbines	_
Assessment	Continuous Assessment 40%		
	Examination 60%		
DP Requirement	40% Continuous assessment mark		
	80% Attendance at practical's		
Title	Engineering Professionalism		
Code	5MEC461	Department	Engineering
Prerequisites	All third year modules	Co-requisites	None
Aim	This module deals practically with the The aim is to complement the stude (in some cases) and reinforcing (in of to be encountered in the engineer	nt's theoretical trair thers) the topics and	ning by introducing d issues most likely
	endeavour to produce a well-round consulting and the design environme	ed mechanical eng	
i	consulting and the design environme Professional registration – ECSA, the due diligence, government certificate of Types of engineering employment – digraduates, the realities of the workpla management. Engineering economics and wages, depreciation, tax consider Health and Safety – managing diseas occupational safety and related legisla work permits and lockouts. Industrial law – Overview of employment equity contracts, basis of Quality, reliability and maintenance mengineering profession. Environment – legislation, ISO14000 and Likely impacts, considerations of the order to the support of the considerations	ed mechanical engint Washington Accord of competence, men letails of the options ce and industry trair — working capital, crations, rate of return e and health in the valion, practical HAZO ent law, labour relat f offer and acceptan anagement and thei 11, aspects of engir	I, code of conduct, torship in industry. I, cavailable for ning, career path ash flow, salaries n, payback period. workplace, OP analysis, safe ions and ce. Ir importance in the neering operations
6	consulting and the design environme Professional registration – ECSA, the due diligence, government certificate of Types of engineering employment – d graduates, the realities of the workpla management. Engineering economics and wages, depreciation, tax consider Health and Safety – managing diseas occupational safety and related legisla work permits and lockouts. Industrial law – Overview of employm employment equity contracts, basis of Quality, reliability and maintenance mengineering profession. Environment – legislation, ISO14000 and Likely impacts, considerations of the of Continuous Assessment 50%	ed mechanical engint Washington Accord of competence, men letails of the options ce and industry trair — working capital, crations, rate of return e and health in the valion, practical HAZO ent law, labour relat f offer and acceptan anagement and thei 11, aspects of engir	I, code of conduct, torship in industry. I, cavailable for ning, career path ash flow, salaries n, payback period. workplace, OP analysis, safe ions and ce. Ir importance in the neering operations
Assessment	consulting and the design environme Professional registration – ECSA, the due diligence, government certificate of Types of engineering employment – d graduates, the realities of the workpla management.Engineering economics and wages, depreciation, tax consider Health and Safety – managing diseas occupational safety and related legisla work permits and lockouts. Industrial law – Overview of employm employment equity contracts, basis of Quality, reliability and maintenance mengineering profession. Environment – legislation, ISO14000 and Likely impacts, considerations of the of Continuous Assessment 50% Examination 50%	ed mechanical engint Washington Accord of competence, men letails of the options ce and industry trair — working capital, crations, rate of return e and health in the valion, practical HAZO ent law, labour relat f offer and acceptan anagement and thei 11, aspects of engir	I, code of conduct, torship in industry. I, cavailable for ning, career path ash flow, salaries n, payback period. workplace, OP analysis, safe ions and ce. Ir importance in the neering operations
	consulting and the design environme Professional registration – ECSA, the due diligence, government certificate of Types of engineering employment – d graduates, the realities of the workpla management. Engineering economics and wages, depreciation, tax consider Health and Safety – managing diseas occupational safety and related legisla work permits and lockouts. Industrial law – Overview of employm employment equity contracts, basis of Quality, reliability and maintenance mengineering profession. Environment – legislation, ISO14000 and Likely impacts, considerations of the of Continuous Assessment 50%	ed mechanical engint Washington Accord of competence, men letails of the options ce and industry trair — working capital, crations, rate of return e and health in the valion, practical HAZO ent law, labour relat f offer and acceptan anagement and thei 11, aspects of engir	I, code of conduct, torship in industry. I, cavailable for ning, career path ash flow, salaries n, payback period. workplace, OP analysis, safe ions and ce. Ir importance in the neering operations

Title	Professional Communication Studies					
Code	5MEC412 Department Engineering					
Prerequisites	5EEE232	Co-requisites	None			
Aim		Professional Writing including: Business Proposals; Graphic Communication and Readability; Posters; Group presentations with Power-point				
Content	Formats for business plans and propovisual literacy. Module content covers Group theory and Team work: aim of communication barriers to communication why groups are formed types of groups group dynamics and how teams advantages of groups. different types of leaders process and benefits of Brainsto	 aim of communication barriers to communication why groups are formed types of groups group dynamics and how teams are formed advantages of groups. different types of leaders process and benefits of Brainstorming different approaches to Problem-solving and decision-making. negotiation skills 				
	etrics: definitions and schools reasons for codes and rules professional practice as defined by ECSA corporate governance and King III report Business Plans and Proposals: solicited and unsolicited proposals requests for proposals functions of SWOT and PESTEL Table of Contents of a Business Proposal Summaries: purpose of an executive summary structure and components of a good executive summary style and language for a persuasive and comprehensive summar CVs and Covering letters formats for and choice and ordering of content traditional and non-traditional CVs covering letters for responding to an advertisement or tender and direct approach. Poster Design:					
	 difference between stand-alone fundamental principles of well-d Group presentations: criteria for giving an effective gr vocal delivery techniques for good cohesion, t person in the group types of visual aids that support 	difference between stand-alone posters and accompanied posters fundamental principles of well-designed posters. Group presentations: criteria for giving an effective group oral presentation vocal delivery techniques for good cohesion, transitioning and handover to the next				
Assessment	Continuous Assessment 50% Examination 50%	en onit siides.				
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's					

Title	New Venture Planning and Management					
Code	5MEC422	Department	Engineering			
Prerequisites	All third year modules	Co-requisites	None			
Aim	Learning Business skills involved in si products designed: feasibility analysis					
Content	The entrepreneurial perspective; developing a new venture; what is a feasibility plan? Product concept and description; market assessment; industrial analysis; marketing plan; operations, development plans and management; financial projections					
Assessment	Continuous Assessment 50% Examination 50%					
DP Requirement	40% Continuous assessment mark					
•	80% Attendance at practical's					
Title	Final Year Research Project					
Code	5MEC432	Department	Engineering			
Prerequisites	Depends on the topic	Co-requisites	None			
Aim	To give individual students the opportunity to tackle a real engineering project within a limited period under the guidance of a supervisor and submit a project report on the results.					
Content	The final year research project is an important opportunity for the student, at the end of the degree programme, to tackle a real engineering project. The student is expected to work on the project both individually and under the guidance of a supervisor. An engineering project involves the creative application of scientific principles to the solution of a technical problem. It involves a problem description or research hypothesis developed in consultation with a supervisor, reviewing the topic in detail and defining the boundaries (scope) carefully, confirming an understanding of the requirements of the supervisor, searching for, selecting and justifying the most appropriate approaches to solving the problem or testing the hypothesis. It also requires a student to be able to analyse, design, build, integrate and test as is appropriate for the specific project. This could include the use of hardware, software and simulation. Students are also required to evaluate the project against the success criteria and design objectives, and to write a report about the project, the findings, and any recommendations. In addition, students need to make an oral presentation and prepare an exhibit.					
Assessment	Thesis 100%					

Title	Industrial Ecology				
Code	5MEC442	Department	Engineering		
Prerequisites	All third year modules Co-requisites None				
Aim	The module is an introduction and overview of the relatively new 'field' of Industrial Ecology and its more recent trends. In the context of the module "industrial ecology" is interpreted as encompassing all of the interactions of an industrial society with the natural environment as well as the associated drivers of industrialization. A more appropriate way of thinking about the module is to rename it "the Ecology of Industrial Society". The objectives are to encourage a systems perspective of industrial activity as it is integrated with and forms part of the natural systems (lithosphere, pedosphere, biosphere, hydrosphere, atmosphere)				
	This module is intended to be an enjoyable and enlightening experience, given the very different kind of learning that is expected. The students in the class have the responsibility to make the learning their own – to engage in debate and ask questions that will lead to the class finding out new information and reading different literature than that originally proposed – because it concerns what interests you and what you want to learn. What you learn and the effects of industry on the environment both affect your future. We are all in this together – the learning and the living. Let's do it with enthusiasm and meaning.				
	There are however, two primary educational goals for the module. The first has to do with the content and the second with the process. Students are expected to become aware of the problem issues facing the global community that relate to the industrial impact on the environment – the ecology of industrial society. You are expected to demonstrate this awareness and the acquisition of knowledge and understanding through discussion in class, through oral arguments, quizzes, projects, an exam and a term paper. These forms of communication hint at the second set of outcomes that relate to the ability to accomplish a limited kind of research as well as communicating ideas in a professional manner. Students are expected to put into practice the skills they have acquired in their professional communication module as well as using the opportunity to improve those skills. These do not only relate to the presentation side of the skills but also to the exploratory and critical aspects – being able to ask critical questions, seek information from the internet and other sources, argue a case in discussion as well as in a formal written presentation, show logical development of a debate and a willingness to be persuaded by a counter				
Content	argument. Ecosystem deterioration, pollution Resource depletion: Fossil fuels, water, uranium, rare earth metals Climate change Systems thinking, thermodynamics Sustainability; the limits to growth Industrial Ecology concepts and tools Material Flow Analysis Life Cycle Assessment; the circular economy Design for Environment Eco-Industrial Parks: industrial symbiosis Ethics: economic paradigms, consumption Energy, Mobility,				
Assessment	Continuous Assessment 50% Examination 50%				
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's				

Degree Module Content for BEng (Electrical Engineering and Computer Engineering)

Title	Calculus I for Engineers			
Code	4MTH171	Departme		ical
			Sciences	
Prerequisites	None	Co-requis	ites None	
Aim			ulus with necessary prere	equisites
	from logic	and general algebr	a.	
Content	subs		heory of Sets: sets and grams, basic set operation ntary logic.	ıs,
	• Ineq	ualities: Definition, o	order axioms, interval nota inequality equations. Abso	
	com	bination of functions	unctions, graph of a functions, inverse functions, mic functions, relations.	on,
	• Limi	•	fferentiation: definition of I	imit,
	 Algebra: induction, vectors and vector algebra, dot products and cross products, introduction to matrices and matrix algebra, transpose and determinants, the adjoint matrix, invertible matrix and Cramer's rule, complex numbers and De Moivre's theorem. 			
Assessment		50% Continuous Assessment Mark		
		al end of module exa		
DP Requirement		nuous Assessment I		
		dance at lectures an		
Title	General P	hysics A for Engin	eers	
Code	4PHY171	Department	Physics	
Prerequisites	None	Co-requisites	None	
Aim	concepts in later study contains	The module is meant for entry level BEng and contains fundamental concepts in Physics and Engineering that prepares the student for later study in more advanced fields in the Physical Sciences. It contains basic concepts in mechanics, waves, optics and thermodynamics.		

Content	 Statistical concepts: Probability, distributions, histograms, standard deviation, propagation of errors. Units and measurement: Dimensions, SI-system of units, basic measurements in physics. Mechanics: Forces, moments, couples, Newton's laws, circular motion, momentum, oscillations, momentum and impulse. Heat and thermodynamics: Mechanisms of heat transfer, heat capacity, phase changes, gases. Waves: Sound waves, light and light sources, laws of refraction, diffraction and reflection. Practical: Laboratory sessions on precision calculations in experimental results, forces, mechanics, optics heat and properties of matter.
Outcomes	 An understanding of statistical concepts for data analysis and presentation. An understanding of basic mechanics concepts, laws of Newton and their practical application. The understanding of circular motion, its mathematical representation and solving of problems associated with repetitive circular motion. An understanding of wave concepts, modes of propagation and associated phenomena inside a material medium. Problems. Learners should be able to identify most of laboratory instruments used in the level 1 laboratory and use these properly to obtain meaningful results. Learners must be able to write simple scientific reports commensurate with level 1 B.Sc.
Assessment	50% Continuous Assessment Mark 50% Formal end of module exam (3 hours)
DP Requirement	40% Continuous Assessment Mark 80% Attendance at practical's and Project work

Title	Introducto	ry Computing fo	r Engineers	
Code	4CPS171 Department Computer Science			
Prerequisites	None	Co- Any Mathematics module		
•	requisites			
Aim	computer		to hardware and softwa	re components of
Content		– Computer Arcl	nitecture	
Comone			nd Digital systems; Machir	ne level
	representation of data; Assembly level machine organization			
	1		lopment Fundamentals	to d Documentario
	Fundamen	iai Programming i	concepts and Object-Orien	nted Programming
Outcomes	At the end	of the module, the	learners should be able to	0:
			ation of the classical von	Neumann machine
	1	d its major functio		
	1		representation of data. ogic problems as: truth tal	oles and logic
	1	cuits.	ogio probiomo do: tratir tak	nee and legie
			, test, and debug pr	
			nming constructs such as:	
		ipie i/O, standard d parameter passi	conditional and iterative s	iructures, metnods,
Assessment			t 50% final practical and th	neory
	examinatio		·	·
DP Requirements	40% Contir	nuous Assessmer	t Mark, 80% Attendance a	t practical's
Title		ng Drawing		
Code	5MEC111		Department	Engineering
Prerequisites	None	f this mandale is	Co-requisites	None
Aim	The aim of this module is to use conventional drawing techniques to develop the skill of reading, interpreting and creating engineering drawings			
			nd free hand sketches	ggc
Content	Understand the concepts of scales and proportions, lines in space			
Content	and true length and shape.			
	2. Under		he drawing standards for i	nternational graphic
	communication. 3. Competently use drawing instruments to generate:			
	orthographic detailed drawings			
	pictorial views with an emphasis on isometric views			
	sectioned and auxiliary views of engineering components			
	4. Generate free hand sketches of orthographic and pictorial projections			
	of engineering components. 5. Communicate with a workshop / manufacturing environment by			
	means of notes and dimensions on drawings.			
	6. Interpret the information on an orthographic detailed working drawing.			
Assessment	Test 1: Descriptive Geometry Test 25%			
	Test 2: Descriptive Geometry Test 25%			
1	Examination 50%			
	LAGITITIAL	1011 30 70		
DP Requirement	40% Cont	tinuous assessme		

Title	Engineering Mechanics				
Code	4MTH181 Department Mathematical Sciences				
Prerequisites	4MTH171(DP)	Co-requisites	None		
Aim	Engineering Mechanics is the first module that prepares students to analyze forces and stresses that exist in structures and machines. It is therefore an extremely important foundational module. The central core of the module has to do with equilibrium of rigid bodies and fixed structures such as trusses and beams. This module				
	continues the modelling approach begun in Physics (for particles extends it to rigid bodies in static equilibrium. Although r mathematics module, aspects of mathematics are brought to be the formulation and solution of equilibrium problems. The eng requires skills of both analysis and of modelling. This module, I an introduction, will emphasize the analysis but will begin to determine the modelling ability in students.				
	The module is concerned with developing ways of "seeing" or visualizing equilibrium problems. It is crucial to develop a variety of skills and strategies that will be used in solving problems, but it is also essential that students realize that these are necessary but not sufficient conditions for problem solving. The visual aspect of recognizing equilibrium, simplifying the system, drawing free body diagrams and applying appropriate boundary conditions is what is really important to develop in students. The importance of geometric ability cannot be over-emphasized.				
	The module aims to develop in students an appreciation of force their various forms or guises, internal and external, and the work which they contribute to the equilibrium of an object. The moduli requires a professional approach that recognizes the need precision in engineering problem solving, mathematical language logical approach to calculations, diagrams that are according representations of the physical situation and a layout that is neat				
Content	1. Review of vectors a. Position, displacement and force vectors b. Line of action and transmissibility, addition of forces at a point c. Adding forces: resultants, components, unit vectors 2. Forces a. Normal reaction and friction b. Equilibrium for a particle c. Connected particles d. Limiting equilibrium: friction, toppling, sliding e. Free body diagrams 3. Parallel and non-parallel coplanar forces, a. Moment of a force, couples, principle of moments b. Addition of a force and a couple c. Resultant and equilibrium for a rigid body, internal forces, toppling and sliding				
		nd three-force systems			

	f. Trusses: meth	ods of nodes and sections			
	g. Beams: bending moments and shear forces				
Assessment	50% Continuous Assessmer				
	50% Formal end of module e	, ,			
DP Requirement	40% Continuous Assessmer				
	80% Attendance at lectures				
Title	General Chemistry for Engir				
Code	4CHM172	Department	Chemistry		
Prerequisites	None	Co-requisites	None		
Aim	The aim of this module is to chemistry for further studies physical chemistry	in analytical, inorganic, orga	anic and		
Content	The nature of matter. Atomic structure and periodicity. Electron configurations and bonding. Types of chemical reactions. Chemical equations and the mole concept. The solid, liquid and gaseous states. Solutions. Thermochemistry. Chemical equilibrium. Chemical Kinetics. Redox equations and basic electrochemistry. Acids, bases and salts. Theory of acid-base titrations, including ph. Basic laboratory skills, including weighing and volume measurements and gravimetric, volumetric, and qualitative analyses				
Outcome	Learners must be able to demonstrate: an understanding of the structure of the atom, the chemical bonding which occurs between atoms and the types of chemical reactions that occur. an ability to write chemical formulas, balance equations, and apply the mole concepts in chemical calculations to mass reactions and reactions in solution. an understanding of the classification of matter and the fundamental properties of matter in the solid, liquid and gaseous phases and of solutions. a thorough grasp of the basic principles of thermochemistry, chemical equilibrium, chemical kinetics, basic electrochemistry and the characteristics of acids, bases and salts as well as the application of this knowledge to acid base titrations. an ability to perform a range of basic laboratory skills, including weighing and volume measurements and simple gravimetric, volumetric, and qualitative analyses 50% Continuous Assessment Mark				
	(comprising 25% practical assessments plus 25% Interim assessments.) 50% Summative assessment(comprising a 3 hour assessment after the course work has been completed)				
DP Requirement	40% Continuous Assessmen	t Mark 80% Attendance at	practical's		
Title	Calculus II for Engineers				
Code	4MTH172 Department Mathematical Sciences				
Prerequisites	4MTH171(DP)	Co-requisites	None		
Aim	The aim of the module is to further develop concepts in calculus (integration, elementary introduction to differential equations) and to apply their techniques in problem solving.				

Content	 Differentiation: some differentiation formulas, the chain rule, implicit differentiation, the mean-value theorem and applications, some curve sketching, applications of derivatives. Integration and Techniques of integration: the fundamental theorem of integral calculus, indefinite integrals, some area problems, Transcendental functions: logarithmic, exponential, inverse trigonometric functions, hyperbolic functions. Elementary Introduction to Differential Equations: First order linear equations. Sequences: properties, limits. 			
Assessment	50% Continuous Assessment Ma 50% Formal end of module exan			
		· /		
DP Requirement	40% Continuous Assessment Ma			
	80% Attendance at lectures and	tutorials		
Title	Physics B for Engineers			
Code	4PHY172	Department	Physics	
Prerequisites	4PHY171(DP)	Co-requisites	None	
Aim	The module is meant for entry concepts in Physics and Engine study in more advanced fields in concepts in electricity, nuclear ph	ering that prepares the stude the Physical Sciences. It cor	ent for later	
Content	 Electricity and Magnetism: Coulomb's law, conductors and insulators. The electric field. Gauss' law. Potential, electrical potential energy, line integral of electric field, Capacitance, dielectrics and properties of dielectrics, Electric circuits. Magnetic field and magnetism, motion of charges particles through magnetic fields, the cyclotron. Ampere's law. Induced electromotive force, The R-L circuit and the L-C circuit. Magnetic properties of matter, materials, permeability, molecular theory. Magnetization and susceptibility. Hysteresis. Magnetic field of the earth. Magnetic circuits. Atomic Physics and radioactivity: Quantum theory of radiation. Wien and Stefan's laws. Planck's radiation formula. Radioactivity, natural decay series. Detectors of radiation, Nuclear reactions, conservation laws, reaction process, proton-induced, neutron-induced and other reactions. Q-values, alphabeta- and gamma-decay. Nuclear binding energy. Fission and fusion. Reactors, nuclear fuel, breeders. Cosmic radiation and fundamental principles. Practical: Laboratory sessions on precision calculations in experimental results, forces, mechanics, optics heat and properties of matter. 			

Outcomes	 An understanding of statistical concepts for data analysis and presentation. 		
	An understanding of basic in static electricity, natural phenomena such as lightening, and the principles of machines based on static electricity concepts such as Van De Graaf Generators.		
	 An understanding of electric current and its effects (such as heating) 		
	 The generation of electricity (Faraday's law, Lenz's law, etc.) 		
	 A learner should understand the basic concepts of 		
	radioactivity, constituents of the nucleus and the effect of radiation.		
	 Learners should be able to solve problems related to theory taught. 		
	 Learners should be able to identify most of laboratory 		
	instruments used in the level 1 laboratory and use these properly to obtain meaningful results		
	 Learners must be able to write simple scientific reports 		
	commensurate with level 1 B.Sc.		
Assessment	50% Continuous Assessment Mark		
	50% Formal end of module exam (3 hours)		
DP Requirement	40% Continuous Assessment Mark		
	80% Attendance at practical's and fieldwork		

Title	Introduction to Engineer	Introduction to Engineering Design			
Code	5MEC112	Department	Engineering		
Prerequisites	5MEC111(DP)	Co-requisites	None		
Aim	Engineering graphics is component manufacturing skills needed for documenti aided methods of graphics fundamentals of descriptive for manufacturing.	information. This module ng designs using drawing al communication will be	aims at developing the s. Manual and computer used to introduce the		

2. Understand and apply the drawing standards for international graphic communication. 3. Competently use drawing instruments to generate: • orthographic detailed drawings • pictorial views with an emphasis on isometric views • sectioned and auxiliary views of engineering components 4. Generate free hand sketches of orthographic and pictorial projections of engineering components. 5. Communicate with a workshop / manufacturing environment by means of notes and dimensions on drawings. 6. Interpret the information on an orthographic detailed working drawing. 7. Use 3D computer aided drawing software as a tool to • Generate working drawings for manufacturing with design intent. • Apply dimension standards to drawings. • Generate assembly drawings applicable to manufacturing. 8. Understand the fundamentals of Fits and Tolerances • Calculations and IT tables 9. Understand constraints and degrees of freedom in assembled mechanical components. Assessment Tests 30% CAD assignments 20% Examination 50% DP Requirement 40% Continuous assessment mark 80% Attendance at practical's and fieldwork Title Introduction to Engineering Code 5EEE112 Department Engineering Prerequisites AMTH17(DP) Co-requisites None Aim • To motivate students and help them understand the nature and scope	Content	Understand the concepts of scales and proportions, lines in space and true length and shape.					
orthographic detailed drawings pictorial views with an emphasis on isometric views sectioned and auxiliary views of engineering components Generate free hand sketches of orthographic and pictorial projections of engineering components. Communicate with a workshop / manufacturing environment by means of notes and dimensions on drawings. Interpret the information on an orthographic detailed working drawing. Use 3D computer aided drawing software as a tool to Generate working drawings for manufacturing with design intent. Apply dimension standards to drawings. Generate assembly drawings applicable to manufacturing. Understand the fundamentals of Fits and Tolerances Calculations and IT tables Understand constraints and degrees of freedom in assembled mechanical components. Assessment Tests 30% CAD assignments 20% Examination 50% DP Requirement 40% Continuous assessment mark 80% Attendance at practical's and fieldwork Title Introduction to Engineering Code 5EEE112		2.					
pictorial views with an emphasis on isometric views sectioned and auxiliary views of engineering components Generate free hand sketches of orthographic and pictorial projections of engineering components. Communicate with a workshop / manufacturing environment by means of notes and dimensions on drawings. Interpret the information on an orthographic detailed working drawing. Use 3D computer aided drawing software as a tool to Generate working drawings for manufacturing with design intent. Apply dimension standards to drawings. Generate assembly drawings applicable to manufacturing. Understand the fundamentals of Fits and Tolerances Calculations and IT tables Understand constraints and degrees of freedom in assembled mechanical components. Assessment Tests 30% CAD assignments 20% Examination 50% DP Requirement 40% Continuous assessment mark 80% Attendance at practical's and fieldwork Title Introduction to Engineering Code SEEE112 Department Engineering Prerequisites AMTH171(DP) Co-requisites None		3.	. Competently use drawing instruments to generate:				
Sectioned and auxiliary views of engineering components Generate free hand sketches of orthographic and pictorial projections of engineering components. Communicate with a workshop / manufacturing environment by means of notes and dimensions on drawings. Interpret the information on an orthographic detailed working drawing. Use 3D computer aided drawing software as a tool to Generate working drawings for manufacturing with design intent. Apply dimension standards to drawings. Generate assembly drawings applicable to manufacturing. Understand the fundamentals of Fits and Tolerances Calculations and IT tables Understand constraints and degrees of freedom in assembled mechanical components. Assessment Tests 30% CAD assignments 20% Examination 50% DP Requirement 40% Continuous assessment mark 80% Attendance at practical's and fieldwork Title Introduction to Engineering Code 5EEE112 Department Engineering Prerequisites 4MTH171(DP) Co-requisites None Aim To motivate students and help them understand the nature and scope			orthographic detailed drawings				
4. Generate free hand sketches of orthographic and pictorial projections of englineering components. 5. Communicate with a workshop / manufacturing environment by means of notes and dimensions on drawings. 6. Interpret the information on an orthographic detailed working drawing. 7. Use 3D computer aided drawing software as a tool to • Generate working drawings for manufacturing with design intent. • Apply dimension standards to drawings. • Generate assembly drawings applicable to manufacturing. 8. Understand the fundamentals of Fits and Tolerances • Calculations and IT tables 9. Understand constraints and degrees of freedom in assembled mechanical components. Assessment Tests 30% CAD assignments 20% Examination 50% DP Requirement 40% Continuous assessment mark 80% Attendance at practical's and fieldwork Title Introduction to Engineering Code 5EEE112 Department Engineering Prerequisites 4MTH171(DP) Co-requisites None			• pictorial views with an	emphasis on isometric \	views		
of engineering components. 5. Communicate with a workshop / manufacturing environment by means of notes and dimensions on drawings. 6. Interpret the information on an orthographic detailed working drawing. 7. Use 3D computer aided drawing software as a tool to • Generate working drawings for manufacturing with design intent. • Apply dimension standards to drawings. • Generate assembly drawings applicable to manufacturing. 8. Understand the fundamentals of Fits and Tolerances • Calculations and IT tables 9. Understand constraints and degrees of freedom in assembled mechanical components. Assessment Tests 30% CAD assignments 20% Examination 50% DP Requirement 40% Continuous assessment mark 80% Attendance at practical's and fieldwork Title Introduction to Engineering Code 5EEE112 Department Engineering Prerequisites 4MTH171(DP) Co-requisites None			 sectioned and auxiliary 	views of engineering o	omponents		
of notes and dimensions on drawings. 6. Interpret the information on an orthographic detailed working drawing. 7. Use 3D computer aided drawing software as a tool to • Generate working drawings for manufacturing with design intent. • Apply dimension standards to drawings. • Generate assembly drawings applicable to manufacturing. 8. Understand the fundamentals of Fits and Tolerances • Calculations and IT tables 9. Understand constraints and degrees of freedom in assembled mechanical components. Assessment Tests 30% CAD assignments 20% Examination 50% DP Requirement 40% Continuous assessment mark 80% Attendance at practical's and fieldwork Title Introduction to Engineering Code 5EEE112 Department Engineering Prerequisites 4MTH171(DP) Co-requisites None Aim		4.		es of orthographic and p	pictorial projections		
7. Use 3D computer aided drawing software as a tool to Generate working drawings for manufacturing with design intent. Apply dimension standards to drawings. Generate assembly drawings applicable to manufacturing. 8. Understand the fundamentals of Fits and Tolerances Calculations and IT tables 9. Understand constraints and degrees of freedom in assembled mechanical components. Assessment Tests 30% CAD assignments 20% Examination 50% DP Requirement 40% Continuous assessment mark 80% Attendance at practical's and fieldwork Title Introduction to Engineering Code 5EEE112 Department Engineering Prerequisites AMTH171(DP) Co-requisites None Aim To motivate students and help them understand the nature and scope		5.			ronment by means		
Generate working drawings for manufacturing with design intent. Apply dimension standards to drawings. Generate assembly drawings applicable to manufacturing. Understand the fundamentals of Fits and Tolerances Calculations and IT tables Understand constraints and degrees of freedom in assembled mechanical components. Assessment Tests 30% CAD assignments 20% Examination 50% DP Requirement 40% Continuous assessment mark 80% Attendance at practical's and fieldwork Title Introduction to Engineering Code 5EEE112 Department Engineering Prerequisites 4MTH171(DP) Co-requisites None Aim To motivate students and help them understand the nature and scope		6.	Interpret the information on a	an orthographic detailed	working drawing.		
Apply dimension standards to drawings. Generate assembly drawings applicable to manufacturing. Understand the fundamentals of Fits and Tolerances		7.	Use 3D computer aided draw	wing software as a tool to	0		
Generate assembly drawings applicable to manufacturing. Understand the fundamentals of Fits and Tolerances Calculations and IT tables Understand constraints and degrees of freedom in assembled mechanical components. Tests 30% CAD assignments 20% Examination 50% DP Requirement 40% Continuous assessment mark 80% Attendance at practical's and fieldwork Title Introduction to Engineering Code 5EEE112 Department Engineering Prerequisites 4MTH171(DP) Co-requisites None Aim To motivate students and help them understand the nature and scope			Generate working draw	wings for manufacturing	with design intent.		
8. Understand the fundamentals of Fits and Tolerances • Calculations and IT tables 9. Understand constraints and degrees of freedom in assembled mechanical components. Assessment Tests 30% CAD assignments 20% Examination 50% DP Requirement 40% Continuous assessment mark 80% Attendance at practical's and fieldwork Title Introduction to Engineering Code 5EEE112 Department Engineering Prerequisites 4MTH171(DP) Co-requisites None Aim • To motivate students and help them understand the nature and scope			Apply dimension stand	dards to drawings.			
Calculations and IT tables 9. Understand constraints and degrees of freedom in assembled mechanical components. Assessment Tests 30% CAD assignments 20% Examination 50% DP Requirement 40% Continuous assessment mark 80% Attendance at practical's and fieldwork Title Introduction to Engineering Code 5EEE112 Department Engineering Prerequisites 4MTH171(DP) Co-requisites None Aim To motivate students and help them understand the nature and scope			Generate assembly dr	awings applicable to ma	nufacturing.		
9. Understand constraints and degrees of freedom in assembled mechanical components. Assessment Tests 30% CAD assignments 20% Examination 50% DP Requirement 40% Continuous assessment mark 80% Attendance at practical's and fieldwork Title Introduction to Engineering Code 5EEE112 Department Engineering Prerequisites 4MTH171(DP) Co-requisites None Aim • To motivate students and help them understand the nature and scope		8.	. Understand the fundamentals of Fits and Tolerances				
Tests 30% CAD assignments 20% Examination 50% DP Requirement 40% Continuous assessment mark 80% Attendance at practical's and fieldwork Title Introduction to Engineering Code 5EEE112 Department Engineering Prerequisites 4MTH171(DP) Co-requisites None Aim • To motivate students and help them understand the nature and scope			Calculations and IT tables				
CAD assignments 20% Examination 50% DP Requirement		9.		and degrees of freed	om in assembled		
Examination 50% DP Requirement	Assessment	Tes	sts 30%				
DP Requirement 40% Continuous assessment mark 80% Attendance at practical's and fieldwork Title Introduction to Engineering Code 5EEE112 Department Engineering Prerequisites 4MTH171(DP) Co-requisites None Aim To motivate students and help them understand the nature and scope		· ·					
80% Attendance at practical's and fieldwork		LX					
Title Introduction to Engineering Code 5EEE112 Department Engineering Prerequisites 4MTH171(DP) Co-requisites None Aim • To motivate students and help them understand the nature and scope	DP Requirement						
Code 5EEE112 Department Engineering Prerequisites 4MTH171(DP) Co-requisites None Aim • To motivate students and help them understand the nature and scope	Title						
Aim • To motivate students and help them understand the nature and scope	Code			Department	Engineering		
Aim • To motivate students and help them understand the nature and scope							
	Prerequisites	4M		•			
of engineering and specifically electrical engineering To familiarize students to electrical circuits Introduce electrical network theorems	Aim	of engineering and specifically electrical engineering To familiarize students to electrical circuits					
To introduce the concept of DC response, steady state AC response		•	To introduce the concept of I	DC response, steady sta	ate AC response		
 and transient response of circuits To analyze steady state single phase AC circuits using phasor diagrams 		•	To analyze steady state s		ts using phasor		

Content	Explanation of the engineering disciplines and some job descriptions for each discipline. Circuit terminology, basic laws of resistive networks, nodal and mesh analysis, further network theorems, energy storage elements, RC and RL circuits, second order circuit analysis, RLC circuits and resonance, introduction to sinusoids and phasors, phasors in steady state AC circuit analysis, AC steady state power in single phase circuits. Introduction to transient analysis of circuits with energy storage elements.
Assessment	Continuous assessment 50% Examination 50%
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's

Title	Advanced calculus for Engineers		
Code	4MTH271	Department	Mathematical
			sciences
Prerequisites	4MTH171, 4MTH172	Co-requisites	None
Aim	This module is designed to introduce students to the concepts of series, vector functions, differentiation and integration of vector functions and functions of several variables.		
Content	 Intro to infinite series: The intest & the ratio test Absolute and conditional corolling Taylors polynomial in x; taylorates Taylors series in (x-a) Vector equation for a line & Limits, continuity, differentia The evaluation of double integral as the line Triple integrals & Reduction Cylindrical co-ordinates & Second Jacobian 	nvergence ors theorem in x Vector equation for a plantion of Vector functions egrals by repeated integra mit of a Reimann sum to repeated integrals	ne
Assessment	50% continuous assessment 50% formal end of semester 3hr exam on all material covered during the semester.		
DP Requirement	40% Continuous Assessment Mark 80% Attendance at lectures and tutorials		
Title	Introduction to Programming for	r Engineers	
Code	4CPS181	Department	Computer
Prerequisites	4CPS171	Co-requisites	None
Aim	To equip students with foundational programming skills including basic data structures.		

Content	Foundational Concepts; Overview of Structured Programming; Procedure-based versus Object-based thinking; Introductory UML representation of Object concepts; Object-oriented programming; Basic Concepts: objects, strings, arrays, classes, GUI, User-defined classes, and ADTs. Inheritance and Polymorphism, Implementation of object-oriented programming concepts using Java.			
Outcomes	 Demonstrate the ability to use Java constructs to build Objects and object relationships and interactions; Usage of UML language to represent core Object-oriented concepts such as encapsulation, inheritance and polymorphism; Acquire skills to use basic data structure algorithms covering array, list, stack and composite data structures based on them. 			
Assessment	Continuous Assessment 50% Examination 50%			
DP Requirement	40% minimum must be scored by a	student to qualify to	write e	examination.
Title	Signals and Systems I			
Code	5EEE211	Department		Engineering
Prerequisites	5EEE112	Co-requisite	es	None
Aim	The module provides students with the basic tools required for understanding linear systems, and the effect that such systems have on deterministic signals.			
Content	 This module provides students with the tools required for understanding linear systems, and the effect that such systems have on deterministic signals. Upon completion, students will be able to characterize and manipulate linear time- Invariant systems in terms of input-output relationships, using both time and frequency domain methods. The module includes concepts related to signal representation, linear convolution, Fourier analysis, and sampling of continuous-time signals. 			
Assessment	Continuous Assessment 50% Examination 50%			
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's			
Title	Analogue Electronic Design		_	
Code	5EEE221	Department	Eng	ineering
Prerequisites	5EEE112	Co-requisites	None	9
Aim	Students are introduced to device structures of some of the important Analog Electronic devices, their properties and models, analysis of simple circuits consisting of passive and active devices, operational amplifiers, and analysis of some practical analog electronic circuits.			

Content	 The module is delivered in the forms of lectures. There is a fixed text book for the module, which standardizes the module. After every 2- 3 weeks' lecture, the students are given a set of SPICE based simulation exercises which helps them to grasp the material. The SPICE exercises are so modelled that the students can see the importance of different device parameters and their effect on some basic designs. There are also four tutorials given in the module, and tutors are available on the tutorial classes to help the struggling students. There is an end-of-semester mini project done in groups. With this, the students try to design and analyze a bigger circuit and make a report. This helps them to grasp some of the challenges of designing an electronic circuits.
Assessment	Continuous Assessment 50% Examination 50%
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's

Title	Project Management			
Code	5MEC231	Department	Engineering	
Prerequisites	All first year modules	Co-requisites	None	
Aim	This module deals with the theory, tools, techniques and practices in project management. Opportunities are provided to develop an understanding of the triangle of Project Management (PM) – time, cost and performance and to use PM techniques to achieve objectives within triangle constrains. The application of the theory, tools, techniques and practices is an objective. This takes the form of a multidisciplinary project i.e. development of a small scale engineering system.			
Content	Introduction to Project Management Introduction to Project Planning and Life Cycle Project Scope Management Project Time Planning and Network Costing Project and Financial Statement Managing Project Resources Managing Risk in Projects Project Quality Management Project Human Resource Project Contracts Trade-off Analysis in a Project Environment Project Closeout Tools include, but are not limited to, WBS, CPM, Gantt Chart, Resource Levelling, Cash Flow Statement, Trade- off analysis and communication techniques			
Assessment	Continuous Assessment 50% Examination 50%			

Title	Linear Algebra and Differential Equations for Engineers		
Code	4MTH272	Department	Mathematical sciences
Prerequisites	4MTH171, 4MTH172	Co-requisites	None
Aim	This module is designed to introduc algebra, and to methods of finding differential equations		
Content	 Linear algebra: finite and infinite dimensional vector spaces, subspaces, linear transformations and matrices, systems of linear equations, determinants, change of bases, similar matrices, eigenvalues and eigenvectors. Differential equations: study ordinary differential equations such as separable variables, exact equations, linear equations. Solutions of homogeneous differential equations with constant coefficients, Cauchy-Euler equation, systems of linear equations, nonlinear equations, Laplace transforms, homogeneous linear systems with constant coefficients. 		
Assessment	50% continuous assessment (two assessments during the semester) 50% formal end of semester 3hr exam on all material covered during the semester.		
DP Requirement	40% Continuous Assessment Mark 80% Attendance at lectures and tut		

Title	Introduction to Power Engineering		
Code	5EEE212	Department	Engineering
Prerequisites	5EEE112	Co-requisites	None
Aim	To provide a foundation in power engineering		
Content	Phasor diagrams for resistive, inductive and capacitive loads; transient analysis of circuits, complex power; power factor correction; 3-phase systems; magnetic circuits; the single phase transformer; dc. machines		
Assessment	Continuous Assessment 50% Examination 50%		
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's	(

Title	Embedded Systems I			
Code	5EEE222	Department	Engineering	
Prerequisites	5EEE112	Co-requisites	None	
Aim	This module aims to give students a strong foundation in embedded systems by introducing them to digital system fundamentals, including information representation, Boolean algebra, logic gate behavior, combinational and sequential digital circuits, digital building blocks and algorithmic state machines. The module also provides a basic understanding of what a microcontroller is, how it works inside and what it can be used for. These objectives will be carried out by writing code for a micro in ASM and C			
	can be used for. These objectives will be carried out by writing code for a			
Assessment	Continuous Assessment 50% Examination 50%			
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's	K		

Title	Professional Communications					
Code	5EEE232 Department E					
Prerequisites	All first year modules Co-requisites None					
Aim	The aim of the module is to equip students with theory of oral and writter communication, and to give them practical skills that will enable them to communicate more effectively at the University and in their professional careers.					
Content	Referential Style and Academic v Discourse of technical written and o evaluative; Executive Summarie graphics and visual literacy.		s – investigative			
	summary style and langual comprehensive summary Graphic and PowerPoint fundamental print documents and presental types of graphics types of visual aid presentation visual literacy and Individual presentations: criteria for giving vocal delivery	n analysis les lefined by ECSA d King III report feasibility ferencing es of reports introduction, methods, r dations) and their functi th as Table of Contents opendices summary to a technical mponents of a good exe ge for a persuasive and Design: aciples of visual literacy tions	or professional ecutive for text nance a good slides. ntation			
	audience reach	•	a presentation			
Assessment	managing questi Continuous Assessment 50% Exam					
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's					

Title	Electromagnetism for Engineers		
Code	4PHY272	Department	Physics
Prerequisites	4PHY171, 4PHY172	Co-requisites	None
Aim	This module is designed to introduc theories applicable to electromagne		
Content	 electromagnetism Electrostatics, Gauss's law. Dipoles. Dielectric media. Phenomena related to electron levels: Introduction to metals, semi-conductors and insulators. Contact potential. Thermoelectric effects. Electromagnetism: Forces on moving charges in electric and magnetic fields. Magnetic scalar potential and vector potential. Ampere's law. Faraday's law. Self-induction and mutual induction. Alternating current: M L C R circuits and A-C bridges Magnetism: dia, para-and ferromagnetic materials. The magnetic circuit. Applications of concepts and theories of electromagnetism Transmission lines, microwaves, waveguides, electromagnetic interference. 		emi-conductors fects. in electric and ector potential. utual induction. is The magnetic
Outcomes Assessment	 An understanding of concepts and theories of electromagnetism. Understanding and applications of Gauss law. An understanding of laws governing electrical conduction and circuits. Understanding principles of magnetism and magnetic circuits Understanding applications of electromagnetism. 50% Continuous Assessment Mark 		
DP Requirement	50% Formal end of module exam (3 hours) 40% Continuous Assessment Mark		
Di Nequirement	80% Attendance at practical's and f	eldwork	

Title	Computer Science II for Computer E	Computer Science II for Computer Engineers		
Code	4CPS371	Department	Computer Science	
Prerequisites	4CPS181	Co-requisites	None	
Aim		To provide the student with the fundamental principles and techniques of data communication, LANs and WANs, TCP/IP protocol architecture and wireless network architectures.		
Content	Data Communication: Signals, Digital and analogue transmission, Multiplexing, error control; Networks: Switching principles, LAN, MAN, WAN; TCP/IP: Network layer addressing and routing, Network layer protocols, Transport layer protocols, Application layer services; Wireless communication: principles, Wireless LAN systems, Cellular telephony, Microwave and Satellite networks.			
Assessment	Continuous Assessment 50% Examination 50%			
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's			

Title	Electronic Devices and Circuits		
Code	5EEE321	Department	Engineering
Prerequisites	5EEE231	Co-requisites	None
Aim	To provide the student with an understanding of basic electronics concepts and also to equip the student with the necessary skills to perform detailed electronics design and analysis		
Content	Operational amplifiers, specifications and limitations and varieties and common configurations. Frequency response of amplifiers; Bodes plot Basic building blocks of analog ICs and circuits; current mirrors. Feedback and its effects in analog circuit design; stability Analog filters: filter design principles; different common ways to implement filters. Signal generators: oscillators and types of oscillators. Power Amplifiers Noise, sources and types. Switched mode power supplies and introduction to power electronics, buck, boost, buck-boost and isolated fly back topologies Safe Operating Area, mixed signal design, circuit layout, decoupling and grounding SPICE based simulations		
Assessment	Continuous Assessment 50% Examination 50%		
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's	(

Title	Signals and Systems II		
Code	5EEE341	Department	Engineering
Prerequisites	5EEE221	Co-requisites	None
Aim	To develop skills for the analysis of signals and noise in linear systems, and also some non-linear systems To convey how systems arising in electrical and electronic engineering may be analyzed in the time domain and the frequency domain. To develop concepts such as bandwidth, response time, power spectral density, and signal to noise ratio for quantifying signals and noise in linear systems To gain familiarity with basic modulation schemes used in communication systems and instrumentation.		

Content	Part A: Random signals and processes in continuous /discrete time, probability distribution/density functions, random signals calculus (mean, variance, moment generation function), transforms of random signals, Bayesian Theorem, covariance and correlation, Central Limit theorem, Gaussian processes, random signals spectrum and bandwidth, power spectral density (PSD), Wiener-Khinchine Theorem, entropy function, estimation/filtering of random signals. Part B: Time and frequency domain signal processing for electronic systems (carrier-wave radio and instrumentation), continuous-time Fourier theory, sampled signals and use of the discrete Fourier transform, propagation of signals and noise through linear systems, complex analytic signal representation, power calculations using PSD functions, pulse detection using correlation and the matched filter, analog carrier-wave modulation/demodulation, amplitude modulation (double sideband and single sideband; suppressed carrier and large carrier), heterodyning, angle modulation (frequency and phase modulation), signal tonoise ratio calculations.
Assessment	Continuous Assessment 50% Examination 50%
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's

Title	Embedded Systems II		
Code	5EEE351	Department	Engineering
Prerequisites	5EEE222	Co-requisites	None
Aim	To introduce the student to the design and programming of an embedded system controlled, for example, by a RISC processor (eg. ARM Cortex). After the initial embedded coding practice, the tool chains for loading, testing and debugging the code are introduced, followed by more advanced topics of hardware/software interfacing. By the end of the module embedded operating systems are used. The implications of multitasking real time operations, safety and maintenance are covered.		
Content	This module focuses on embedded systems and computer architecture, covering embedded operating systems, theory and practices for the design and analysis of computer architecture and an introduction to Hardware Description Language (HDL) programming. This module builds on Embedded Systems I module. The module is split into two parts. Part 1 (8 credits) concerns the design process, modelling and analysis of embedded systems designs, the structure of an operating system, cross-compiling toolchains, and relevant related theories. Techniques for execution time analysis, resource control protocols, and methods for modelling and simulation of computer systems are studied. Practicals concern using and embedded operating system, cross-compiling applications, and using a single board computer embedded platform. Part 2 (4 credits) introduces HDL programming techniques and tools for developing gateware and simulating designs. A mini-project is performed which involves implementing a state machine and performing thorough analysis of its design and performance.		
Assessment	Continuous Assessment 40% Examination 60%		
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's		

Title	Statistics for Engineers		
Code	4STT171	Department	Mathematical Sciences
Prerequisites	4MTH171, 4MTH172	Co-	None
		requisites	
Aim	This Module aims to introduce engineering students to the basic concepts and tools of Statistics which are of particular relevance in an engineering context, and to enable		
	students to apply these to data colle		
Content	Topics include: Random variables, sampling and basic statistical measures; Normal, t, F and Chi-square distributions; Confidence intervals; Statistical models, such as the means and the effects models; t, F and Chi-square tests; Regression and correlation; One-way analysis of variance; Introduction to the design of experiments; Application of statistical tools to experimental data in an engineering setting.		
Assessment	Continuous Assessment 50% Examination 50%		
DP	40% Continuous assessment mark		
Requirement	80% Attendance at practical's		

Title	Control Engineering		
Code	5EEE312	Department	Engineering
Prerequisites	4MTH271, 4MTH272, 5EEE231	Co-requisites	None
Aim	To train and educate students in control engineering methods for SISO control problems, including formulation of elementary problems as block diagrams, analysis of system interconnected systems, design and synthesis of feedback control systems in terms of input-output and state-space models. To introduce students to open-ended control engineering projects by means of a team project centered around a control problem.		
Content	Terminology: Open and closed loop configurations, block diagrams, dynamic system modelling, transient response, stead state error criterion. System stability: Routh Hurwitz criterion, Root Locus. Frequency responses. Nyquist lots, Bode diagrams, Nichols Charts. Compensation: Lead-lag circuits, minor loops, feedforward and three-term controllers. Sensitivity functions, minimum prototype response controllers, bilinear transformation, frequency response methods. State variables, state space models and design methods. Robustness, observability controllability, stability and performance.		
Assessment	Continuous Assessment 50% Examination 50%		
DP	40% Continuous assessment mark		
Requirement	80% Attendance at practical's		

Title	Power Systems		
Code	5EEE322	Department	Engineering
Prerequisites	5EEE212	Co-requisites	None
Aim	To create an interest in power systems engineering, to provide a sound basis of study for those who will continue studies in this subject and, for those who do not continue with power modules, to provide useful information relevant to future needs		
Content	Structure of power system, ac power theory, electrical loads, customer tariffs and power factor correction, introduction to power systems analysis, including: 3-ph transformer representation, Per unit calculations, Load flow and fault calculations; AC and DC power distributors, Transmission efficiency and conductor efficacy; Protection principles and Matlab programming.		
Assessment	Continuous Assessment 50% Examination 50%		
DP	40% Continuous assessment mark		
Requirement	80% Attendance at practical's		
Title	Communications and Networks		
Code	5EEE332	Department	Engineering
Prerequisites	5EEE231	Co-requisites	None
Aim	To provide a basic understanding architecture, technology, and protoc		

0 1 1	Madula A.
Content	Introduction to Networks: Internet, protocol, network edge, core network and access networks, circuit switching and packet switching, LAN topology, physical media, layered architecture, performance, protocol model. Application layer: service, client-server paradigm, network applications: web and http, ftp, email, ssh, DNS, p2p file sharing, socket programming. Transport layer: transport layer services, multiplexing/demultiplexing, Network layer: Introduction, virtual circuit and datagram networks, router, Internet Protocol datagram, fragmentation, IPv4, Physical layer: Digital information, Digital communication system, Sampling, Pulse modulation, Quantization, Pulse code modulation, Bandpass modulation schemes ASK, FSK, PSK, Phase-shift keying and amplitude phase keying in vector representation, Orthogon Module B: Communication system and network design II: Transport layer: UDP, reliable data transfer, TCP, connection management, congestion and congestion control. Network layer: ICPM, IPv6, link-state algorithm, distance vector routing algorithm, routing in Internet, broadcast and multicast routing. Data link layer: link layer services, error detection and correction. Multiple access: TDMA, Aloha, CSMA. LAN technologies: IEEE 802 family, MAC, LAN addressing, ARP, Ethernet, Token Rings, hubs and switches, PPP, ATM, MPLS, all IP networks. Physical layer: Information theory and entropy, Channel capacity, Source coding, Probability of error, Eb/n performance, Matched filter detection, ISI and pulse shaping, Equalization, Bandpass demodulation/detection schemes with ASK, FSK, PSK, Probability of Error with bandpass detection, MSK
Accessment	Continuous Assessment FOO/
Assessment	Continuous Assessment 50% Examination 50%
DP	40% Continuous assessment mark
Requirement	80% Attendance at practical's
	00 /0 /htteridance at practical 3

Title	Electrical Engineering and Computer Engineering Design			
Code	5EEE352 Department Engineering			
Prerequisites	5EEE321, 5EEE341, 5EEE351 Co-requisites None			
Aim	To tackle a design and research project in Electrical Engineering			

Content	In this module students will be assigned a design problem relevant to the Electrical Engineering discipline within which they will need to design a prototype and test a sub- system. This will provide insight to understand the intricacies of real-life complex sub system design. Students will be expected to solve an Electrical Engineering problem methodically using the skills they have gathered over the previous semesters of the curriculum, especially from the Design 1 module. Financial constraints required to complete the project and financial decision making will be reported.
Assessment	Continuous Assessment 40%
	Examination 60%
DP Requirement	40% Continuous assessment mark
	80% Attendance at practical's

Title	Culture and Society in Africa		
Code	1ANT172	Department	Social Anthropology
Prerequisites	None	Co-requisites	None
Aim	This is a Complementary Studies Module for Electrical Engineering students aimed at broadening student's perspective.		
Content	Culture and Society in Africa provides students from all faculties with background knowledge about the continent on which they live. The module includes an examination of the concepts of culture, race, society, ethnicity and nation-state, a perspective on African worldviews and ways of thought, and a consideration of the role of Africa in a changing world.		
Assessment	Continuous Assessment 50% Examination 50%		
DP	40% Continuous assessment mark		
Requirement	80% Attendance at practical's		

Title	Process Control and Instrumentation			
Code	5EEE411 Department Engineerin			
Prerequisites	5EEE312	Co-requisites	None	
Aim	Aims to provide an integrated view of industrial control and its application		ctice of modern	
Content	Various topics will be covered including: Measurement of physical variables, industrial transducers, integration of programmable logic controllers (PLCS), supervisory control and data acquisition (SCADA) systems and management information systems (MIS), signal transmission and conditioning, microcontrollers, computer interfacing, realtime multitasking in computer control, nonlinear and advanced control methods.			
Assessment	Continuous Assessment 50%			
	Examination 50%			
DP Requirement	40% Continuous assessment mark		_	
	80% Attendance at practical's			

Title	Engineering Systems Design			
Code	5EEE421	Department	Engineering	
Prerequisites	5EEE342	Co-requisites	None	
Aim	To understand and apply the princ	ciples of engineering des	ign	
Content	The pessimistic mind view - worst- statistical yield. Standards and codes. STEEP and economic and political context. ED/ of candidate concepts and selectio of specifications and user requir checks; design work; qualification Case histories Formal Design Methodology - methodologies. IBM's Rational Unified Process elaboration, construction, transition. Disciplines - business modelling, design, implementation, testing, configuration and change managem	Standards and codes. STEEP analysis - social, technical, environmental, economic and political context. EDA and CAD <i>Design methods</i> - Synthesis of candidate concepts and selection of an optimum concept; development of specifications and user requirements; modelling, simulation, reality checks; design work; qualification and acceptance tests; documentation. Case histories Formal Design Methodology - Common features of formal design methodologies. IBM's Rational Unified Process. Phases and iterations -inception, elaboration, construction, transition. Disciplines - business modelling, requirements gathering, analysis and design, implementation, testing, deployment, project management, configuration and change management, environment. Project - Two assignments will be tackled, and a poster will be prepared		
Assessment	Continuous Assessment 50% Examination 50%			
DP Requirement	40% Continuous assessment mar	k		
	80% Attendance at practical's			

Title	Power Systems Engineering		
Code	5EEE441	Department	Engineering
Prerequisites	5EEE322	Co-requisites	None
Aim	To develop an understanding of pow	er systems and protec	ction

Content	Distribution and transmission systems, protection systems, steady state operation of transmission lines, high voltage engineering, electricity pricing, microgrids and smart grids. Topics include: Loads - Electrical load characteristics (PIR, transient, statistical distribution and probabilistic load model), Non Linear Loads, non- active power, unbalance, Load data collection, Data analysis, Time series, parametric, sectoral and spatial load forecasting High Voltage Engineering - Introduction and fields, Gas discharges, solids, liquids; Over voltages, insulation coordination Branches — Cables, LV feeders voltage drop calculations, Herman Beta spread sheet, Overhead lines: design, safety, electric machinery regulations,3-ph overhead lines: types of structures and conductors, conductor selection, load capacity, line parameters; 3-ph overhead lines: cost, MV voltage drop and losses — radial feeder with point loads, minimum route length; Mechanical design of overhead lines, 2-ph and SWER lines: capacity, design, safety/reliability, unbalance; Comparison of alternative overhead lines, HVDC transmission.; Nodes - Small substations; Large substations; Unconventional: CCS, Captap, SWS; DG: Energy resources, environment and cost,: Voltage rise constraints Protection - Protection philosophy, switchgear and surge arresters, instrument transformers, , OC and DOC relays, Relay settings grading, Protection testing and commissioning, protection lab, , Unit feeder protection delivery processes and policy - Delivery processes: planning design, construction, O&M (incl condition monitoring), EIA, QA,standards; Logframe for planning and evaluation of electrification; Electrification in SA, NEP, future electrification, EDI restructuring, Power Quality/Quality of Supply; Reliability; Financial evaluation of projects (IRR, NPV, inflation, losses, economics of pf correction); Pricing policy, rationalization, residential tariffs, BEST/	
Assessment	Continuous Assessment 50%	
, 100000	Examination 50%	
DP Requirement	40% Continuous assessment mark	
	80% Attendance at practical's	

Title	Telecommunications		
Code	5EEE451	Department	Engineering
Prerequisites	5EEE332	Co-requisites	None
Aim	To enhance an understanding of and competence in analyzing and designing wireless communication systems to specified performance criteria. To extend your study of principles of communication engineering towards current design topics.		

Content

Selected topics in (1) digital communication systems (24 lectures) and (2) radio frequency & wireless systems (24 lectures).

<u>Digital Communication Systems Content</u>: Any topics from: <u>Digital Modulation</u>:

highlights; Formatting and Source Coding; Synchronization; Reducing Signal Degradation: signals, spectra and noise, communications link

analysis, coding and interleaving to mitigate fading effects, main parameters of

interleaving to mitigate fading effects, main parameters of Fading Channel Models,

applications. *Modulation and Coding* trade-offs; *Error Performance* of communication systems corrupted by noise.

<u>[Fundamental Digital Communication Systems Concepts</u>: Communication theory

enables us to understand how to insert, protect, transmit and extract information by applying successive transformations and forcing functions to enable signals to propagate through a number of stages (modules) from the source to the destination.

Digital formatting and modulation in wireless systems are transformation techniques for encoding information into some digital format at low frequencies, mapping the sequence onto a high frequency and high energy sinusoid for transfer through the air or free space and then reversing the process at the receiving destination

[insertion, protection, transmission and extraction]. Random process theory enables us to use probabilistic and Fourier models in time, space and frequency to describe and estimate signals when their characteristics at an instant are not fully accessible for measurement. We apply random process theory to real voice, data, video, noise and interference signals. Linear systems theory along with information theory and Fourier techniques provide a modelling framework for describing, analyzing and testing signals and circuits used in transferring information from selected sources to intended destinations. Through that framework, we can determine things like the maximum density of distinct signals we can pack into a single channel of finite bandwidth, creating logical channels out of physical versions, how we can insert a driving function at some point in the system and measure a delayed effect (convolution, impulse response, transfer function) elsewhere across the system by assuming distortionless transmission of amplitude, frequency and phase information, modelling a channel as a filter for shaping and controlling the bandwidths of signals in it. and

analyzing the frequency components of a received information signal.

How do we know when we are doing well or badly in this field of work? An analysis of spectral efficiency reveals how many bits per second per Hertz of bandwidth we can push through a channel using a given approach to modulate and allocate resources for the available bandwidth. On the other hand, an analysis of the minimum amount ofenergy required to reduce the rate of occurrence of errors in a given transmission to a desired level reveals the energy efficiency of a given coding/modulation/multiple-

access (i.e., resource allocation) plan and implementation.]

RF & Wireless Systems Content: Any topics from: Microwave and RF components and transmission lines; Mobile communication systems; Radar systems; Noise and

distortion in microwave systems; Frequency planning; Regulatory aspects of Spectrum usage; Antenna technology; Satellite communication systems; Global Positioning Systems (GPS); Use of microwave test equipment.

Assessment	Continuous Assessment 50% Examination 50%
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's

Title	Engineering Professionalism			
Code	5EEE461 Department Engineering			
Prerequisites	All 3 rd year modules	Co-requisites	None	
Aim	This module deals practically with the student's transition to the workplace. The aim is to complement the student's theoretical training by introducing (in some cases) and reinforcing (in others) the topics and issues most likely to be encountered in the engineering profession. This is part of the endeavour to produce a well-rounded mechanical engineer for industry, consulting and the design environment			
Content	for industry, consulting and the design environment Professional registration – ECSA, the Washington Accord, code of conduct, due diligence, government certificate of competence, mentorship in industry. Types of engineering employment – details of the options available for graduates, the realities of the workplace and industry training, career path management. Engineering economics – working capital, cash flow, salaries and wages, depreciation, tax considerations, rate of return, payback period. Health and Safety – managing disease and health in the workplace, occupational safety and related legislation, practical HAZOP analysis, safe work permits and lockouts. Industrial law – Overview of employment law, labour relations and employment equity contracts, basis of offer and acceptance. Quality, reliability and maintenance management and their importance in the engineering profession. Environment – legislation, ISO140001, aspects of engineering operations and likely impacts, considerations of the created environment as well as			
Assessment	Continuous Assessment 50%			
DD Doguirom and	Examination 50%			
DP Requirement	40% Continuous assessment mai 80% Attendance at practical's	IK		

Title	Computer Science III for Co	Computer Science III for Computer Engineers		
Code	4CPS471	Department	Computer Science	
Prerequisites	4CPS371	Co-requisites	None	
Aim	To introduce the concepts of programming the computer at the system level with particular emphasis on operating systems and formal language			
Content	Section A – Foundational Concepts Introduction to Assembly Language; Assembling; Linking and Running Assembly Language programs; Section B – Operating Systems Principles Process and thread management, Device management, Memory management, File systems, and Input/output and concurrency principles.			
Assessment	Continuous Assessment 50° Examination 50%	%		
DP Requirement	40% Continuous assessmen 80% Attendance at practical			

Title	Professional Communication Studies		
Code	5EEE412	Department	Engineering
Prerequisites	5EEE241	Co-requisites	None
Aim	Professional Writing including: Communication and Readability; Power-point		
Content	Referential and Academic writing and Formats for business plans and prop and visual literacy. Module content of Group theory and Team work: aim of communication barriers to communication why groups are formed types of groups group dynamics and how team advantages of groups. different types of leaders process and benefits of Brains different approaches to Problet negotiation skills Ethics: definitions and schools reasons for codes and rules professional practice as define corporate governance and King Business Plans and Proposals: solicited and unsolicited propositions of SWOT and PESTE Table of Contents of a Busines Summaries: purpose of an executive summ structure and components of a style and language for a persus CVs and Covering letters formats for and choice and ord traditional and non-traditional of covering letters for responding for direct approach. Poster Design: difference between stand-alone fundamental principles of well- Group presentations: criteria for giving an effective g vocal delivery techniques for good cohesion, next person in the group types of visual aids that suppor visual literacy and creating Pov	osals; group presentation osals; group presentation osals; group presentation osals are formed of torming osals os	mary sive summary or tender and panied posters
Assessment	Continuous Assessment 50% Examination 50%		
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's		

Title	New Venture Planning and Management			
Code	5EEE422 Department Engineerin			
Prerequisites	All third year modules	Co-requisites	None	
Aim	Learning Business skills involved in starting entrepreneurial businesses from products designed: feasibility analysis, business plan, presentations			
Content	The entrepreneurial perspective; developing a new venture; what is a feasibility plan? Product concept and description; market assessment; industrial analysis; marketing plan; operations, development plans and management; financial projections			
Assessment	Continuous Assessment 50%			
	Examination 50%			
DP Requirement	40% Continuous assessment mark			
	80% Attendance at practical's			

Title	Final Year Research Project		
Code	5EEE432	Department	Engineering
Prerequisites	Depends on the topic	Co-requisites	None
Aim	To give individual students the opportunity to tackle a real engineering project within a limited period under the guidance of a supervisor and submit a project report on the results.		
Content	The final year research project is an important opportunity for the student, at the end of the degree programme, to tackle a real engineering project. The student is expected to work on the project both individually and under the guidance of a supervisor. An engineering project involves the creative application of scientific principles to the solution of a technical problem. It involves a problem description or research hypothesis developed in consultation with a supervisor, reviewing the topic in detail and defining the boundaries (scope) carefully, confirming an understanding of the requirements of the supervisor, searching for, selecting and justifying the most appropriate approaches to solving the problem or testing the hypothesis. It also requires a student to be able to analyze, design, build, integrate and test as is appropriate for the specific project. This could include the use of hardware, software and simulation. Students are also required to evaluate the project against the success criteria and design objectives, and to write a report about the project, the findings, and any recommendations. In addition, students need to make an oral presentation and prepare an exhibit.		
Assessment	Thesis 100%		
DP Requirement	Meeting the ELO requirements		

Title	Industrial Ecology		
Code	5EEE442	Department	Engineering
Prerequisites	All third year	Co-requisites	None
	Modules		
Aim	of Industrial Ecology a module "industrial eco interactions of an indu as the associated drivithinking about the miscociety". The objectivindustrial activity as it systems (lithospheratmosphere) This module is intended given the very differer in the class have the engage in debate and out new information a proposed – because it to learn. What you leaboth affect your future living. Let's do it with There are however, two first has to do with Students are expected the global communitienvironment – the eco demonstrate this away understanding throug quizzes, projects, are communication hint a ability to accomplish a ideas in a profession practice the skills communication modu those skills. These descritical questions, seel argue a case in discus show logical development.	and to be an enjoyable and enlighted the kind of learning that is expected responsibility to make the learning and ask questions that will lead to and reading different literature that concerns what interests you are arrained the effects of industry on the word of the enthusiasm and meaning. The enthusiasm and meaning or primary educational goals for the content and the second will do become aware of the problem of the the enthusiasm and the second will be the problem of the enthusiasm and the second will be the problem of the enthusiasm and the second will be the problem of the discussion in class, through the exam and a term paper. If the second set of outcomes the exam and a term paper they have acquired in the leas well as using the opport to not only relate to the present exploratory and critical aspects— K information from the internet as ssion as well as in a formal writhent of a debate and a willingness.	the context of the bassing all of the vironment as well ppropriate way of logy of Industrial as perspective of art of the natural hydrosphere, ening experience, ed. The students and their own — to the class finding and that originally and what you want to the environment elearning and the the module. The vith the process, em issues facing I impact on the are expected to a knowledge and oral arguments, These forms of that relate to the iss communicating ected to put into eir professional funity to improve tation side of the being able to ask and other sources, then presentation,
Content	by a counter argumen Ecosystem deterioration		
	Resource depletion: Fo	ssil fuels, water, uranium, rare e	arth metals
	Climate change Systems thinking, thern	nodynamics Sustainability; the lin	mits to growth
	Industrial Ecology conc	epts and tools Material Flow Ana	
	Life Cycle Assessment; Design for Environment		
		dustrial symbiosis Ethics: econo	mic paradigms,
Assessment	Continuous Assessme Examination 50%	ent 50%	
DP Requirement	40% Continuous asse 80% Attendance at pr		

Degree Module Content for BEng (Mechatronic Engineering)

Title	Calculus I for Engineers		
Code	4MTH171 Department Mathematical		
Prerequisites	None	Co-requisites	None
Aim	To introduce differential calculus with necessary prerequisites from logic and general algebra.		
Content	 Elementary Logic and Theory of Sets: sets and subsets, Venn-Euler diagrams, basic set operations, sets of numbers, elementary logic. Inequalities: Definition, order axioms, interval notation, set builder notation, solving inequality equations. Absolute value Functions: elementary functions, graph of a function, combination of functions, inverse functions, exponential and logarithmic functions, relations. Limits, Continuity and Differentiation: definition of limit, continuity and the derivative Algebra: induction, vectors and vector algebra, dot products and cross products, introduction to matrices and matrix algebra, transpose and determinants, the adjoint matrix, invertible matrix and Cramer's rule, complex numbers and De Moiré's theorem 		
Assessment	40% Continuous Assessment Mark 60% Formal end of module exam (3 hours)		
DP Requirement	40% Continuous Ass	% Continuous Assessment Mark	
	80% Attendance at lectures and tutorials.		

Title	General Physics A for Engineers			
Code	4PHY171 Department Physics			
Prerequisites	None	Co-requisites	None	
Aim	The module is meant for entry level BEng and contains fundamental concepts in Physics and Engineering that prepares the student for later study in more advanced fields in the Physical Sciences. It contains basic concepts in mechanics, waves, optics and thermodynamics.			
Content	Statistical concepts: Probability, distributions, histograms, standard deviation, propagation of errors. Units and measurement: Dimensions, SI-system of units, basic measurements in physics. Mechanics: Forces, moments, couples, Newton's laws, circular motion, momentum, oscillations, momentum and impulse. Heat and thermodynamics: Mechanisms of heat transfer, heat capacity, phase changes, gases. Waves: Sound waves, light and light sources, laws of refraction, diffraction and reflection. Practical: Laboratory sessions on precision calculations in experimental results, forces, mechanics, optics heat and			

Outcomes	 An understanding of statistical concepts for data analysis and presentation. An understanding of basic mechanics concepts, laws of Newton and their practical application. The understanding of circular motion, its mathematical representation and solving of problems associated with repetitive circular motion. An understanding of wave concepts, modes of propagation and associated phenomena inside a material medium. Problems. Learners should be able to identify most of laboratory instruments used in the level 1 laboratory and use these properly to obtain meaningful results. 	
	 Learners must be able to write simple scientific reports commensurate with level 1 B.Sc. 	
Assessment	40% Continuous Assessment Mark	
	60% Formal end of module exam (3 hours)	
DP Requirement	40% Continuous Assessment Mark	
	80% Attendance at practical's and Project work	

Title	Introductory Computing	ng for Engineers	
Code	4CPS171	Department	Computer Science
Prerequisites	None	Co-requisites	Any Mathematics
Aim	To provide an introduct	ion to hardware and s	oftware components of
Content	Section A – Computer Architecture Introduction to Digital logic and Digital systems; Machine level representation of data; Assembly level machine organization Section B – Software Development Fundamentals Fundamental Programming concepts and Object-Oriented Programming		
Outcomes	At the end of the module, the learners should be able to: Explain the organization of the classical von Neumann machine and its major functional units. Describe the internal representation of data. Represent Boolean logic problems as: truth tables and logic circuits. Design, implement, test, and debug programs that use fundamental programming constructs such as: basic computation, simple I/O, standard conditional and iterative structures, methods, and parameter passing.		
Assessment	15% practical tests, 15% theory tests, 10% assignments (40% Continuous assessment) 60% final practical and theory examination		
DP Requirements	40% Continuous Assessr	ment Mark, 80% Atten	dance at practical's
Title	Engineering Drawing		
Code	5MEC111	Department	Engineering
Prerequisites	None	Co-requisites	None
Aim	The aim of this module is to use conventional drawing techniques to develop the skill of reading, interpreting and creating engineering drawings using drawing instruments and free hand sketches		

Content	 Understand the concepts of scales and proportions, lines in space and true length and shape. Understand and apply the drawing standards for international graphic communication. Competently use drawing instruments to generate: orthographic detailed drawings pictorial views with an emphasis on isometric views sectioned and auxiliary views of engineering components Generate free hand sketches of orthographic and pictorial projections of engineering components. Communicate with a workshop / manufacturing environment by means of notes and dimensions on drawings. Interpret the information on an orthographic detailed working drawing. 	
Assessment	Test 1: Descriptive Geometry Test 20% Test 2: Descriptive Geometry Test 20% Examination 60%	
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's and fieldwork	

Title	Engineering Mechanics			
Code	4MTH181	Department Mathematical Sciences		
Prerequisites	4MTH171(DP)	Co-requisites	None	
Aim	analyze forces and s is therefore an extrer The central core of bodies and fixed strucontinues the model and extends it to rig mathematics module the formulation and requires skills of both an introduction, will ethe modelling ability. The module is convisualizing equilibriur skills and strategies tessential that stude sufficient conditions recognizing equilibriu diagrams and applying really important to deability cannot be ove The module aims to their various forms of which they contribut requires a profession in engineer logical approach to	tresses that exist in stanely important foundathe module has to doctures such as trusses ling approach begungid bodies in static ed, aspects of mathematics olution of equilibrium analysis and of modemphasize the analysis in students. cerned with develope my problems. It is cruchat will be used in solving the sign appropriate bound appropriate bound evelop in students. The remphasized, develop in students and reguises, internal and the to the equilibrium of conal approach that in ring problem solving, in calculations, diagrifulations.	that prepares students to ructures and machines. It tional module. o with equilibrium of rigid and beams. This module in Physics (for particles) juilibrium. Although not a tics are brought to bear on problems. The engineer elling. This module, being is but will begin to develop ing ways of "seeing" or cial to develop a variety of ing problems, but it is also be are necessary but not go are ne	

Content	Review of vectors	
Content	F	
	a. Position, displacement and force vectors	
	b. Line of action and transmissibility, addition of forces at a	
	point	
	c. Adding forces: resultants, components, unit vectors	
	2. Forces	
	a. Normal reaction and friction	
	b. Equilibrium for a particle	
	c. Connected particles	
	d. Limiting equilibrium: friction, toppling, sliding	
	e. Free body diagrams	
	3. Parallel and non-parallel coplanar forces,	
	a. Moment of a force, couples, principle of moments	
	b. Addition of a force and a couple	
	c. Resultant and equilibrium for a rigid body, internal forces,	
	toppling and sliding	
	d. Two-force and three-force systems	
	e. Compound systems	
	f. Trusses: methods of nodes and sections	
	g. Beams: bending moments and shear forces	
	g. Boarno. Boriaing moments and orload forces	
Assessment	40% Continuous Assessment Mark	
	60% Formal end of module exam (3 hours)	
DP Requirement	40% Continuous Assessment Mark	
	80% Attendance at lectures and tutorials	
	00 /0 / Moridanios de localisto dina tatolidio	

Title	General Chemistry for		
Code	4CHM172	Department	Chemistry
Prerequisites	None	Co-requisites	None
Aim	The aim of this module is to give learners the necessary grounding in chemistry for further studies in analytical, inorganic, organic and physical chemistry		
Content	configurations and be equations and the mol Solutions. Thermochel Kinetics. Redox equati and salts. Theory of laboratory skills, include		

Outcome	Learners must be able to demonstrate:	
Guicome	 an understanding of the structure of the atom, the chemical bonding which occurs between atoms and the types of chemical reactions that occur. an ability to write chemical formulas, balance equations, and apply the mole concepts in chemical calculations to mass reactions and reactions in solution. an understanding of the classification of matter and the fundamental properties of matter in the solid, liquid and gaseous phases and of solutions. a thorough grasp of the basic principles of thermochemistry, chemical equilibrium, chemical kinetics, basic electrochemistry and the characteristics of acids, bases and salts as well as the application of this knowledge to acid base titrations. an ability to perform a range of basic laboratory skills, including 	
Assessment	40% Continuous Assessment Mark (comprising 20% practical assessments plus 20% Interim assessments.) 60% Summative assessment(comprising a 3 hour assessment after the course work has been completed)	
DP Requirement	40% Continuous Assessment Mark 80% Attendance at practical's	

Title	Calculus II for Engineers		
Code	4MTH172 Department Mathematical Science		Mathematical Sciences
Prerequisites	4MTH171(DP)	Co-requisites	None
Aim	The aim of the module is to further develop concepts in calculus (integration, elementary introduction to differential equations) and to apply their techniques in problem solving.		
Content	 Differentiation: some differentiation formulas, the chain rule, implicit differentiation, the mean-value theorem and applications, some curve sketching, applications of derivatives. Integration and Techniques of integration: the fundamental theorem of integral calculus, indefinite integrals, some area problems, Transcendental functions: logarithmic, exponential, inverse trigonometric functions, hyperbolic functions. Elementary Introduction to Differential Equations: First order linear equations. Sequences: properties, limits. 		
Assessment	40% Continuous Ass 60% Formal end of r	sessment Mark module exam (3 hours)	
DP Requirement	40% Continuous Ass		
	80% Attendance at le	ectures and tutorials	

Title	General Physics B for Engineers		
Code	4PHY172	Department	Physics
Prerequisites	4PHY171(DP)	Co-requisites	None
Aim	The module is meant for entry level B.Sc. and contains fundamental concepts in Physics and Engineering that prepares the student for later study in more advanced fields in the Physical Sciences. It contains basic concepts in electricity, nuclear physics and modern physics.		
Content	insulators. potential er dielectrics Magnetic f through r Induced e circuit. Magnetic molecular Hysteresis. Atomic Pl radiation. V Radioactivi Nuclear re proton-indu values, a energy. Fis Cosmic rad Practical: I	Magnetic field of the earth. nysics and radioactivity: Vien and Stefan's laws. Platy, natural decay series. Deactions, conservation lawaced, neutron-induced and lpha beta- and gamma-dision and fusion. Reactors, reliation and fundamental princulaboratory sessions on preal results, forces, mechal	aw. Potential, electrical ric field, Capacitance, rics, Electric circuits. In of charges particles of the charges particles and susceptibility. In and susceptibility. Magnetic circuits. Quantum theory of nack's radiation formula. In the charges of the
Outcomes	presentatio An unders phenomena machines be Graaf Gene An underst heating) The genera A learner s radioactivity radiation. Learners s taught. Learners s instruments properly to Learners m	standing of basic in stat a such as lightening, a ased on static electricity con	cic electricity, natural and the principles of cepts such as Van De dits effects (such as law, Lenz's law, etc.) concepts of as and the effect of ms related to theory cost of laboratory tory and use these
Assessment	40% Continuous Assessment Mark 60% Formal end of module exam (3 hours)		
DP Requirement	40% Continuous Ass	, ,	

Title	Introduction to Engineering Design			
Code	5MEC112	Department	Engineering	
Prerequisites	5MEC111(DP)	Co-requisites	None	
Aim	component manufact the skills needed for computer aided meth introduce the fundar	uring information. This documenting designs unods of graphical comm	mmunicating concepts and module aims at developing sing drawings. Manual and munication will be used to geometry and apply the	
Content	and true length 2. Understand and communication. 3. Competently us	and shape. apply the drawing stand e drawing instruments to	I proportions, lines in space ards for international graphic o generate:	
	1	hic detailed drawings		
	'	pictorial views with an emphasis on isometric views		
	4. Generate free projections of et 5. Communicate vineans of notes 6. Interpret the indrawing.	ngineering components. vith a workshop / ma and dimensions on drav	orthographic and pictorial nufacturing environment by vings.	
	Generate intent.	working drawings for	manufacturing with design	
	Apply dim	ension standards to dra	wings.	
		assembly drawings app fundamentals of Fits and	licable to manufacturing. d Tolerances	
Assessment	Tests 25% CAD assignments 19 Examination 60%	5%		
DP Requirement	40% Continuous ass 80% Attendance at p	essment mark practical's and fieldwork		

Title	Introduction to Engineering		
Code	5EEE112	Department	Engineering
Prerequisites	4MTH171(DP)	Co-requisites	None
Aim	of engineering a To familiarize stu Introduce electric To introduce the and transient res	nd specifically electric idents to electrical circ cal network theorems concept of DC respor ponse of circuits	0
Content	each discipline. Circuit terminology, b analysis, further netw RL circuits, second o introduction to sinuso circuit analysis, AC si	asic laws of resistive r fork theorems, energy rder circuit analysis, R ids and phasors, phas teady state power in si	networks, nodal and mesh storage elements, RC and LC circuits and resonance, sors in steady state AC ingle phase circuits. rcuits with energy storage
Assessment	Continuous assessm Examination 60%	nent 40%	
DP Requirement	40% Continuous ass 80% Attendance at p		

Degree Module Content for Shared second year for Mechanical Engineering + Mechatronic Engineering

Title	Advanced calcu	Advanced calculus for Engineers		
Code	4MTH271	Department	Mathematical sciences	
Prerequisites	4MTH171, 4MTH172	Co-requisites	None	
Aim	concepts of ser	This module is designed to introduce students to the concepts of series, vector functions, differentiation and integration of vector functions and functions of several variables.		
Content	The root tes Absolute an Taylors poly Taylors seri Vector equa Limits, conti The evaluat The double Triple integr	The root test & the ratio test Absolute and conditional convergence Taylors polynomial in x; taylors theorem in x Taylors series in (x-a) Vector equation for a line & Vector equation for a plane Limits, continuity, differentiation of Vector functions The evaluation of double integrals by repeated integrals The double integral as the limit of a Reimann sum Triple integrals & Reduction to repeated integrals Cylindrical co-ordinates & Spherical co-ordinates		
Assessment	60% formal en	40% continuous assessment 60% formal end of semester 3hr exam on all material covered during the semester.		
DP Requirement	40% Continuous Assessment Mark 80% Attendance at lectures and tutorials			

Title	Signals and Sy	Signals and Systems I		
Code	5EEE211	Department	Engineering	
Prerequisites	5EEE112	Co-requisites	None	
Aim		inear systems, and tl	the basic tools required for ne effect that such systems	
Content	understand systems, a deterministi Upon comp manipulate Invariant sy both time al domain met The module	ing linear and the effect that ic signals. Detion, students will l linear time- restems in terms of inpi nd frequency thods. Eincludes concepts rel Diution,	with the tools required for such systems have on the able to characterize and out-output relationships, using atted to signal representation, continuous-time signals.	

Assessment	Continuous Assessment 40% Examination 60%
DP Requirement	40% Continuous assessment mark
	80% Attendance at practical's

Title	Analogue Electronic Design		
Code	5EEE221	Department	Engineering
Prerequisites	5EEE112	Co-requisites	None
Aim	Students are introduced to device structures of some of the important Analog Electronic devices, their properties and models, analysis of simple circuits consisting of passive and active devices, operational amplifiers, and analysis of some practical analog electronic circuits.		
Content	The module is delivered in the forms of lectures. There is a fixed textbook for the module, which standardizes the module. After every 2- 3 weeks' lecture, the students are given a set of SPICE based simulation exercises which helps them to grasp the material. The SPICE exercises are so modelled that the students can see the importance of different device parameters and their effect on some basic designs. There are also four tutorials given in the module, and tutors are available on the tutorial classes to help the struggling students. There is an end-of-semester mini project done in groups. With this, the students try to design and analyze a bigger circuit and produce a report. This helps them to grasp some of the challenges of designing an electronic circuit.		
Assessment	Continuous Assessment 40% Examination 60%		
DP Requirement	40% Continuous 80% Attendance	assessment mark at practical's	

Title	Mechanics of Solids I		
Code	5MEC211	Department	Engineering
Prerequisites	4MTH172,	Co-requisites	None
	4MTH182	-	
Aim	thorough ground Solids. He one capability to formareas of (i) single and bending torsion, and (vidimensions). It of the mathe "point" loads	nding in the essential r she will also have mulate and undertample direct stress a moment, (iii) bending i) analysis of complete addition, they would matical modelling, (i) stress concentrate	tes this Module will have a principles of Mechanics of ye the understanding and the problem solving in the nd strain, (ii) shearing force is stress, (iv) deflection, (v) ex stress and strain (in 2 d be aware of the limitations e.g. St Venant's principle, ions, symmetric sections, alue of free body diagrams,

Content	 Simple Stress and strain: Understanding of material tensile stress behaviour, Young's modulus and Poisson's ration. Formulation of solving of direct stress problems, including prestress and temperature induced loads. Shearing of force and bending moment: Determination of reactions and subsequently drawing up free body diagrams for loaded structures. Accurate drawing up of shear force and bending moment diagrams on the exploded structure. Bending Stress. Clear understanding of the relationship between moment M, second moment of area I, stress δ, distance to outer fibre y, Young's modulus E and radius of curvature R. Calculation of second moment of areas for symmetrical and nonsymmetrical sections as well as compound beams. Determination of stress under various loads. Defection of beams: Calculation of beam deflection using direct integration, Macaulay's method and moment area techniques. Torsion: Strong understanding of the relationship between Torque T, polar moments of J, shear stress τ, radius R, shear modulus G, and angular twist θ/L, for round sections. Calculation of polar moments of area, and determination of torsional stresses and general torsional behaviour, including power transmission. Analysis of complex stress and strain: Understanding of shear stress and strain in two dimensions. Calculation of stresses and places and use of Mohr's circle
Assessment	principal stresses and planes and use of Mohr's circle. Continuous Assessment 40% Examination 60%
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's

Title	Materials Science in Engineering		
Code	5MEC221	Department	Engineering
Prerequisites	4MTH172, 4MTH182	Co-requisites	None
Aim	best fit the demands demands, as well a Module is intended t and limitations. It ca teach you how to ma	of a particular designas demands of struction of struction give a broad intround make you a make a sensible choiced to embarrassmen	to select materials which n – economic and aesthetic ength and durability. This duction to these properties naterials expert, but it can be of material, how to avoid tor tragedy in the past, and diassistance.

Content	Overview of the classification, price and availability of engineering materials. Structure-property relationships of metallic materials, with particular emphasis on the transition from elastic to plastic behaviour. Description and measurement of mechanical properties of metals. Modification of the properties of metals by deformation and heat treatment (consider plain carbon steels and low alloy steels as examples). Structure-property relationships of ceramic and amorphous (glass) materials, with particular emphasis on brittle behaviour and crack growth. Measurement of fracture toughness in relation to the energy required to propagate a crack. Modification of the properties of ceramics and glasses by controlled processing (eg thermal treatment to induce residual stress) and composite design (eg influence of fibres on crack propagation).		
	heat treatment (consider plain carbon steels and low alloy steels as examples). • Structure-property relationships of ceramic and amorphous		
	(glass) materials, with particular emphasis on brittle behaviour and crack growth.		
	Modification of the properties of ceramics and glasses by controlled processing (eg thermal treatment to induce residual stress) and composite design (eg influence of fibres on crack		
	 Structure-property relationships of polymeric materials, with particular emphasis on the classification of thermoplastics, thermosets and elastomers. 		
	Description of the manufacture of polymer components using processes such as extrusion, spinning, and injection and blow moulding. The principles of reinforcement and design on the properties		
	of composite materials. Relationship between structure and the electrical behaviour of engineering materials.		
	Influence of environmental effects (particularly corrosion) on the deterioration and degradation of materials. the Cambridge Engineering Selector (CES):		
	The first steps in optimising the selection of materials in design (translation, screening, documentation). Ranking materials suitability using material indices.		
	Several case studies in materials selection.		
Assessment	Continuous Assessment 40% Examination 60%		
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's		

Title	Linear Algebra and Diff Equations for Engineers			
Code	4MTH272	4MTH272 Department Mathematical sciences		
Prerequisites	4MTH171, 4MTH172	Co-requisites	None	
Aim	This module is designed to introduce students to the concepts of linear algebra, and to methods of finding exact solutions to			

Content	 Linear algebra: finite and infinite dimensional vector spaces, subspaces, linear transformations and matrices, systems of linear equations, determinants, change of bases, similar matrices, eigenvalues and eigenvectors. Differential equations: study ordinary differential equations such as separable variables, exact equations, linear equations. Solutions of homogeneous differential equations with constant coefficients, Cauchy-Euler equation, systems of linear equations, nonlinear equations, Laplace transforms, homogeneous linear systems with constant coefficients.
Assessment	40% continuous assessment (two assessments during the semester each carrying a weight of 20%) 60% formal end of semester 3hr exam on all material covered during the semester.
DP Requirement	40% Continuous Assessment Mark 80% Attendance at lectures and tutorials

Title	Thermofluids I		
Code	5MEC212	Department	Engineering
Prerequisites	4MTH172,	Co-requisites	None
	4MTH182		
Aim	thermodynamics students will ga thermodynamics,	and fluid mecha ain an understa mechanisms of	introduce students to the nics sciences. In particular, nding of the 1st law of heat transfer, as well as omentum associated with fluid
Content	The subject will be covered by presenting both the theory as well as solving examples related to the individual topics. The Module will cover principles and examples of:		
	The fundamentals of pressure, temperature and forms of energy.		
	 The origin and calculation of hydrostatic forces and pressure and their application. 		
	■ The First Law of Thermodynamics and its		
	application	to closed system	ms and control
Assessment	Continuous Assessment 40% Examination 60%		
DP Requirement	40% Continuous a 80% Attendance a		

Title	Dynamics I		
Code	5MEC222	Department	Engineering
Prerequisites	4MTH172, 4MTH182	Co-requisites	None

Aim	The objective of this Module is to review and extend the fundamental principles and formulations of the kinematics and kinetics of Newtonian mechanics in the context of problems involving the dynamics of particles and rigid bodies.
Content	Particle Kinematics: Rectilinear, plane and curvilinear motion Relative and constrained motion Particle Kinetics: Newton's 2nd law Work, kinetic energy and potential energy (power and efficiency) Linear and angular impulse-momentum and impact D'Alembert's principle Rigid Body Kinematics: Rotation and absolute motion Instantaneous centres of zero velocity Relative velocity and acceleration Motion relative to rotating axes (Coriolis acceleration)
Assessment	Continuous Assessment 40% Examination 60%
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's

Title	Mechanical Engin	eering Machine E	Element Design I
Code	5MEC232	Department	Engineering
Prerequisites	5MEC112, 5MEC122	Co-requisites	None
Aim	The aim of this mod for Mechanical En		e students to the design process e elements.
Content	applied to selectic development of basengineering scien Dynamics) and Processes) to under and sized, depend Computer Aided Mointroduced in first yeanalysis of more resto be covered during Process; manufact geometry; bearing to	on of simple sic machine assece (Solid Mec applied enginee retand how maching on the requipedelling and Designation of the Module was turing processes; the selection and drive selection.	hanics, Materials Science, bring topics (Manufacturing ne components are selected red application and function. gn (CAD) principles, which are d further in the modelling and x machine assemblies. Topics ill include: Elementary Design tolerances of size and sizing; gear type selection and and kinetics; fasteners and
Assessment	Continuous Assessment 40% Examination 60%		
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's		

Title	Introduction to Power Engineering		
Code	5EEE212 Department Engineering		Engineering
Prerequisites	5EEE112	Co-requisites	None
Aim	To provide a fo	oundation in power e	engineering
Content	Phasor diagrams for resistive, inductive and capacitive loads; transient analysis of circuits, complex power; power factor correction; 3-phase systems; magnetic circuits; the single-phase transformer; dc. machines		
Assessment	Continuous Assessment 40% Examination 60%		
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's		

Title	Mechanics of Solids II			
Code	5MECH311	5MECH311 Department Engineering		
Prerequisites	5MEC211 Co-requisites None			
Aim	Solid Mechanics is the study of load carrying structures in terms of forces, deformations, and stability. The main objective is to develop the skills that will allow students to understand materials. under different loading conditions.			
Content	Strain Energy and Theories of Failure Understanding combined loading conditions and formulating point of failure. Failure theories including maximum principal stress theory, maximum shear stress theory, maximum principal strain theory, maximum shear strain energy theory, Coulomb-Mohr shear stress theory. Determination of component failure using elastic failure theories.			
			Energy Method. sing Energy Methods, for different	
	Thin and thick cylinders Understanding and calculation of the stresses developed in vessels under pressure, shrink fits and compound cylinders.			
	Strains beyond the elastic limit Understanding of material behaviour beyond its yield stress where deformation is permanent and non-reversible. Calculation of additional load capacity when considering plasticity.			
	Rotating discs Understanding the stresses developed in discs under rotary motion.			
	Two laboratory sessions on tensile testing and loading of structures.			
Assessment	Continuous Assessment 40% Examination 60%			
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's			
Title	Thermofluids II			
Code	5MEC321	EC321 Department Engineering		
Prerequisites	5MEC212 Co-requisites None			

Aim	The Module consists of two topics, Thermodynamics and Fluid Dynamics. The main objectives are to develop the skills that will allow students to solve engineering problems and also to communicate the outcomes of a laboratory session in a report.
-----	--

Content

Different types of flow.

- Application of the conservation of mass in fluid flow.
- Application of the conservation of momentum in fluid flow.
 - Application of the conservation of energy in fluid flow.
- Application of dimensional analysis and similarity for reduced
- Experimentation and scaling.
- The velocity of pressure waves in fluids.
- Laminar and turbulent flows in pipe flows.

Revision of basic concepts:

- energy
- properties of pure substances
- energy analysis of closed systems
- mass and energy analysis of control volumes.
- O Constant volume and constant pressure processes
- enthalpy

Second Law of Thermodynamics, heat source and sink, thermal ef perpetual motion machines, reversible and irreversible processes, 0 cycle, entropy, isentropic processes.

Efficiency of compressors, steady flow devices, isothermal, polytrog isentropic processes, isentropic efficiencies for turbines, compressor nozzles

Gas cycles:

- Otto,
- Diesel.
- Stirling,
- Ericsson.
- O Brayton and jet-propulsion cycles. Vapour and combined cycles:
 - Rankine cycle:
 - reheat,
 - regeneration,
 - co-generation,
 - Refrigeration cycles:
 - vapour-compression cycles,

heat pumps, absorption refrigeration (basic concept)

Gas and vapour mixtures, psychrometric charts. (basic concept)

Title	Mechanical E	nanical Engineering Machine Element Design II		
Code	5MEC331	Department	Engineering	
Prerequisites	5MEC232	Co-requisites	None	
Aim	To introduce s	students to machine	design methods.	
Content	will allow stude by generating assemblies the can be produ requirements, and assemblie design and be part and asser are static and (welding, three	s Module aims to facilitate the development of knowledge and skills that allow students to address design problems with both creativity and rigor, generating concept designs, designing machine components and emblies that will perform and be produced in accordance with appropriately specified development irements, and the creation of suitable engineering drawings for parts assemblies. Topics include: Concept generation, machine component gn and basic machine system design, CAD modelling and creation of and assembly drawings including tolerances. Specific knowledge areas static and fatigue failure theories; standard machine design for joints ding, threaded and non-threaded fasteners), and power screws and ides basic design projects on the machine level.		
Assessment	Continuous Assessment 40% Examination 60%			
DP Requirement		40% Continuous assessment mark		
	80% Attenda	O% Attendance at practical's		
Assessment	Continuous Assessment 40%			
	Exam	Examination 60%		
DP Requirement	40% (40% Continuous assessment mark		
	80% A	80% Attendance at practical's		

Title	Project Management		
Code	5MEC231	Department	Engineering
Prerequisites	All first year modules	Co-requisites	None
Aim	This module deals with the theory, tools, techniques and practices in project management. Opportunities are provided to develop an understanding of the triangle of Project Management (PM) – time, cost and performance and to use PM techniques to achieve objectives within triangle constrains. The application of the theory, tools, techniques and practices is an objective. This takes the form of a multidisciplinary project i.e. development of a small scale engineering system.		

Content	 Introduction to Project Management Introduction to Project Planning and Life Cycle Project Scope Management Project Time Planning and Network Costing Project and Financial Statement Managing Project Resources Managing Risk in Projects Project Quality Management Project Human Resource Project Contracts Trade-off Analysis in a Project Environment Project Closeout Tools include, but are not limited to, WBS, CPM, Gantt Chart, Resource Levelling, Cash Flow Statement, Trade- off analysis 	
Assessment	Continuous Assessment 40% Examination 60%	
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's	

Title	Energy Conversion			
Code	5EEE331	Department	Engineering	
Prerequisites	5EEE212	Co-requisites	None	
Aim		To introduce students to the fundamentals of AC Electrical Machines and Power Electronics.		
	Two machine types are studied, i.e. induction and synchronous machines. The constructional features, operational differences, capability and characteristics of each machine type are studied. Uncontrolled rectifier circuits and DC-DC converters are also being introduced. Industrial applications of power electronics and electrical machines are analyzed.			
Content	AC machine windings, rotating magnetic field in AC machines, induction and synchronous machine equivalent circuits, determination of equivalent circuit parameters, induction and synchronous machine performance characteristics, uncontrolled rectification, controlled rectification, dc-dc converters			
Assessment	Continuous Assessment 40% Examination 60%			
DP Requirement		ous assessment ma nce at practical's	rk	

Title	Statistics for	Statistics for Engineers		
Code	4STT171	4STT171 Department Mathematical Sciences		
Prerequisites	4MTH171,	Co-requisites	None	
	4MTH172			
Aim	and tools of	Statistics which are of particular relevance in an engineering context, and		

Content	Topics include: Random variables, sampling and basic statistical measures; Normal, t, F and Chi-square distributions; Confidence intervals; Statistical models, such as the means and the effects models; t, F and Chi-square tests; Regression and correlation; One-way analysis of variance; Introduction to the design of experiments; Application of statistical tools to experimental data in an engineering setting.
Assessment	Continuous Assessment 40%
	Examination 60%
DP Requirement	40% Continuous assessment mark
	80% Attendance at practical's

Title	Professional Communications		
Code	5EEE232 Department Engineering		
Prerequisites	All second year modules	Co-requisites	None
Aim	communication, a	and to give them	students with theory of oral and written practical skills that will enable them to he University and in their professional

Discrinves prese Mode Com	types: investigative and feasibility research: citation and referencing different formats for types of reports sections within reports (introduction, methods, results, slusions, recommendations) and their functions
sum repor sumr Grap prese	structure and components of a good executive summary style and language for a persuasive and comprehensive mary phic and PowerPoint Design: fundamental principles of visual literacy for text documents and entations types of graphics types of visual aids that support and enhance a good entation visual literacy and creating PowerPoint slides. ridual presentations: criteria for giving an effective oral presentation vocal delivery
· · · · · · · · · · · · · · · · · · ·	vocal delivery techniques for planning and balance in a presentation audience reach managing questions
Accomment	
	tinuous Assessment 40% mination 60%
DP Requirement 40%	Continuous assessment mark
•	Attendance at practical's

Title	Control Engi	neering		
Code	5EEE312	Department	Engineering	
Prerequisites	4MTH271, 4MTH272, 5EEE231	Co-requisites	None	
Aim	control proble diagrams, a synthesis of space model	To train and educate students in control engineering methods for SISO control problems, including formulation of elementary problems as block diagrams, analysis of system interconnected systems, design and synthesis of feedback control systems in terms of input-output and state-space models. To introduce students to open-ended control engineering projects by means of a team project centered around a control problem.		
Content	dynamic sys System staresponses. Lead-lag ci Sensitivity t transformat space mo	Terminology: Open and closed loop configurations, block diagrams, dynamic system modelling, transient response, stead state error criterion. System stability: Routh Hurwitz criterion, Root Locus. Frequency responses. Nyquist lots, Bode diagrams, Nichols Charts. Compensation: Lead-lag circuits, minor loops, feedforward and three-term controllers. Sensitivity functions, minimum prototype response controllers, bilinear transformation, frequency response methods. State variables, state space models and design methods. Robustness, observability controllability, stability and performance.		
Assessment	Continuous A Examination	Assessment 40% 60%		
DP Requirement		ous assessment n	nark	

Title	Embedded Systems II			
Code	5EEE322	Department	Engineering	
Prerequisites	5EEE222	Co-requisites	None	
	To introduce the student to the design and programming of an embedded system controlled, for example, by a RISC processor (eg. ARM Cortex). After the initial embedded coding practice, the tool chains for loading, testing and debugging the code are introduced, followed by more advanced topics of hardware/software interfacing. By the end of the module embedded operating systems are used. The implications of multitasking real time operations, safety and maintenance are covered.			

Content	This module focuses on embedded systems and computer architecture, covering embedded operating systems, theory and practices for the design and analysis of computer architecture and an introduction to Hardware Description Language (HDL) programming. This module builds on Embedded Systems I module. The module is split into two parts. Part 1 (8 credits) concerns the design process, modelling and analysis of embedded systems designs, the structure of an operating system, cross-compiling toolchains, and relevant related theories. Techniques for execution time analysis, resource control protocols, and methods for modelling and simulation of computer systems are studied. Practicals concern using and embedded operating system, cross-compiling applications, and using a single board computer embedded platform. Part 2 (4 credits) introduces HDL programming techniques and tools for developing gateware and simulating designs. A mini-project is performed which involves implementing a state machine and performing thorough analysis of its design and performance.
Assessment	Continuous Assessment 40% Examination 60%
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's

Title	Dynamics II		
Code	5MEC322	2 Department Engineering	
Prerequisites	5MEC222	Co-requisites	None
Aim	This Module provides an introduction to engine balancing, kinematic analysis of gear trains, energy storage in flywheels and single-degree-of-freedom models in vibration analysis. Students will learn to analyze the dynamic behaviour of common engineering systems and components, for example gear trains, rotating and reciprocating machinery, flywheels and gyroscopes		
Content	efficiency; epic Vibrations: F freedom syster Rotating Unit balancing in Practice Engine Bala unbalanced foengines V- eng Flywheels: fluctuations,Cr operations Gyroscopes:	ryclic gears and differee and forced vibrams Resonance balance: Static balancing: Componer and couples, gines Energy storage; pank- effort diagram Gyroscopic motion;	helical, worm; transmission ratio and rentials tion, viscous damping, Single-degree-of-ncing, Dynamic balancing, examples of ats of an engine, Determination of Single cylinder engines, Multi-cylinder pulse smoothing torque and speeds, applications - engines and pressing steady precession only gearbox, Rotating Unbalance
Assessment	Continuous A Examination	ssessment 40% 60%	
DP Requirement		ous assessment mai nce at practical's	k

Title	Culture and Society in Africa			
Code	1ANT172	Department	Social Anthropology	
Prerequisites	None	Co-requisites	None	
Aim	This is a Complementary Studies Module for Electrical Engineering students aimed at broadening student's perspective.			
Content	Culture and Society in Africa provides students from all faculties with background knowledge about the continent on which they live. The module includes an examination of the concepts of culture, race, society, ethnicity and nation-state, a perspective on African worldviews and ways of thought, and a consideration of the role of Africa in a changing world.			
Assessment	Continuous Assessment 40%			
	Examination 60%			
DP Requirement	40% Contin	40% Continuous assessment mark		
	80% Attend	lance at practical's		

Title	Mechanical	Mechanical Vibrations		
Code	5MEC411	5MEC411 Department Engineering		
Prerequisites	5MEC322	Co-requisites	None	
Aim	machines a freedom mo practical ap multi- degre solution tec methods; m	and structures. This wi odels; analytical and n oplications. Formulatio ees of freedom by Nev chniques for equations	udents to the modelling of vibration in II include single- and multi- degree of numerical solution techniques; and n of equations of motion for single- and wton's laws and energy methods; of motion via analytical and numerical ation of techniques to analysis and	

Comtout	1 Cingle degree of freedom systems:		
Content	Single degree of freedom systems: 1. Single degree of freedom systems:		
	1.1 Formulation of the equation of motion of linear SDOF system by		
	c) Newton's Law		
	d) Energy Method(s)		
	1.2 Solution of equation of motion by:		
	c) Analytical solutions		
	d) Numerical methods		
	1.3 Applications: Rotating unbalance, vibration isolation, vibration		
	measurement		
	2. Multi degree of freedom systems:		
	2.1 Formulation of the equation of motion of linearized DMOF		
	system		
	c)Analytical solutions		
	d) Numerical methods		
	2.2 Solutions of equations of motion for free and forced systems by		
	d) Modal analysis		
	e) Numerical methods		
	f) Application: Vibration absorbers, complex structures, mechanisms		
	2.3 Continuous Systems (Time Allowing)		
	3. Formulation of equations of motion for simple continuous systems		
	4. Vibration absorbers		
Assessment	Continuous Assessment 40%		
	Examination 60%		
DP Requirement	40% Continuous assessment mark		
	80% Attendance at practical's		

Title	Product Design		
Code	5MEC421	Department	Engineering
Prerequisites	5MEC312	Co-requisites	None
Aim	candidates to team and ind considering n identification, process, con-	o design a convent ividually. The desi narket opportunitie requirement form cept generation ar technical performa	f knowledge and skills that will allow ional engineering device working in a gn is to be performed holistically, duly es and product architecture, needs ulation, planning and managing the id selection, detail design and drawing, ance analysis and communicating the

Content	 The Design Process (Ulrich & Eppinger, Chapter 2) Opportunity identification (Ulrich & Eppinger, Chapter 3) Product planning and architecture (Ulrich & Eppinger, Chapters 4 & 10) Customer needs and requirements specification (Ulrich & Eppinger, Chapters 5 & 6) Concept generation and selection (Ulrich & Eppinger, Chapters 7 & 8) Managing projects (Ulrich & Eppinger, Chapters 18) Product development economics (Ulrich & Eppinger, Chapter 17) Design for Environment, Manufacture and Assembly (Ulrich & Eppinger, Chapters 12 & 13) Prototyping and modelling (Ulrich & Eppinger, Chapter 14) Patents and Intellectual Property (Ulrich & Eppinger, Chapter 16) Industrial design (Ulrich & Eppinger, Chapter 11) Robust design (Ulrich & Eppinger, Chapter 15) Design project (Afternoon session plus own time)
Assessment	Continuous Assessment 40% Examination 60%
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's

Title	System Design		
Code	5MEC431	Department Engineering	
Prerequisites	5MEC312	Co-requisites	None
Aim	The objective of the Module is to enable students to structure and plan a high level system design and to generate system and subsystem development specifications. Structuring of the development process according to the life cycle model portrayed by the V-diagram. Functional decomposition and allocation to hardware. Determination of the system and subsystem requirements by means of system modelling and simulation and creation of a system verification matrix.		
Content	This Module marks the final chapter in the design programme that covers 3 years of undergraduate engineering studies. Students are now ready to tackle engineering problems that stretch beyond disciplinary boundaries, and involve complexity that is beyond the mastery of a single engineer. This is the world of Systems Engineering where various processes and techniques are used to make a seemingly impossible problem manageable and solvable. From the previous design Modules students have learned the skills of component or product design. Now it is time to broaden the horizons and tackle systems containing several interrelated products. The fundamental skills from mathematics, physic thermofluids, dynamics and other subjects will be essential for students to master the subject of System Design. The aim of this Module is to give students an appreciation of the effort and methodologies used when developing large and complex systems like power plants, aircraft, vehicles, space stations or even transportation networks.		
Assessment	Continuous Assessment 40% Examination 60%		

DP Requirement	40% Continuous assessment mark	
	80% Attendance at practical's	

Title	Engineering Professionalism		
Code	5MEC461	Department Engineering	
Prerequisites	All third year modules	Co-requisites	None
Aim	This module deals practically with the student's transition to the workplace. The aim is to complement the student's theoretical training by introducing (in some cases) and reinforcing (in others) the topics and issues most likely to be encountered in the engineering profession. This is part of the endeavour to produce a well-rounded mechanical engineer for industry, consulting and the design environment		
Content	Professional registration – ECSA, the Washington Accord, code of conduct, due diligence, government certificate of competence, mentorship in industry. Types of engineering employment – details of the options available for graduates, the realities of the workplace and industry training, career path management. Engineering economics – working capital, cash flow, salaries and wages, depreciation, tax considerations, rate of return, payback period. Health and Safety – managing disease and health in the workplace, occupational safety and related legislation, practical HAZOP analysis, safe work permits and lockouts. Industrial law – Overview of employment law, labour relations and employment equity contracts, basis of offer and acceptance. Quality, reliability and maintenance management and their importance in the engineering profession. Environment – legislation, ISO140001, aspects of engineering operations and likely impacts, considerations of the created environment as well as the impacts on socio-economic and cultural systems.		
Assessment	Continuous Assessment 40% Examination 60%		
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's		

Title	Mechatronic Con	Mechatronic Control and Instrumentation			
Code	5MEC471	Department	Engineering		
Prerequisites	All third year modules	Co-requisites	None		
Aim	systems; the signa the conversion of actions. Related	This module will acquaint students with various electronic measurement systems; the signal processing needed to use these measurements and the conversion of the results through power elements into physical actions. Related topics such as digital communications, electronic circuits and programming will be dealt with as necessary			

Content	Transistors and H-bridge amplifiers Op-amps – gains and filters Brushed and Brushless DC motors, controlling these motors electronica Speed and position sensing for use Measurement: Temperature, Pressi Acceleration, Light level, Humidity Measurement problems, noise versidrivers, differential measurements Communication with external device Introduction, equipment, tools Op-amp circuitry Analogue control system Practical Laboratory Sessions Introduction, equipment, tools Transistors PWM and H-bridge Op-amp circuitry Analogue control system C-intro and Interrupts ADC and timer module Communication Start combined analogue/micro proje	with rotating devices ure, Strain, Displacement, us filter bandwidth, shielding, line es such as IIC, SPI, SCI
Assessment	The module is assessed as follows:	
Strategy	Assignments	10%
	Class Tests	30%
	Exam 60%	

Title	Professional	Professional Communication Studies			
Code	5MEC412	Department	Engineering		
Prerequisites	5EEE241	Co-requisites	None		
Aim	Professional Writing including: Business Proposals; Graphic Communication and Readability; Posters; Group presentations with Power-point				

Content

Referential and Academic writing and presentation; Persuasive argument; Formats for business plans and proposals; group presentations; graphics and visual literacy.

Module content covers the following areas:

Group theory and Team work:

- aim of communication
- barriers to communication
- why groups are formed
- types of groups
- group dynamics and how teams are formed
- advantages of groups.
- different types of leaders
- process and benefits of Brainstorming
- different approaches to Problem-solving and decision-making.
- negotiation skills

Fthics:

- definitions and schools
- reasons for codes and rules
- professional practice as defined by ECSA
- corporate governance and King III report

Business Plans and Proposals:

- solicited and unsolicited proposals
- requests for proposals
- functions of SWOT and PESTEL
- Table of Contents of a Business Proposal

Summaries:

- purpose of an executive summary
- structure and components of a good executive summary
- style and language for a persuasive and comprehensive summary CVs and Covering letters

formats for and choice and ordering of content

- traditional and non-traditional CVs
- covering letters for responding to an advertisement or tender and for direct approach.

Poster Design:

- difference between stand-alone posters and accompanied posters
- fundamental principles of well-designed posters.

Group presentations:

- criteria for giving an effective group oral presentation
- vocal delivery
- techniques for good cohesion, transitioning and handover to the next person in the group
- types of visual aids that support and enhance a good presentation
- visual literacy and creating PowerPoint slides.

Assessment	Continuous Assessment 40% Examination 60%	
DP Requirement	40% Continuous assessment mark	
	80% Attendance at practical's	

Title	New Venture Planning and Management			
Code	5MEC422	Department	Engineering	
Prerequisites	All third year modules	Co-requisites	None	
Aim		Learning Business skills involved in starting entrepreneurial businesses from products designed: feasibility analysis, business plan, presentations		
Content	The entrepreneurial perspective; developing a new venture; what is a feasibility plan? Product concept and description; market assessment; industrial analysis; marketing plan; operations, development plans and management; financial projections			
Assessment	Continuous Assessment 40% Examination 60%			
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's			

Title	Final Year Research Project		
Code	5MEC432	Department	Engineering
Prerequisites	All third	Co-requisites	None
	year modules		
Aim	project within a l	imited period und	portunity to tackle a real engineering er the guidance of a supervisor and ts.
Content	submit a project report on the results. The final year research project is an important opportunity for the student, at the end of the degree programme, to tackle a real engineering project. The student is expected to work on the project both individually and under the guidance of a supervisor. An engineering project involves the creative application of scientific principles to the solution of a technical problem. It involves a problem description or research hypothesis developed in consultation with a supervisor, reviewing the topic in detail and defining the boundaries (scope) carefully, confirming an understanding of the requirements of the supervisor, searching for, selecting and justifying the most appropriate approaches to solving the problem or testing the hypothesis. It also requires a student to be able to analyse, design, build, integrate and test as is appropriate for the specific project. This could include the use of hardware, software and simulation. Students are also required to evaluate the project against the success criteria and design objectives, and to write a report about the project, the findings, and any recommendations. In addition, students need to make an oral presentation and prepare an exhibit.		
Assessment	Thesis 100%		
DP Requirement	Meeting the ELO	requirements	

Title Code	Industrial Ecology		
	5MEC442	Department	Engineering
Prerequisites	All third	Co-requisites	None
•	year modules		
Aim	The module is an introduction and overview of the relatively new 'field' of Industrial Ecology and its more recent trends. In the context of the module "industrial ecology" is interpreted as encompassing all of the interactions of an industrial society with the natural environment as well as the associated drivers of industrialization. A more appropriate way of thinking about the module is to rename it "the Ecology of Industrial Society". The objectives are to encourage a systems perspective of industrial activity as it is integrated with and forms part of the natural systems (lithosphere, pedosphere, biosphere, hydrosphere, atmosphere)		

Content	Ecosystem deterioration, pollution Resource depletion: Fossil fuels, water, uranium, rare earth metals Climate change Systems thinking, thermodynamics Sustainability; the limits to growth Industrial Ecology concepts and tools Material Flow Analysis Life Cycle Assessment; the circular economy Design for Environment Eco-Industrial Parks: industrial symbiosis Ethics: economic paradigms, consumption Energy, Mobility,
Assessment	Continuous Assessment 40% Examination 60%
DP Requirement	40% Continuous assessment mark 80% Attendance at practical's