



Module Catalogue

School of Engineering

**A DIRECTORY OF UNDERGRADUATE MODULES FOR
EXCHANGE AND STUDY ABROAD STUDENTS**

SEMESTER A, B AND AB 2021/22

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Module name: Mechatronic Systems Modelling and Control

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Module name: Mechatronics Design

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Academic year 2021-2022

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Academic year 2021-2022

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INTRODUCTION

This module directory is specifically designed for exchange students to select modules at School of Engineering, University of Hertfordshire.

1. Please see the box below explaining the module codes:

6ELE0062		
6	ELE	0062
Module level	School of study	Module code

2. As an exchange student you can choose modules from levels 5, 6 and exceptionally at level 4.

Level 4	Level 5	Level 6
First Year module	Second year module	Third Year module

3. Co-requisites, pre-requisites and prohibited combinations.

Some of the modules may have co-requisites or pre-requisites which you will find indicated in each module. Please note for you, as an exchange student, *if a module has co-requisites or pre-requisites you must have previously studied the subject and have completed the relevant module(s) at your home institution.* When sending your application, please include a copy of your transcript to show that you have taken the minimum required co-requisites or pre-requisites module(s) at your home institution. Additionally, we may require you to provide a module description in order to evidence prior study.

If you are in the process of completing the required module(s) at the time of the application and you do not have the final copy of the transcript, please include a letter from your home institution clearly listing the modules that you are registered on.

Prohibited combinations- please note if there are modules listed under prohibited combinations you can only study one of the modules.

Module name: Advanced Power Conversion and Control

Module code: 6ELE0062

Semester: B

Credits: 15

Module Aims:

Further develop their understanding of analogue and digital electronics in the context of power control, particularly of rotating machines, and to gain sufficient understanding of the principles to design simple systems.

Intended Learning Outcomes:

Successful students will typically:

- * describe the main principles of speed control of a range of typical rotating machines;
- * explain the main principles and design concepts of switched electronic power control;
- * discuss the main underlying concepts of intelligent power control systems.

Successful students will typically:

- * analyse mathematically typical power electronics switching circuits in selected applications;
- * design, at block diagram level, speed control systems for selected typical rotating machines;
- * use selected appropriate software simulation tools.

Module Content:

This module develops analogue and digital design concepts in the context of power control. Material covered includes rotating machine control fundamentals, fundamentals of the design of switched electronic power control circuits and an introduction to "intelligent" machine control.

Electromagnetic Compatibility (EMC) in power conversion is also studied. All material is covered at an analytical level including statistical methods (e.g. repeatability). The emphasis is on understanding the design concepts inherent in the topics. Theoretical study is supported and enhanced by both practical work and by the use of computer simulation tools.

The module typically encompasses the following topics:

- * Power Electronic Devices, MOSFETS, IGBT, SCR, GTO Thyristors, DIACs, TRIACS, Schottky Diodes.
- * Pulse width modulation concepts and Fourier analysis for EMC considerations.
- * AC to DC conversion with fire angle control.
- * DC to DC switch mode power supplies.
- * DC to AC conversion VSI and CSI basic structures.
- * State Space control concept and mathematical development.

* Speed Control of BLDC Motor.

* Rotating machine Drivers and Control.

The in-course assessment typically consists of two labs - for example:

* Switch Mode Power Supply Operation including performance analysis: eg. static and dynamic, efficiency, repeatability - assessed via a submitted answer sheet.

* Speed Control of DC Drives- controller performance analysis: eg. settling times, steady-state error – assessed via submitted report on the lab

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

Module name: Aerodynamics

Module code: 6ENT1064

Semester: B

Credits: 15

Module Aims:

Develop their ability to analyse the aerodynamics of an aircraft.

Intended Learning Outcomes:

Successful students will typically:

- * examine different fundamental approaches to modelling fluid flow;
- * explore Computational Fluid Dynamics and turbulence modelling.

Successful students will typically:

- * evaluate the relative importance of various general flow mechanisms for aircraft aerodynamics; evaluate the appropriateness of different analytical, experimental and numerical methods.
- * apply Computational Fluid Dynamics (CFD) methods to evaluate aerodynamic flows.

Module Content:

This module builds on material learnt in level 5 Aerothermodynamics and Computer Aided Engineering modules. It encompasses experimental, numerical and theoretical aerodynamic analysis for a range of aerodynamic applications Topics include; Potential Flow Theory, Navier-Stokes equations, Euler and Boundary Layer equations, Transonics and Supersonics, Hypersonics, Turbulence and turbulence modelling, CFD and post processing of CFD results.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

Module name: Aerospace Design

Module code: 5ENT1032

Semester: A

Credits: 15

Module Aims:

Understand the role of design in the aerospace industry through practical experience in the design of typical aerospace sub-assemblies, features and systems; be aware of the relevant airworthiness requirements and other aerospace data, their application and influence on design.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * explore the factors affecting the design of aircraft including the implications of their designs on weight, cost and complexity, and regulatory requirements; * describe the fundamental operation of a variety of aircraft and missile systems. Skills and Attributes: Successful students will typically: * apply basic aerospace engineering design practice; * propose appropriate materials for designed components; * select and specify appropriate bought-out components and units.

Module Content:

This module introduces students to the fundamental knowledge and skills associated with aircraft design, and in particular the design of aircraft subassemblies. Typical aerospace engineering design tasks such as the design of mounting arrangements for a guided-weapon sub-assembly, hydraulic actuation mechanism layout and component design will be practiced based on common aerospace practice. Key design parameters including weight, specific functions, cost, reliability and fitness for purpose will be addressed to reflect the themes of Innovative Design, Systems Integration Design and Sustainability. Student learning will be supported by lectures, tutorials, and assignments. The intended learning outcomes are facilitated through a combination of approaches to learning and teaching, typically this will include lectures, tutorials, supported by extensive use of CAD software. These activities will be supported by the academic staff and by encouraging the students to access a variety of resources including StudyNet, electronic databases, relevant professional and academic text and cases. The module will cover the following topics: A series of lectures covering the fundamental drawing skills and design principles of major aircraft structure and systems, including detailed descriptions of the functions of principal components. A series of short assignments covering a range of drawing skills and techniques in accordance with BS308. Two major design tasks of escalating complexity, with appropriate guidance and support. The two major tasks are intended to introduce different aspects of the systems design activity, and each will require different skills, as well as the usual CAD skills.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Aerospace Design, Test and Certification

Module code: 5AAD0006

Semester: B

Credits: 15

Module Aims:

Be introduced to the role of design in the aerospace industry, particularly with respect to typical aerospace sub-assemblies, features and systems; gain an understanding of aircraft aerodynamics, stability, structure and strength; gain an awareness of the practices of flight test and its significance for certification.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: demonstrate knowledge of aircraft detail design practice; explain the influence of aerodynamics on aircraft stability; identify appropriate aircraft test and certification practices. **Skills and Attributes:** Successful students will typically: produce design drawings of aircraft sub-assemblies; conduct and report experimental work relating to aircraft aerodynamics

Module Content:

This module develops students' knowledge of aircraft design, and in particular the design of aircraft sub assemblies. It covers fundamentals of aircraft aerodynamics, stability, control and airworthiness, certification and flight testing. It includes elements required for PPL – Ground School Training. Lectures and assignments on the design of typical aircraft engineering assemblies, structural components and systems using common aerospace engineering practice. This includes evaluation and selection of standard aerospace engineering components with particular attention to weight, function, reliability and fitness for purpose Principles of aircraft aerodynamics: - fundamentals of lift and drag, laminar and turbulent flow - fundamentals of aircraft stability and control and their impact on aircraft operation - scaling effects associated with experimental testing The module includes laboratory work using subsonic wind tunnels. The needs and practices of aircraft flight testing. Introduction to airworthiness authorities, documentation and the certification process.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Aerospace Technology & Industry

Module code: 4AAD0016

Semester: A

Credits: 15

Module Aims:

Gain a basic understanding of the design & performance of an aircraft and its components; * acquire a basic understanding of civil & military aircraft operations; * gain an understanding of the Aerospace Industry.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: describe the basic design of an aircraft to achieve its functional and performance aims; explain the history and current structure of the Aerospace Industry; describe Aircraft civil and military operations. 9b. Skills and Attributes: Successful students will typically: investigate, collate and present technical information on aspects of aircraft design.

Module Content:

This module introduces students to the basic design of an aircraft to achieve its functional and performance aims, civil and military aircraft operations. This module includes elements required for PPL Ground School Training. The basic design of an aircraft to achieve its functional and performance aims. This includes the design of the airframe, flight control systems, cockpit, undercarriage and hydraulic, fuel, cabin air, electrical and weapons systems. Civil and military aircraft operations covering missions, flight plans, air traffic control, airport operations and maintenance. Student group projects to investigate and present particular aspects of the aerospace industry.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Aerospace Technology & Industry

Module code: 4AAD0016

Semester: A

Credits: 15

Module Aims:

Gain a basic understanding of the design & performance of an aircraft and its components; acquire a basic understanding of civil & military aircraft operations; gain an understanding of the Aerospace Industry.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * describe the basic design of an aircraft to achieve its functional and performance aims; * explain the history and current structure of the Aerospace Industry; * describe Aircraft civil and military operations. Skills and Attributes: Successful students will typically: * investigate, collate and present technical information on aspects of aircraft design.

Module Content:

This module introduces students to the basic design of an aircraft to achieve its functional and performance aims, civil and military aircraft operations. This module includes elements required for PPL Ground School Training. The basic design of an aircraft to achieve its functional and performance aims. This includes the design of the airframe, flight control systems, cockpit, undercarriage and hydraulic, fuel, cabin air, electrical and weapons systems. Civil and military aircraft operations covering missions, flight plans, air traffic control, airport operations and maintenance. Student group projects to investigate and present particular aspects of the aerospace industry.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Aerothermodynamics

Module code: 5ENT1014

Semester: B

Credits: 15

Module Aims:

Understand the laws, principles and methods of analysis in aerothermodynamic systems; use appropriate methods of experimental investigation in aerothermodynamics; understand the physics of boundary layers and compressible flows in order to evaluate the flow parameters and aerodynamic forces around a wing; understand the behaviour of ideal and real gases, the second law of thermodynamics, concept of entropy, principles of operation of heat engines and heat pumps; understand the behaviour of compressible flows in nozzles and diffusers under various flow speed conditions, the phenomenon of normal and oblique shock waves and expansion waves.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * demonstrate an understanding of the growth of boundary layers and viscous drag; * demonstrate an understanding of ideal and real gases and the practical implications of the second law of thermodynamics and concept of entropy. Skills and Attributes: Successful students will typically: * analyse and calculate the aerodynamic forces and performance characteristics encountered in aircraft flight; * analyse and characterise the performance of heat pumps and heat engines; * analyse compressible flow, resolve normal and oblique waves and determine design parameters of nozzles and diffusers under various flow speed conditions.

Module Content:

This module has two sections: Aerodynamics including: Speed measurements, Aerodynamic forces and moments, Aerodynamic drag and its estimation. Wing vortex system, and Viscous drag. Reynolds number. Mach numbers. Wind tunnel testing. Thermodynamics including: Perfect, semi perfect and real gases. Enthalpy and internal energy of gases. The second law of thermodynamics and its applications. Principle of heat engines and heat pumps. Carnot cycles. Entropy. Compressible flow. Stagnation and static properties of flow. Compression and expansion waves. Normal and oblique shock waves. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning. Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow students to practice and refine their skills. Topics include: Aerodynamics - Measurement of speed, IAS, TAS, EAS. Determination of pressure distribution, lift and drag using results from wind tunnel tests. Modelling of wing vortex system to evaluate the aerodynamic forces. Determination of spanwise variation of incidence for a given wing loading . Calculation of viscous drag, determination of criteria for transition and separation. Appreciation of changes in wing characteristics fitted with high lift devices. Calculation of different components of aerodynamic drag. Determination of lift, drag, and speed corresponding to the condition of minimum drag. Analysis of a model aircraft in a wind tunnel to obtain its performance characteristics. Appreciation of problems associated with wind tunnel testing. Thermodynamics - Determination of perfect and semi perfect gases properties. Determination of Heat pumps and Heat engines coefficient of performances and efficiencies. Calculations of entropy changes in various gaseous systems. Appreciation of the use of a combination of heat engines and pumps for

refrigeration and power production purposes. Calculation of the work output and rate of heat transfer in heat engines and pumps. Calculations of compressible flow parameters, including stagnation parameters, in various aerospace applications. Appreciation of the use of nozzles and diffusers in aerospace applications. Calculation of the flow parameters in variable cross sectional area ducts under variable flow speed conditions. Calculations of the Mach Number, entropy change and other flow parameters across normal and oblique shock waves. Calculation of the flow parameter across an expansion (Prandtl-Meyer) wave.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
70%	30%	%

70 Exam 30 ICA The successful candidates are required to pass overall. All Learning Outcomes to be assessed in both Exam and ICA

Module name: Air Law, Navigation and Meteorology

Module code: 5ENT1091

Semester: B

Credits: 15

Module Aims:

Become familiar with air law and aircraft operational procedures under VFR flight rules; * gain an understanding of the atmospheric conditions for VFR flight; understand the principles of aircraft navigation.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * demonstrate knowledge and understanding to enable them to operate a flight safely under VFR rules; * have the necessary knowledge appropriate for the Meteorology, Navigation, Air Law and Operational Procedures ground school syllabus accredited by CAA for the UK PPL/NPPL license; * recognise the limitations posed by the atmosphere for VFR flight; * identify the classification of airspace for IFR/VFR flight operations. 9b. Skills and Attributes: Successful students will typically: * read meteorological charts and use of the Met Office aviation services; * plan and navigate a course under VFR rules.

Module Content:

In this module, students will be taught the theoretical aspects of safe conduct of flight under VFR rules, as specified by the UK CAA and EASA. In conjunction with other modules, the taught material will entail sufficient depth of coverage so that the students would be able to undertake CAA examinations in Air Law, Navigation and Meteorology in pursuance of the CAA PPL/NPPL(UK) status. Knowledge and understanding is achieved through the delivery of lectures, tutorials plus directed learning. Exercises posed during tutorials and directed learning allow students to practice and refine their skills. Students will be supported to develop their understanding of the need for a high level of professional and ethical conduct in engineering. With a focus on professional codes of conduct, this module will develop knowledge required for safe operation, and navigation of aircraft in the air or ground, and will typically entail aspects of the following topics from the PPL/NPPL(UK) ground school syllabus. The module will develop knowledge required for safe operation, and navigation of aircraft in the air or ground, and will typically entail aspects of the following topics from the PPL/NPPL(UK) ground school syllabus. - Air Law - Meteorology - Navigation - Operational Procedures - Use of the Online Met office aviation system

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Aircraft Systems

Module code: 5ENT1039

Semester: A

Credits: 15

Module Aims:

Extend their knowledge and understanding of various aircraft systems; develop their skills in using simulation in the development of aircraft systems; appreciate the role of regulatory bodies in the safety and certification of aircraft systems.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * describe common electrical and mechanical systems found on modern aircraft; * identify regulatory bodies and their role with regard to safety and certification of aircraft systems. Skills and Attributes: Successful students will typically: * analyse the performance of various aircraft systems; * critically evaluate aircraft systems with respect regulatory requirements.

Module Content:

This module will further enhance the knowledge and understanding of undergraduate students, concerning propulsion, electrical, pneumatic and hydraulic systems found in modern aircraft with the emphasis from an engineering and operational view point. This module will cover aspects of safety management, flight critical systems, effects of human factors on safety of flight systems, operational and maintenance consideration of various aircraft systems. The role of regulatory bodies on maintenance safety as well as system and sub-system certification will be included. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning. Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow students to practice and refine their skills. Under each of the following headings appropriate aspects of safety management, flight critical systems, effects of human factors on safety, operational and maintenance consideration and the role of regulatory bodies in certification will be identified. Electrical Systems Electrical Power Generation and Distribution Auxiliary Power Units Power Budget Hydraulic and Pneumatic Systems (valves, actuators etc) Servo-Control actuation systems Undercarriage System Braking System Electro-Mechanical Systems Warning Systems, Power plant and Fuel Systems Anti-Icing system, Fire Protection, Heating and Ventilation System Bleed Air Systems

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Aircraft Systems Integration

Module code: 6ENT1063

Semester: B

Credits: 15

Module Aims:

Understand industry recognised models of the systems engineering life cycle; further develop their skills in systems simulation.

Intended Learning Outcomes:

Successful students will typically:

- * explain the importance of communication protocols employed in aircraft;
- * describe how aircraft systems information is displayed to pilots.

Successful students will typically:

- * investigate the interaction of aircraft systems and identify critical safety problems;
- * design, test and critically evaluate a complex aircraft system.

Module Content:

The module starts by introducing students to the industry recognised concept of systems engineering and the system life cycle as outlined in ISO 15288. Following a continuous improvement approach to quality and

processes in the life cycle, case studies will be used to understand the top level architecture of systems, e.g.

human, electrical and multidisciplinary projects such as Heathrow T5; and the interaction of sub-systems

through verification and testing processes.

The assessment will be based on following these processes to undertake a technical problem requiring

students to define a requirements specification and perform testing of a complex aircraft system using

simulation software.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

Module name: Automotive and Motorsport Technology

Module code: 4ENT1115

Semester: A

Credits: 15

Module Aims:

Understand the fundamental terms, science and technologies associated with motor vehicles; gain an understanding of how to design, build and drive motor vehicles.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * identify of the major systems and components of a vehicle; * recognise how the parts contribute to the whole vehicle. Skills and Attributes: Successful students will typically: * apply tools and methods to do engine calibrations and calculations; * estimate vehicle performance.

Module Content:

This module will introduce students to the fundamental terms, science and technologies commonly used in the automotive industry. Students will become familiar with the basic parts of a vehicle and gain an appreciation for how they are integrated together. They will be introduced to the parameters used to assess vehicle performance and through laboratory work learn how to use standard equipment to measure the performance a vehicle. They will also be introduced to how the methods the motorsport side of the industry enhances vehicle performance. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning. Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow students to practice and refine their skills. Topics include: - Engines: types, layouts and basic dimensions and effects on engine performance; - Fuels and alternative fuels including bio-fuels, hydrogen, electric and hybrid vehicles; -Engine control systems; -Materials especially where specific properties are required in the engine components; -Thermodynamics: basic indicator diagrams and factors affecting performance; -Calibration: methods of construction and basic parameters such as torsional stiffness, COG; -Suspension and steering: resume of different suspension types and their relative merits in terms such as cost, complexity, performance. Basic theory such as the effects of camber angle, scrub radius, damping, anti-roll, squat, dive, load transfer; -Tyres: basic terms and their practical significance. eg slip angle, tractive force, traction circles, camber thrust; -Introduction to motorsports. What actually goes on at the race track and what preparation is needed to get there. The requirements for racing vehicles and their setup.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Automotive Chassis & Powertrain Technology

Module code: 6AAD0006

Semester: B

Credits: 15

Module Aims:

Develop their understanding of the types of system technology associated with the chassis and powertrain of vehicles.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * describe and compare alternative forms the chassis and powertrain systems. **Skills and Attributes:** Successful students will typically: * select specific systems, steering systems, fuel systems, power units, emission control techniques and systems, transmission systems and brakes in the design of a vehicle; * evaluate the effects that these sub-systems have on the emissions and environmental aspects of the vehicle including: cost, performance, handling, ride, noise, vibration and safety characteristics.

Module Content:

The module examines the sub-systems that comprise the chassis and powertrain of typical automobiles, and covers suspension systems, steering systems, tyres, power units, fuels and fuel systems, emission control, transmission systems and brakes. The treatment is mainly descriptive in nature and is concerned with the alternative types of suspension systems, steering systems, tyres, power units, automotive fuels and fuel systems, emission control systems, transmission systems and brakes that comprise an automobile and considers the merits, or otherwise, of each design. Also considered is the effect each alternative has on the cost, performance, handling, ride, vibration, noise and safety characteristics of the vehicle, together with the effects that the automobile has on the environment. The module will also show how computer simulation packages can be used in assessing the performance of these design alternatives. Some of these characteristics will also be demonstrated in the laboratories.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

60 Exam 40 ICA The successful candidates are required to pass overall. All Learning Outcomes to be assessed in both Exam and ICA

Module name: Automotive Electrical Systems

Module code: 5ENT1004

Semester: A

Credits: 15

Module Aims:

A knowledge base of the main principles and practices as well as an understanding of how various components and systems work and interact; An appreciation of the environmental impact of automobiles and how electrical systems can help improve this should also be gained.

Intended Learning Outcomes:

Successful students will typically:

- * describe various electrical/electronic components/systems and understand how they operate;
- * be able to explain how technology can be used to reduce the environmental impact of vehicles by minimising energy consumption and emissions.

Successful students will typically:

- * analyse in detail the performance of systems and components to evaluate their functions in theoretical and practical terms;
- * Identify the key elements of problems in system analysis and resolve them in a considered manner.

Module Content:

Automotive electrical systems and components including:

Cables, fuses, relays, solenoids and actuators, fuel injectors, electric motors, ignition coils, batteries. Starting

and charging systems including ISG and regenerative braking, specialist automotive sensors and operating

principles e.g. lambda and MAP sensors. Solid state power distribution, automotive digital systems and

networks, ODBC.

Engine electronics, function of components, minimizing the environmental impact of the internal combustion

engine by using electronic control.

Introduction to hybrid (full and mild), electric, fuel cell vehicles and their environmental benefits.

Academic year 2021-2022

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

Module name: Automotive Electronics and Control Systems

Module code: 5ENT1011

Semester: B

Credits: 15

Module Aims:

Understand the role of electronics and control systems in automotive applications; understand how these systems work.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * describe the major electronic systems and components on a vehicle; * recognise how the electronic systems are integrated into the vehicle. **Skills and Attributes:** Successful students will typically: * obtain, analyse and evaluate information in order to predict system performance and quantify the benefits of such systems to a vehicle; * control parameters in order to enhance system performance using given principles and common automotive practices.

Module Content:

This module will extend the students understanding of electronics and applications within automotive vehicles. It will also introduce students to control theory and how to apply it to automotive applications. The content will include a revision of electrical basics, electrical power generation within vehicles, components and automotive electronic systems, instrumentation, actuators and sensors, digital systems and communication, introduction to control loops, transient and steady state performance and controller design methods. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning. Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow students to practice and refine their skills. Topics include: Revision of Electrical Basics. Fuses, cable sizing, wiring harness design. AC, rectification, Switch mode power control, inversion, electronic switches, capacitance. Electromagnetism, motors, generators, inductors, transformers. Transient response of reactive circuits. Analysis of transient response in auto applications. Automotive applications eg relays, alternators, starter motor, ignition systems. Charging and starting circuits. Power flow control. Application to electric vehicles. Higher voltage systems and applications. Automotive Sensors & Actuators. Signal conditioning, Instrumentation. EMC. Digital systems. A2D and D2A conversion. Automotive communication media and bandwidth. OBD and CANBUS. Open loop, feed-forward and closed loop control. Steady state and frequency response methods to design control systems and estimate their performance. Tuning PID controllers, Z/N continuous cycling method. Where possible laboratory experiments will be conducted on an open access basis.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Avionics Systems

Module code: 5ENT1067

Semester: B

Credits: 15

Module Aims:

Understand the principles of basic electronics and computer coding, e-m radiation, and sound wave propagation; gain knowledge of avionics instruments and systems such as radio, radar and satellite based links, cockpit displays (visual and auditory) and autopilots; appreciate the role of regulatory bodies and communication protocols

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * explain essential aircraft instrumentation found in modern flight decks; * describe the electronics and avionics supporting airborne vehicle movements given by regulatory bodies and air traffic controllers; * examine current and possible future technologies for improving situational awareness and safety including the human interface with modern avionics. **Skills and Attributes:** Successful students will typically: * research technical literature including journals and on-line academic sources and communicate findings in the form of a technical report and oral presentation.

Module Content:

This module explores the technology that enables aircraft avionics to function in a modern aircraft. It looks at the technological advances that have made modern avionics systems viable, and looks at some of the drivers for safety, reliability and security that modern avionics systems deliver. Lecture content delivered by UH staff and external speakers: - 1. Introduction to radio 2. Introduction to radar 3. Communication systems 4. Navigation systems 5. Flight deck displays 6. Autopilots and flight management systems 7. Avionics in safety, security and emergency 8. The human interface with avionics systems 9. Embedded electronics in aviation Seminars: Students will be expected to research a topic related to avionics systems, and give a short seminar to their fellow students. Practical Sessions: Students will take part in a series of in-class practical sessions.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Avionics Technology

Module code: 6ENT1059

Semester: B

Credits: 15

Module Aims:

Understand the principles of basic electronics and computer coding, e-m radiation, and sound wave propagation; gain knowledge of avionics instruments and systems such as radio, radar and satellite based links, cockpit displays (visual and auditory) and autopilots; appreciate the role of regulatory bodies and communication protocols.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * explain essential aircraft instrumentation found in modern flight decks; * describe the electronics and avionics supporting airborne vehicle movements given by regulatory bodies and air traffic controllers; * examine current and possible future technologies improving situational awareness and safety including the human interface with modern avionics. **Skills and Attributes:** Successful students will typically: * research technical literature including journals and on-line academic sources and communicate findings in the form of a technical report and oral presentation.

Module Content:

This module explores the technology that enables aircraft avionics to function in a modern aircraft. It looks at the technological advances that have made modern avionics systems viable, and looks at some of the drivers for safety, reliability and security that modern avionics systems deliver. Lecture content delivered by UH staff and external speakers: - 1. Introduction to radio 2. Introduction to radar 3. Communication systems 4. Navigation systems 5. Flight deck displays 6. Autopilots and flight management systems 7. Avionics in safety, security and emergency 8. The human interface with avionics systems 9. Embedded electronics in aviation Seminars: Students will be expected to research a topic related to avionics systems, and give a short seminar to their fellow students. Practical Sessions: Students will take part in a series of in-class practical sessions.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Advanced Biomechanics

Module code: 6LMS0040

Semester: A

Credits: 15

Module Aims:

Intended Learning Outcomes:

Module Content:

Pre and Co requisites:

Module name: Biomedical Engineering Design

Module code: 6ENT1046

Semester: B

Credits: 15

Module Aims:

Gain deeper experience of producing a total engineered design solution from brief to technical drawings; provide comprehensive analytical evidence via a variety of simulations, of the design validity from a theoretical viewpoint.

Intended Learning Outcomes:

Successful students will typically:

- * understand the needs of the patient and the patient interaction with the product in a variety of environments;
- * understand the regulatory procedure for the EU for invasive and non-invasive devices and the process and tools for ethical and regulatory compliance.

Successful students will typically:

- * translate a brief into a technical specification of the product, showing an awareness of the regulatory requirements;
- * analyse the problem or requirements and perform a series of simulations to provide the fitness of the design to meet the technical requirements, including cost effectiveness;
- * work as member of a design team and to communicate effectively their design contribution to the project team.

Module Content:

This module will address the need for the design of products that provide solutions to both invasive or noninvasive medical problems or medical products.

Students will be required to work in teams to develop industrial biased design solutions for healthcare products

that are both ethically and regulatory compliant. They will be expected to use the analysis tools developed in

other modules to justify their design decisions, including cost effectiveness as well as meeting the technical requirements specified.

Pre and Co requisites:
None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: CAE for Biomedical Systems

Module code: 5ENT1057

Semester: B

Credits: 15

Module Aims:

Select and use appropriate computer software to aid in the engineering evaluation/solution of a medical related engineering problem; analyse and provide engineering solutions to medical engineering problems using CAE tools.

Intended Learning Outcomes:

Successful students will typically:

- * provide biomedical engineering solutions that satisfy a medical based requirement or problem by analytical

and simulation methods. The outcome of the analysis will provide a simulated solution to the requirement of a

problem;

- * undertake to learn and become proficient in applying analytical tools that simulate and provide engineering

solutions using Computer Aided Engineering tools including Computational Fluid Dynamics and Finite Element

Analysis.

Successful students will typically:

- * become proficient in the understanding of a biomedical engineering problem or requirement, dissecting that

requirement into smaller problems, and applying CAE tools to provide a solution to these problems;

- * apply, with understanding, computational tools that can solve CAE, CFD and FEA problems or requirements.

Module Content:

This module facilitates the learning and skills acquisition to use Computer aided tools to evaluate medical

related engineering problems or requirements. The module provides the learning of three different analytical

tools that enable the students to simulate problems and obtain solutions.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Career Planning

Module code: 5ENT1082

Semester: AB

Credits: 30

Module Aims:

Develop and enhance their professional awareness and communication skills and use tools, techniques and methods to review, reflect and plan for their future careers.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * recognise their own strengths and areas for improvement through reflection and review. * demonstrate aspects of professional awareness. 9b. Skills and Attributes: Successful students will typically: * reflect how their previous work, academic and life experience can be related to employability.

Module Content:

This module aims to encourage students to reflect on their career aspirations and review/plan for the development of appropriate skills necessary to realise these aspirations. Many students will specifically use this module as an aid to prepare for the optional industrial placement year. Students who undertake the placement will work within industry or a commercial organisation that is able to provide an appropriate learning experience within an engineering environment. This placement must be of at least 48 weeks duration. To be eligible for placement students should normally have passed the progression requirements to Level 6. For students who do not go on placement, this module will be a precursor to the Level 6 Career s Portfolio module. The module is mainly StudyNet based. However there will be lectures introducing the benefits of taking the sandwich option, and support is available to help secure a placement. The StudyNet site will be used to promote careers related matters and students are encouraged to consult it on a regular basis. Students will be encouraged to seek further advice on preparation of CV's, letters of application, methods for successfully completing on-line applications and interview technique. Students will be encouraged to attend seminars from visiting industrialists as well as Careers Fairs. Students will be encouraged to use IT facilities to research appropriate career paths. As part of the assessment, students will be required to submit an assignment in which they review their employability experience. Further assignments will also be set to develop aspects of employability and professional awareness.

Pre and Co requisites:

None

Total hours: 50

Assessment:

Exam	Coursework	Practical
%	%	%

Assessment on this module is on a pass/fail basis.

Academic year 2021-2022

Module name: Career Skills Development

Module code: 4ENT1096

Semester: AB

Credits: 30

Module Aims:

Provide an appreciation of employment and careers in the engineering and technology sector; develop generic skills to assist in academic study and career management for the future.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: describe the context of regulatory frameworks within the engineering and technology area; assess their own development needs over a wide range of generic skills areas including for example business, innovation and enterprise; engage positively with the careers and IT support services within the University and relevant external Professional institutions. **Skills and Attributes:** Successful students will typically: gain an appreciation of a relevant engineering sector; plan and manage their reflective plans to achieve progression in their studies and future career paths; develop independence in relation to their learning and the acquisition of employability skills.

Module Content:

This module will ensure students are able to utilise the University systems for information technology, information search and acquisition, as well as encouraged to reflect on their current employment related skills and experience. The module will provide a mix of careers support, enterprise and business insight and challenging thinking about future skills needs of graduates and employers. Students will gain an appreciation of a range of engineering and technology careers and sectors to enable them to better understand future opportunities. Students will be guided through the first weeks of the academic year by academic staff. The module will include guidance and support in IT and IS systems, as well as the provision from important central support services. Lectures will include study skills and techniques, guest lectures from industrial visitors, employment, internships and placements, employment and work experience, the business and regulatory environment and the innovation cycle.

Pre and Co requisites:

None

Total hours: 60

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA -Pass / Fail

Module name: Career Skills Development

Module code: 4ENT1096

Semester: AB

Credits: 30

Module Aims:

Provide an appreciation of employment and careers in the engineering and technology sector; develop generic skills to assist in academic study and career management for the future.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * describe the context of regulatory frameworks within the engineering and technology area; * assess their own development needs over a wide range of generic skills areas including for example business, innovation and enterprise; * engage positively with the careers and IT support services within the University and relevant external Professional institutions. **Skills and Attributes:** Successful students will typically: * gain an appreciation of a relevant engineering sector; * plan and manage their reflective plans to achieve progression in their studies and future career paths; * develop independence in relation to their learning and the acquisition of employability skills.

Module Content:

This module will ensure students are able to utilise the University systems for information technology, information search and acquisition, as well as encouraged to reflect on their current employment related skills and experience. The module will provide a mix of careers support, enterprise and business insight and challenging thinking about future skills needs of graduates and employers. Students will gain an appreciation of a range of engineering and technology careers and sectors to enable them to better understand future opportunities. Students will be guided through the first weeks of the academic year by academic staff. The module will include guidance and support in IT and IS systems, as well as the provision from important central support services. Lectures will include study skills and techniques, guest lectures from industrial visitors, employment, internships and placements, employment and work experience, the business and regulatory environment and the innovation cycle.

Pre and Co requisites:

None

Total hours: 300

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA -Pass/Fail

Module name: Career Skills Development

Module code: 4ENT1096

Semester: AB

Credits: 0

Module Aims:

Provide an appreciation of employment and careers in the engineering and technology sector; develop generic skills to assist in academic study and career management for the future.

Intended Learning Outcomes:

Successful students will typically:

- * describe the context of regulatory frameworks within the engineering and technology area;

- * assess their own development needs over a wide range of generic skills areas including for example business,

innovation and enterprise;

- * engage positively with the careers and IT support services within the University and relevant external

Professional institutions.

Successful students will typically:

- * gain an appreciation of a relevant engineering sector;

- * plan and manage their reflective plans to achieve progression in their studies and future career paths;

- * develop independence in relation to their learning and the acquisition of employability skills.

Module Content:

This module will ensure students are able to utilise the University systems for information technology,

information search and acquisition, as well as encouraged to reflect on their current employment related skills

and experience. The module will provide a mix of careers support, enterprise and business insight and

challenging thinking about future skills needs of graduates and employers. Students will gain an appreciation of

a range of engineering and technology careers and sectors to enable them to better understand future

opportunities. Students will be guided through the first weeks of the academic year by academic staff.

Pre and Co requisites:

None

Total hours: 60

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Civil Engineering Materials 1

Module code: 4ENT1134

Semester: A

Credits: 15

Module Aims:

Develop an understanding of the scientific principles, general properties and appropriate uses of engineering materials for given engineering environments, know the origin and key properties of the main materials used in construction, recognise the diverse ways by which materials interact with the environment and hence deteriorate.

Intended Learning Outcomes:

Successful students will typically:

- describe the structure of metals, polymers and ceramics, explain relationships with mechanical and physical properties and recognise their use and limitations in engineering environments
- explain the reuse and recyclability of materials to meet sustainability drivers in engineering

Successful students will typically:

- Select materials for applications based on the behaviour of the major classes of engineering materials
- Select appropriate testing procedures for the evaluation of engineering materials
- Undertake physical measurements of basic properties of soils, concrete and steel

Module Content:

Summary of what module involves

This module introduces students to common civil engineering materials, their physical and mechanical

properties (elastic and plastic deformation, tensile & compressive strengths, modulus, ductility, toughness,

hardness), and testing methods. Students will also develop an appreciation of the ethical, environmental and

social factors associated with the extraction and processing of materials.

Practical activities will include the casting and testing of concrete, soil properties and testing of steel in tension

to measure modulus.

What the student will learn from the module

Students will learn about the properties and behaviour in-use of the main materials used in civil engineering,

which will enable them to select the most appropriate materials for particular applications.

Why will this be of benefit

An understanding of the behaviour of materials is fundamental to the construction and design of the built

environment.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

Module name: Computer Aided Engineering

Module code: 5ent1078

Semester: A

Credits: 15

Module Aims:

Apply Computational Fluid Dynamics to the analysis of fluid flow; develop an understanding of fluid mechanics; gain experience in the use of CAD solid modelling software; gain an understanding of the potential of solid modelling as a design tool; gain experience in the use of a stress analysis program.

Intended Learning Outcomes:

Successful students will typically:

- * describe the governing equations and numerical methods underpinning CFD and their application to real flows.

Successful students will typically:

- * obtain and analyse results of a CFD simulation for a practical engineering application;
- * envisage and model a part that satisfies a given brief and construct solid models of prismatic parts;
- * obtain and analyse results of a stress analysis for a representative engineering application.

Module Content:

This module introduces the students to three CAE systems; CAD solid modelling, stress analysis using Finite

Element Analysis (FEA) and Computational Fluid Dynamics (CFD).

The CAD component entails learning further skills in solid modelling used in design processes and shows the

benefits and potential of 3D models.

This module is primarily practical, based around commercial standard software packages available in the

computer laboratories for CAD, FEA and CFD simulation. Knowledge and understanding is provided through

introductory lectures and tutor support during practical sessions plus directed learning activities outside of

scheduled classes. Skills in setting up and running the various CAE software packages are developed through

case study based exercises including some group based open ended assignments in the laboratories with

additional experience gained through directed learning outside of scheduled classes.

The FEA component introduces concepts of extracting the mid-surface of a solid CAD model and the various

techniques to ensure that the surfaces are fully joined. Techniques for ensuring water-tightness and avoidance

of initial penetration will also be introduced. Both static and modal analysis will be covered and reinforced by

experimental tests. The effect of mesh density on the accuracy of the results will be looked at by using

a classical engineering problem.

The CFD component introduces the concept of discretisation of the governing equations of fluid mechanics and

covers setting up simple flow scenarios and geometries. Analysis is carried out with a view to parameters

affecting result sensitivity.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Computer Aided Engineering

Module code: 5ENT1078

Semester: A

Credits: 15

Module Aims:

Apply Computational Fluid Dynamics to the analysis of fluid flow; develop an understanding of fluid mechanics; gain experience in the use of CAD solid modelling software; gain an understanding of the potential of solid modelling as a design tool; gain experience in the use of a stress analysis program.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * describe the governing equations and numerical methods underpinning CFD and their application to real flows. Skills and Attributes: Successful students will typically: * obtain and analyse results of a CFD simulation for a practical engineering application; * envisage and model a part that satisfies a given brief and construct solid models of prismatic parts; * obtain and analyse results of a stress analysis for a representative engineering application.

Module Content:

This module introduces the students to three CAE systems; CAD solid modelling, stress analysis using Finite Element Analysis (FEA) and Computational Fluid Dynamics (CFD). The CAD component entails learning further skills in solid modelling used in design processes and shows the benefits and potential of 3D models. The FEA component introduces concepts of extracting the mid-surface of a solid CAD model and the various techniques to ensure that the surfaces are fully joined. Techniques for ensuring water-tightness and avoidance of initial penetration will also be introduced. Both static and modal analysis will be covered and reinforced by experimental tests. The effect of mesh density on the accuracy of the results will be looked at by using a classical engineering problem. The CFD component introduces the concept of discretisation of the governing equations of fluid mechanics and covers setting up simple flow scenarios and geometries. Analysis is carried out with a view to parameters affecting result sensitivity. This module is primarily practical, based around commercial standard software packages available in the computer laboratories for CAD, FEA and CFD simulation. Knowledge and understanding is provided through introductory lectures and tutor support during practical sessions plus directed learning activities outside of scheduled classes. Skills in setting up and running the various CAE software packages are developed through case study based exercises including some group based open ended assignments in the laboratories with additional experience gained through directed learning outside of scheduled classes.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
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%	100%	%
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100 ICA

Module name: Computer Aided Manufacture

Module code: 5ENT1001

Semester: B

Credits: 15

Module Aims:

Understand the state of the art knowledge of computer-aided manufacture; understand the relationship between CAD and CAM; understand the functions and limitations of modern CAD/CAM systems; develop skills in the use of a modern CAD/CAM system in effective and efficient manufacture and relate these to the product design / manufacturing processes.

Intended Learning Outcomes:

Successful students will typically:

- * detail and specify the necessary links to enable communication between CAD and CAM;
- * explain rapid prototyping and its capability to reduce product lead time;
- * explain the connection between CAM and manufacturing processes;
- * describe the concepts of computer integrated manufacture.

Successful students will typically:

- * formulate part manufacturing process plans;
- * use a suitable CAD/CAM system to generate part NC machining programs and simulate its machining processes;
- * verify the machining processes and modify machining parameters;
- * present their findings in writing.

Module Content:

The module introduces students the state of the art knowledge of computer-aided manufacturing, including

process planning, NC machining and programming, rapid prototyping and CIM, and to the use of a suitable

CAD/CAM system for the manufacture of engineering components. The main focus is on the effective

application of a 3D CAD/CAM system to 1) plan the machining processes; 2) specify machining parameters, 3)

generate NC programs, for engineering components. Students will both create their own models and acquire

and use models from other sources. The emphasis is on the use of a CAD/CAM system. The intended learning outcomes are facilitated through a series of lectures and tutorials/workshop activities to

fulfil the aims and learning outcomes of the module, by encouraging the students to access a variety of

resources, eg Studynet, relevant professional and academic text, available manufacturing laboratory facilities,

technologies and CAE facilities.

Lectures:-

- CAM principles
- 2D NC machining & programming
- CAM and manufacturing processes
- 3D NC machining & programming
- Rapid prototyping
- CAM and CIM system.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Computer Programming for Electronics Engineers

Module code: 4ele0049

Semester: B

Credits: 15

Module Aims:

Gain an insight into stored program concepts and structured program design methodology.

Intended Learning Outcomes:

Successful students will typically: * identify stored programme concepts such as program flow; * explain the relationship between high level and low level structures; * describe the procedures involved in the specification and design of algorithms using a suitable structured design methodology. Successful students will typically: * implement and verify simple programs using a high level language such as 'C'.

Module Content:

This module introduces the student to a variety of programming concepts and practices. Study topics include

fundamental material such as number systems, functions and procedures and variables, constants and arrays.

Also included is introductory material on more advanced concepts such as software design methodology. The

module is taught both by lecture and practical exercises, with the practical work being largely centred on the use of a high level language such as 'C'.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Computer Programming for Electronics Engineers

Module code: 4ELE0049

Semester: B

Credits: 15

Module Aims:

Gain an insight into stored program concepts and structured program design methodology.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * identify stored programme concepts such as program flow; * explain the relationship between high level and low level structures; * describe the procedures involved in the specification and design of algorithms using a suitable structured design methodology. Skills and Attributes: Successful students will typically: * implement and verify simple programs using a high level language such as 'C'.

Module Content:

This module introduces the student to a variety of programming concepts and practices. Study topics include fundamental material such as number systems, functions and procedures and variables, constants and arrays. Also included is introductory material on more advanced concepts such as software design methodology. The module is taught both by lecture and practical exercises, with the practical work being largely centred on the use of a high level language such as 'C'. The learning outcomes will be facilitated by lecture and/or practical exercises in the following topic areas. From time to time, other topics may be added or substituted as appropriate if these are felt to better achieve the aims and learning outcomes. * Number systems; * Stored programme concepts; * Differences between interpreted programmes and compiled programmes; * Functions and procedures; * Variables, constants, arrays and pointers; * Algorithms; * Software design methodology * The software environment (memory maps etc.) * Input-output programming * Compiler fundamentals Coursework will typically take the form of a series of short tests together with assessed practical lab sessions.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Computing for Business and Technology

Module code: 4ENT1130

Semester: B

Credits: 15

Module Aims:

Understand the importance of computer applications as a tool to aid in the solution of engineering and business problems; acquire a good knowledge and understanding of the benefits and methods of spreadsheet technology in the engineering and business sectors; acquire a working knowledge and understanding of the benefits and methods of database technology in the engineering and business sectors; gain an understanding of the benefits and uses of E-Commerce; acquire a knowledge of simple computer networks and, in particular how data is transmitted across the internet.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: select appropriate uses for spreadsheets and databases to solve engineering and business problems; demonstrate understanding of the importance of E-commerce and computer networking and discuss its benefits and dangers; describe how data is transmitted across the internet. **Skills and Attributes:** Successful students will typically: apply spreadsheets to solve simple engineering and management problems; apply graphing techniques to display engineering and business data and employ more advanced spreadsheet techniques such as macros, lookup tables and dropdown lists to enhance the functionality of spreadsheets; implement some simple Visual Basic commands on spreadsheets; build a relational database to solve a business or engineering problem and use tables, forms, reports and queries to implement a relational database to fulfil given requirements.

Module Content:

This module will develop the students skills in using spreadsheets and databases to solve engineering and business problems including how to present results and draw conclusions. The methods, advantages and possible draw backs of E-commerce will be discussed including future trends and their possible impact on commercial and domestic operations. The basic principles of networking will be explored, including types of network and networking hardware, the advantages and possible dangers of networking and data security. Internet communications will be studied in some depth, including the OSI model, IP numbers, domain names, routing, physical addresses and the concept of internetworking. Studynet will be used to distribute all module materials and to inform students of important notices, dates etc. The basic functionality of a spreadsheet will be explored and students will analyse and solve problems for solution, using the spreadsheet as an analysis tool. In particular, students will study basic spreadsheet topics including: Basic data entry techniques, cell formatting, building formulas, using functions, conditional programming, conditional formatting, advanced formatting, multiple sheets, recording macros, buttons, protecting sheets, sorting data, solver, charting and graphing. Students will also explore the use of graphing tools to display and analyse data sets to support the solution of various engineering and business applications. More advanced techniques will be introduced to allow the production of more sophisticated spreadsheets capable of carrying out more complex tasks. The use of drop-down lists and look-up tables. Students will be introduced to the Visual Basic editor to accomplish some simple

object oriented, event driven programming techniques. Relational databases will be introduced through the hands on use of Microsoft Access. Students will design and build their own database to solve specific problems relevant to business and engineering. Students will become familiar with the use of: Tables, forms, reports, primary keys, entity relationship models, simple queries, complex queries involving mathematical relationships. The methods, advantages and possible drawbacks of E-commerce will be discussed. Future trends will be considered and their possible impact on future commercial and domestic operations. The basic principles of networking will be explored. Types of network and networking hardware will be introduced. The advantages and possible dangers of networking will be considered including data security. Internet communications will be studied in some depth, including the OSI model and a knowledge of what each of its layers provides. IP numbers, domain names, routing, physical addresses and the concept of internet working will be explained. Some simple domain and IP lookup services will be used as well as IP configuration utilities and some simple IP port scanning software. Teaching Methods For the spreadsheet and database aspects of the module (75 of the class time), a hands-on approach will be adopted to allow the students to benefit from experiential learning. Students will learn the principles and techniques of spreadsheet and database systems by working through prepared tutorials and by practically tackling specific problems. All class activities will take place in a computer teaching lab.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Content & Asset Management

Module code: 5ENT1081

Semester: A

Credits: 15

Module Aims:

Refine and develop project management strategies including process analysis, problem classification and investigation, sourcing challenges, information handling and evaluation, content communication and presentation in the context of dynamic web applications; demonstrate confidence and competence in the use of contemporary digital audio visual technologies & software tools for completing a digital content based task.

Intended Learning Outcomes:

Successful students will typically:

- * explore appropriate tools and packages for the purpose of content production, retrieval, and asset management;
- * explain the basic principles of dynamic web applications;
- * discuss a range of programming models and environments

Successful students will typically:

- * use appropriate planning and content management strategies, processes and systems;
- * examine given problems and select appropriate implementation solutions which address given technical/aesthetic and audience parameters;
- * develop a dynamic web application to serve a content and asset management task;
- * prepare and report upon appropriate content and asset management strategies

Module Content:

The module allows students to develop an understanding and appreciation of contemporary content retrieval

management and governance strategies and industry practices.

Through a series of hands-on practice sessions, students are expected to become familiar with the tools and

packages for developing dynamic web applications. The module also provides an opportunity for students to

explore the process of developing web applications to address a particular requirement.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Control Systems

Module code: 6AAD0007

Semester: A

Credits: 15

Module Aims:

Further develop their ability to analyse the performance of control systems; design controllers to modify the performance of control systems.

Intended Learning Outcomes:

Successful students will typically:

- * identify whether a system satisfies a desired performance specification.

9b. Skills and Attributes:

Successful students will typically:

- * evaluate the dynamic performance of a control system;
- * design a controller to improve the performance of a control system;

Module Content:

This module will further the students understanding of classical control theory and give the experience of

applying the theory to modify the dynamic performance of systems. The module will introduce root locus

methods for the design of series controllers, in both continuous and digitally controlled systems. The module

will also extend the students understanding of frequency response methods into the design of controllers and the analysis of non-linear systems using describing functions to predict limit cycles.

Where possible students will be encouraged to use Matlab to check theoretical calculations and to design

controllers. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning.

Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow

students to practice and refine their skills.

Lectures

1. Revision of year 2 control systems - Transfer Functions, Block diagrams, Stability, Frequency Response

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Analysis.

2. Nichols Charts & Closed Loop Performance - Plotting FR data on Nichols Charts, Gain & Phase Margins,

Bandwidth, Resonance.

3. Controller Design using Frequency Response - Bode Plots of Lead & Lag controllers, effect of Lead/Lag

controllers on Nichols Chart.

4. Introduction to Non-Linear Systems - input vs output curves, describing functions.

5. Stability of Non-linear Systems - Limit cycle prediction using Nyquist and Nichols.

6. Introduction to Root Locus - Effect of a proportional controller on closed loop poles, Gain & Magnitude

conditions.

7. Rules for Root Locus Plotting - sketching root locus plots.

8. Controller Design using Root Locus - Lines of damping constants and undamped natural frequency, effect of

controller poles and zeros.

9. Introduction to Digital Control - Pros and cons of digital control, A/D & D/A converters, Z Transforms & Digital

Time Response.

10. Digital equivalent transfer function and Digital Stability- Zero Order Hold model, Z plane.

11. Digital Root Locus - drawing digital root locus plots, first order digital controllers

Tutorials

Students will receive a tutorial each week to support the lectures above.

Matlab Surgeries

On-line tutorial sheets will guide students on how to use Matlab to analyse systems and design controllers

using the methods covered in lectures above. Students who have difficulties with these online instructions may

attend optional surgery classes.

Pre and Co requisites:

None

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Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

Module name: Control Systems

Module code: 6AAD0007

Semester: A

Credits: 15

Module Aims:

Further develop their ability to analyse the performance of control systems; design controllers to modify the performance of control systems.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * identify whether a system satisfies a desired performance specification. Skills and Attributes: Successful students will typically: * evaluate the dynamic performance of a control system; * design a controller to improve the performance of a control system; * use a computer to simulate the performance of a control system.

Module Content:

This module will further the students understanding of classical control theory and give the experience of applying the theory to modify the dynamic performance of systems. The module will introduce root locus methods for the design of series controllers, in both continuous and digitally controlled systems. The module will also extend the students understanding of frequency response methods into the design of controllers and the analysis of non-linear systems using describing functions to predict limit cycles. Where possible students will be encouraged to use Matlab to check theoretical calculations and to design controllers. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning. Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow students to practice and refine their skills. Lectures 1. Revision of year 2 control systems - Transfer Functions, Block diagrams, Stability, Frequency Response Analysis. 2. Nichols Charts & Closed Loop Performance - Plotting FR data on Nichols Charts, Gain & Phase Margins, Bandwidth, Resonance. 3. Controller Design using Frequency Response - Bode Plots of Lead & Lag controllers, effect of Lead/Lag controllers on Nichols Chart. 4. Introduction to Non-Linear Systems - input vs output curves, describing functions. 5. Stability of Non-linear Systems - Limit cycle prediction using Nyquist and Nichols. 6. Introduction to Root Locus - Effect of a proportional controller on closed loop poles, Gain & Magnitude conditions. 7. Rules for Root Locus Plotting - sketching root locus plots. 8. Controller Design using Root Locus - Lines of damping constants and undamped natural frequency, effect of controller poles and zeros. 9. Introduction to Digital Control - Pros and cons of digital control, A/D & D/A converters, Z Transforms & Digital Time Response. 10. Digital equivalent transfer function and Digital Stability- Zero Order Hold model, Z plane. 11. Digital Root Locus - drawing digital root locus plots, first order digital controllers Tutorials Students will receive a tutorial each week to support the lectures above. Matlab Surgeries On-line tutorial sheets will guide students on how to use Matlab to analyse systems and design controllers using the methods covered in lectures above. Students who have difficulties with these online instructions may attend optional surgery classes.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

60 Exam 40 ICA The successful candidates are required to pass overall. All Learning Outcomes to be assessed in both Exam and ICA.

Module name: Data Communication Systems for Biomedical Applications

Module code: 6ENT1047

Semester: A

Credits: 15

Module Aims:

Comprehensively understand the architecture and principles of local area, wide area and wireless data networks, including communications with biomedical instrumentation systems and "In the body", "On the body" and "Off the body" biomedical systems, select and apply appropriate engineering skills to develop and evaluate data communication systems for Biomedical Applications.

Intended Learning Outcomes:

Successful students will typically:

- * identify local area, wide area and wireless networks for biomedical communication and instrumentation;
- * identify solutions to various biomedical data communication requirements;
- * explain various network protocols and services in a biomedical context.

Successful students will typically:

- * select appropriate hardware, software and communication links to support data communications for biomedical applications;
- * analyse wide area, local area and personal area networks for biomedical applications;
- * apply appropriate software tools to evaluate and analyse network operation.

Module Content:

This module introduces principles of wide and local area networks including wireless networks and then moves

on to Biomedical applications including tele-health, communication with "In the body", "On the body" and "Off

the body" biomedical systems and communication with biomedical instrumentation.

Lecture schedule

1. Fundamentals of networks and layered protocols – TCP/IP
2. Ethernet
3. Wireless local area networks IEEE802.11

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4. Cellular data networks, 3G, 4G, 5G
5. Optical networks and Digital Subscriber Line (DSL)
6. Network security
7. Data communication with "On the body" and "Off the body" biomedical systems
8. Data communication with "In the body" biomedical systems
9. Data communication interfaces and protocols for medical instrumentation equipment –IEEE488, Ethernet and LAN Extensions for Instrumentation (LXI).
10. Biomedical applications of wide area networks, e.g. Tele-health

Pre and Co requisites:
None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

Module name: Data Security and Biometrics

Module code: 6ENT1031

Semester: B

Credits: 15

Module Aims:

Expand their understanding of modern day security and vulnerability issues and explore both theoretically and practically, the encryption methods used to secure information and data access; gain knowledge and understanding of the underpinning principles and relative performance of a range of biometric systems.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: recognise security threats in a networked environment; compare and contrast the preventative methods available to address data security threats; explain the underlying principles, methodologies and characteristics of different biometric systems. **Skills and Attributes:** Successful students will typically: determine preventative methods to address modern day security issues; * perform statistical analysis to evaluate the performance of a given biometric system; recommend the most appropriate biometric system for a given application.

Module Content:

This module is designed to introduce students to the fundamentals of computer security and biometrics based authentication. Modern problems relating to security issues (e.g. Hacking, fraud, viruses) are addressed and examined, and the methods established for tackling these problems are described. The module also covers the principles of biometrics. It details various approaches to identifying and verifying individuals through biometrics methods. The challenges in different types of biometrics are also discussed. One part of the module will typically cover the following topics: 1. Security and Vulnerability Issues 2. Data Privacy, 3. Physical, Transmission protection 4. Policies, Mechanisms, 5. Hacking methods, 6. Firewall architectures 7. Data encryption principles. The remainder of the module will typically cover these topics: 8. Definition and principle of biometrics-based recognition. 9. Biometric systems - a) Fingerprint, face, iris; b) Principles, methodology, and challenges in practice. 10. Multimodality and fusion. The mathematics necessary to support the statistical analysis and data encryption principles delivered within this module will be introduced as required.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

60 Exam 40 ICA The successful candidates are required to pass overall.

Module name: Design of High Performance Engines

Module code: 6ENT1060

Semester: B

Credits: 15

Module Aims:

Gain an understanding of design techniques appropriate to Engine Design; experience of applications of appropriate methods for evaluating Engine Design; gain an understanding of engine related practical skills.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * select appropriate design techniques suitable for the design of a high performance engine; * justify design decisions that have been made during the design of parts for a high performance engine. Skills and Attributes: Successful students will typically: * produce design solutions to performance engine design with known design constraints; * analyse a high performance engine design to predict engine performance.

Module Content:

This module will explain how to determine the basic geometric properties of piston engines according to a set of design requirements. The prior knowledge of thermodynamics will be expanded related to combustion engines. Then, the derivation of thermal and mechanical loads on engine parts will be taught. The material grades that are usual for engine parts and their properties will be introduced and the material selection procedure will be explained. Fundamentals of machine element design will be introduced, and then applied on a variety of engine parts (gudgeon pin, piston, bearings) in order to evaluate an individual part or assembly. Throughout the module real-life examples and research results will be presented to support theory (NASCAR, Formula 1, MotoGP and other high performance type engines). The basic functions of engine design are examined with an emphasis on those aspects that enable improved performance to be achieved. These aspects are further examined for the implications and feasibility of manufacture, assembly and testing in the area of Motorsport. Based on the performance requirement the necessary engine size, configuration, bore and stroke values, conrod to stroke ratio will be identified. Using the ideal p-V diagram and real engine data the temperatures and pressures will be estimated on the combustion chamber parts and on the exhaust. The gas exchange process will be investigated and design of the valvetrain will be shown. Basics of fine tuning an exhaust header and intake manifold will be investigated with supporting examples from high performance engines. Machine element design will be introduced via some worked examples in order to clarify terms such as: stress, safety factor, strain, allowable stress, static load, alternating load, failure modes etc. Effect and the importance of surface roughness and geometric tolerances will be explained. Finally the acquired knowledge and skills will be used on design tasks to determine the geometry of a variety of engine elements.

Pre and Co requisites:

None

Total hours: 150

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Assessment:

Exam	Coursework	Practical
60%	40%	%

60 Exam 40 ICA The successful candidates are required to pass overall. All Learning Outcomes to be assessed in both Exam and ICA

Module name: Digital Design & Embedded Systems

Module code: 5ele0060

Semester: A

Credits: 15

Module Aims:

Gain sufficient understanding of microcontrollers, microprocessors and programmable logic devices to design, build and program simple systems based on their use.

Intended Learning Outcomes:

Successful students will typically:

- * Explain the main principles behind the hardware design of embedded systems;
- * describe the main principles of assembly language programming and how this relates to high-level language programming;
- * describe the different attributes and uses of programmable logic devices.

Successful students will typically:

- * illustrate, at block diagram level, a simple microprocessor or microcontroller based system;
- * write a simple assembly language programme for a microcontroller or microprocessor based system;
- * generate a simple interconnect structure for a programmable logic device, using high level language tools.

Module Content:

This module extends coverage of digital design into the area of microprocessor, microcontroller and programmable logic devices. The fundamental aspects of microprocessor system hardware design are covered,

along with an introduction to programming in assembly language. The module also extends study of digital

systems into field programmable logic devices and introduces the student to the modern computer based tools

such as VHDL that are used in the programming of such devices. This module encompasses the following topics:

- * Overall architecture for Embedded and real-time systems, basic architecture of microprocessors, microcontrollers, I/O subsystems.
- * Architecture organisation for embedded Software based and Hardware based systems.

- * Memory organisation, types, architecture, map and usage.
- * Basic CPU design considerations, selection criteria.
- * Software development for embedded systems based on UML principles.
- * Assembly language, C language and mixed language programming.
- * FPGA structure.
- * VHDL language, structural, data flow and behavioural design entry principles.

The coursework is typically based on a series of assessed laboratory sessions.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
70%	30%	%

Module name: Digital Electronics & Computer Organisation

Module code: 4ELE0050

Semester: A

Credits: 15

Module Aims:

Develop design skills in simple digital building blocks.

Intended Learning Outcomes:

Successful students will typically: * identify digital logic gates and their functionality; * explain the concepts inherent in the design and analysis of combinational and sequential circuits; * describe the functional behaviour of a modern computer system. Successful students will typically: * illustrate, at block diagram level, simple examples of combinational and sequential circuits; * analyse and measure the functionality of simple digital circuits.

Module Content:

Digital Electronics and Computer Organisation' complements 'Electrical and Electronic Theory' by introducing

students to digital electronic fundamentals. Common types of switching devices and logic gates are introduced

as are common circuit implementations using them. Fundamental concepts such as binary number systems,

binary arithmetic and Boolean logic are also covered, as are common logical and mathematical 'tools' used in the design of both combinational and sequential digital electronic systems. Finally, these and other topics are

brought together in the context of computer and microprocessor systems, to introduce students to the

fundamental digital organisation of items such as the CPU and memory. The learning outcomes will be facilitated by lecture and/or practical exercises in the following topic areas. From

time to time, other topics may be added or substituted as appropriate if these are felt to better achieve the aims

and objectives.

Binary systems and binary arithmetic;

Boolean logic;

Gates and logic functions;

Karnaugh maps and combinational logic;

Sequential synchronous and asynchronous circuits;

Solid state storage devices;

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Algorithmic state machines and finite state machines;

CPU and Computer organisation

The coursework will typically be based on a number of lab experiments and assessed via submissions made

prior to and after each lab session.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
80%	20%	%

Module name: Digital Signal Processing

Module code: 6ELE0066

Semester: A

Credits: 15

Module Aims:

Gain an insight into the principles of signal processing techniques and design methods and to enable them to implement simple DSP algorithms using digital signal processors.

Intended Learning Outcomes:

Successful students will typically:

- * explain, in mathematical terms, simple algorithms commonly used in digital signal processing applications.

Successful students will typically:

- * design simple digital signal processing systems;
- * use selected software tools for simulating DSP techniques and systems;
- * implement simple DSP algorithms on selected digital signal processors.
- * utilise both fundamental and advanced DSP tools, techniques and systems;

Module Content:

This module introduces the student to modern concepts of digital signal processing. Material covered includes

typical theoretical concepts as well as an introduction to typical hardware implementations. The theoretical

study is supported by practical work using typical software tools for simulating DSP techniques as well as

practical work in implementing simple algorithms on selected digital signal processors . This module typically covers the following topics:

- * Discrete Fourier transform and its efficient implementation; Power spectral estimation;
- * Design and realisation of digital filters;
- * Signal modelling; inverse systems and deconvolution;
- * Digital signal processing architectures and programming.
- * Digital vs Analogue; Motivation for features & applications of DSP;
- * DSP Devices: Characteristics & Software tools/Binary Notation

* Features of a known DSP processor such as ADSP-2100; Base Architecture; ADSP-2100 Family Base

Internal

* Architecture ALU/MAC/Barrel Shifter

* DAG/Program Sequencer Operations

* DSP peripherals such as Serial Ports

In-course assessment will typically include:

a) Digital Signal Processing Lab: A practical, lab-based project assessed by report

b) Digital Signal Processors Lab: A practical, lab-based assessment exercise

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

Module name: Distributed Systems & Network Management

Module code: 6ELE0079

Semester: AB

Credits: 30

Module Aims:

Consolidate their understanding of the principles of operation of distributed systems; explore the details of different networking applications; gain practical experience and theoretical understanding of the construction of network applications and management of a networked environment.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: analyse the performance of a range of modern distributed systems; compare and contrast the operational needs of a modern distributed network environment; propose appropriate strategies for the management of a typical networked application. **Skills and Attributes:** Successful students will typically: relate the technical performance of a contemporary network system to user needs within the context of a distributed networked environment; evaluate and report upon the practical methods required to manage a networked environment.

Module Content:

The student will be introduced to a range of modern networking environments through a combination of lectures and practical, hands-on, sessions. The module also covers distributed systems and addresses practical issues encountered in the real-world. The course provides a framework for understanding the details of different systems such that, whether as a potential purchaser or developer of these systems, the student will be able to rapidly assimilate the details relevant to a particular requirement. The student will then be able to apply the knowledge, experience and understanding gained on this course to a range of environments in the IT industry. The following topics will typically be covered in this module: * Network management functions, tools and standards; need for standard interfaces to provide portability and standard protocols for network and distributed systems applications. Data representation, data access over networks, protection, security, routing and NAT * Error detection and recovery, Fault tolerance, safety critical applications, redundancy. Concurrency control and transaction processing. Meeting business and user requirements. * Distributed Systems: Architectures, Distributed Processing, * Distributed File Systems, Distributed Coordination, Distributed Databases, Load Balancing, Clustering * An appreciation of the implications of the next generation internet, both in terms of technical design, economic impact and the needs of users.

Pre and Co requisites:

None

Total hours: 300

Assessment:

Exam	Coursework	Practical
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60%	40%	%
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60 Exam 40 ICA The successful candidates are required to pass overall

Module name: Dynamics

Module code: 5ent1013

Semester: A

Credits: 15

Module Aims:

Further a student's understanding of the principles of dynamics; perform simple experiments to measure the dynamic performance of mechanical systems.

Intended Learning Outcomes:

Successful students will typically:

- * explain the fundamental principles of dynamics;

Successful students will typically:

- * derive the equations of motion for simple mechanical systems from fundamental dynamic principles;

- * use laboratory equipment to measure the performance of mechanical systems;

- * analyse the dynamic performance of mechanical systems.

Module Content:

This module will further expand the students understanding of the basic dynamics principles covered in year 1

to include rotational motion in mechanical systems and the dynamic response to applied forces.

Through a combination of case studies presented in lectures, experiments and tutorial activities students will

develop their ability to analyse the dynamic behaviour of mechanical systems including an introduction vibrational analysis and how to dampen the effect of vibration. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning.

Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow

students to practice and refine their skills.

Topics include:

1. Kinematics (20) Velocity and acceleration analysis of mechanisms including the Coriolis component of

acceleration, by the use of simple analysis and graphical methods.

2. Kinetics (40) - Dynamic force analysis of mechanisms. The transmission of forces and power through

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mechanisms and machines. Balancing of rotating and reciprocating systems. Principles and applications of

gyroscopic motion.

3. Vibration (40) - Description of various forms of damping. Analysis of free and forced vibrations of single

degree of freedom systems possessing viscous damping. Vibration isolation of forces and motion. Transient

responses for various excitations including impulse and general functions.

Where possible laboratory experiments will be conducted on an open access basis.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
70%	30%	%

Module name: Dynamics

Module code: 5ENT1013

Semester: A

Credits: 15

Module Aims:

Further a student's understanding of the principles of dynamics; perform simple experiments to measure the dynamic performance of mechanical systems.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * explain the fundamental principles of dynamics; Skills and Attributes: Successful students will typically: * derive the equations of motion for simple mechanical systems from fundamental dynamic principles; * use laboratory equipment to measure the performance of mechanical systems; * analyse the dynamic performance of mechanical systems.

Module Content:

This module will further expand the students understanding of the basic dynamics principles covered in year 1 to include rotational motion in mechanical systems and the dynamic response to applied forces. Through a combination of case studies presented in lectures, experiments and tutorial activities students will develop their ability to analyse the dynamic behaviour of mechanical systems including an introduction UNIVERSITY OF HERTFORDSHIRE Published (visible) 25-FEB-19 11:12 Page 2 of 3 vibrational analysis and how to dampen the effect of vibration. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning. Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow students to practice and refine their skills. Topics include: 1. Kinematics (20) Velocity and acceleration analysis of mechanisms including the Coriolis component of acceleration, by the use of simple analysis and graphical methods. 2. Kinetics (40) - Dynamic force analysis of mechanisms. The transmission of forces and power through mechanisms and machines. Balancing of rotating and reciprocating systems. Principles and applications of gyroscopic motion. 3. Vibration (40) - Description of various forms of damping. Analysis of free and forced vibrations of single degree of freedom systems possessing viscous damping. Vibration isolation of forces and motion. Transient responses for various excitations including impulse and general functions. Where possible laboratory experiments will be conducted on an open access basis.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
70%	30%	%

70 Exam 30 ICA The successful candidates are required to pass overall. All Learning Outcomes to be assessed in both Exam and ICA.

Module name: E-Culture

Module code: 4ENT1126

Semester: A

Credits: 15

Module Aims:

Establish and develop a knowledge and understanding of cultural and historical contexts which have shaped the techno-scientific practices of E-culture; recognise and discuss some of the key factors that have influenced the emergence of the globalised E-culture including such things as technological innovation, economic and political theories and E-conflict; demonstrate the ability to sustain a process of enquiry including the gathering of information, the strengthening of ideas and their effective communication and presentation.

Intended Learning Outcomes:

Successful students will typically:

- * describe critical responses to, and accounts of, the emergence of E-culture within a broad cultural and

historical context;

- * identify factors affecting the emergence and burgeoning influence of the globalised E-culture;

Successful students will typically:

- * analyse E-cultural emergence using a critical vocabulary of terms and concepts;

- * discuss and support argument about various accounts of the emergence of E-culture and present the

outcomes of enquiry;

- * deploy relevant theories and methodologies in making a critical and informed analysis of the impact of

instances and artefacts of E-culture.

Module Content:

The emergence of a distinctly globalised E-culture can be accounted for in a number of ways. This module

focuses on histories of technologies and their impact on many aspects of the broader culture. It includes

theoretical accounts and communications which enable a comprehensive understanding of the present in order

to inform a vision of possible future. Assessable outcomes are presented in a variety of forms including written,

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verbal, visual and interactive media on both an individual and group basis.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: E-Enterprise and Entrepreneurship

Module code: 5ENT1083

Semester: B

Credits: 15

Module Aims:

Have a theoretical and practical understanding of a range of issues found in E-entrepreneurship and enterprise development, their contexts and behaviours, and their nature, significance and problems; develop an entrepreneurial cast of mind, an appreciation of some of the practicalities of an entrepreneurial life, and a personal and professional toolkit for taking the first steps to entrepreneurial self-employment; develop transferable skills such as the use of IT, information retrieval, manipulation and presentation, communication skills, time management, team working and problem solving.

Intended Learning Outcomes:

Successful students will typically:

- * explain the factors affecting the emergence of the globalised E-enterprise culture;
- * discuss the techniques and approaches to problem-solving and decision-making associated with start-up processes and the development of new E-enterprises;
- * identify human resource management and employment systems and issues relevant to small and developing E-enterprise organisations.

Successful students will typically:

- * apply entrepreneurial techniques to identify and produce an innovative artefact;
- * evaluate and present the outcomes of the innovative artefact created.

Module Content:

The challenges and opportunities presented by a networked, digitised and globalised economy are at the centre

of this module. Understanding not only how to exploit those opportunities, but the responsibility that goes with

them, is an important aspect of developing a successful career in the digital E-enterprise and entrepreneurship

field.

The emergence of a distinctly digital business culture can be accounted for in a number of ways and this

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module also focuses on the histories of technologies and their impact on the broader culture to inform a vision,

both personal and professional, of the future.

This module specifically addresses entrepreneurs and entrepreneurship, their nature and motivation, and the

character of innovation. It will explore the nature of developing the human resources involved and how

emergence, survival and growth might best be managed, whether in the public or private sectors.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Electrical and Electronic Theory

Module code: 4ENT1026

Semester: B

Credits: 15

Module Aims:

Acquire a sound understanding of the scientific principles underpinning electrical and electronic engineering; acquire a broad understanding of electrical and electronic circuits and components; gain insight into selected software based circuit simulation tools.

Intended Learning Outcomes:

Successful students will typically: * explain the fundamental physics of electricity and electrical circuit principles; * describe a variety of analogue electronic circuit topologies; * describe the properties and limitations of widely used discrete electronic devices and components. Successful students will typically: * evaluate currents and voltages in multi-loop linear circuits including the transient behaviour of simple LR and CR circuits; * analyse simple amplifier circuits; * use circuit simulation tools for simple circuit simulation tasks.

Module Content:

This module aims to further student's knowledge and understanding of the fundamental concepts of electrical and electronic engineering systems. Topics are covered at introductory level and range from circuit theory and analysis to an introduction to electronic circuit design. Further coverage is provided of the fundamentals of common semiconductor materials and devices and circuit simulation tools and techniques. Although taught at introductory level, an analytical approach is adopted throughout in order to provide a firm base for later study. The module includes the following topics:

AC circuit analysis, capacitors and inductors, series and parallel circuits, resonance, complex power and

transient analysis.

Frequency Response, Amplification and Feedback.

Operational amplifier principles

Analogue circuits applications - op-amps, feedback & stability.

Further computer-based simulation of examples of electronic circuits.

Coursework is typically based on lab work, some of which is formative. Summative assessment is typically

based on submission of a logbook.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
80%	20%	%

Module name: Electrical Engineering and Power Control

Module code: 5ELE0058

Semester: A

Credits: 15

Module Aims:

Gain an insight into principles of electric and magnetic fields and transmission lines; gain an insight into the principles of designing transformers and common rotating machines for light current and heavy current applications; gain an insight into the principles of balanced and unbalanced 3 phase systems.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * describe basic theory applied to transformers and transmission lines in various contexts; * describe the principles of 3 phase power systems; * evaluate the operation and control of AC and DC machines. Skills and Attributes: Successful students will typically: * analyse basic principles of transformers and transmission lines; * analyse mathematically fundamental 3 phase systems; * analyse mathematically behaviour and performance of AC and DC machines at a fundamental level.

Module Content:

The module introduces some electrical engineering topics such as fields and transmission lines that are applicable to various applications including power systems, communications and high speed digital logic. It also includes transformers for heavy current and light current applications together with small and large electric motors and techniques for controlling them. Three phase AC circuits and alternators/generators and are also analysed in the context of modern power generation. Although introductory the module assumes prior knowledge of electric circuit theory gained from earlier study and builds on this knowledge. Material is treated in an analytical way, supported and augmented by both practical work and by the use of relevant specialist computer simulations. Basic magnetic and electric field theory including skin effect in the context of. power systems and machines and also radio frequency Basic transmission line theory, in the contexts of power systems, communications and high speed digital logic interconnections. Transformers for light current and heavy current applications; AC and DC motors for light current and heavy current applications; Control of AC and DC motors. Alternators and generators. Balanced and unbalanced 3 phase systems; Simulation by software of examples of electronic circuits.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
70%	30%	%

70 Exam 30 ICA The successful candidates are required to pass overall.

Module name: Electrical Engineering and Power Control

Module code: 5ELE0058

Semester: B

Credits: 15

Module Aims:

Gain an insight into principles of electric and magnetic fields and transmission lines; gain an insight into the principles of designing transformers and common rotating machines for light current and heavy current applications; gain an insight into the principles of balanced and unbalanced 3 phase systems.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * describe basic theory applied to transformers and transmission lines in various contexts; * describe the principles of 3 phase power systems; * evaluate the operation and control of AC and DC machines. Skills and Attributes: Successful students will typically: * analyse basic principles of transformers and transmission lines; * analyse mathematically fundamental 3 phase systems; * analyse mathematically behaviour and performance of AC and DC machines at a fundamental level.

Module Content:

The module introduces some electrical engineering topics such as fields and transmission lines that are applicable to various applications including power systems, communications and high speed digital logic. It also includes transformers for heavy current and light current applications together with small and large electric motors and techniques for controlling them. Three phase AC circuits and alternators/generators and are also analysed in the context of modern power generation. Although introductory the module assumes prior knowledge of electric circuit theory gained from earlier study and builds on this knowledge. Material is treated in an analytical way, supported and augmented by both practical work and by the use of relevant specialist computer simulations. Basic magnetic and electric field theory including skin effect in the context of. power systems and machines and also radio frequency Basic transmission line theory, in the contexts of power systems, communications and high speed digital logic interconnections. Transformers for light current and heavy current applications; AC and DC motors for light current and heavy current applications; Control of AC and DC motors. Alternators and generators. Balanced and unbalanced 3 phase systems; Simulation by software of examples of electronic circuits.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
70%	30%	%

70 Exam 30 ICA The successful candidates are required to pass overall.

Module name: Electrical Engineering and Power Control

Module code: 5ele0058

Semester: A

Credits: 15

Module Aims:

Gain an insight into principles of electric and magnetic fields and transmission lines; gain an insight into the principles of designing transformers and common rotating machines for light current and heavy current applications; gain an insight into the principles of balanced and unbalanced 3 phase systems.

Intended Learning Outcomes:

Successful students will typically: * describe basic theory applied to transformers and transmission lines in various contexts; * describe the principles of 3 phase power systems; * evaluate the operation and control of AC and DC machines. Successful students will typically: * analyse basic principles of transformers and transmission lines; * analyse mathematically fundamental 3 phase systems; * analyse mathematically behaviour and performance of AC and DC machines at a fundamental level.

Module Content:

The module introduces some electrical engineering topics such as fields and transmission lines that are

applicable to various applications including power systems, communications and high speed digital logic. It

also includes transformers for heavy current and light current applications together with small and large electric

motors and techniques for controlling them. Three phase AC circuits and alternators/generators and are also

analysed in the context of modern power generation. Although introductory the module assumes prior

knowledge of electric circuit theory gained from earlier study and builds on this knowledge. Material is treated

in an analytical way, supported and augmented by both practical work and by the use of relevant specialist

computer simulations.

Basic magnetic and electric field theory including skin effect in the context of. power systems and machines

and also radio frequency

Basic transmission line theory, in the contexts of power systems, communications and high speed digital logic

interconnections.

Transformers for light current and heavy current applications;

AC and DC motors for light current and heavy current applications;

Control of AC and DC motors.

Alternators and generators.

Balanced and unbalanced 3 phase systems;

Simulation by software of examples of electronic circuits.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
70%	30%	%

Module name: Electronic Communication Systems

Module code: 5ent1074

Semester: A

Credits: 15

Module Aims:

Gain an insight into the principles of signal transmission and reception and related electronic circuitry; develop an understanding of the relationship between channel properties and conditions and transmission system design; further develop an understanding of mathematical tools used in communications and signal processing.

Intended Learning Outcomes:

Successful students will typically:

- * describe the main principles of modulation theory and of the properties of typical signals and channels;
- * explain common mathematical concepts related to continuous time and discrete time signals in communication systems;
- * identify common electronic circuit blocks used in communication systems.

Successful students will typically:

- * implement, in mathematical language, simple modulation techniques;
- * produce, at block diagram level, a typical communications system;
- * illustrate a range of electronic circuit blocks used in communication systems

Module Content:

modulation techniques are introduced along with study of relationships between them and typical channel

properties. Also included in the module is further development of mathematical techniques relevant to

communications and signal processing including discrete time mathematics.

Theoretical study is supported by practical exercises and lab experiments and where appropriate, software

based simulation tools. The learning outcomes will be achieved through lectures, tutorial and practical laboratory sessions using

relevant software simulation tools.

The following list is indicative of the course content:

- * General architecture of transmitters and receivers
- * Analogue electronic circuits for communication systems
- * Noise & interference and Channels
- * AM and FM modulation (including laboratory measurements)
- * Continuous and discrete time signals and systems;
- * Fourier series and Fourier transform
- * Convolution and correlation
- * Z transform

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
70%	30%	%

Module name: Electronic Engineering Practice

Module code: 4ent1113

Semester: B

Credits: 15

Module Aims:

Be introduced to the practical aspects of electrical and electronic product manufacture, test and design, and of the importance of documentation, both paper and electronic, in these activities; be able to use common electronic laboratory instrumentation.

Intended Learning Outcomes:

Successful students will typically:

- * explain fundamental aspects of electronic circuit construction and testing;
- * describe the range of hardware and software tools used in modern electrical and electronic engineering design
and test;
- * recognise how documentation forms the definitive description of a product or process and why it must comply
with agreed conventions;

Successful students will typically:

- * construct a simple electronic-circuit based assembly use instrumentation to evaluate typical aspects of its
performance;
- * produce and interpret simple examples of documents which communicate electrical and electronic design
requirements and which comply with relevant standards and conventions;
- * use, at an introductory level, typical examples of computer aids to produce such documents;
- * present results in a variety of ways to a professional standard.

Module Content:

This module introduces students to the fundamental aspects of typical processes found in electrical and

electronic engineering design and manufacture, mainly focused in the area of electronic circuit assembly and

testing. In addition to practical exercises, students are introduced to the role of computer aids for electronic

'schematic capture' and electronic pcb layout and design. The module also aims to further develop the student's

ability to use typical electronic laboratory hardware-based instrumentation. In general material is taught as far

as possible by practical 'hands-on' exercises with the aim of developing not only an appreciation of the techniques involved, but also a basic level of skill in their use. Although practical exercises carried out by students may vary from year to year, all will normally carry out, or

participate in, a majority of the following tasks:-

- * Construction of a simple electronic assembly which encompasses tasks such as the design of a simple pcb,

hand soldering of components and design and building of a simple enclosure

- * Production of a simple circuit diagram in line with recognised drawing conventions. Both hand drawn and

computer-aided versions will normally be involved.

- * Measurement and interpretation of key performance parameters of simple circuits and how common

laboratory equipment such as oscilloscopes, signal generators and power supplies are used in these processes. Parameters investigated may include items such as frequency, frequency response, gain, switching

times, power consumption and simple electromagnetic radiation considerations.

- * Production of a simple printed circuit artwork using computer-aided packages

- * Simulation of circuit operation using appropriate software packages

Assessment is typically through submitting work at the end of practical exercises, a phase test and log book

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Engineering Application of Mathematics

Module code: 4PAM1033

Semester: B

Credits: 15

Module Aims:

Apply their knowledge and understanding of the fundamental mathematical techniques required for engineering applications and develop the mathematical concepts required to support other modules in the engineering programmes.

Intended Learning Outcomes:

Successful students will typically: * demonstrate understanding of matrix operation, calculus and statistics for engineering applications. Successful students will typically: * perform operations on standard mathematical expressions; * apply calculus techniques to engineering functions; * use a suitable software applications package to solve engineering problems.

Module Content:

The module follows on from the module 4PAM1007 Engineering Mathematics to provide further mathematical

techniques required for applications in Engineering disciplines. The module includes the techniques associated

with the manipulation of matrices and vectors, evaluation of eigenvalues and eigenvectors, development of power series approximations of elementary mathematical functions, techniques for the solution of ordinary

differential equations and the principles of probability and data handling. The mathematics material will be

supported using a suitable software package, for example MATLAB, and will also be used to solve engineering

problems. Knowledge and understanding is achieved through the delivery of lectures, tutorials and Matlab workshops.

Problem sheets in tutorials allow students to practice and refine their skills.

Topics include:

Algebra, Scalar and Vector Products

Eigenvalues and Eigenvectors

First Order Differential Equations

2nd Order Differential Equations

Nonhomogeneous Differential Equations

Partial Differentiation

Academic year 2021-2022

Statistics

Probability

Binomial and Poisson Distributions

Continuous Variables and Normal Distribution

Power Series

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Engineering Application of Mathematics

Module code: 4PAM1033

Semester: B

Credits: 15

Module Aims:

Apply their knowledge and understanding of the fundamental mathematical techniques required for engineering applications and develop the mathematical concepts required to support other modules in the engineering programmes.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * demonstrate understanding of matrix operation, calculus and statistics for engineering applications. Skills and Attributes: Successful students will typically: * perform operations on standard mathematical expressions; * apply calculus techniques to engineering functions; * use a suitable software applications package to solve engineering problems.

Module Content:

The module follows on from the module 4PAM1007 Engineering Mathematics to provide further mathematical techniques required for applications in Engineering disciplines. The module includes the techniques associated with the manipulation of matrices and vectors, evaluation of eigenvalues and eigenvectors, development of power series approximations of elementary mathematical functions, techniques for the solution of ordinary differential equations and the principles of probability and data handling. The mathematics material will be supported using a suitable software package, for example MATLAB, and will also be used to solve engineering problems. Knowledge and understanding is achieved through the delivery of lectures, tutorials and Matlab workshops. Problem sheets in tutorials allow students to practice and refine their skills. Topics include: Algebra, Scalar and Vector Products Eigenvalues and Eigenvectors First Order Differential Equations 2nd Order Differential Equations Nonhomogeneous Differential Equations Partial Differentiation Statistics Probability Binomial and Poisson Distributions Continuous Variables and Normal Distribution Power Series

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Academic year 2021-2022

Module name: Engineering Application of Mathematics

Module code: 4PAM1033

Semester: B

Credits: 15

Module Aims:

Apply their knowledge and understanding of the fundamental mathematical techniques required for engineering applications and develop the mathematical concepts required to support other modules in the engineering programmes.

Intended Learning Outcomes:

Successful students will typically:

- * demonstrate understanding of matrix operation, calculus and statistics for engineering applications.

Successful students will typically:

- * perform operations on standard mathematical expressions;
- * apply calculus techniques to engineering functions;
- * use a suitable software applications package to solve engineering problems.

Module Content:

The module follows on from the module 4PAM1007 Engineering Mathematics to provide further mathematical

techniques required for applications in Engineering disciplines. The module includes the techniques associated

with the manipulation of matrices and vectors, evaluation of eigenvalues and eigenvectors, development of power series approximations of elementary mathematical functions, techniques for the solution of ordinary

differential equations and the principles of probability and data handling. The mathematics material will be

supported using a suitable software package, for example MATLAB, and will also be used to solve engineering

problems.

Pre and Co requisites:

None

Total hours: 150

Academic year 2021-2022

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Engineering Fundamentals

Module code: 4ENT1098

Semester: A

Credits: 15

Module Aims:

Recognise mechanical machine elements and associated tools; develop an appreciation of basic mechanical engineering components and how they are combined as part of a mechanical system design; develop elementary skills of engineering practice; identify with, and appreciate the role of engineers in industry and society.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * identify and describe common mechanical elements, components and principles; * understand the language and terminology of mechanical and manufacturing engineering; * describe practical requirements associated with mechanical engineering design and manufacture, and how mechanical elements are combined in an engineering design and system; * explain how mechanical elements are combined in an engineering design and system; * discuss their understanding of the role of the engineer in industry and society.
Skills and Attributes: Successful students will typically: * demonstrate basic practical skills associated with mechanical engineering and manufacture;

Module Content:

This introductory module provides level 4 engineering students with the practical opportunity to become familiar with the basic elements and practices associated with mechanical and manufacturing engineering, providing a foundation upon which subsequent engineering modules will build. Using lectures, online tutorials and practical sessions, students will become conversant with and develop foundational skills associated with mechanical and manufacturing engineering. This module is primarily lab or workshop based with online tutorials supporting these sessions. Typical lab topics may include (but are not limited to): Measuring, dimensioning and units; Fasteners and fastening methods; Transmissions; Bearings; Tribology; Workshop and manufacturing tools, practices and terminology. Lectures will run parallel to these sessions to provide context and further information on the above as well as to introduce the identity and role of engineers in industry and society.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Academic year 2021-2022

Module name: Engineering Management and Finance

Module code: 6AAD0020

Semester: A

Credits: 15

Module Aims:

Further their knowledge and understanding of the factors which influence human resource and finance management; select appropriate techniques for the identification of human and finance resources.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * discuss the development of management theories and applications; * compare alternative organisational structures and their applications; * describe and discuss the factors effecting finance resource management within company examples set, both from the study of company examples set, and from the study of other companies. Skills and Attributes: Successful students will typically: * apply appropriate management process techniques to decision making and control; * apply human resource management planning techniques; * select and apply appropriate financial techniques to accounting management examples described

Module Content:

This module will provide the student with an understanding of the financial tools and techniques applied in manufacturing industries. The application of financial data is applied through case studies to develop an understanding of short and long term planning and decision making. The module examines the development of industrial management theory and practice. The module provides an understanding of the role and responsibilities of managers in the organisation and motivation of human resource in organisations. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning. Problem sheets in tutorials, additional problems set as directed learning allow students to practice and refine their skills

1. Financial Framework of company accounts The relationship between day to day transactions and the formal published accounts of companies The relationship between the formal sets of published financial data. Analysis of company accounts Interfirm comparison
2. Management information for decision making both in the short and long- term - margin and contribution - profit/volume analysis - break even analysis - make or buy decisions - payback analysis - net present value - internal rate of return
3. Issues in Cost Accounting Distinction between financial and cost management accounting Cost classification - labour, materials and overheads. Overhead recovery. Approaches to costing- absorption, marginal and standard costing Budgetary control. Budget preparation in a manufacturing context. Cost variance analysis Performance measurement.
4. Management Process Strategic Planning Planning Decision Making Control Systems
5. Organisational Behaviour Management Theorists Scientific Management Human Relations Management Practice Leadership & Motivation Management and Organisation of Change

Pre and Co requisites:

None

Academic year 2021-2022

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Engineering Mathematics

Module code: 4PAM1007

Semester: A

Credits: 15

Module Aims:

Further their knowledge and understanding of the fundamental mathematical techniques required for engineering applications and develop the mathematical concepts required to support other modules in the engineering programmes.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * demonstrate knowledge of elementary functions; * demonstrate knowledge of the use of calculus for engineering. Skills and Attributes: Successful students will typically: * be able to perform operations on standard mathematical expressions; * apply calculus techniques to engineering functions

Module Content:

The module builds on from A-Level mathematics (or equivalent qualification) to provide mathematical techniques required for engineering. The module includes the manipulation and applications of elementary functions (trigonometric, logarithmic and exponential), complex numbers, Boolean algebra and the techniques of differentiation and integration for functions of one variable. Knowledge and understanding is achieved through the delivery of lectures and tutorials. Problem sheets in tutorials allow students to practice and refine their skills. Topics include: Concept of functions: Limits; Revision of Trigonometry: radians, Trigonometric identities; Exponential Function, Logarithmic Function, Hyperbolic Functions; Differentiation: Chain Rule, Parametric, Implicit, Log Differentiation. Stationary points, classification, Optimisation problems; Integration: Techniques and definite integration, Integration by parts, Partial Fractions, Substitution, Areas, mean and r.m.s values; Introduction to Complex Numbers; Polar form, Euler formulae, Exponential Form of Complex Numbers; Maclaurin and Taylor series, Binomial Theorem, Newton-Raphson method, Use of Series, Trapezoidal Rule, Simpson's Rule Algebra of matrices, inverse matrix, Properties of determinants, Solution of linear equations. Scalar and Vector Products.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
80%	20%	%

80 Exam 20 ICA The successful candidates are required to pass overall. All Learning Outcomes to be assessed in both Exam and ICA.

Module name: Engineering Mathematics

Module code: 4PAM1007

Semester: A

Credits: 15

Module Aims:

Further their knowledge and understanding of the fundamental mathematical techniques required for engineering applications and develop the mathematical concepts required to support other modules in the engineering programmes.

Intended Learning Outcomes:

Successful students will typically:

- * demonstrate knowledge of elementary functions;
- * demonstrate knowledge of the use of calculus for engineering.

Successful students will typically:

- * be able to perform operations on standard mathematical expressions;
- * apply calculus techniques to engineering functions.

Module Content:

The module builds on from A-Level mathematics (or equivalent qualification) to provide mathematical techniques

required for engineering. The module includes the manipulation and applications of elementary functions (trigonometric, logarithmic and exponential), complex numbers, Boolean algebra and the techniques of

differentiation and integration for functions of one variable.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
80%	20%	%

Module name: Engineering Operations Management

Module code: 5ENT1087

Semester: A

Credits: 15

Module Aims:

Develop their knowledge and understanding of industrial and business processes and systems both in terms of performance as well as their operational context; Select and apply appropriate techniques to improve the performance of an operational system; Develop an understanding of, and apply concepts, tools and techniques used to achieve “lean” engineering and business processes.

Intended Learning Outcomes:

Successful students will typically:

- * describe techniques associated with “lean” processes in various contexts including quality assurance;
- * identify ethical and social issues surrounding engineering operations, as applied to various stakeholders;
- * recognise the holistic and integrated approach of various business functions in a global context. Successful students will typically:
- * apply principles and techniques associated with “lean” processes to existing or new processes;
- * incorporate a systems perspective to the holistic design of processes in their operational context.

Module Content:

This module will start with setting out the role of engineering and its operations in a business including strategy

and organisational processes.

The development of student knowledge will continue with Lean Manufacturing techniques, Toyota production

system and the theory of constraints as methods for improving operational performance.

Having established this foundation of knowledge, the rest of the module will focus on the operational

implementation and implementation of these techniques.

Across the module, particular emphasis will be given to a holistic view of operations stressing their context and

effects on various stakeholders with due consideration to ethical and environmental issues.

Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning.

Academic year 2021-2022

Problem sheets in tutorials, additional problems set as directed learning and laboratory exercises allow

students to practice and refine their skills.

Topics include:

- Introduction to Engineering Operations (strategy, organizations, teams, quality control)
- Lean Manufacturing techniques, Toyota production system and the theory of constraints
- Introduction to systems theory and holistic view of operations from both internal and global perspectives.
- Process design and optimisation
- Ethics, teamwork, social impact of business operations, human resources management.
- Product life cycles and the operational impact of product type and design
- Manufacturing supply chain, sustainability and partnerships
- Planning and control - inventory, design, layout, job design, WP, buffers
- Introduction to Manufacturing quality assurance.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

Module name: Engineering Statistics

Module code: 4ENT1045

Semester: B

Credits: 15

Module Aims:

Develop knowledge and understanding of the statistical tools and techniques; develop knowledge and understanding of statistical data in manufacturing; solve manufacturing problems using statistical techniques.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: recognise and explain the fundamental concepts of probability and engineering statistics; identify appropriate techniques in solving engineering statistical problems. **Skills and Attributes:** Successful students will typically: apply linear regression and correlation techniques to engineering problems; apply statistical techniques to typical manufacturing process improvement; use suitable technology and software to simulate statistical problems.

Module Content:

The module introduces the basic tools of statistical analysis used in control of manufacturing processes. The basics of probability theory are introduced, leading to the types of data distributions useful in engineering. Normal distributions are introduced with measures available to analyse these such as standard deviation and sample means. Linear Regression and Correlation are introduced and also visual means of displaying data, e.g., histograms and frequency polygons. The ideas of confidence limits and confidence intervals are used to emphasise that knowledge of the reliability of data must be known. A brief outline of hypothesis testing is given. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning. Problem sheets in tutorials, additional problems set as directed learning and on-line guidance will allow students to practice and refine their skills. Topics include: Probability and probability distribution relevant to manufacturing engineering (35) Probability. Counting Outcomes. Disjoint and independent events. The addition and multiplication laws of probability. The Binomial and Poisson distribution. Histograms. Calculation of sample means and standard deviations. Arithmetic probability graph paper. The normal distribution. Sums and differences of normal random variables. The central limit theorem. Triangular distribution. Characteristics of triangular distributions. Microsoft Excel (15) Basic functionality of Excel. Formulas, including conditional statements. Application of Excel to all appropriate content in this course. Simple 'recorded' macros. Estimation and hypothesis testing involving means (15) Introduction to statistical estimation and hypothesis testing Hypothesis tests and confidence intervals for the difference between two population means. Simple Linear regression and correlation (15) Correlation (with independent and dependent variables). Simple linear regression. Precision of estimates. Use of Computer based packages to assist simulation and visualisation (15)

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

60 Exam 40 ICA The successful candidates are required to pass overall. All Learning Outcomes to be assessed in both Exam and ICA.

Module name: Final Year Project

Module code: 6ENT1061

Semester: AB

Credits: 30

Module Aims:

Critically review a subject area, analyse and synthesise results, alternatives or concepts, use problem solving skills, and demonstrate initiative and evidence of original thought; develop the ability to identify and define technological problems and to produce technically viable solutions; present their ideas and technical solutions in front of their peers and seniors; gain an awareness of the legal, social, ethical and environmental context under which engineers and technologists are expected to operate.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: describe the principles underpinning a specified topic which they work on; explore the benefits and limitations of various approaches to overcoming the problem at hand. examine their work in the context of Economic, Legal, Social, Ethical and Environmental issues. **Skills and Attributes:** Successful students will typically: plan, structure and organise a programme of work and deliver outputs according to a predetermined timescale; analyse and synthesise results, alternatives or concepts to solve the problem at hand possibly with information which might be incomplete or uncertain; demonstrate their ability for original and innovative work; prepare, present and defend their work orally and in writing

Module Content:

The final year project can take several forms ranging from design oriented work to investigative work. The project title and topic are chosen to provide intellectual challenge appropriate to an honours programme of study. The student is expected to firstly identify and elucidate the problems, then to plan and execute a relevant programme of work. Assessment is ongoing through the project via an individual supervisor, culminating with a comprehensive report of work done. Students would normally be expected to register their interest in the area of work, but are encouraged to suggest their own projects where appropriate. A list of project topics is compiled annually, moderated and approved within the school project structure. Students would normally be expected to register their interest in the area of work, but they are encouraged to suggest their own alternatives. Students are asked to choose a subject area of interest. This should normally be within the specialist area of their programme of study. They are then allocated a particular topic title within that area. Students are supported via regular progress meetings with their individual project supervisor. Students are required to produce regular progress reports and to document their work in a project log book. A final project report and formal presentation must be delivered by a published deadline. The assessment team will also implement an interim progress check for each student. Depending on the nature of the project, some aspects of the project may be laboratory based (computer simulation, practical and experimental analysis and evaluation). The project report must include a section where the student relates his/her project, and/or the subject area of his/her project to the various legal and ethical constraints under which engineers and technologists are expected to operate – ie :

* Understanding of the need for a high level of professional and ethical conduct in engineering and

knowledge of professional codes of conduct * Knowledge and understanding of the commercial, economic and social context of engineering processes * Knowledge of management techniques that may be used to achieve engineering objectives * Understanding of the requirement for engineering activities to promote sustainable development, * Awareness of relevant legal requirements governing engineering activities, including personnel, health & safety, contracts, intellectual property rights, product safety and liability issues, * Awareness of risk issues, including health & safety, environmental and commercial risk.

Pre and Co requisites:

None

Total hours: 300

Assessment:

Exam	Coursework	Practical
%	100%	%

Students are required to achieve at least a minimum pass mark in the project report and overall in order to pass the module as a whole. The module must be included in the calculation for degree classification.

Module name: Final Year Project

Module code: 6ENT1061

Semester: AB

Credits: 30

Module Aims:

Critically review a subject area, analyse and synthesise results, alternatives or concepts, use problem solving skills, and demonstrate initiative and evidence of original thought; develop the ability to identify and define technological problems and to produce technically viable solutions; present their ideas and technical solutions in front of their peers and seniors gain an awareness of the legal, social, ethical and environmental context under which engineers and technologists are expected to operate.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * describe the principles underpinning a specified topic which they work on; * explore the benefits and limitations of various approaches to overcoming the problem at hand. * examine their work in the context of Economic, Legal, Social, Ethical and Environmental issues. Skills and Attributes: Successful students will typically: * plan, structure and organise a programme of work and deliver outputs according to a predetermined timescale; * analyse and synthesise results, alternatives or concepts to solve the problem at hand possibly with information which might be incomplete or uncertain; * demonstrate their ability for original and innovative work; * prepare, present and defend their work orally and in writing

Module Content:

The final year project can take several forms ranging from design oriented work to investigative work. The project title and topic are chosen to provide intellectual challenge appropriate to an honours programme of study. The student is expected to firstly identify and elucidate the problems, then to plan and execute a relevant programme of work. Assessment is ongoing through the project via an individual supervisor, culminating with a comprehensive report of work done. Students would normally be expected to register their interest in the area of work, but are encouraged to suggest their own projects where appropriate. A list of project topics is compiled annually, moderated and approved within the school project structure. Students would normally be expected to register their interest in the area of work, but they are encouraged to suggest their own alternatives. Students are asked to choose a subject area of interest. This should normally be within the specialist area of their programme of study. They are then allocated a particular topic title within that area. Students are supported via regular progress meetings with their individual project supervisor. Students are required to produce regular progress reports and to document their work in a project log book. A final project report and formal presentation must be delivered by a published deadline. The assessment team will also implement an interim progress check for each student. Depending on the nature of the project, some aspects of the project may be laboratory based (computer simulation, practical and experimental analysis and evaluation). The project report must include a section where the student relates his/her project, and/or the subject area of his/her project to the various legal and ethical constraints under which engineers and technologists are expected to operate – ie :
* Understanding of the need for a high level of professional and ethical conduct in engineering and a

knowledge of professional codes of conduct * Knowledge and understanding of the commercial, economic and social context of engineering processes * Knowledge of management techniques that may be used to achieve engineering objectives * Understanding of the requirement for engineering activities to promote sustainable development, * Awareness of relevant legal requirements governing engineering activities, including personnel, health & safety, contracts, intellectual property rights, product safety and liability issues, * Awareness of risk issues, including health & safety, environmental and commercial risk.

Pre and Co requisites:

None

Total hours: 300

Assessment:

Exam	Coursework	Practical
%	100%	%

Students are required to achieve at least a minimum pass mark in the project report and overall in order to pass the module as a whole. The module must be included in the calculation for degree classification

Module name: Fluid Mechanics & Thermodynamics

Module code: 4ENT1068

Semester: B

Credits: 15

Module Aims:

Be introduced to fundamental concepts and definitions in Fluid Mechanics and Thermodynamics; understand the application of the principles of Mechanics to Fluids; be introduced to the first law of Thermodynamics and associated processes.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * identify the properties of liquids and gases; * classify thermodynamic systems and processes. Skills and Attributes: Successful students will typically: * apply fluid mechanics principles to the analysis of fluid systems; * analyse fluid mechanics problems using dimensional analysis; * apply the first law of thermodynamics to the analysis of open and closed systems; * apply the perfect gas concept to simple gaseous systems.

Module Content:

This module introduces students to the fundamentals of fluid flow and thermodynamics and provides a basis for higher level modules in aerothermodynamics, vehicle aerodynamics and thermofluid mechanics. Lectures and tutorials are accompanied by laboratory sessions in fluid mechanics and thermodynamics. Assessment is through laboratory reports, written coursework and an examination. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning. Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow students to practice and refine their skills. Topics include: Properties of liquids and gases, Gauge and absolute pressure. Hydrostatic principles, manometry, forces on immersed surfaces. Definition of types of fluid flow. The mass conservation principle. The Euler-Bernoulli equation. Application of Bernoulli's equation to pipeline problems with energy losses and flow measurement. Momentum equation for steady flow. Dimensional analysis, Buckingham's method, non-dimensional coefficients. The concept of a thermodynamic system, open and closed. Thermodynamic processes. Zeroth Law and concept of temperature. Thermodynamic work and heat, their equivalence and energy transfer. First law of thermodynamics, definition of internal energy and enthalpy. The specific heat capacities of perfect gases and their relevance to isentropic processes.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

60 Exam 40 ICA The successful candidates are required to pass overall. All Learning Outcomes to be assessed in both Exam and ICA.

Module name: Fluid Mechanics and Hydraulics

Module code: 4ENT1138

Semester: B

Credits: 15

Module Aims:

Apply the fundamental principles of fluid mechanics to the solution of common engineering problems involving pipe flows and forces on submerged surfaces. Appreciate the context within which water distribution and asset management are applied in civil engineering.

Intended Learning Outcomes:

Successful students will typically:

- Define the properties of liquids and understand the fundamental principles of hydrostatics and hydrodynamics, including the conservation of mass, momentum and energy.
- Describe how pipe networks and water assets are designed, managed, maintained and operated

Successful students will typically:

- Apply the principles of fluid mechanics to typical engineering problems involving fluid systems.
- Be able to use basic computer methods to solve problems

Module Content:

Summary of what module involves

The module will typically involve the following topics: • Introduction to the properties of fluids including density, specific gravity, viscosity and kinematic viscosity,

surface tension, atmospheric and gauge pressure, and pressure measurement.

- Hydrostatics and forces on submerged surfaces including plane and curved surfaces, pressure variation with

depth, and typical engineering examples of structures where hydrostatics are important.

- Introduction to hydrodynamics including laminar and turbulent flow, discharge (mass and volumetric), steady

incompressible flow, velocity, boundary layers, Reynolds number, conservation of mass, momentum and

energy, total energy and hydraulic grade line and Bernoulli equation.

- Instrumentation for fluid mechanics and hydraulics including pressure measurement, piezometers,

manometers, differential pressure devices, electromagnetic and other electronic flow measurement methods

- Pipe networks and pumping including pipe network analysis, frictional losses in pipelines, minor losses,

rotodynamic machines and types of pump, pump and system curves, control of flow in pipelines, and pumps in

series and parallel.

- The management of water assets and typical application examples in civil engineering

What the student will learn from the module

Students will learn about how fluids move, the forces they apply to engineering structures and how water

assets be used for the benefit of society. Topics will include developing an understanding of fluids at rest and in

motion.

- Why will this be of benefit

This module will equip students to solve typical problems relating to the storage, delivery and measurement of

water and other fluids that engineers are frequently asked to design and build.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
80%	20%	%

Module name: Foundations of Human Physiology

Module code: 5LMS0062

Semester: AB

Credits: 30

Module Aims:

Comprehend a basic theoretical and practical understanding of human physiology, in the particular contexts of exercise and health. Explain the structure, function and interrelationships between the cells, tissues, and organs of the human body. Develop the skills of collection, presentation, interpretation, and reflection of physiological data under laboratory and practical settings.

Intended Learning Outcomes:

Successful students will typically:

Discuss the micro and gross structure of selected organ systems

Explain a range of human physiological processes at cell, organ and organism level.

Explain the homeostatic, control and regulatory mechanisms related to a range of human physiological processes.

Evaluate the physiological characteristics of health and disorder.

Critically discuss the responses and adaptations of the body to exercise.

Successful students will typically:

Verbally communicate effectively and work within group settings under practical conditions.

Conduct safe and effective simple physiological experiments on human subjects.

Collect and interpret quantitative physiological data.

Implement awareness of basic health and safety issues, applied during laboratory and practical settings.

Module Content:

Foundations of Human Physiology will provide students with an introduction to human physiology applied

particularly to sport and exercise. This module will involve fundamentals of structure, function and biochemistry

from cellular, to tissue, organ, and organism levels. An understanding of muscular, cardiovascular, respiratory,

renal, digestive, endocrine and nervous systems will be developed. There will some coverage of applied sporting

topics of relevance to physiology, such as the principles of training and periodicity, and the design of training

programmes. Practical work will used to provide additional insight into specific physiological systems.

Practical work will include instruction in the use of physiological interfaces, transducers, and recording and

analytical software, basic studies on the respiratory (spirometry and off-line techniques) and cardiovascular

system (ECG and blood pressure) and measurement of spinal reflexes and reaction times.

Pre and Co requisites:

None

Total hours: 300

Assessment:

Exam	Coursework	Practical
40%	60%	%

Module name: Further Engineering Mathematics

Module code: 5pam1005

Semester: A

Credits: 15

Module Aims:

Enhance and develop the students understanding of the mathematical techniques required for engineering; use the language of mathematics in the description of engineering problems.

Intended Learning Outcomes:

Successful students will typically:

- * LO1 - recognise multiple integrals;
- * LO2 - recognise Laplace transforms and Fourier series;
- * LO3 - recognise numerical techniques for solving ordinary differential equations.

Successful students will typically:

- * LO4 - evaluate line and multiple integrals;
- * LO5 - obtain Fourier series;
- * LO6 - apply Laplace transforms;
- * LO7 - use a suitable software applications package to solve engineering problems.

Module Content:

The module follows on from the mathematics modules at Level 4 to provide further mathematical techniques

required for applications in Engineering disciplines. The module includes numerical methods for ordinary

differential equations, Laplace transforms, Fourier series, line and double integrals, as well as using a

suitable software applications package to solve engineering problems. Emphasis is put on techniques and

applications rather than complete mathematical rigour. Knowledge and understanding are achieved through the delivery of lectures/tutorials/interactive practical

sessions. Problem sheets in tutorials allow students to practice and refine their skills. The courseworks and

the end-of-module examination are used to assess the Learning Outcomes. Refer to the teaching plan for a

more detailed description. The examination assesses LO1 - 6 The coursework assesses a selection of LO's 1 -

6, plus LO7.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
70%	30%	%

Module name: Further Engineering Mathematics

Module code: 5PAM1005

Semester: A

Credits: 15

Module Aims:

Enhance and develop the students understanding of the mathematical techniques required for engineering; use the language of mathematics in the description of engineering problems.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * LO1 - recognise multiple integrals; * LO2 - recognise Laplace transforms and Fourier series; * LO3 - recognise numerical techniques for solving ordinary differential equations. Skills and Attributes: Successful students will typically: * LO4 - evaluate line and multiple integrals; * LO5 - obtain Fourier series; * LO6 - apply Laplace transforms; * LO7 - use a suitable software applications package to solve engineering problems.

Module Content:

The module follows on from the mathematics modules at Level 4 to provide further mathematical techniques required for applications in Engineering disciplines. The module includes numerical methods for ordinary differential equations, Laplace transforms, Fourier series, line and double integrals, as well as using a suitable software applications package to solve engineering problems. Emphasis is put on techniques and applications rather than complete mathematical rigour. Knowledge and understanding are achieved through the delivery of lectures/tutorials/interactive practical sessions. Problem sheets in tutorials allow students to practice and refine their skills. The courseworks and the end-of-module examination are used to assess the Learning Outcomes. Refer to the teaching plan for a more detailed description. The examination assesses LO1 - 6 The coursework assesses a selection of LO's 1 - 6, plus LO7.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
70%	30%	%

Overall pass required, with both elements of assessment attempted. Further Details: For details of in-course assessment refer to the module guide.

Module name: Further Engineering Mathematics

Module code: 5PAM1005

Semester: A

Credits: 15

Module Aims:

Enhance and develop the students understanding of the mathematical techniques required for engineering; use the language of mathematics in the description of engineering problems.

Intended Learning Outcomes:

Successful students will typically:

- * LO1 - recognise multiple integrals;
- * LO2 - recognise Laplace transforms and Fourier series;
- * LO3 - recognise numerical techniques for solving ordinary differential equations.

Successful students will typically:

- * LO4 - evaluate line and multiple integrals;
- * LO5 - obtain Fourier series;
- * LO6 - apply Laplace transforms;
- * LO7 - use a suitable software applications package to solve engineering problems.

Module Content:

The module follows on from the mathematics modules at Level 4 to provide further mathematical techniques

required for applications in Engineering disciplines. The module includes numerical methods for ordinary

differential equations, Laplace transforms, Fourier series, line and double integrals, as well as using a

suitable software applications package to solve engineering problems. Emphasis is put on techniques and

applications rather than complete mathematical rigour.

Pre and Co requisites:

None

Total hours: 150

Academic year 2021-2022

Assessment:

Exam	Coursework	Practical
70%	30%	%

Module name: General Health Care Design

Module code: 5ENT1059

Semester: B

Credits: 15

Module Aims:

Provide engineering design solutions to non-invasive medical problems and product requirements; gain experience and knowledge of the total product design process of healthcare products including medical regulations and ethics; gain experience and understanding of the factors affecting the design of healthcare products and the environments in which they would be used.

Intended Learning Outcomes:

Successful students will typically: Successful students will typically:

* provide biomedical engineering solutions that satisfy a medical based requirement or problem by analytical

and simulation methods. The outcome of the analysis will provide a simulated solution to the requirement of a

problem;

* undertake to learn and become proficient in applying analytical tools that simulate and provide engineering

solutions using Computer Aided Engineering tools including Computational Fluid Dynamics and Finite Element

Analysis.

Successful students will typically:

* become proficient in the understanding of a biomedical engineering problem or requirement, dissecting that

requirement into smaller problems, and applying CAE tools to provide a solution to these problems;

* apply, with understanding, computational tools that can solve CAE, CFD and FEA problems or requirements.

* translate a brief into a technical specification for a viable healthcare product;

* understand the needs of the patient and the patient interaction with the product in a variety of environments.

Successful students will typically:

* provide engineering solutions that satisfy a healthcare product requirement or problem;

* providing complete design solutions that include the following activities : brainstorming, concept generation

and selection, detail design, material selection, costing, and technical drawing.

Module Content:

On this module students will experience designing healthcare products for non-invasive medical problems.

Students are expected to research and define the product requirements taking into account medical regulations

the product will have to satisfy as well as the ethical considerations and the environments within which the

product will be used. Students will experience brainstorming to generate design ideas and developing the most

appropriate idea into a full design solution including choice of materials, costing and drawings for manufacture.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Individual Major Project

Module code: 6ENT1062

Semester: AB

Credits: 30

Module Aims:

Plan, organise and execute an individual programme of work related to a chosen field of study, requiring the critical review of a subject area, analysis and synthesis of results, alternatives or concepts, the use of problem solving skills, the demonstration of initiative and evidence of original thought; develop the ability to manage time and resources effectively; further develop their ability to communicate both orally and in writing; gain an awareness of the legal, social, ethical and environmental context under which engineers are expected to operate.

Intended Learning Outcomes:

Successful students will typically:

- * identify and review relevant research materials to support their project;
- * explore the benefits and limitations of various approaches to overcoming the problem at hand;
- * examine their work in the context of Economic, Legal, Social, Ethical and Environmental issues.

Successful students will typically:

- * assess ethical and risk issues and identify resource requirements associated with a programme of independent work;
- * plan and manage their own time for conducting an independent programme of work;
- * demonstrate their ability for original and innovative work;
- * apply appropriate analytical or experimental techniques to solve the problem at hand working with information that may be uncertain or incomplete;
- * describe and evaluate, orally and in writing, material researched and work carried out independently in support of their project.

Module Content:

The major project in the fourth year of study can take several forms ranging from design oriented work to

investigative work, placing their findings in the context of the application of real-world engineering. Project work

should give students extensive knowledge of characteristics of particular equipment, processes, or products,

and an understanding of a wide range of engineering materials and components.

The project title and topic are chosen to provide intellectual challenge appropriate to an honours programme of

study. The student is expected to firstly identify and elucidate the problems, then to

plan and execute a relevant programme of work. Assessment is ongoing through the project via an individual

supervisor, culminating with a comprehensive report of work done. Students would normally be expected to

register their interest in the area of work, but are encouraged to suggest their own projects where appropriate.

A list of project topics is compiled annually, moderated and approved within the school project structure.

Students would normally be expected to register their interest in the area of work, but they are encouraged to

suggest their own alternatives. Students are asked to choose a subject area of interest. This should normally

be within the specialist area of their programme of study. They are then allocated a particular topic title within

that area.

Students are supported via regular progress meetings with their individual project supervisor.

Students are required to produce regular progress reports and to document their work in a project log book.

A final project report and formal presentation must be delivered by a published deadline.

The assessment team will also implement an interim progress check for each student.

Depending on the nature of the project, some aspects of the project may be laboratory based (computer

simulation, practical and experimental analysis and evaluation).

The project report must include a section where the student relates his/her project, and/or the subject area of

his/her project to the various legal and ethical constraints under which engineers are expected to operate - ie:

* Understanding the need for a high level of professional and ethical conduct in engineering and a knowledge of

professional codes of conduct.

* Knowledge and understanding of the commercial, economic and social context of engineering processes.

* Knowledge and understanding of management techniques, including project management, that may be used

to achieve engineering objectives.

* Understanding of the requirement for engineering activities to promote sustainable development and ability to

apply quantitative techniques where appropriate.

* Awareness of relevant regulatory requirements governing engineering activities in the context of the particular

specialisation,

* Awareness of relevant legal requirements governing engineering activities, including personnel, health &

safety, contracts, intellectual property rights, product safety and liability issues.

* Knowledge and understanding of risk issues, including health & safety, environmental and commercial risk,

and of risk assessment and risk management techniques

Pre and Co requisites:

None

Total hours: 300

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Individual Major Project

Module code: 6ENT1062

Semester: AB

Credits: 30

Module Aims:

Plan, organise and execute an individual programme of work related to a chosen field of study, requiring the critical review of a subject area, analysis and synthesis of results, alternatives or concepts, the use of problem solving skills, the demonstration of initiative and evidence of original thought; develop the ability to manage time and resources effectively; further develop their ability to communicate both orally and in writing; gain an awareness of the legal, social, ethical and environmental context under which engineers are expected to operate.

Intended Learning Outcomes:

Successful students will typically:

- * identify and review relevant research materials to support their project;
- * explore the benefits and limitations of various approaches to overcoming the problem at hand;
- * examine their work in the context of Economic, Legal, Social, Ethical and Environmental issues.

Successful students will typically:

- * assess ethical and risk issues and identify resource requirements associated with a programme of independent work;
- * plan and manage their own time for conducting an independent programme of work;
- * demonstrate their ability for original and innovative work;
- * apply appropriate analytical or experimental techniques to solve the problem at hand working with information that may be uncertain or incomplete;
- * describe and evaluate, orally and in writing, material researched and work carried out independently in support of their project.

Module Content:

The major project in the fourth year of study can take several forms ranging from design oriented work to

investigative work, placing their findings in the context of the application of real-world engineering. Project work

should give students extensive knowledge of characteristics of particular equipment, processes, or products,

and an understanding of a wide range of engineering materials and components.

The project title and topic are chosen to provide intellectual challenge appropriate to an honours programme of

study. The student is expected to firstly identify and elucidate the problems, then to

plan and execute a relevant programme of work. Assessment is ongoing through the project via an individual

supervisor, culminating with a comprehensive report of work done. Students would normally be expected to

register their interest in the area of work, but are encouraged to suggest their own projects where appropriate.

Pre and Co requisites:

None

Total hours: 300

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Individual Major Project

Module code: 6ENT1062

Semester: AB

Credits: 30

Module Aims:

Plan, organise and execute an individual programme of work related to a chosen field of study, requiring the critical review of a subject area, analysis and synthesis of results, alternatives or concepts, the use of problem solving skills, the demonstration of initiative and evidence of original thought; develop the ability to manage time and resources effectively; further develop their ability to communicate both orally and in writing; gain an awareness of the legal, social, ethical and environmental context under which engineers are expected to operate.

Intended Learning Outcomes:

Successful students will typically:

- * identify and review relevant research materials to support their project;
- * explore the benefits and limitations of various approaches to overcoming the problem at hand;
- * examine their work in the context of Economic, Legal, Social, Ethical and Environmental issues.

Successful students will typically:

- * assess ethical and risk issues and identify resource requirements associated with a programme of independent work;
- * plan and manage their own time for conducting an independent programme of work;
- * demonstrate their ability for original and innovative work;
- * apply appropriate analytical or experimental techniques to solve the problem at hand working with information that may be uncertain or incomplete;
- * describe and evaluate, orally and in writing, material researched and work carried out independently in support of their project.

Module Content:

The major project in the fourth year of study can take several forms ranging from design oriented work to

investigative work, placing their findings in the context of the application of real-world engineering. Project work

should give students extensive knowledge of characteristics of particular equipment, processes, or products,

and an understanding of a wide range of engineering materials and components.

The project title and topic are chosen to provide intellectual challenge appropriate to an honours programme of

study. The student is expected to firstly identify and elucidate the problems, then to

plan and execute a relevant programme of work. Assessment is ongoing through the project via an individual

supervisor, culminating with a comprehensive report of work done. Students would normally be expected to

register their interest in the area of work, but are encouraged to suggest their own projects where appropriate.

Pre and Co requisites:

None

Total hours: 300

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Instrumentation and Control Systems

Module code: 6ENT1009

Semester: A

Credits: 15

Module Aims:

Introduce control systems and components in engineering applications; Introduce and develop fundamental control theory; develop an appreciation and understanding of control systems in auto/motorsport/aero applications.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * explore instrumentation techniques, standard control terminology and basic control strategies; * examine transducer selection criteria and operating principles and aero/auto/motorsport control applications. **Skills and Attributes:** Successful students will typically: * select appropriate transducers, actuators and instrumentation systems; * recognise applications suitable for control and apply an appropriate control strategy; * setup open, feed forward and closed loop systems, tune PID controllers and simulate control systems using computers.

Module Content:

Sensors, instrumentation systems, actuators, selection criteria, signal conditioning. Analogue and digital systems. A to D and D to A conversion. Open loop, feedforward and closed loop control. Error, stability and controller gain, frequency response and time domain methods. Tuning PID controllers, Z/N continuous cycling method, digital control strategies. Lectures will cover the theory and practice of basic linear control systems in a largely descriptive fashion. The emphasis will be on treating control theory as a tool for achieving the most out of systems rather than the more traditional analytical approach. The important practical issues will be highlighted and many examples and case studies described. Workshop, Laboratory and site visits will be used to show controlled systems and controllers and students will be able to study, observe and work with these systems. Tutorials will support the above by a mix of questions, problem solving, group work and simulation. In-course, summative assessment will be based on a simulation study of control for multiple order systems and the examination will test the candidates knowledge, skills and understanding of the work covered in this module.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

60 Exam 40 ICA The successful candidates are required to pass overall. All Learning Outcomes to be assessed in both Exam and ICA.

Module name: Integrated Engineering Systems Design

Module code: 5ent1033

Semester: B

Credits: 15

Module Aims:

Understand top level integrated system design for a product; experience the process of system design.

Intended Learning Outcomes:

Successful students will typically:

- * describe how products with various combinations of electrical, mechanical, hydraulic, or pneumatic systems, interact together to become a top level system design;
- * explain how the top level integrated system design affects and relates to the detail design of the product.

Successful students will typically:

- * produce a top level integrated system design for a product which may contain various combinations of electrical, mechanical, hydraulic, or pneumatic systems;
- * present the product user inputs and system outputs, and the need for system feedback and user control.

Module Content:

This module will introduce the concept of integrated engineering system design to products. The main thrust of

the module is to provide an understanding of common existing engineering systems such as hydraulic, pneumatic, electrical systems, and to show how many products in the market contain multi-systems within.

The module will look at the system level interface with users of the product, via controls and feedback. The

students via design assignments will be asked to top level system design a product comprising of various

systems. The system design will be driven by a technical specification and some conceptual and feasibility

work. The students will be expected to produce a system design flow chart for a product which shows the

interactions, inputs and outputs between the various systems of the product. Some design engineering

calculations will be performed at the system interface level. Mini-lectures in class held weekly throughout the module.

1. Introduction to integrated engineering system design - overview of Module.
2. A look at a variety of existing typical systems e.g. electrical circuits, hydraulic circuits diagrams, etc.
3. System components, what makes up a system? Bought in components, designed parts, standard parts, whole sub systems.
4. Technical specification for a product - writing a technical specification for a product.
5. Feasibility study and conceptual system design - which combination of systems is best for the product.
6. Choosing the best integrated system for the product - System Concepts Selection Chart - a methodical selection.
7. Producing an integrated system flow chart for a product - a graphical representation.
8. Performing input and output system calculations at system interfaces.
9. Identifying user controls and feedbacks - this is the interface with the user of the product.
10. System design - external considerations - financial, maintenance, environmental, safety.

Tutorials

Following a mini lecture on a weekly basis students will receive a tutorial session to support their system

design assignments.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Integrated Engineering Systems Design

Module code: 5ENT1033

Semester: B

Credits: 15

Module Aims:

Understand top level integrated system design for a product; experience the process of system design.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * describe how products with various combinations of electrical, mechanical, hydraulic, or pneumatic systems, interact together to become a top level system design; * explain how the top level integrated system design affects and relates to the detail design of the product. **Skills and Attributes:** Successful students will typically: * produce a top level integrated system design for a product which may contain various combinations of electrical, mechanical, hydraulic, or pneumatic systems; * present the product user inputs and system outputs, and the need for system feedback and user control.

Module Content:

This module will introduce the concept of integrated engineering system design to products. The main thrust of the module is to provide an understanding of common existing engineering systems such as hydraulic, pneumatic, electrical systems, and to show how many products in the market contain multi-systems within. The module will look at the system level interface with users of the product, via controls and feedback. The students via design assignments will be asked to top level system design a product comprising of various systems. The system design will be driven by a technical specification and some conceptual and feasibility work. The students will be expected to produce a system design flow chart for a product which shows the interactions, inputs and outputs between the various systems of the product. Some design engineering calculations will be performed at the system interface level. Mini-lectures in class held weekly throughout the module.

1. Introduction to integrated engineering system design - overview of Module.
2. A look at a variety of existing typical systems e.g. electrical circuits, hydraulic circuits diagrams, etc.
3. System components, what makes up a system? Bought in components, designed parts, standard parts, whole sub systems.
4. Technical specification for a product - writing a technical specification for a product.
5. Feasibility study and conceptual system design - which combination of systems is best for the product.
6. Choosing the best integrated system for the product - System Concepts Selection Chart - a methodical selection.
7. Producing an integrated system flow chart for a product - a graphical representation.
8. Performing input and output system calculations at system interfaces.
9. Identifying user controls and feedbacks - this is the interface with the user of the product.
10. System design - external considerations - financial, maintenance, environmental, safety.

Tutorials Following a mini lecture on a weekly basis students will receive a tutorial session to support their system design assignments.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Interaction Design

Module code: 5ENT1084

Semester: A

Credits: 15

Module Aims:

Develop an understanding of design, communication and audience issues within an interactive software environment; further develop and consolidate competent and confident handling of processes, techniques, software tools and media involved in Interaction Design.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: discuss a variety of factors that influence Interaction Design; explore appropriate visual and aural languages used in interface devices and software; be able to develop a questioning Interaction Design approach which challenges established preconceptions Skills and Attributes: Successful students will typically: critique approaches to Interaction Design apply Interactive Software Design and Interaction Design principles to given tasks concerning user specific parameters and environments; utilise multimedia authoring software tools and processes effectively and appropriately to solve a variety of Interactive Software Design and Interaction Design focussed problems; present the design solution

Module Content:

This module considers the use of multimedia technologies in a variety of interactive environments and installations. Interaction Design involves designing interactive products and services for ordinary and specialised users to utilise effectively in their everyday working and social lives. In particular, it is concerned with authoring user experience scenarios that enhance and extend the way people work, communicate and interact. Lecture topics will typically include coverage of: 1. The Digital Project Process 2. Text & Layout 3. Designing Icons 4. The Process of Interaction Design 5. Content Structure & Navigation 6. Narratives & Metaphors 7. Storyboarding (advanced) 8. Interactivity 9. Feedback 10. Content Re-purposing 11. Usability & Accessibility Assessment will typically be by lab work, written report and theory test.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Interactive Group Design Project

Module code: 5ENT1068

Semester: B

Credits: 15

Module Aims:

Develop a body of skills, practices and understanding that enables effective contribution to collaborative group work of the kind typically found whilst delivering projects; further develop through sustained practice, a body of skills and knowledge used to create interactive digital artefacts in the multimedia industries; consolidate and develop understandings of and practice in, the design methodologies by which projects develop and are realised; further develop a range of information handling and communication skills including the location and evaluation of materials, the use of written modes, listening skills, visual presentations and contribution to debate and discussion.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: understand interaction within groups and the roles that individuals may occupy; recognise factors that contribute to the success of a group; understand processes by which digital interactive projects develop and are realised in the multimedia industries. **Skills and Attributes:** Successful students will typically: reflect upon their own contribution to a group; select and use processes for the ideation, development and implementation and presentation of projects which reflect those used in the digital interactive multimedia industries; contribute effectively within a group to the development of projects and the realisation of ideas using appropriate design methodologies; locate, evaluate and make use of information and material from diverse sources.

Module Content:

It is a rarity in the creation of Multimedia artefacts that people work in isolation, more often than not interdisciplinary groups are involved in the development of ideas and in the realisation of interactive digital multimedia artefacts. The effective working of such groups requires group working abilities and skills and an understanding of such things as group leadership and membership roles, interpersonal and group dynamics and establishing and attaining shared group objectives. This module requires that students develop the skills and practices needed to contribute effectively to group based interactive digital multimedia enterprises through group work and through working with illustrative fictional clients. The first section of the module requires the student to acquire an understanding of how teams function within the Interactive Design Multimedia industry. The student will then engage with interactive learning materials which cover a range of design collaborations, and group-working theories such as Tuckman's "Forming, Storming, Norming, Performing and mourning" and the various roles within a digital interactive multimedia team. Students will be asked to fulfil a defined Brief as part of a group by applying various theories to the project. This will require a discussion to define roles and responsibilities within the group, resolving any conflicts that arise and developing effective communication practices between group members to produce an interactive multimedia artefact. The module typically contains two projects. The assessment comprises a design project that involves the creation of a range of interactive and complex interfaces for a given digital multimedia brief. This will involve research, design and development. The work on this project includes students taking on particular roles within a group

and reflecting on the ways they worked within the group dynamics and managed their own learning (worth 50 of overall mark) Students will be required to understand and assess a range of ideas and theories that are associated with teamwork. These ideas will be reflected upon in a Personal Enquiry within the context of working as a team to produce a solution to the given brief (worth 50 of overall mark). The work submitted for assessment typically includes the working project artefact(s) and supporting materials showing the development of ideas, the selection from design alternatives, an engagement with the critical evaluation of similar artefacts drawn from contemporary and historical contexts and effective use of multimedia tools and technologies in the delivery and presentation of the digital interactive artefact.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Interactive Programming

Module code: 4ENT1071

Semester: B

Credits: 15

Module Aims:

Understand the principles and benefits of object-oriented programming and design; develop proficiency in designing a structured solution to a simple task;

develop proficiency in writing, testing and debugging simple high-level language programs; describe the software life cycle from requirement specification through to testing and maintenance.

Intended Learning Outcomes:

Successful students will typically:

- describe the principles of object-oriented programming;
- recognise the software design process and concepts used in high-level programming;
- explain the compilation/interpretation process and the implications for portability of programs;
- recognise the factors that contribute to the ease of maintenance of a software product.

Successful students will typically:

- develop programs in a high-level language, in order to solve basic problems;
- produce documentation and use appropriate coding techniques to ensure that software is easy to understand and maintain.

Module Content:

This module provides an opportunity for students to develop interactive multimedia applications using an object-oriented, high-level language. The software development lifecycle is introduced and the key principles of

design, implementation and testing explored. A significant amount of the contact time is spent on a series of

laboratory-based exercises that give the students first-hand experience of the process of software development.

Pre and Co requisites:

None

Total hours: 150

Academic year 2021-2022

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Introduction to Design

Module code: 4ent1121

Semester: AB

Credits: 15

Module Aims:

Acquire skills in using and applying a CAD system; produce and interpret engineering drawings in accordance with recognised standards, conventions and accepted practices; understand and apply the process of design to engineering problems.

Intended Learning Outcomes:

Engineering drawings; * define the nature and application of the process of design. Successful students will typically: * use CAD tools to produce 3D models and drawings of a satisfactory solution to an identified requirement * produce and interpret detailed drawings which communicate production requirements and comply with the relevant standards and conventions; * devise and present design solutions to specified requirements; * contribute to the design process as a member of a team.

Module Content:

This module introduces students to the process of engineering design, and to CAD tools for creating and

documenting design solutions. The principles and standard practices of technical drawing and tolerancing are

taught. The role and use of CAD in design is taught and practiced, both 3D solid modelling and 2D drafting. The

nature of design as a structured process is considered, and demonstrated by students undertaking a variety of

design exercise and assignments. The design activities are mostly done in small teams, thereby developing

skills in teamwork, communication and leadership. There are staged assessments that require the students to

present their work using a variety of methods and communication tools. Knowledge and understanding is achieved through the delivery of lectures, small group work and directed

learning. Computer based laboratory sessions and directed learning allow students to practice and refine their

skills.

Topics include:

- use of CAD tools to prepare 3D models and 2D drawings
- principles and standard practices of technical drawing to recognised standards

Academic year 2021-2022

- the design process
- design projects done in small teams, devising and presenting solutions to specified problems

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Introduction to Design

Module code: 4ENT1121

Semester: AB

Credits: 15

Module Aims:

Acquire skills in using and applying a CAD system; produce and interpret engineering drawings in accordance with recognised standards, conventions and accepted practices; understand and apply the process of design to engineering problems.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * apply standard conventions for engineering drawings; * define the nature and application of the process of design. Skills and

Attributes: Successful students will typically: * use CAD tools to produce 3D models and drawings of a satisfactory solution to an identified requirement * produce and interpret detailed drawings which communicate production requirements and comply with the relevant standards and conventions; * devise and present design solutions to specified requirements; * contribute to the design process as a member of a team.

Module Content:

This module introduces students to the process of engineering design, and to CAD tools for creating and documenting design solutions. The principles and standard practices of technical drawing and tolerancing are taught. The role and use of CAD in design is taught and practiced, both 3D solid modelling and 2D drafting. The nature of design as a structured process is considered, and demonstrated by students undertaking a variety of design exercise and assignments. The design activities are mostly done in small teams, thereby developing skills in teamwork, communication and leadership. There are staged assessments that require the students to present their work using a variety of methods and communication tools. Knowledge and understanding is achieved through the delivery of lectures, small group work and directed learning. Computer based laboratory sessions and directed learning allow students to practice and refine their skills. Topics include: · use of CAD tools to prepare 3D models and 2D drawings · principles and standard practices of technical drawing to recognised standards · the design process · design projects done in small teams, devising and presenting solutions to specified problems

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Academic year 2021-2022

Module name: Introduction to Design for Technologists

Module code: 4ENT1108

Semester: AB

Credits: 15

Module Aims:

Acquire skills in using and applying a CAD system; produce and interpret engineering drawings in accordance with recognised standards, conventions and accepted practices; understand and apply the process of design to engineering problems.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: apply standard conventions for engineering drawings; define the nature and application of the process of design. **Skills and**

Attributes: Successful students will typically: use CAD tools to produce 3D models and drawings of a satisfactory solution to an identified requirement; produce and interpret detailed drawings which communicate production requirements and comply with the relevant standards and conventions; devise and present design solutions to specified requirements; contribute to the design process as a member of a team.

Module Content:

This module introduces students to the process of engineering design, and to CAD tools for creating and documenting design solutions. The principles and standard practices of technical drawing and tolerancing are taught. The role and use of CAD in design is taught and practiced, both 3D solid modelling and 2D drafting. The nature of design as a structured process is considered, and demonstrated by students undertaking a variety of design exercise and assignments. The design activities are mostly done in small teams, thereby developing skills in teamwork, communication and leadership. There are staged assessments that require the students to present their work using a variety of methods and communication tools. Knowledge and understanding is achieved through the delivery of lectures, small group work and directed learning. Computer based laboratory sessions and directed learning allow students to practice and refine their skills. Topics include: · use of CAD tools to prepare 3D models and 2D drawings · principles and standard practices of technical drawing to recognised standards · the design process · design projects done in small teams, devising and presenting solutions to specified problems

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Academic year 2021-2022

Module name: Introduction to Electronic Systems

Module code: 4ENT1028

Semester: A

Credits: 15

Module Aims:

Acquire an introductory understanding of the scientific principles underpinning electrical and electronic systems; acquire an introductory understanding of electrical and electronic circuits and components; gain an insight into selected software based circuit simulation tools.

Intended Learning Outcomes:

Successful students will typically: * describe semiconductor physics fundamentals in the context of electronic systems; * explain the fundamental physics of electricity and electrical circuit principles. 9b. Skills and Attributes: Successful students will typically: * evaluate currents and voltages in multi-loop linear circuits; * perform simple measurements using oscilloscopes and DVMs and use other relevant instruments for signal generation; * analyse and synthesise simple discrete-component circuits; * prepare technical reports to a professional standard.

Module Content:

This module aims to introduce students to the fundamental concepts of electrical and electronic systems. Topics are covered at introductory level and are supported by accompanying laboratory-based investigations providing a hands-on introduction to test and measurement equipment. Lecture topics range from d.c. circuit theory and analysis to an introduction to electronic circuit design. Also covered are the fundamentals of common semiconductor materials and devices and an introduction to electronic circuit simulation using software based simulation tools. Although taught at introductory level, an analytical approach is adopted throughout in order to provide a firm foundation for studies during the second semester. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning.

Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow

students to practice and refine their skills.

Topics typically covered include:

Electronic components and systems,

DC circuit analysis - loop and nodal analysis, Kirchoff's Laws, Thevenin's and Norton's theorems.

Semiconductors materials, PN junctions, diodes, forward and reverse bias.

Transistor characteristics - BJT, FET & CMOS.

Transistor bias and amplification, simple circuits.

Linear power supplies.

Software simulation of examples of electronic circuits.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Introduction to Electronic Systems

Module code: 4ENT1028

Semester: A

Credits: 15

Module Aims:

Acquire an introductory understanding of the scientific principles underpinning electrical and electronic systems; acquire an introductory understanding of electrical and electronic circuits and components; gain an insight into selected software based circuit simulation tools.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * describe semiconductor physics fundamentals in the context of electronic systems; * explain the fundamental physics of electricity and electrical circuit principles. **Skills and Attributes:** Successful students will typically: * evaluate currents and voltages in multi-loop linear circuits; * perform simple measurements using oscilloscopes and DVMs and use other relevant instruments for signal generation; * analyse and synthesise simple discrete-component circuits; * prepare technical reports to a professional standard.

Module Content:

This module aims to introduce students to the fundamental concepts of electrical and electronic systems. Topics are covered at introductory level and are supported by accompanying laboratory-based investigations providing a hands-on introduction to test and measurement equipment. Lecture topics range from d.c. circuit theory and analysis to an introduction to electronic circuit design. Also covered are the fundamentals of common semiconductor materials and devices and an introduction to electronic circuit simulation using software based simulation tools. Although taught at introductory level, an analytical approach is adopted throughout in order to provide a firm foundation for studies during the second semester. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning. Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow students to practice and refine their skills. Topics typically covered include: Electronic components and systems, DC circuit analysis - loop and nodal analysis, Kirchoff's Laws, Thevenin's and Norton's theorems. Semiconductors materials, PN junctions, diodes, forward and reverse bias. Transistor characteristics - BJT, FET & CMOS. Transistor bias and amplification, simple circuits. Linear power supplies. Software simulation of examples of electronic circuits.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Introduction to Manufacturing for Technologists

Module code: 4ENT1109

Semester: AB

Credits: 15

Module Aims:

Acquire basic engineering workshop practice in CNC, fabrication and machining; be aware of the influence of production processes on product design and manufacture; understand and apply the engineering processes creating machined parts.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: understand safety and hazardous substance legislation and impact in the engineering workshop environment; define manufacturing processes, the technology used and their relationship with the environment in the context of recycling and sustainable production. 9b. Skills and Attributes: Successful students will typically: interpret engineering drawings for component manufacture and assembly; use software to create programmes for Computer Numerical Control and Computer Aided Manufacture using standard conventions.

Module Content:

This module introduces the student to a range of production processes and practice used commonly in the manufacture of products. Students develop a hands-on appreciation of production techniques including turning, milling, fabrication and assembly using manual and computer controlled plant and machinery. Transferable skills are developed in the application of the processes used to manufacture a range of products and subassemblies taking into account design and supply requirements. The intended learning outcomes are facilitated through a combination of approaches to learning and teaching, typically this will include lectures and workshop practical sessions. These activities will be supported by the module team and by encouraging the students to access a variety of resources including available equipment and appropriate software packages. The module is taught through a series of workshop based practical sessions supported by lectures on the manufacturing processes and their application. Students will develop an awareness of quality issues and their application to continuous improvement in manufacturing. The hands-on practical sessions are intended to develop the student's appreciation of the techniques, capabilities and limitations of a range of commonly available production processes that support product manufacture. A logbook is issued to each student containing the relevant drawings and information for their practical sessions including the engineering drawings and assembly detail for the toolbox and Aluminium mini vice. Students will be assessed by their ability to manufacture and assemble the toolbox and mini vice in groups from engineering drawings. The students must also produce CNC code and machine a part of their own design to comply with the individual assessment on CNC programming and machining. Practical work will support the development of students' awareness of risk issues, including health & safety, risk assessment and risk management techniques. Students will be able to recognize the importance and influence of Health & Safety and COSHH legislation prior to commencing workshop practical sessions. The lectures cover an introduction to: - Health and safety in an engineering workshop environment is covered in the first lecture and emphasized in their first session in each of the practical workshop areas. - Manufacturing is introduced and includes the linking to product design, material selection,

process selection and the effect of advances in technology. - Design and manufacturing are discussed in terms of current legislation and the impact of cradle to grave production on the environment, processes and production quantities. - Casting Process; typically covering sand, shell moulding, gravity, high-pressure, centrifugal and investment casting processes. - Forming Processes; typically covering forging, rolling cold heading and forming, drawing and extrusion processes. - Machining Processes; typically covering turning, milling, planning/shaping, drilling/remaining, broaching and grinding processes. - Plastic and composite processes; typically covering injection, compression, transfer, blow, rotational moulding, vacuum forming and continuous extrusion. - Joining processes; typically covering manual metal arc, metal inert gas, tungsten inert gas, resistance, friction and gas welding techniques. - Automation in manufacturing. - Prototyping and Product Design to Manufacture.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Introduction to Manufacturing Technology

Module code: 4ENT1117

Semester: AB

Credits: 15

Module Aims:

Acquire basic engineering workshop practice in CNC, fabrication and machining ; be aware of the influence of production processes on product design and manufacture; understand and apply the engineering processes creating machined parts.

Intended Learning Outcomes:

Successful students will typically: * understand safety and hazardous substance legislation and impact in the engineering workshop environment; * define manufacturing processes, the technology used and their relationship with the environment in the context of recycling and sustainable production. 9b. Skills and Attributes: Successful students will typically: * interpret engineering drawings for component manufacture and assembly; * use software to create programmes for Computer Numerical Control and Computer Aided Manufacture using standard conventions.

Module Content:

This module introduces the student to a range of production processes and practice used commonly in the manufacture of products. Students develop a hands-on appreciation of production techniques including turning, milling, fabrication and assembly using manual and computer controlled plant and machinery. Transferable skills are developed in the application of the processes used to manufacture a range of products and subassemblies taking into account design and supply requirements. The intended learning outcomes are facilitated through a combination of approaches to learning and teaching,

typically this will include lectures and workshop practical sessions. These activities will be supported by the

module team and by encouraging the students to access a variety of resources including available equipment

and appropriate software packages.

The module is taught through a series of workshop based practical sessions supported by lectures on the

manufacturing processes and their application.

The hands-on practical sessions are intended to develop the student's appreciation of the techniques,

capabilities and limitations of a range of commonly available production processes that support product

manufacture.

A logbook is issued to each student containing the relevant drawings and information for their practical

sessions including the engineering drawings and assembly detail for the toolbox and Aluminium mini vice.

Students will be assessed by their ability to manufacture and assemble the toolbox and mini vice in groups

from engineering drawings. The students must also produce CNC code and machine a part of their own design

to comply with the individual assessment on CNC programming and machining.

Practical work will support the development of students' awareness of risk issues, including health & safety,

risk assessment and risk management techniques. Students will be able to recognize the importance and

influence of Health & Safety and COSHH legislation prior to commencing workshop practical sessions.

The lectures cover an introduction to:

- Health and safety in an engineering workshop environment is covered in the first lecture and emphasized in

their first session in each of the practical workshop areas.

- Manufacturing is introduced and includes the linking to product design, material selection, process selection

and the effect of advances in technology.

- Design and manufacturing are discussed in terms of current legislation and the impact of cradle to grave

production on the environment, processes and production quantities.

- Casting Process; typically covering sand, shell moulding, gravity, high-pressure, centrifugal and investment

casting processes.

- Forming Processes; typically covering forging, rolling cold heading and forming, drawing and extrusion

processes.

- Machining Processes; typically covering turning, milling, planing/shaping, drilling/reaming, broaching and

grinding processes.

- Plastic and composite processes; typically covering injection, compression, transfer, blow, rotational

moulding, vacuum forming and continuous extrusion.

- Joining processes; typically covering manual metal arc, metal inert gas, tungsten inert gas, resistance,

friction and gas welding techniques.

- Automation in manufacturing.

- Prototyping and Product Design to Manufacture.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Introduction to Manufacturing Technology

Module code: 4ENT1117

Semester: AB

Credits: 15

Module Aims:

Acquire basic engineering workshop practice in CNC, fabrication and machining ; be aware of the influence of production processes on product design and manufacture; understand and apply the engineering processes creating machined parts.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * understand safety and hazardous substance legislation and impact in the engineering workshop environment; * define manufacturing processes, the technology used and their relationship with the environment in the context of recycling and sustainable production. Skills and Attributes: Successful students will typically: * interpret engineering drawings for component manufacture and assembly; * use software to create programmes for Computer Numerical Control and Computer Aided Manufacture using standard conventions.

Module Content:

This module introduces the student to a range of production processes and practice used commonly in the manufacture of products. Students develop a hands-on appreciation of production techniques including turning, milling, fabrication and assembly using manual and computer controlled plant and machinery. Transferable skills are developed in the application of the processes used to manufacture a range of products and subassemblies taking into account design and supply requirements. The intended learning outcomes are facilitated through a combination of approaches to learning and teaching, typically this will include lectures and workshop practical sessions. These activities will be supported by the module team and by encouraging the students to access a variety of resources including available equipment and appropriate software packages. The module is taught through a series of workshop based practical sessions supported by lectures on the manufacturing processes and their application. The hands-on practical sessions are intended to develop the student's appreciation of the techniques, capabilities and limitations of a range of commonly available production processes that support product manufacture. A logbook is issued to each student containing the relevant drawings and information for their practical sessions including the engineering drawings and assembly detail for the toolbox and Aluminium mini vice. Students will be assessed by their ability to manufacture and assemble the toolbox and mini vice in groups from engineering drawings. The students must also produce CNC code and machine a part of their own design to comply with the individual assessment on CNC programming and machining. Practical work will support the development of students' awareness of risk issues, including health & safety, risk assessment and risk management techniques. Students will be able to recognize the importance and influence of Health & Safety and COSSH legislation prior to commencing workshop practical sessions. The lectures cover an introduction to: - Health and safety in an engineering workshop environment is covered in the first lecture and emphasized in their first session in each of the practical workshop areas. - Manufacturing is introduced and includes the linking to product design, material selection, process selection and the effect of advances in technology. - Design and manufacturing are

discussed in terms of current legislation and the impact of cradle to grave production on the environment, processes and production quantities. - Casting Process; typically covering sand, shell moulding, gravity, high-pressure, centrifugal and investment casting processes. - Forming Processes; typically covering forging, rolling cold heading and forming, drawing and extrusion processes. - Machining Processes; typically covering turning, milling, planning/shaping, drilling/reaming, broaching and grinding processes. - Plastic and composite processes; typically covering injection, compression, transfer, blow, rotational moulding, vacuum forming and continuous extrusion. - Joining processes; typically covering manual metal arc, metal inert gas, tungsten inert gas, resistance, friction and gas welding techniques. - Automation in manufacturing. - Prototyping and Product Design to Manufacture.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Manufacturing Strategy

Module code: 6AAD0019

Semester: B

Credits: 15

Module Aims:

Have a comprehensive understanding of current production concepts and techniques in formulating a manufacturing strategy; develop a practical approach in the development and implementation of manufacturing strategies in the business of manufacture.

Intended Learning Outcomes:

Successful students will typically:

- * explore key issues in manufacturing strategy.

Successful students will typically:

- * analyse and model a manufacturing strategy and use the outcome to derive a manufacturing systems

design;

- * derive appropriate manufacturing strategies to suit different companies and product scenarios.

Module Content:

The module argues for the case of a modern systems approach to manufacturing strategy, and describes the

competitive environment that faces manufacturing in Britain today e.g. Globalisation. An important aim of the module is seen as placing the manufacturing systems in its proper perspective at the centre of the companies

manufacturing strategy. The module will also serve a dual purpose i.e. to broaden the perspective of the

manufacturing function, and to heighten the awareness of other functional critical areas involved in the task of

formulating a successful manufacturing strategy.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

Module name: Mark-up Languages and Metadata

Module code: 5ent1049

Semester: A

Credits: 15

Module Aims:

Recognise the concepts of markup languages and how these are deployed; develop applications using contemporary markup languages; understand the concepts and usage of metadata.

Intended Learning Outcomes:

Successful students will typically:

- * describe the fundamental structures of contemporary markup languages;
- * evaluate the use of markup language in application development;
- * explain the use of metadata.

Successful students will typically:

- * use markup languages in application development;
- * create appropriate web-based applications that integrate metadata;
- * be able to evaluate and report upon the outcomes of project work.

Module Content:

This module provides an introduction to the concepts of markup languages, the use of typical metadata in

markup languages and how these are deployed. The module also enables students to develop an ability to

generate simple code in a typical example of an advanced markup language.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Materials and Bio-compatibility

Module code: 6ENT1045

Semester: A

Credits: 15

Module Aims:

Examine the mechanisms leading to degradation of biomaterials; investigate the biological effect of the degradation of biomaterials on the human body; examine the principles of biomaterials design and testing.

Intended Learning Outcomes:

Successful students will typically:

- * understand the principles of degradation of biomaterials;
- * explain the response of the human body to degradation of biomaterials.

Successful students will typically:

- * have an in-depth understanding of, and be able to recognise biomaterial failure mechanisms;
- * present laboratory findings, analyses and conclusions clearly in appropriate formats;
- * be able to apply underlying principles of materials to the design of biocompatible prosthetic devices.

Module Content:

This module will extend the students understanding of the degradation of biomaterials and how the body responds. This includes metals, ceramics and polymers, and their different methods of degradation as well as

their effect on the immune systems and heal of the body in the presence of biomaterials. The module will also

look at methods of testing for biocompatibility and the replacement of soft and hard tissues with biomaterials.

Finally the module will consider biomaterials criteria required when selecting materials for the design of

biomedical products.

Pre and Co requisites:

None

Total hours: 150

Academic year 2021-2022

Assessment:

Exam	Coursework	Practical
60%	40%	%

Module name: Materials and Electrical Science

Module code: 4ENT1119

Semester: A

Credits: 15

Module Aims:

Develop an understanding of the scientific principles, general properties and appropriate uses of engineering materials for given engineering environments; develop an understanding of the fundamental principles of electrical circuits and the characteristics and properties of electromechanical machines.

Intended Learning Outcomes:

Successful students will typically:

- * identify the structure of metals, polymers and ceramics, explain relationships with mechanical and physical

properties and recognise their use and limitations in engineering environments.

- * explain electronic principles, analogue and digital circuits and review the operation of electromechanical

machines.

- * discuss the reuse and recyclability of materials to meet sustainability drivers in engineering.

Successful students will typically:

- * select materials for applications based on the behaviour of the major classes of engineering materials.

- * select appropriate mechanical testing procedures for the evaluation of engineering materials.

- * use electronic test equipment to measure electrical characteristics of practical systems.

Module Content:

This module encompasses (i) electrical science (fundamental concepts of electrical units and relationships, basic AC and DC circuit theory, digital systems and electro-mechanical machines), (ii) engineering materials (classification of materials, mechanical and physical properties, structure of materials, testing, materials selection for metals, polymers and ceramics (iii) issues of recyclability and sustainability in regard to materials selection. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning.

Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow

students to practice and refine their skills.

Topics include:

Academic year 2021-2022

Materials.

1. Classification of materials - metals polymers and ceramics, composites, natural materials.

Summary of

common physical and mechanical properties and the relative properties of the classes of materials.

2. Structure of materials - atomic and/or molecular bonding in each class of material, periodic table; crystalline

structures of metals, alloys and cements/concrete; defects in crystals.

3. Properties and evaluation of materials - elastic and plastic deformation, tensile and compressive strengths,

modulus, ductility, toughness, hardness, fatigue strength, specific properties, corrosion resistance.

4. An introduction to practical materials, their properties and selection: metals (Steels, cast-irons, aluminium

and its alloys, copper and its alloys); polymers (Thermoplastics, thermosets, elastomers); Ceramics (general

and engineering ceramics and semiconductor materials.)

5. Consideration of issues of recyclability and sustainability when applied to materials choice / selection.

Electrical Science

1. Fundamental concepts; electric and magnetic fields; conduction and resistance; units of volts, amps and

watts; circuit symbols, basic circuit elements, EMF and PD, resistance, inductance, capacitance and their

units; voltage and current relationships; power and energy.

2. DC circuit theory; resistors and capacitors in series/parallel, Kirchoff's laws, voltage and current dividers; 1st

order transient response.

3. AC circuit theory; single-phase generation; sine, square, triangle waveforms, Fourier concept; frequency,

period, rms, and peak; the behaviour of discrete R, L and C circuit elements; introduction to phasor diagrams

and their manipulation. Series RLC circuits and resonance.

4. Introduction to digital systems; basic logic functions, gates and truth tables.

5. Machines and transformers; electro-mechanical energy conversion and power flow through a machine; 3-

phase basics. Introduction to ac and dc machines and their applications.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Materials and Electrical Science

Module code: 4ENT1119

Semester: A

Credits: 15

Module Aims:

Develop an understanding of the scientific principles, general properties and appropriate uses of engineering materials for given engineering environments. develop an understanding of the fundamental principles of electrical circuits and the characteristics and properties of electromechanical machines.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * identify the structure of metals, polymers and ceramics, explain relationships with mechanical and physical properties and recognise their use and limitations in engineering environments. * explain electronic principles, analogue and digital circuits and review the operation of electromechanical machines. * discuss the reuse and recyclability of materials to meet sustainability drivers in engineering. Skills and Attributes: Successful students will typically: * select materials for applications based on the behaviour of the major classes of engineering materials. * select appropriate mechanical testing procedures for the evaluation of engineering materials. * use electronic test equipment to measure electrical characteristics of practical systems.

Module Content:

This module encompasses (i) electrical science (fundamental concepts of electrical units and relationships, basic AC and DC circuit theory, digital systems and electro-mechanical machines), (ii) engineering materials (classification of materials, mechanical and physical properties, structure of materials, testing, materials selection for metals, polymers and ceramics (iii) issues of recyclability and sustainability in regard to materials selection. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning. Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow students to practice and refine their skills. Topics include: Materials. 1. Classification of materials - metals polymers and ceramics, composites, natural materials. Summary of common physical and mechanical properties and the relative properties of the classes of materials. 2. Structure of materials - atomic and/or molecular bonding in each class of material, periodic table; crystalline structures of metals, alloys and cements/concrete; defects in crystals. 3. Properties and evaluation of materials - elastic and plastic deformation, tensile and compressive strengths, modulus, ductility, toughness, hardness, fatigue strength, specific properties, corrosion resistance. 4. An introduction to practical materials, their properties and selection: metals (Steels, cast-irons, aluminium and its alloys, copper and its alloys); polymers (Thermoplastics, thermosets, elastomers); Ceramics (general and engineering ceramics and semiconductor materials.) 5. Consideration of issues of recyclability and sustainability when applied to materials choice / selection. Electrical Science 1. Fundamental concepts; electric and magnetic fields; conduction and resistance; units of volts, amps and watts; circuit symbols, basic circuit elements, EMF and PD, resistance, inductance, capacitance and their units; voltage and current relationships; power and energy. 2. DC circuit theory; resistors and capacitors in series/parallel, Kirchoff's laws, voltage and current dividers; 1st order transient response. 3. AC

circuit theory; single-phase generation; sine, square, triangle waveforms, Fourier concept; frequency, period, rms, and peak; the behaviour of discrete R, L and C circuit elements; introduction to phasor diagrams and their manipulation. Series RLC circuits and resonance. 4. Introduction to digital systems; basic logic functions, gates and truth tables. 5. Machines and transformers; electro-mechanical energy conversion and power flow through a machine; 3- phase basics. Introduction to ac and dc machines and their applications.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Materials and Electrical Technology

Module code: 4ENT1129

Semester: A

Credits: 15

Module Aims:

Develop an understanding of the scientific principles, general properties and appropriate uses of engineering materials for given engineering environments. develop an understanding of the fundamental principles of electrical circuits and the characteristics and properties of electromechanical machines.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: identify the structure of metals, polymers and ceramics, explain relationships with mechanical and physical properties and recognise their use and limitations in engineering environments; explain electronic principles, analogue and digital circuits and review the operation of electromechanical machines; discuss the reuse and recyclability of materials to meet sustainability drivers in engineering. **Skills and Attributes:** Successful students will typically: select materials for applications based on the behaviour of the major classes of engineering materials; select appropriate mechanical testing procedures for the evaluation of engineering materials; use electronic test equipment to measure electrical properties of practical systems.

Module Content:

This module encompasses (i) electrical science (fundamental concepts of electrical units and relationships, basic AC and DC circuit theory, digital systems and electro-mechanical machines), (ii) engineering materials (classification of materials, mechanical and physical properties, structure of materials, testing, materials selection for metals, polymers and ceramics (iii) issues of recyclability and sustainability in regard to materials selection. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning. Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow students to practice and refine their skills. Topics include: 1. Classification of materials metals polymers and ceramics, composites, natural materials. Summary of common physical and mechanical properties and the relative properties of the classes of materials. 2. Structure of materials - atomic and/or molecular bonding in each class of material, periodic table; crystalline structures of metals, alloys and cements/concrete; defects in crystals. 3. Properties and evaluation of materials - elastic and plastic deformation, tensile & compressive strengths, modulus, ductility, toughness, hardness, fatigue strength, specific properties, corrosion resistance. 4. An introduction to practical materials, their properties and selection- metals (Steels, cast-irons, aluminium and its alloys, copper and its alloys); polymers (Thermoplastics, thermosets, elastomers); Ceramics (general and engineering ceramics and semiconductor materials.) 5. Consideration of issues of recyclability and sustainability when applied to materials choice / selection. **Electrical Science** 1. Fundamental concepts; electric and magnetic fields; conduction and resistance; units of volts, amps and watts; circuit symbols, basic circuit elements, EMF and PD, resistance, inductance, capacitance and their units; voltage and current relationships; power and energy. 2. DC circuit theory; resistors and capacitors in series/parallel, Kirchoff's laws, voltage and current dividers; 1st order transient response. 3. AC

circuit theory; single-phase generation; sine, square, triangle waveforms, Fourier concept; frequency, period, rms, and peak; the behaviour of discrete R, L and C circuit elements; introduction to phasor diagrams and their manipulation. Series RLC circuits and resonance. 4. Introduction to digital systems; basic logic functions, gates and truth tables. 5. Machines and transformers; electro-mechanical energy conversion and power flow through a machine; 3- phase basics. Introduction to ac and dc machines and their applications.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Mathematics for Engineering

Module code: 4PAM1047

Semester: A

Credits: 15

Module Aims:

Further their knowledge and understanding of basic mathematical techniques required by engineers.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: recognise the elementary rules of arithmetic, algebra, trigonometry and calculus. **Skills and Attributes:** Successful students will typically: apply simple algebraic and statistical techniques; apply simple trigonometric techniques; apply the elementary rules of calculus.

Module Content:

This module provides the basic mathematical techniques required for the technical modules later in the programme. Very little prior mathematical knowledge is assumed and a strong emphasis is put on exercises as the most valuable method for learning the key mathematical techniques. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning. Problem sheets in tutorials, additional problems set as directed learning and practical classes allow students to practice and refine their skills. Topics include: 1. Approximation of numbers, errors, estimation and order of magnitude. 2. Transposition of formulae manipulation of algebraic expressions and solution of equations. 3. Trigonometry. 4. Differentiation and integration. 5. Standard functions curve sketching.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Mechanical Engineering Design

Module code: 6ENT1071

Semester: B

Credits: 15

Module Aims:

Participate in a team-based major design project; develop a further understanding of the design to production process; present detailed and coherent design proposals and supporting information.

Intended Learning Outcomes:

Successful students will typically:

- * demonstrate understanding and judgment of a range of issues that influence design decisions;
- * select appropriate tools and techniques to assist in the design process.

Successful students will typically:

- * specify requirements and develop appropriate solutions to design needs;
- * apply computer aided tools to develop design solutions;
- * prepare and present the outcomes of design projects in a professional manner;
- * contribute effectively to the design process as a member of a team.
- * present the outcomes of their work,

Module Content:

This module aims to provide a realistic experience of a major design project, spanning the initial client brief

through to the presentation of detailed design proposals. It affords the opportunity to develop engineering

competence by applying a wide range of academic studies to the development of a viable product.

The module comprises a series of substantial and related design projects, done in teams of typically 5-7.

Teamwork, project management, and the use of appropriate computer design tools are inherent to the module.

The products may vary most years, but will be selected so as to be challenging and include a measure of

social awareness.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Mechanical Experimental Engineering

Module code: 4ENT1006

Semester: B

Credits: 15

Module Aims:

Develop a fundamental understanding of the principal topics of Mechanical Science; develop skills in the measurement, observation, reporting and analysis of laboratory experiments; develop an appreciation of the role of Mechanical Science in an engineering context.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: demonstrate a fundamental knowledge of statics and dynamics; demonstrate a fundamental knowledge of structural mechanics and strength of materials; recognise the purpose, benefits and limitations of conducting experiments. **Skills and Attributes:** Successful students will typically: apply the principles of Mechanical Science to solve elementary Engineering problems; conduct simple experiments and report findings; perform basic analysis of experimental data and perform objective comparison of results against theoretical expectations.

Module Content:

The Mechanical Experimental Engineering module serves to introduce students to the main topics of Mechanical Science in the context of practical application and laboratory based experimentation. Topics covered by the module include Experimental Methods, Force Systems, Stress and Strain, Engineering Beams and Newton's Laws of Motion. Each topic is accompanied with at least one open access experimental study. Main topics covered by the module are Experimental Methods, Force Systems, Stress and Strain, Engineering Beams and Newton's Laws of Motion. Each topic is accompanied with at least one open access experimental study. Topics in more detail: experimental methods - design and execution of simple experiments, measurement error, statistical methods, graphing of data and interpretation; force systems - forces, moments, simple free body diagrams and analysis of systems in equilibrium. Measurement of force; stress and strain - uni-axial plane stress, shear stress, Young's modulus. Measurement of strain; engineering beams - shear force and bending moment diagrams, second moment of area and engineer's theory of bending. Stress due to torsion of shafts, polar moment of area; Newton's Laws of motion - linear motion and acceleration, inertia, impulse and momentum, velocity and acceleration diagrams. The measurement of motion. Examples of laboratory sessions: measurement of gravity using a simple pendulum; vector board simulation of force and moment systems; force analysis of a racing car wishbone to optimize geometry; mechanical strength testing of adhesive bonds (tensile, shear and peel); three point beam bending test to determine Young's modulus; rocket sled motion analysis using webcam, broken wire and optical gate measurement

Pre and Co requisites:

None

Total hours: 150

Academic year 2021-2022

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Mechanical Science

Module code: 4ENT1067

Semester: B

Credits: 15

Module Aims:

Develop an understanding of the principles of mechanics and application of the basic principles of structural analysis in determining the behaviour of simple structures and mechanisms; develop an understanding of fundamental principles of forces in equilibrium.

Intended Learning Outcomes:

Successful students will typically: * explain the fundamental principles of forces in static and dynamic equilibrium; * explain the principles of statics and dynamics and the behaviour of simple structures. Successful students will typically: * apply fundamental principles of statics and dynamics to basic engineering components and assemblies; * carry out simple vibrational analysis of mechanical structures.

Module Content:

This module encompasses statics (fundamental concept of units, forces, force systems, free body diagrams,

couples, moments, direct & shear stresses, beams, frames, shear force-bending moment relationships) and

dynamics (quantities and concepts, linear & angular motion, non-constant acceleration, forces and torques, moment of inertia, application of free-body diagrams, work-energy equation, impulse-momentum equation,

simple harmonic motion, dynamic mechanisms, engineering vibrations). Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning.

Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow

students to practice and refine their skills.

Topics include:

Dynamics

1. Linear & angular motion, expressed graphically. Constant acceleration equations.
2. Introduction to non-constant acceleration - use of acceleration-time graph.
3. Forces and torques (Newton's Laws of motion. Friction effects. Free-body diagrams. Use of graphical and analytical methods). Moment of inertia (Radius of gyration. Parallel axis theorem)

4. Further application of free-body diagrams to engineering systems involving linear and angular accelerations.

5. Work-Energy equation. Impulse-momentum equation for linear and angular systems.

6. Simple harmonic motion, single degree of freedom undamped systems in free vibration, introduction to

damping.

7. Dynamic Mechanisms. Engineering vibrations.

Statics

1. Fundamental concepts and quantities (units, vector and scalar quantities). Fundamentals of forces and force

systems (resolution of forces, triangle of forces), equilibrium, free body diagrams, couples and moments.

2. Direct and shear stresses in simple cases, shear distribution in beams, elementary bending theory.

3. Two-dimensional pin-jointed frames, shear force-bending moment relationships (using various loading cases -

point & uniformly distributed loads), 3-pin arches.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

Module name: Mechanical Science

Module code: 4ENT1067

Semester: B

Credits: 15

Module Aims:

Develop an understanding of the principles of mechanics and application of the basic principles of structural analysis in determining the behaviour of simple structures and mechanisms; develop an understanding of fundamental principles of forces in equilibrium.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * explain the fundamental principles of forces in static and dynamic equilibrium; * explain the principles of statics and dynamics and the behaviour of simple structures. Skills and Attributes: Successful students will typically: * apply fundamental principles of statics and dynamics to basic engineering components and assemblies; * carry out simple vibrational analysis of mechanical structures.

Module Content:

This module encompasses statics (fundamental concept of units, forces, force systems, free body diagrams, couples, moments, direct & shear stresses, beams, frames, shear force-bending moment relationships) and dynamics (quantities and concepts, linear & angular motion, non-constant acceleration, forces and torques, moment of inertia, application of free-body diagrams, work-energy equation, impulse-momentum equation, simple harmonic motion, dynamic mechanisms, engineering vibrations). Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning. Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow students to practice and refine their skills. Topics include: Dynamics 1. Linear & angular motion, expressed graphically. Constant acceleration equations. 2. Introduction to non-constant acceleration - use of acceleration-time graph. 3. Forces and torques (Newton's Laws of motion. Friction effects. Free-body diagrams. Use of graphical and analytical methods). Moment of inertia (Radius of gyration. Parallel axis theorem) 4. Further application of free-body diagrams to engineering systems involving linear and angular accelerations. 5. Work-Energy equation. Impulse-momentum equation for linear and angular systems. 6. Simple harmonic motion, single degree of freedom undamped systems in free vibration, introduction to damping. 7. Dynamic Mechanisms. Engineering vibrations. Statics 1. Fundamental concepts and quantities (units, vector and scalar quantities). Fundamentals of forces and force systems (resolution of forces, triangle of forces), equilibrium, free body diagrams, couples and moments. 2. Direct and shear stresses in simple cases, shear distribution in beams, elementary bending theory. 3. Two-dimensional pin-jointed frames, shear force-bending moment relationships (using various loading cases - point & uniformly distributed loads), 3-pin arches.

Pre and Co requisites:

None

Total hours: 150

Academic year 2021-2022

Assessment:

Exam	Coursework	Practical
60%	40%	%

60 Exam 40 ICA The successful candidates are required to pass overall. All Learning Outcomes to be assessed in both Exam and ICA.

Module name: Mechanical Science

Module code: 4ENT1067

Semester: B

Credits: 15

Module Aims:

Develop an understanding of the principles of mechanics and application of the basic principles of structural analysis in determining the behaviour of simple structures and mechanisms; develop an understanding of fundamental principles of forces in equilibrium.

Intended Learning Outcomes:

Successful students will typically:

- * explain the fundamental principles of forces in static and dynamic equilibrium;
- * explain the principles of statics and dynamics and the behaviour of simple structures.

Successful students will typically:

- * apply fundamental principles of statics and dynamics to basic engineering components and assemblies;
- * carry out simple vibrational analysis of mechanical structures.

Module Content:

This module encompasses statics (fundamental concept of units, forces, force systems, free body diagrams,

couples, moments, direct & shear stresses, beams, frames, shear force-bending moment relationships) and

dynamics (quantities and concepts, linear & angular motion, non-constant acceleration, forces and torques, moment of inertia, application of free-body diagrams, work-energy equation, impulse-momentum equation,

simple harmonic motion, dynamic mechanisms, engineering vibrations).

Pre and Co requisites:

None

Total hours: 150

Academic year 2021-2022

Assessment:

Exam	Coursework	Practical
60%	40%	%

Module name: Mechanics and Properties of Materials

Module code: 6ACM0003

Semester: A

Credits: 15

Module Aims:

Extend the student's knowledge of the analysis of structural components subjected to complex stress/strain fields; enable students to select materials and their processing in a design situation, by matching properties of specific materials with engineering requirements; provide an understanding of the possible modes of failure of engineering materials during service.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * identify the types, properties and manufacture of composite materials; * recognise modes of failure in engineering materials; * identify the response of components to complex stresses. Skills and Attributes: Successful students will typically: * examine existing designs and actual components in engineering situations, using methods such as finite element analysis, photoelasticity, non-destructive testing and fractography; * limit the occurrence of failure in materials by appropriate modelling, design and materials selection; * apply analytical methods to structural components subjected to complex stress/strain fields.

Module Content:

This module will extend the students knowledge and understanding of structural analysis and the importance of selecting appropriate materials to meet the design requirements. Topics include: Plate theory, elasticity and plasticity, composite materials, viscoelasticity, creep and relaxation, fracture and fatigue, corrosion and nondestructive testing. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning. Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow students to practice and refine their skills. Topics include: 1. Plate theory - bending of thin plates subjected to pressure loading. 2. Elasticity & Plasticity - Equilibrium and compatibility conditions for a continuum. Plane stress and plane strain. Stress analysis using photoelastic techniques. Use of strain gauges, computer reduction of laboratory data. Finite Elements: Introduction to basic elements in FE systems and appreciation of their characteristics. Simple problems. Stress concentrations: use of FE systems to evaluate simple stress concentrations; comparison with data sheets and photoelasticity results. Yield criteria for ductile materials. Plastic bending and torsion; residual stresses. 3. Composite Materials - Particle- and fibre-reinforced materials. Theories of strengthening and the micromechanics of fibre-reinforced materials. Types of material, their manufacture and applications. Strength of bonded joints. sandwich panels. 4. Viscoelasticity - creep and relaxation. Definition, stages and theories of creep deformation. Linear and nonlinear models for creep behaviour. Relaxation. Steady-state creep laws. Mechanism of creep fracture. Testing and presentation of data. Alloys and ceramics for creep resistance. 5. Fracture and Fatigue - Characteristics and mechanisms of fracture. Ductile and brittle modes of fracture, shear and cleavage modes. Griffith theory, the importance of critical defect size, fracture mechanics. Importance of temperature on mode of fracture, materials for low temperature service. Fatigue S-N data, effects of mean stress, surface finish and environment. Fatigue life prediction, cumulative damage concept. Damage tolerance, prediction of crack propagation under realistic loading. 6. Corrosion - Dry corrosion: mechanisms,

oxidation laws, limitation. Aqueous corrosion: mechanisms, localised acceleration. Corrosion prevention: Materials selection, design, cathodic protection, coatings. 7.Non-Destructive Testing - Defects arising during manufacture and service, their causes and prevention. Methods of detecting defects, their uses and limitations.

Pre and Co requisites:
None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

60 Exam 40 ICA The successful candidates are required to pass overall. All Learning Outcomes to be assessed in both Exam and ICA

Module name: Mechatronic Systems Modelling and Control

Module code: 5ENT1056

Semester: B

Credits: 15

Module Aims:

Simulate the dynamic performance of electro-mechanical systems; design simple feedback control systems.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: *explain the use of sensors, actuators and appropriate interfacing technology to enable the development of a mathematical model of the dynamic behaviour of each component. **Skills and Attributes:** Successful students will typically: * simulate the dynamic behaviour of a system with a mixture of electrical and mechanical components; * apply step and frequency response techniques to analyse the dynamic performance of electro-mechanical control systems; * design simple series controllers to modify the performance of electro-mechanical control systems.

Module Content:

This module will enable students to develop mathematical models of sensors, actuators and the necessary interfacing to enable them to simulate the dynamic performance of a range of electro-mechanical systems. Students will be introduced to the principles of feedback control systems and performance prediction using step and frequency response analysis. Finally students will be introduced to common series controllers and expected to design appropriate controllers to modify the performance of various control systems. The module will make extensive use of MATLAB to develop simulations of a wide range of case studies. For example: speed control of electric wheel chairs, temperature control system, position control of robotic arms, flow control systems. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning. Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow students to practice and refine their skills. Topics include: 1. Systems Modelling – Block diagrams, 1st & 2nd order transfer functions and their characteristic parameters, 2. Actuator Models – AC and DC Motors, Stepper motors, Electric Pumps, Electric Heaters and Boilers. 3. Sensor Models – accelerometers, gyroscopes, displacement sensors, pressure sensors, temperature sensors. 4. Time Response Simulation – Analogue diagrams, block manipulation, step responses with and without initial conditions, dynamic and steady state performance measurement, Transfer Function identification. 5. Frequency Response Simulation – gain and phase shift measurement, Nyquist and Bode plots, Nyquist Stability Criterion, stability margins, resonance, bandwidth. 6. Controller design – steady state error prediction, P, PI, PD and PID controllers. 7. Implementation consideration – common analogue circuits for implementing P, PI, PD and PID controllers, signal conditioning. (NB Digital implementation of controllers is covered at level 6.) Simulink and the Control Systems Tool Box within MATLAB will be used to support this module.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Mechatronic Systems Modelling and Control

Module code: 5ENT1055

Semester: A

Credits: 15

Module Aims:

The aims of this module are to enable students to...

- * simulate the dynamic performance of electro-mechanical systems;
- * design simple feedback control systems.

Intended Learning Outcomes:

Successful students will typically:

- * explain the use of sensors, actuators and appropriate interfacing technology to enable the development of a mathematical model of the dynamic behaviour of each component.

Successful students will typically:

- * simulate the dynamic behaviour of a system with a mixture of electrical and mechanical components;
- * apply step and frequency response techniques to analyse the dynamic performance of electro-mechanical control systems;
- * design simple series controllers to modify the performance of electro-mechanical control systems.

Module Content:

This module will enable students to develop mathematical models of sensors, actuators and the necessary

interfacing to enable them to simulate the dynamic performance of a range of electro-mechanical systems. Students will be introduced to the principles of feedback control systems and performance prediction using

step and frequency response analysis. Finally students will be introduced to common series controllers and

expected to design appropriate controllers to modify the performance of various control systems.

The module will make extensive use of MATLAB to develop simulations of a wide range of case studies. For

example: speed control of electric wheel chairs, temperature control system, position control of robotic arms,

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flow control systems.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Mechatronic Systems Modelling and Control

Module code: 5ent1056

Semester: B

Credits: 15

Module Aims:

The aims of this module are to enable students to...

- * simulate the dynamic performance of electro-mechanical systems;
- * design simple feedback control systems.

Intended Learning Outcomes:

Successful students will typically:

*explain the use of sensors, actuators and appropriate interfacing technology to enable the development of a mathematical model of the dynamic behaviour of each component.

Successful students will typically:

- * simulate the dynamic behaviour of a system with a mixture of electrical and mechanical components;
- * apply step and frequency response techniques to analyse the dynamic performance of electro-mechanical control systems;
- * design simple series controllers to modify the performance of electro-mechanical control systems.

Module Content:

This module will enable students to develop mathematical models of sensors, actuators and the necessary

interfacing to enable them to simulate the dynamic performance of a range of electro-mechanical systems. Students will be introduced to the principles of feedback control systems and performance prediction using

step and frequency response analysis. Finally students will be introduced to common series controllers and

expected to design appropriate controllers to modify the performance of various control systems.

The module will make extensive use of MATLAB to develop simulations of a wide range of case studies. For

example: speed control of electric wheel chairs, temperature control system, position control of robotic arms,

flow control systems.

Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning.

Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow

students to practice and refine their skills.

Topics include:

1. Systems Modelling – Block diagrams, 1st & 2nd order transfer functions and their characteristic parameters,

2. Actuator Models – AC and DC Motors, Stepper motors, Electric Pumps, Electric Heaters and Boilers.

3. Sensor Models – accelerometers, gyroscopes, displacement sensors, pressure sensors, temperature sensors.

4. Time Response Simulation – Analogue diagrams, block manipulation, step responses with and without initial conditions, dynamic and steady state performance measurement, Transfer Function identification.

5. Frequency Response Simulation – gain and phase shift measurement, Nyquist and Bode plots, Nyquist

Stability Criterion, stability margins, resonance, bandwidth.

6. Controller design – steady state error prediction, P, PI, PD and PID controllers.

7. Implementation consideration – common analogue circuits for implementing P, PI, PD and PID controllers,

signal conditioning. (NB Digital implementation of controllers is covered at level 6.)

Simulink and the Control Systems Tool Box within MATLAB will be used to support this module

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Mechatronic Systems Modelling and Control

Module code: 5ENT1056

Semester: B

Credits: 15

Module Aims:

The aims of this module are to enable students to...

- * simulate the dynamic performance of electro-mechanical systems;
- * design simple feedback control systems.

Intended Learning Outcomes:

Successful students will typically:

- * explain the use of sensors, actuators and appropriate interfacing technology to enable the development of a mathematical model of the dynamic behaviour of each component.

Successful students will typically:

- * simulate the dynamic behaviour of a system with a mixture of electrical and mechanical components;
- * apply step and frequency response techniques to analyse the dynamic performance of electro-mechanical control systems;
- * design simple series controllers to modify the performance of electro-mechanical control systems.

Module Content:

This module will enable students to develop mathematical models of sensors, actuators and the necessary

interfacing to enable them to simulate the dynamic performance of a range of electro-mechanical systems. Students will be introduced to the principles of feedback control systems and performance prediction using

step and frequency response analysis. Finally students will be introduced to common series controllers and

expected to design appropriate controllers to modify the performance of various control systems.

The module will make extensive use of MATLAB to develop simulations of a wide range of case studies. For

example: speed control of electric wheel chairs, temperature control system, position control of robotic arms,

flow control systems.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Mechatronics Design

Module code: 6ENT1039

Semester: B

Credits: 15

Module Aims:

The aims of this module are to enable students to...

* gain experience in designing a product that contains electrical, electronic and mechanical components that

are integrated to enable the control and operation of the product by the end user.

Intended Learning Outcomes:

Successful students will typically:

- * examine a range of issues that influence design decisions;
- * explore appropriate tools and techniques to assist in the design process.

Successful students will typically:

- * specify requirements and develop appropriate solutions to design needs;
- * apply computer aided tools and analytical methods to develop design solutions;
- * prepare and present the outcomes of design projects in a professional manner;
- * contribute effectively to the design process as a member of a team.
- * present the outcomes of their work.

Module Content:

This module aims to provide a realistic experience of a major design project, spanning the initial client brief

through to the presentation of detailed design proposals. It affords the opportunity to develop engineering

competence by applying a wide range of academic studies to the development of a viable product.

The module comprises a series of substantial and related design projects, done in teams of typically 5 -7.

Teamwork, project management, and the use of appropriate computer design tools are inherent to the module.

The products may vary most years, but will be selected so as to be challenging and include a measure of social awareness.

Pre and Co requisites:
None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Mechatronics Design

Module code: 6ENT1039

Semester: B

Credits: 15

Module Aims:

The aims of this module are to enable students to...

* gain experience in designing a product that contains electrical, electronic and mechanical components that

are integrated to enable the control and operation of the product by the end user.

Intended Learning Outcomes:

Successful students will typically:

- * examine a range of issues that influence design decisions;
- * explore appropriate tools and techniques to assist in the design process.

Successful students will typically:

- * specify requirements and develop appropriate solutions to design needs;
- * apply computer aided tools and analytical methods to develop design solutions;
- * prepare and present the outcomes of design projects in a professional manner;
- * contribute effectively to the design process as a member of a team.
- * present the outcomes of their work.

Module Content:

This module aims to provide a realistic experience of a major design project, spanning the initial client brief

through to the presentation of detailed design proposals. It affords the opportunity to develop engineering

competence by applying a wide range of academic studies to the development of a viable product.

The module comprises a series of substantial and related design projects, done in teams of typically 5 -7.

Teamwork, project management, and the use of appropriate computer design tools are inherent to the module.

The products may vary most years, but will be selected so as to be challenging and include a measure of

social awareness.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Micro Engineering for Biomedical Applications

Module code: 6ENT1049

Semester: B

Credits: 15

Module Aims:

The aims of this module are to enable students to...

- * develop an understanding of the principles required for innovative, integrated microengineering design and

manufacture of biomedical components;

- * further develop students ability to work in multidisciplinary teams to design a microengineering product.

Intended Learning Outcomes:

Successful students will typically:

- * demonstrate an understanding of the underlying engineering principles appropriate to the design of a

microengineering product for use in the biomedical engineering industry;

- * demonstrate an understanding of the manufacturing considerations particularly appropriate to a microengineering product for use in the biomedical engineering industry.

Successful students will typically:

- * apply appropriate analysis techniques to assess the performance of a microengineering product;

- * work effectively in a multi-disciplinary team and communicate the development and outcomes of individual, as

well as group project, work.

Module Content:

The MEMS for Biomedical applications module provides level 6 student engineers with a base understanding of

the principles required for innovative, integrated microengineering design and manufacture. The core of the

module is a case study led group project focussing on the design of a microengineered biomedical device. The

individual members of the project groups are designated responsibility for a specific aspect of the overall

design. Depending on the case study this can include:

- Structural design and modelling (stress/strain, bond strength, FEA modelling)
- Fluidic and flow regime analysis (scaling, CFD modelling)
- Photomask design and development
- Electronic control (scaling, piezo drivers)

Supporting lectures, seminars and tutorials run in parallel with the group project to provide an academic

backbone to the practical application of engineering knowledge.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Microelectronics and VLSI

Module code: 6ent1027

Semester: A

Credits: 15

Module Aims:

The aims of this module are to enable students to...

- * consolidate their knowledge of analogue and digital circuits, extending it into specialised integrated circuit

design concepts, including high speed analogue and digital circuit techniques and 'System on Chip'.

Intended Learning Outcomes:

Successful students will typically:

- * evaluate analogue and digital IC technologies such as CMOS and bipolar;

- * present typical applications of advanced analogue and digital IC technologies, such as integrated filter design

and FPGAs.

Successful students will typically:

- * use computer-aided methods for design, analysis and simulation of analogue and digital circuits;

- * critically analyse and design typical simple filters and circuits using integrated active devices for selected

analogue signal processing applications;

- * critically analyse and design typical combinational, sequential and FSM logic circuits for implementation in an

integrated circuit such as an FPGA.

Module Content:

This module aims to extend students' knowledge of analogue and digital electronics into the area of integrated

circuit design. Material is biased toward advanced high-speed analogue and digital IC technologies and circuits.

The module also covers the way in which these concepts are used in the design of integrated analogue circuits

and digital 'systems on chip'. Although treated in an analytical way, learning is supported by the use of modern

relevant software design and simulation tools. This module encompasses the following topics:

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Implementation of logic functions (e.g. combinational, sequential) and Finite State Machines using VHDL,

FPGA, System on Chip or custom ICs;

Analogue, mixed signal and digital systems, advanced IC technologies such as CMOS;

CAD tools such as VHDL;

High speed op-amps; integrated filters, advanced systems, field programmable analogue array;

The coursework is typically based on lab experiments and takes the average of two lab works/reports on

analogue and digital respectively. The exam is a closed-book exam.

Further details may be found in the module guide.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

Module name: Micro-Engineering & Micro-Technology

Module code: 6ENT1022

Semester: B

Credits: 15

Module Aims:

The aims of this module are to enable students to...

- * develop an understanding of the principles required for innovative, integrated microengineering design and

manufacture;

- * further develop students ability to work in multidisciplinary teams to design a microengineering product.

Intended Learning Outcomes:

Successful students will typically:

- * examine the engineering principles appropriate to the design of a microengineering product;

- * explore the manufacturing considerations particularly appropriate to a microengineering product.

Successful students will typically:

- * apply appropriate analysis techniques to assessing the performance of a microengineering product;

- * work effectively in a multi-disciplinary team and communicate the development and outcomes of individual, as

well as group project, work.

Module Content:

The Microengineering & Microtechnology module provides both mechanical and electrical engineers with a base

understanding of the principles required for innovative, integrated microengineering design and manufacture. The core of the module is a case study led group project focusing on the design of a microfluidic pump. The

individual members of the project groups are designated responsibility for a specific aspect of the overall pump

design. This can include:

- " Structural design and modelling (stress/strain, bond strength, FEA modelling);

- " Fluidic and flow regime analysis (scaling, CFD modelling);

- " Electronic control (scaling, piezo drivers). The module is designed to accommodate both mechanical and electrical students, split with individual groups

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comprising up to 3 students. It is expected that the fluidic and Structural responsibilities of the group design

will fall on the mechanical students, while the electrical students will primarily have responsibility for the

electronic driver design for the piezo chips. Overall group responsibility will lie in the design of a photomask for

the manufacture of a physical PDMS micropump, this task is equally suited to both electrical and mechanical

students.

The focus of the group design project is heavily orientated on the integration of each of the key responsibility

areas. Where a group role is left unfulfilled, basic design data for critical component interactions will be provided

by the module staff to ensure that the project group is not unduly penalised and that the project can be

completed by the remaining group members.

An outcome of the group design will be the manufacture of their final PDMS micropump (to be manufactured by

Microengineering and Microfluidics Research Group staff). This pump will be tested for volumetric flow rate

using the research groups existing piezo drive system. Students will be allocated a 20 minute slot in order to

setup and calibrate their PDMS pump using the provided piezo driver chip. The volumetric flow rate will be

analysed by collecting the output volume over a 5 minute period and the results calculated using gravimetric

methods.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Micro-Engineering & Micro-Technology

Module code: 6ENT1022

Semester: B

Credits: 15

Module Aims:

The aims of this module are to enable students to...

- * develop an understanding of the principles required for innovative, integrated microengineering design and

manufacture;

- * further develop students ability to work in multidisciplinary teams to design a microengineering product.

Intended Learning Outcomes:

Successful students will typically:

- * examine the engineering principles appropriate to the design of a microengineering product;

- * explore the manufacturing considerations particularly appropriate to a microengineering product.

Successful students will typically:

- * apply appropriate analysis techniques to assessing the performance of a microengineering product;

- * work effectively in a multi-disciplinary team and communicate the development and outcomes of individual, as

well as group project, work.

Module Content:

The Microengineering & Microtechnology module provides both mechanical and electrical engineers with a base

understanding of the principles required for innovative, integrated microengineering design and manufacture. The core of the module is a case study led group project focusing on the design of a microfluidic pump. The

individual members of the project groups are designated responsibility for a specific aspect of the overall pump

design. This can include:

- " Structural design and modelling (stress/strain, bond strength, FEA modelling);

- " Fluidic and flow regime analysis (scaling, CFD modelling);

" Electronic control (scaling, piezo drivers).

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Mini Project CTN

Module code: 5ENT1085

Semester: B

Credits: 15

Module Aims:

Develop their professional skills in project planning and time management. * enhance their problem-solving and independent learning abilities. * deploy technology effectively to solve given Computer and Network Technology problems.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: recognise how previous and concurrent learning is used to solve technology-based problems; describe the project life-cycle appropriately; Skills and Attributes: Successful students will typically: analyse and breakdown problem tasks into manageable steps; produce a solution to a defined Computer and Network Technology problem; carry out a simple critical evaluation of the solution; manage time and resources effectively.

Module Content:

Students are given specific investigative and problem solving tasks to perform. Although tasks vary depending on individual interests and aspirations, and available resources, each task has common elements. These include the necessity to gather information, to synthesise a solution or solutions drawing on previous learning and to evaluate those solutions in the context of the original objectives. At least 3 defined problems, each to be solved in 1 to 2 days by students working individually. Students' practical work is assessed, together with their written submissions . Examples of typical project areas are given below: 1. Micro-LAN Office Project 2. Case Study of a local Network Infrastructure 3. Home Automation

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Mini Projects (Electrical)

Module code: 5ent1075

Semester: B

Credits: 15

Module Aims:

The aims of this module are to enable students to...

- * integrate previous and concurrent learning and to use it to solve real engineering problems.
- * develop the ability to manage time and resources effectively.
- * develop their awareness of sustainability and ethical issues in engineering

Intended Learning Outcomes:

Successful students will typically:

- * identify and enhance knowledge gained from other studies in areas relevant to the project topic selected;
- * discuss sustainability and ethical issues in engineering;

Successful students will typically:

- * use relevant measurement instruments to analyse a defined electrical/electronic engineering problem;
- * synthesise a solution to a defined electrical/electronic engineering problem;
- * take, and analyse appropriately, test results from that solution;
- * carry out a simple critical evaluation of the results taken;

Module Content:

Small groups of students are given specific investigative and problem solving tasks to perform.

Although tasks

vary depending on individual interests and aspirations, and available resources, each task has common

elements. These include the necessity to make measurements, the necessity to synthesise a solution or

solutions and the necessity to evaluate those solutions in the context of the original objectives. The module will involve at least 3 defined problems, each to be solved in 1 to 2 days by students working individually or collectively.

The following topics will be covered in a four hour lecture at the start of the module and students will be required

to pay particular attention to these issues when carrying out individual mini projects:

Ethics - Handling and storage of data relating to human and animal subjects.

Sustainability - power consumption and energy efficiency, renewable and alternative energy sources, clean

technology and recyclability.

Typical topics for projects might include:

- Explore Automated Selection Machine
- Suggest and draw an industrial process control machine
- Familiarisation with GX IEC Developer and Human Machine Interface E-1007
- Write Ladder Logic and Sequential Chart for Human Interface Machine, Try them on the provided PLC

(Programmable Logic Controller). Draw the application on HMI E1071, Test and verify the application in real

time

- Build first order and second order differential systems
- Evaluate the RL constant of a motor and take measurements
- Torque control of a DC motor,
- Capture the current rise and settling times (hardware and software)
- Use SISO tool to evaluate a simple controller design
- Use of Matlab/Simulink for developing: 1) first order system and evaluate the error, 2) model of the torque

motor, 3) model implementing the op-amp's operating limitations, 4) the PI compensator for the motor model

box

Assessment will typically require students to feedback on each lab session and to submit a report. Awareness

of ethics and sustainability issues will be assessed.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Academic year 2021-2022

Module name: Motorsport and Automotive Technology

Module code: 4ENT1128

Semester: A

Credits: 15

Module Aims:

Understand the fundamental terms, science and technologies associated with motor vehicles; * gain an understanding of how to design, build and drive motor vehicles.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: identify the major systems and components of a vehicle; recognise how the parts contribute to the whole vehicle. **Skills and**

Attributes: Successful students will typically: apply tools and methods to do engine calibrations and calculations; estimate vehicle performance.

Module Content:

This module will introduce students to the fundamental terms, science and technologies commonly used in the automotive industry. Students will become familiar with the basic parts of a vehicle and gain an appreciation for how they are integrated together. They will be introduced to the parameters used to assess vehicle performance and through laboratory work learn how to use standard equipment to measure the performance of a vehicle. They will also be introduced to how the methods the motorsport side of the industry enhances vehicle performance. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning. Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow students to practice and refine their skills. Topics include: - Engines: types, layouts and basic dimensions and effects on engine performance; - Fuels and alternative fuels including bio-fuels, hydrogen, electric and hybrid vehicles; -Engine control systems; -Materials especially where specific properties are required in the engine components; -Thermodynamics: basic indicator diagrams and factors affecting performance; -Calibration: methods of construction and basic parameters such as torsional stiffness, COG; -Suspension and steering: resume of different suspension types and their relative merits in terms such as cost, complexity, performance. Basic theory such as the effects of camber angle, scrub radius, damping, anti-roll, squat, dive, load transfer; -Tyres: basic terms and their practical significance. eg slip angle, tractive force, traction circles, camber thrust; -Introduction to motorsports. What actually goes on at the race track and what preparation is needed to get there. The requirements for racing vehicles and their setup.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Motorsport Design

Module code: 5ENT1041

Semester: B

Credits: 15

Module Aims:

Develop the process of design and application of validation and measurement, to a product design in order to provide high lap speed and race reliability; appreciate how to design vehicle systems that produce desirable motorsport performance; appreciate how design intent is applicable to motorsport design application.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * describe design principles and the interaction of aerodynamic and mechanical design taking into account performance, motorsport manufacturing techniques, selection of materials/treatments, packaging, regulatory and economic constraints; * identify limitations of software tools to assess performance; * understand benchmarking, and its relationship to performance; * demonstrate a knowledge of the RAC Blue Book, and a selection of typical FIA paperwork. **Skills and Attributes:** Successful students will typically: * apply computer software techniques to assess various performance factors in motorsport and assess, measure, and quantify the influence of aerodynamic and other key performance factors to establish the best design compromise.

Module Content:

Fundamental concepts of motorsport design and modelling of aerodynamic performance and handling utilising design and modelling tools which may include CFD CAD FEA FMEA etc. Design specification; validation plans and project management. Production of engineering solutions, supported by drawings; analysis and calculation. Design intent and manufacturability of components. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning. Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow students to practice and refine their skills. Topics include: Benchmarking: collate; analyse; and prioritise customer requirements, to describe a product that the customer would value and want to own. Specify performance and functional criteria to meet customer requirements, in operating environment, for life. Awareness of professional liability. Establish validation plan to prove the product meets requirements, fit, function legality performance etc. Establish project plan to achieve required time to profit. Manage project and component design versus plan. Analyse; decide; report; and recommend. Influences on design and styling. Economic implications. Students will undertake design assignments to practise and learn the above skills. Influence of aerodynamic factors lift and drag on performance, road-handling and fuel economy.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Motorsport Technology

Module code: 6ENT1057

Semester: A

Credits: 15

Module Aims:

Develop an understanding of tools required for motorsport; * develop both a practical and theoretical understanding of a range of these tools; * apply the techniques and skills developed to real life examples.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * explain the influence of engine, aerodynamics, tyres and suspension system parameters on the performance of race cars. Skills and Attributes: Successful students will typically: * analyse vehicle data and provide useful data to the set-up / development engineers and drivers; * modify the set up of a race car to improve its performance; * communicate effectively and succinctly with the range of personnel in the team.

Module Content:

This module aims to develop an understanding of tools required for motorsport, develop both a practical and theoretical understanding of a range of these tools and give the ability to apply the techniques and skills to real life examples. It encompasses data logging and analysis, safety in race cars, engine mapping and development, tyre technology, suspension system analysis, damper analysis, aerodynamics and performance modelling and 'the race'. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning. Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow students to practice and refine their skills. Topics include:: DATA LOGGING AND ANALYSIS Using real data collected from a variety of race cars. ENGINE MAPPING AND DEVELOPMENT Using an engine dyno and engine mapping you will look at the options open to the engine tuner to maximise the 'performance' of the engine. Engine performance software based prediction. TYRE TECHNOLOGY The four points of contact with the track, you will look at the construction of the carcass, compound and operating parameters of a race tyre along with the best way of using the tyre and monitoring its performance SUSPENSION SYSTEM ANALYSIS Be able to analyse race suspension systems. DAMPER ANALYSIS Look at the effect of the dampers on the car, the use of a damper dyno, the interpretation of the results, the nose, bump / rebound, bleed and shim stacks etc. AERODYNAMICS Aero balance and optimisation drag reduction and induction enhancement. Lab/ demo work on centre of gravity measurement and suspension set-up. THE RACE Be familiar with race event preparation.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
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%	100%	%
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100 ICA

Module name: Multimedia Regulatory Framework

Module code: 4ENT1104

Semester: B

Credits: 15

Module Aims:

The aims of this module are to enable students to...

- * recognise the relationship between individual rights and individual responsibilities;
- * understand and evaluate sources of English law and other regulatory frameworks and issues, both domestic and international, influencing the multimedia industry;
- * evaluate the rights and obligations of both producers and consumers of Multimedia.

Intended Learning Outcomes:

Successful students will typically:

- * describe and evaluate the legal regulatory framework surrounding the Multimedia industry;
- * explain, at an introductory level, the relevant general legal principals and legislation relevant to the development and administration of the Multimedia industry.

Successful students will typically:

- * interpret specific real-life issues and existing legal case law pertaining to contemporary Media practice;
- * analyse current legislative and political initiatives pertinent to this rapidly developing industry.

Module Content:

An understanding of the various rules and regulations, both voluntary and legally enforceable, directly influencing the development and implementation of multimedia technology is essential to both students and

professionals operating in this complex and rapidly developing area.

This module will focus on specific problems and opportunities arising within the English legal system and

administrative framework relating to the Multimedia industry, whilst examining the continuing importance of

international law on trans-national online communications.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Networking

Module code: 5ENT1047

Semester: A

Credits: 15

Module Aims:

Gain an understanding of the architecture and principles of local area, wide area and mobile data networks; * examine applicable network communication protocols; * be aware of emerging trends governing network management.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: explain the principles of various network protocols and services; contrast various means of access to networks in the context of multimedia services. **Skills and Attributes:** Successful students will typically: select appropriate hardware, software and communication links to support multi-media services; use appropriate software tools to analyse systems architecture configurations; recognise and report upon a range of network management issues.

Module Content:

This module covers local area and wide area computer networks in the context of multimedia communications, including the assessment of requirements for hardware, software and communication networks to support distributed multi-media services including IP telephony, streaming audio and video and video on demand. Network technologies, systems, protocols and security are included, together with recently developed local access technologies such as Asymmetric Digital Subscriber Line, (ADSL), and cable modems. Mobile and wireless networks are also covered including, for example, General Packet Radio System, (GPRS), Wireless Access Protocol, (WAP), and Bluetooth. Lecture topics will typically include coverage of: 1. Introduction to Data Communication Networks, Protocols & Architecture 2. WANs - Circuit Switching and Packet Switching 3. WANs - Means of local access, modems, ISDN, ADSL/VDSL & cable modems 4. LANs - Technology and Systems 5. LANs - Network Operating Systems 6. Fundamentals of Protocols, TCP/IP 7. Data and network security issues 8. Mobile/wireless multi-media networking - GPRS, WAP, Bluetooth. 9. Webcasting Typically, assessment will be by means of practical lab work, report and exam.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
50%	50%	%

50 Exam 50 ICA The successful candidates are required to pass overall.

Academic year 2021-2022

Module name: Noise and Vibration Analysis

Module code: 6ENT1038

Semester: B

Credits: 15

Module Aims:

The aims of this module are to enable students to...

- * understand the vibration and dynamic response of complex mechanical engineering systems and structures;
- * understand the nature of noise and achieve the ability to measure, specify and analyse noise spectra;
- * assess the effects of dynamic excitation on the responses of a system;
- * apply appropriate noise reduction techniques

Intended Learning Outcomes:

Successful students will typically:

- * identify and understand noise control problems encountered from machines;
- * explain characteristics of free and forced vibrations of multi-degrees of freedom systems.

Successful students will typically:

- * model, analyse and simulate the vibration modes and dynamic response of mechanical engineering systems;
- * analyse noise levels generated by engines and machines and apply appropriate noise reduction techniques.

Module Content:

This module covers: (i) vibration and dynamic responses of complex mechanical engineering systems and structures, this includes

normal modes of vibration of both two and multi-degree of freedom systems. The forced response of these

systems subject to harmonic excitations is also evaluated. The response of simple systems subject to random

excitation is considered too.

(ii) the nature of noise and to achieve the ability to measure, specify and analyse noise spectra. It encompasses vibration modelling of complex mechanical engineering systems and structures and their

dynamic responses, and also noise control which is the analysis to limit and control the levels of noise emitted

by machines. Principles of noise absorption and techniques of noise control are examined with particular

reference to internal mechanical noise/room acoustics.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

Module name: Operating Systems and Object Oriented Programming

Module code: 6ELE0070

Semester: A

Credits: 15

Module Aims:

The aims of this module are to enable students to...

- * develop knowledge of the concepts underlying the design of software systems and object oriented programming and in the context of modern software languages;
- * demonstrate an understanding of the concepts and principles of computer operating systems design and their interaction with modern hardware architectures.

Intended Learning Outcomes:

Successful students will typically:

- * explain the principles of design of software operating systems.
- * describe the main principles involved in a methodology for software design and testing;
- * discuss the main object oriented programming principles and concepts;

Successful students will typically:

- * write simple object oriented code in at least one selected object oriented language;
- * design, at conceptual level, the structure and test schedule for a simple example of software;
- * explore the main functional aspects and attributes of selected operating systems.

Module Content:

Object oriented programming develops the student's prior study of programming in two ways. The first develops

a more in-depth appreciation of the object-oriented approach and this topic is mainly dealt with by practical

exercises using modern object oriented software languages. The second area developed is the design concepts

inherent in modern computer operating systems, in the context of embedded systems or real time systems in

Engineering.

Pre and Co requisites:

None

Academic year 2021-2022

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

Module name: Physical Sensors and Actuators

Module code: 5ENT1054

Semester: A

Credits: 15

Module Aims:

The aims of this module are to enable students to...

* understand and become familiar with physical sensors and actuators. This includes understanding of basic

sensor theory and hands on experience in sensor development, sensor data acquisition and calibration, through

the use of modern microcontroller systems (e.g. ARM Cortex M series, PIC microcontrollers, etc.)

Intended Learning Outcomes:

Successful students will typically:

* demonstrate understanding of the basic principles of a number of sensors used in the biomedical industries;

* be able to demonstrate a knowledge of basic data acquisition and control, system integration and its

application for electro-mechanical circuits;

* demonstrate understanding and judgment of a range of issues that influence design, architecture, interoperability and data integrity.

Successful students will typically:

* specify requirements and develop appropriate original and innovative design solutions around the use of

sensors and actuators, taking into account commercial and industrial constraints and requirements;

* apply appropriate analytical theories and computer aided tools to the design of products.

Module Content:

This module aims to provide a realistic experience of understanding and familiarisation with sensors used in the

biomedical industry. The module provides hands on experience in the understanding and development of such

sensors, designing appropriate data acquisition and control system on a modern microcontroller using series of

sensors and actuators. It is envisaged that the use of ARM or MIPS based micro-controllers will be introduced

and used within the hands-on laboratory session providing students with the opportunity to specify, design, and

build an open-loop or closed-loop system depending on the project requirement. These projects are specified

by staff and industries

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
70%	30%	%

Module name: Pilot Studies and Flight Planning

Module code: 6ENT1040

Semester: AB

Credits: 30

Module Aims:

Have a sound knowledge of navigation principles, flight performance and planning; * have a good understanding of the technical components of a fixed wing, light aircraft * understand the factors that limit human performance and endurance * acquire skills necessary to pursue careers as aviation pilots and or flight test engineers.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * recognise the various aircraft modes of motion, aircraft technical components, principles of flight, performance characteristics and handling qualities. * identify the factors that limit human performance and endurance. Skills and Attributes: Successful students will typically: * pilot a fixed wing aircraft under supervision of an instructor; * plan, and navigate a course under Visual Flight Rules; * communicate correctly over aircraft radio; * measure and evaluate the performance characteristics of an aircraft from flight data.

Module Content:

In this module, students will be taught the technical aspects of an aircraft, handling and operation principles, flight planning and expected to investigate aircraft performance through a set of exercises on a fixed wing aircraft. The students will undergo pre-flight briefing which will outline the task. The Task will be carried out in air as a pilot under study or as pilot in command (after first solo flight). After the completion of the task a post flight debriefing will take place to review the flight with a view to improving skills and understanding. One of the roles of this module is to help students in their eventual choice of a career, either as a pilot or as an engineer. This module will motivate the students, develop their self-discipline, time management and study skills. The flying experience will develop knowledge required for operation of aircraft in the air or ground and will serve as necessary experience in the pursuance of the CAA NPPL(UK) status. Typically, within 20 hours of flight training a student would be expected to reach exercise 13 from the following: - Exercise 1,1E Familiarization with the aeroplane, Emergency drills - Exercise 2 Preparation for and action after flight - Exercise 3 Air experience - Exercise 4 Effects of controls - Exercise 5 Taxying - Exercise 5E Emergencies - Exercise 6 Straight and level - Exercise 7 Climbing - Exercise 8 Descending - Exercise 9 Turning - Exercise 10A,B Slow flight and Stalling - Exercise 11 Spin avoidance - Exercise 12 Take-off and climb to downwind position - Exercise 13 Circuit, approach and landing - Exercise 12/13E Emergencies - Exercise 15 Advanced turning - Exercise 16 Forced landing without power - Exercise 17 Precautionary landing - Exercise 18A,B Navigation and Navigation problems at lower levels and in reduced visibility - Exercise 19 Instrument appreciation The piloting element of the module will be augmented by flight test laboratory sessions which may take place either in an aircraft or by using the Flight Simulation facilities. These exercises will link to BSc level 5 and 6 study, whereby aspects from stability & control, aerospace performance & propulsion will be incorporated into the teaching and assessment. The module will also enable students to develop their understanding of the factors that limit human performance and endurance.

Pre and Co requisites:

None

Total hours: 300

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA In order to be eligible for a pass grade in this module, students must have flown a minimum of 20 hours. A compensated Pass cannot be awarded for this module. Assessment of the flying will be based on confirming the hours from the pilot's logbook

Module name: Power Systems

Module code: 6ELE0071

Semester: A

Credits: 15

Module Aims:

The aims of this module are to enable students to...

- * develop and extend their knowledge of the design of modern electrical power generation, control and

distribution systems;

- * gain an insight into 3-phase circuits, generator stability and power system faults.

Intended Learning Outcomes:

Successful students will typically:

- * examine the principles of power flow control in transmission systems and of the methods used for compensation for load variation;

- * explore the principles and underlying concepts of power systems design including generator stability and the

effect of power system faults.

Successful students will typically:

- * analyse and describe mathematically and statistically, power flow control in selected examples of transmission systems;

- * design, at system block level, a power system;

- * evaluate power systems using appropriate software simulation tools.

Module Content:

This module builds on previous introductory material to extend students knowledge of modern power generation

and distribution practice. Treatment of material is essentially analytical, supported by investigation of a typical

power transmission system as well as by the use of relevant software simulation tools.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

Module name: Principles of Aircraft Systems

Module code: 5ENT1035

Semester: A

Credits: 15

Module Aims:

Extend their knowledge and understanding of various aircraft systems;

Develop their skills in using simulation in the development of aircraft systems;

Appreciate the role of regulatory bodies in the safety and certification of aircraft systems.

Intended Learning Outcomes:

Successful students will typically:

- * describe common electrical and mechanical systems found on modern aircraft;
- * identify regulatory bodies and their role with regard to safety and certification of aircraft systems.

Successful students will typically:

- * analyse the performance of various aircraft systems;
- * critically evaluate aircraft systems with respect regulatory requirements.

Module Content:

This module will further enhance the knowledge and understanding of undergraduate students, concerning

propulsion, electrical, pneumatic and hydraulic systems found in modern aircraft with the emphasis from an

engineering and operational view point. This module will cover aspects of safety management, flight critical systems, effects of human factors on safety of flight systems, operational and maintenance consideration of

various aircraft systems. The role of regulatory bodies on maintenance safety as well as system and subsystem certification will be included. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning.

Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow

students to practice and refine their skills.

Under each of the following headings appropriate aspects of safety management, flight critical systems, effects

of human factors on safety, operational and maintenance consideration and the role of regulatory bodies in

certification will be identified.

Academic year 2021-2022

Electrical Systems

Electrical Power Generation and Distribution

Auxiliary Power Units

Power Budget

Hydraulic and Pneumatic Systems (valves, actuators etc)

Servo-Control actuation systems

Undercarriage System

Braking System

Electro-Mechanical Systems

Warning Systems, Power plant and Fuel Systems

Anti-Icing system, Fire Protection, Heating and Ventilation System

Bleed Air Systems

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Principles of Sustainable Design and Construction

Module code: 4ENT1137

Semester: A

Credits: 15

Module Aims:

The aims of this module are to enable students to...

- Understand the importance of health and safety in the workplace, in developing designs and on construction

sites.

- Interpret and apply the principles of sustainability to typical civil engineering case studies.
- Understand and apply the process of design to engineering problems, and develop safe design options.
- Appreciate civil engineering for infrastructure development in the context of socio-economic and demographic

change, the commercial factors influencing major projects, the project management process, and relevant

government initiatives.

Intended Learning Outcomes:

Successful students will typically:

- Explain safe working practices on construction sites, key health and safety legislation and safety in design.

- Express the principles and process of sustainability and sustainable engineering design with reference to

construction.

- Discuss the economic, social and commercial context within which infrastructure is designed, developed,

constructed, operated and decommissioned

Successful students will typically:

- Identify safe and unsafe working practices and understand the role of key safety legislation.
- Devise design options, sketch and present potential solutions to engineering problems in teams
- Use common project management tools and techniques.

- Produce and interpret engineering drawings in accordance with accepted standards, conventions and practices

Module Content:

The module covers the following topics:

- Health and Safety on construction sites, legislation, safe working, risk assessment and risk management.
- Design principles, sketching, interpreting engineering drawings, design for safety, construction and manufacture, lean methods, and codes and standards.
- Principles of sustainability and the environment in civil engineering design, sustainable materials, sustainability assessment and the interface with Building Information Modelling.
- Introduction to Construction Management – The socio-economic, demographic and commercial environment

for infrastructure projects, project management, QCD, project life cycles, critical path and network analysis,

tendering and contracts.

- What the student will learn from the module

Students learn how designs are conceived and developed in a commercial and socio-economic context whilst

balancing the need for sustainability, resource efficiency, economy and viability.

- Why will this be of benefit

The context for major infrastructure projects is explored and students will appreciate the importance of

sustainability, design processes, construction management and underpinning factors for future technological

developments.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Product and Project Management

Module code: 5ENT1030

Semester: B

Credits: 15

Module Aims:

Understand the techniques used in the management of engineering projects;

Understand the team and organisational issues of project management;

Understand the product development process and techniques typically used during product development;

Be aware of the economic, social, legal and ethical issues associated with the development of a new product.

Intended Learning Outcomes:

Successful students will typically:

- * recognise the organisational management and team working aspects of managing projects;
- * examine the role and process of product development in the context of meeting the organisation's strategic objectives.
- * discuss the economic, social, legal and ethical issues associated with the development of a new product.

Successful students will typically:

- * apply a range of project management techniques;
- * explore the tools and techniques typically used during the product development process.

Module Content:

To achieve and maintain market position the manufacturing industry must develop profitable and competitive

products in time, to quality and within budget. This requires the functions of the company to be organised to

achieve common objectives. This module examines the organisational aspects of product development from

definition through design to manufacture. The team issues and techniques of project management are

addressed as applicable to the product development process and in general terms. The project management

content is taught first in order to support the product development content.

Knowledge and understanding is achieved through the delivery of lectures, tutorials/seminars and directed

learning.

Problems posed in tutorials/seminars and additional problems set as directed learning allow students to

practice and refine their skills.

Topics include:

PROJECT MANAGEMENT

- An examination of project drivers and the role of project management within organisations.
- Team work and leadership through problem definition, problem solving, planning, monitoring and control.
- Project management techniques and practice. e.g. Gantt, PERT, Resource and Cost Planning.

PRODUCT DEVELOPMENT

- Introduction to the strategic issues of product development.
- Organisational issues of product development.
- The tools and techniques typically used during the development process.
- An introduction to patent and sale-of-goods product legislation.
- Customer values, ethics and social issues explored.
- Product development standards.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

Module name: Project Management & Product Development

Module code: 5ENT1080

Semester: B

Credits: 15

Module Aims:

Understand the techniques used in the management of engineering projects; understand the team and organisational issues of project management; understand the product development process and techniques typically used during product development; be aware of the economic, social, legal and ethical issues associated with the development of a new product.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * recognise the organisational management and team working aspects of managing projects; * examine the role and process of product development in the context of meeting the organisation's strategic objectives. * discuss the economic, social, legal and ethical issues associated with the development of a new product. **Skills and Attributes:** Successful students will typically: * apply a range of project management techniques; * explore the tools and techniques typically used during the product development process.

Module Content:

To achieve and maintain market position the manufacturing industry must develop profitable and competitive products in time, to quality and within budget. This requires the functions of the company to be organised to achieve common objectives. This module examines the organisational aspects of product development from definition through design to manufacture. The team issues and techniques of project management are addressed as applicable to the product development process and in general terms. The project management content is taught first in order to support the product development content. Knowledge and understanding is achieved through the delivery of lectures, tutorials/seminars and directed learning. Problems posed in tutorials/seminars and additional problems set as directed learning allow students to practice and refine their skills. Topics include: **PROJECT MANAGEMENT** An examination of project drivers and the role of project management within organisations. Team work and leadership through problem definition, problem solving, planning, monitoring and control. Project management techniques and practice. e.g. Gantt, PERT, Resource and Cost Planning. **PRODUCT DEVELOPMENT** Introduction to the strategic issues of product development. Knowledge and understanding of the commercial, economic and social context of engineering processes Organisational issues of product development. The tools and techniques typically used during the development process. An introduction to patent and sale-of-goods product legislation. Customer values, ethics and social issues explored. Product development, including quality assurance and continuous improvement.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
70%	30%	%

70 Exam; 30 ICA The successful candidates are required to pass overall. All Learning Outcomes to be assessed in both Exam and ICA.

Module name: Project Management & Product Development

Module code: 5ent1080

Semester: B

Credits: 15

Module Aims:

Understand the techniques used in the management of engineering projects; understand the team and organisational issues of project management; understand the product development process and techniques typically used during product development; be aware of the economic, social, legal and ethical issues associated with the development of a new product.

Intended Learning Outcomes:

Successful students will typically:

- * recognise the organisational management and team working aspects of managing projects;
- * examine the role and process of product development in the context of meeting the organisation's strategic objectives.
- * discuss the economic, social, legal and ethical issues associated with the development of a new product.

Successful students will typically:

- * apply a range of project management techniques;
- * explore the tools and techniques typically used during the product development process.

Module Content:

To achieve and maintain market position the manufacturing industry must develop profitable and competitive

products in time, to quality and within budget. This requires the functions of the company to be organised to

achieve common objectives. This module examines the organisational aspects of product development from

definition through design to manufacture. The team issues and techniques of project management are

addressed as applicable to the product development process and in general terms. The project management

content is taught first in order to support the product development content. Knowledge and understanding is achieved through the delivery of lectures, tutorials/seminars and directed

learning.

Problems posed in tutorials/seminars and additional problems set as directed learning allow students to

practice and refine their skills.

Topics include:

PROJECT MANAGEMENT

An examination of project drivers and the role of project management within organisations.

Team work and leadership through problem definition, problem solving, planning, monitoring and control.

Project management techniques and practice. e.g. Gantt, PERT, Resource and Cost Planning.

PRODUCT DEVELOPMENT

Introduction to the strategic issues of product development.

Knowledge and understanding of the commercial, economic and social context of engineering processes

Organisational issues of product development.

The tools and techniques typically used during the development process.

An introduction to patent and sale-of-goods product legislation.

Customer values, ethics and social issues explored.

Product development, including quality assurance and continuous improvement.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
70%	30%	%

Module name: Real-time Systems & Programming

Module code: 5ele0062

Semester: B

Credits: 15

Module Aims:

Gain an insight into the fundamental concepts of real-time systems and software design.

Intended Learning Outcomes:

Successful students will typically:

- * explain assembly language programming principles and how these relate to "high level" languages;
- * describe the principles of hardware design and software issues of real-time systems.
- * describe real-time kernel services (e.g. scheduling, inter-task communication, memory management).
- * recognise the challenges facing real-time system designers.

Successful students will typically:

- * write a simple program to implement concepts of real-time systems.

Module Content:

This module extends knowledge of embedded systems in two main ways. Study of device programming is

extended from high-level language techniques to low-level language techniques and to the relationship and interaction between them. Also covered is introductory material on both the hardware design and software

issues of real-time systems, including an introduction to aspects such as handshake protocols, scheduling and

context switching.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Reliability Engineering

Module code: 6ENT1006

Semester: B

Credits: 15

Module Aims:

Evaluate the reliability techniques relating to engineering; select and summarise the suitability of reliability techniques for different application.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * compare and relate Weibull modelling methods to engineering; * compare and relate Experimental Design to engineering. Skills and Attributes: Successful students will typically: * select and organise a range of techniques for determining reliability; * contrast and evaluate a range of experimental design techniques.

Module Content:

This module covers two principal areas: firstly, Weibull Analysis and the associated support material (Load Strength analysis, redundancy, Extreme and Hazard Analysis). The second part is that of experimental design. This is divided into statistical experimental design, and Taguchi Analysis. This subject is taught with a variety of teaching methods. Lectures are used to introduce core material. This is further explored with tutorial, seminars and case studies as in-class exercises to highlight overlapping material. Practical demonstrations and simulation packages are used. - Failures (types of failure; complete, partial sudden) (5) - Reliability as a function of time (5) - Failure rates with time (bath tub curve) (5) - Failure distributions (normal, exponential, Weibull) (10) - Relationships between $Z(t)$, $F(t)$, $R(t)$ (5) - Weibull - plotting at calculations from failure data (20) - Redundancy - types (series and parallel). Improving reliability. Calculating stand by requirements (10) - Extreme value, sudden death testing and hazard plotting (5) - Load-Strength Analysis (loading roughness, safety margins (5) - Design of Experiments. Full and fractional factorials. Effects and interactions (30)

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

60 Exam 40 ICA The successful candidates are required to pass overall. All Learning Outcomes to be assessed in both Exam and ICA.

Module name: Rocket Performance and Propulsion

Module code: 6AAD0026

Semester: A

Credits: 15

Module Aims:

Broaden their experience of aerospace engineering; gain knowledge and understanding of the performance of rockets and their propulsion systems together with an appreciation of their applications.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * explore the principles behind rocket propulsion systems, together with their advantages and drawbacks; * examine the principles behind rocket performance prediction. Skills and Attributes: Successful students will typically: * recommend an appropriate propulsion system to fulfill a specific application; * predict and optimise rocket performance for a range of flight regimes.

Module Content:

This module will introduce students to flight dynamics of rockets and their propulsion systems. Typical applications under consideration will include satellite launch and insertion into orbit, sounding rockets and potential future applications such as space tourism, together with some aspects of guided weapons. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning. Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow students to practice and refine their skills. The performance element of the module will cover the analysis of rocket flight taking account of gravitational, aerodynamic and propulsive forces; multi-staging and optimisation of multi-stage rockets; re-entry dynamics; ballistic trajectories and trajectory optimisation; methods of steering. The propulsion element of the module will cover the following topics: rocket motor types and applications; definition of terms; energy and efficiency of motors; the combustion process; combustion chambers; nozzles and expansion ratios; ignition systems; control systems; liquid-fuelled rocket motors; solid-fuelled rocket motors; hybrid motors; liquid feed systems. Practical experience will typically include a propulsion laboratory and rocket launching together with the use of computer software to simulate rocket flight.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

60 Exam 40 ICA The successful candidates are required to pass overall. All Learning Outcomes to be assessed in both Exam and ICA.

Module name: Satellite Terrestrial Communication Systems

Module code: 6ENT1014

Semester: B

Credits: 15

Module Aims:

Extend knowledge of communication systems or avionic systems to include applications of terrestrial and

space communications; gain knowledge of the principles of communication system link design, building blocks, antennas and radio wave propagation.

Intended Learning Outcomes:

Successful students will typically:

- * explain underlying design principles to a range of terrestrial and space communication links;
- * compare typical architectures for radio receivers and transmitters;

Successful students will typically:

- * evaluate the operation of range of mobile, satellite and space communications systems;
- * design simple terrestrial and space communication links at a systems level;
- * evaluate a range of functional blocks including antennas for radio communication systems;
- * apply appropriate solutions to terrestrial, satellite and space communication requirements.

Module Content:

This module introduces the student to the principles of terrestrial, mobile, satellite and space communication

system design, including communication system building blocks, antenna properties and radio wave propagation phenomena. Treatment of some material is at systems level with some topics being treated at

more in-depth, analytical level. Theoretical study is supported by practical exercises and lab experiments and

where appropriate, software based simulation tools.

Pre and Co requisites:

None

Academic year 2021-2022

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Simulation and Analysis Techniques

Module code: 5ENT1088

Semester: A

Credits: 15

Module Aims:

Develop a knowledge and understanding of the computer-based methods used for simulation and analysis in

engineering;

Explore the basic functionality of typical examples of specialist Computer Aided Engineering simulation

software;

Provide an understanding of the importance of validating computer generated results using a combination of

manual and simple experimental methods.

Intended Learning Outcomes:

Successful students will typically:

- * explain the importance of validating software to ensure that results are realistic;

Successful students will typically:

- * design CAE simulations from a practical engineering problem;

- * apply specialist simulation software to solve typical engineering problems;

- * analyse results from a computer simulation and draw conclusions.

Module Content:

The module will introduce students to the use of Computer Fluid Dynamics (CFD) and Finite Element Analysis

(FEA) software used to assist in the analysis engineering designs. The basic functionality of specialist software

will be explored, producing an awareness of the range and scope of standard CAE software and techniques

currently used in engineering.

Students will be introduced to the best practices in using the software and will focus on concepts embedded

and taught in the vehicle and aerospace disciplines. Emphasises will be put in the importance of questioning

and validating computer generated results by comparison with theoretical models and experimental methods.

A hands-on, task based approach will be adopted, encouraging independent learning. Case studies will be used

in order to simulate the solutions to real world problems. The range of delivery styles and the breadth of coursework provides the opportunity for the teaching team to

meet all the module specific learning outcomes. The intended learning outcomes are facilitated through a series

of lectures, practical tutorials and course work to fulfil the aims and learning outcomes of the module, by

encouraging the students to access a variety of resources, such as Studynet, relevant professional and

academic literature and available CAE packages.

Lectures will include:

- Introduction to CFD
- Meshing in CFD
- Convergence in CFD
- Turbulence Modelling
- Introduction to FEA
- Static applications of FEA
- Modal Analysis
- Validation methods

Practical tutorials will include:

- Introduction to CFD software;
- Introduction to FEA software.
- Introduction to case study based assignments.

In addition to lectures and practical sessions, practical assignments will be supported by weekly drop-in

workshops.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Site Surveying and Setting Out

Module code: 4ENT1135

Semester: A

Credits: 15

Module Aims:

Understand the role and importance of the survey operations that occur at each stage of a Civil Engineering project. Acquire the theoretical and practical skills necessary to carry out the common survey processes required for Civil Engineering projects.

Intended Learning Outcomes:

Successful students will typically:

- Apply the principles of basic survey instrumentation used in Civil Engineering.
- Demonstrate the basic surveying methods commonly used in Civil Engineering

Successful students will typically:

- Apply the general principles of surveying to fulfil the typical requirements of Civil Engineering projects.
- Measure angles, distances and levels using theodolites, EDMs, tapes and levels.
- Apply appropriate surveying techniques to provide control, carry out detail surveys, and set out works on site,
- Present data as drawings, calculations and field records in a clear and professional manner.
- Work successfully as a member of a team.

Module Content:

Summary of what module involves

This module will typically include:

- The appropriate and correct use of levels, theodolites, EDM's, plumbs, lasers, data-loggers, tapes and

associated equipment, to carry out:

- Levelling, contouring, provision of vertical control and bench marks, area and volume calculation, mass-haul

calculations.

- Plan control, traversing, angles, bearings and linear measurement.
- Detail surveys, manual recording and data-logging.

- Setting out profiles, site and slope rails, buildings, drains and horizontal circular curves.
- Checking verticality
- Calculations, including misclosure, adjustment and accuracy assessment of the above processes.
- Scale, co-ordinate systems, grids, automatic and manual plotting and plan production.
- What the student will learn from the module

Students will learn the surveying processes that commonly occur in Civil Engineering projects, the importance

of accurate observation, and how to successfully carry out the work involved

- Why will this be of benefit

Surveying is an essential part of virtually all Civil Engineering projects and is required at every stage, from initial

plan production, to dimensional control and producing as-built drawings.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Smart Systems

Module code: 6ENT1030

Semester: A

Credits: 15

Module Aims:

Consolidate their understanding of the principles of contemporary operating systems to support a smart environment; understand the application of smart systems operating in a cloud-based environment; * understand the technological requirements of different operating system applications.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * analyse the performance of a range of modern operating systems; * evaluate the operational needs of operating systems for specific platforms supporting smart environments; * describe the principles of cloud-based support and delivery. Skills and Attributes: Successful students will typically: * relate the technical performance of a contemporary operating system to user needs within the context of a smart environment; * recommend and deploy suitable operating system to support a specific platform and a set of user needs; * report and present the outcomes of a task.

Module Content:

The student will be introduced to a range of modern operating systems and networked smart environments through a combination of lectures, tutorial and practical, hands-on, sessions. The module provides a framework for understanding the principals and limitations of a range of operating systems. A Case Study approach will be used to assess requirements, develop specifications and development Smart systems. The student will then be able to apply the knowledge, experience and understanding gained on this module to a range of environments within the wider computer industry. Lecture topics will typically include coverage of: 1. Operating Systems Concepts. 2. Smart-System and Operating-System Structures. 3. Processes, Deadlocks. 4. Memory management, Virtual Memory 5. File System Implementation, I/O Systems, Mass-Storage Structure. 6. Multiplatform operating environments; from mobile and embedded systems to server and cloud based OS. 7. Appropriate references would be made to LINUX, Windows, iOS, in order to be able to compare and contrast features and implementation issues of operating systems with migration capability to different platforms. Coursework typically consists of class tests, lab work and written assignments

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

60 Exam 40 ICA The successful candidates are required to pass overall

Module name: Smart Technology

Module code: 4ENT1102

Semester: A

Credits: 15

Module Aims:

Recognise the technical requirements of a range of smart systems; understand the importance of appropriate human-machine and machine-machine interface design strategies; have a broad understanding of the fundamental concepts underlying the science of human machine interaction; with particular reference to smart devices and surface computing.

Intended Learning Outcomes:

Successful students will typically:

- * describe the appropriate design methodologies required to implement fundamental smart interactive environments utilising re-purposed content;
- * recognise the basic technical interface requirements for a selection of contemporary smart systems;
- * explain, at an introductory systems level, the technical operation of a range of smart systems.
- * compare, at an introductory level, the application of devices in the context of a digitally converged world;

Successful students will typically:

- * apply standard PC-software to design and develop basic smart interactive environments;
- * reflect on the results of an investigation of an appropriate smart system.

Module Content:

This module will introduce students to the use of a range of smart systems, from modern gaming platforms

through to web-based applications and mobile apps. All these systems make extensive use of a range of digital

media and you will develop fundamental skills and understanding of the basic technologies that support

contemporary entertainment systems. Examples include; games platforms, home entertainment systems,

mobile systems, surface systems, interactive web systems.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Software Application Practice

Module code: 4ENT1100

Semester: A

Credits: 15

Module Aims:

Plan, acquire and manipulate digital assets as part of a managed process; develop competence in the use of contemporary digital tools and applications.

Intended Learning Outcomes:

Successful students will typically:

- * describe the fundamental aspects of a range of professional computer-based tools and applications to support

specific technological requirements;

- * recognise how documentation, both paper and electronic, forms the definitive description of a product of

process and why it must comply with agreed conventions.

Successful students will typically:

- * use a range of computer-based packages to develop a simple artefact appropriate to their preferred studyroute and be competent in evaluation of typical aspects of its performance;

- * produce and interpret simple examples of documents which communicate design requirements and which

comply with relevant industry standards and conventions;

- * present results in a variety of ways to a professional standard.

Module Content:

This module introduces students to the fundamental aspects of typical processes found in contemporary digital

media production and infrastructure support. In addition to practical exercises, a series of lectures introduces

students to a range of digital technologies. The module also aims to develop further the student's ability to use

typical digital media tools. In general material is taught as far as possible by practical 'hands-on' project-based

work with the aim of developing not only an appreciation of the techniques involved, but also a basic level of skill

in their application.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Sound & Psychoacoustics

Module code: 4ENT1125

Semester: A

Credits: 15

Module Aims:

Describe the fundamental physical properties of sounds and how these relate to the physiological and cognitive aspects of human hearing; describe the fundamental concepts underlying the science of psychoacoustics, with particular reference to the way in which these concepts relate to modern electronic sound data reduction strategies; describe the concepts underlying the ways in which the design of selected audio systems is influenced by human physiological and cognitive auditory processes.

Intended Learning Outcomes:

Successful students will typically:

- * identify the common parameters used to measure the physical characteristics and features of sound, and be

able to relate these quantities to the human perception of auditory data;

- * describe the limitations of human auditory within the context of electronic reproduction of sound;

- * explain basic concepts involved in quantifying and describing sound data, including digital sampling rates and

resolution and the transformation of sound data from time domain into the frequency domain.

Successful students will typically:

- * use standard PC or lab based equipment to make simple measurements of typical audio physical parameters

and human perception of sound;

- * apply simple PC based software to produce examples of compressed audio data;

- * analyse, at an introductory level, the results of selected examples of sound data compression parameters. The following topics are typically covered in this module:

SOUND

Physics of sound propagation in air: eg waves; velocity; rarefaction/ compression.

Measurement, digital representation and perception of sound parameters: eg SPL; hearing threshold; audible

and line dB scales; frequency/pitch; dynamic range.

Complex sounds and their measurement and representation: eg harmonics; complex wave synthesis;

description/analysis in frequency domain; noise; S/N ratio. Underpinning mathematics is reviewed as these

concepts are introduced. The application of software such as MATLAB for analysis and manipulation of sound

data is introduced.

PSYCHOACOUSTICS

Physiology and cognitive aspects of human auditory processes: eg ear as a spectrum analyser; logarithmic

loudness perception; audible frequency range and sensitivity dependence; sound masking; spatial perception

issues.

Psychoacoustics and encoding: eg bandwidth restriction, masking, spatial cue extraction; fundamentals of

surround sound and compression strategies.

Electrical representation of sounds: eg microphones, digitisation, bit depth issues; digital sampling rate issues

Module Content:

This module first gives an introduction to the fundamental physical properties of sound, and to the physiological

processes underlying human perception of sounds. The module continues with an introductory-level examination of how the characteristics of human perception of sounds is exploited in modern sound compression strategies. Fundamental mathematical techniques are taught within the module as necessary.

These include the concepts of logarithmic scales and units, such as the decibel scale for audio measurements,

sampling rates, resolution and the effects of digitisation.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
50%	50%	%

Module name: Space Dynamics

Module code: 6PAM0027

Semester: B

Credits: 15

Module Aims:

Understand and apply core physics concepts to the area of space dynamics, including orbital trajectories, orbital stability, the influence of non-gravitational forces, and the spin dynamics of spacecraft; gain experience in numerical methods and the visualisation of dynamical problems.

Intended Learning Outcomes:

Successful students will typically:

- summarise the core physics concepts and their application in orbital and rotational dynamics;
- explore practical techniques in numerical modelling of dynamics applied to astronautics;
- explain the physical processes that govern the orbits of spacecraft.

Successful students will typically:

- select appropriately between analytical and numerical approaches to solving problems in space dynamics;
- model the orbital and rotational physics of spacecraft using computational methods;
- take responsibility for their own learning via the group space mission development project, appraising alternative plans and communicating the conclusions effectively.

Module Content:

Space dynamics is a coursework-only module. Students work in a computer lab supervised by the module

facilitator. There are no formal lectures. Instead, students work their way through a set of computer exercises

using Matlab. The exercises allow the student to tackle problems in different ways and develop their own style

of problem-solving. The module covers various aspects in spacecraft dynamics including: atmospheric drag;

aerobraking; transfer orbits; injection orbits; spacecraft spin; the stability of spinning motion – Euler's

equations; three-dimensional spin motion and mass models of irregular objects.

Academic year 2021-2022

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Stability & Control of Aircraft

Module code: 6AAD0018

Semester: A

Credits: 15

Module Aims:

Develop an understanding of the dynamics of rigid aircraft flight and of the significance of aircraft dynamic and stability characteristics in aircraft design; extend their knowledge of control systems and design simple controllers to modify an aircraft's natural modes of flight.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * identify the natural modes of an aircraft and explain an aircraft's long term response to control inputs. Skills and Attributes: Successful students will typically: * apply analytical techniques to study the static and dynamic stability of an aircraft and its response to control inputs; * design controllers to modify the speed, accuracy and damping of an aircraft's flight motion using both continuous and digital state space methods; * use a computer to simulate the dynamics of an aircraft and the performance of a control system.

Module Content:

This module explores the stability of an aircraft through mathematical modelling and analysis and how to augment the aircraft stability using state space control systems techniques. Topics include: aircraft natural modes, linearised aircraft equations of motion, aerodynamic derivatives, analytical solution of aircraft equations of motion, long term effects of controls, aircraft static stability, state space modelling of aircraft, stability of state space models, control using state space methods, principles of digital control, control using digital state space methods. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning. Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow students to practice and refine their skills. Topics include: 1. Aircraft natural modes (10) - physical description; influence of aircraft design on their characteristics. 2. Formulation of linearised aircraft equations of motion. (10) - Longitudinal and lateral equations of motion 3. Aerodynamic derivatives (10) - Definition; effects of aircraft design; introduction to experimental methods to determine them. 4. Analytical solutions of aircraft equations of motion. (10) - Identification of natural modes from their solution. Approximate solutions and assessment of their accuracy. 5. Long term effects of controls. (5) - Response of aircraft to thrust and elevator changes; steady turns; sideslipping motion. 6. Aircraft static stability. (5) - Derivation of condition for longitudinal static stability and elevator angle to trim. CG margin and neutral point. 7. State space modelling (15) - State and output matrix equations. Simulation of aircraft using state space models. Transfer function matrix, characteristic equation, Routh stability criterion. 8. Control using state space methods (15) - State controllability and observability, canonical forms. State feedback and state estimators to modify the natural modes of an aircraft. 9. Principles of digital control (5) - Difference equations, z-transforms, A/D and D/A converters and zero order hold model. 10. Digital state space methods (15) - digital form of state space models, digital state and time response, stability of digital state space models, digital canonical forms, design of controllers using digital state feedback and digital state estimation. Computer simulation software and controller design packages will be used throughout the course.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

60 Exam 40 ICA The successful candidates are required to pass overall. All Learning Outcomes to be assessed in both Exam and ICA.

Module name: Structural Mechanics

Module code: 5ent1012

Semester: B

Credits: 15

Module Aims:

Extend their understanding of engineering and scientific principles appropriate to mechanical engineering; gain an understanding of fundamental mechanics concepts and structural behaviour for combinations of types of loading; further their knowledge and understanding of mechanics.

Intended Learning Outcomes:

Successful students will typically:

- * describe the principles of mechanics for bending and torsion;
- * identify the theoretical response of engineering components to complex applied loading systems.

Successful students will typically:

- * apply the basic principles of structural analysis in determining the behaviour of simple structures;
- * analyse relatively complex assemblies of structural components

Module Content:

This module includes shear force-bending moment diagrams, beam theory, combined loading conditions, direct

stress/strain, shear stress/strain, torsion of shafts, bending stresses in beams with unsymmetrical sections, and power transmission. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning.

Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow

students to practice and refine their skills.

Topics include:

1. Further studies on shear force and bending moment diagrams, second moment of area, engineers theory of

bending, beam theory, combined bending and direct loading.

2. Torsion of shafts, power transmission using circular shaft.

3. Thermal stressing.

4. 2D stress and strain analysis Analysis of stress and strain in two dimensions, Poisson's ratio, Hooke's Law

for 2-D stress, Mohr's stress circle. Rosette strain gauge analysis, Mohr's strain circle.

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5. Bending stresses in beams with unsymmetrical sections.
6. The failure theories.
7. Integration of moment equation for beam displacements
8. Fundamental strut theory.
9. Effects of support constraints and combined loads, instability of struts, Euler buckling theory, effect of end.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
70%	30%	%

Module name: Structural Mechanics

Module code: 5ENT1012

Semester: B

Credits: 15

Module Aims:

Extend their understanding of engineering and scientific principles appropriate to mechanical engineering; gain an understanding of fundamental mechanics concepts and structural behaviour for combinations of types of loading; further their knowledge and understanding of mechanics.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * describe the principles of mechanics for bending and torsion; * identify the theoretical response of engineering components to complex applied loading systems. Skills and Attributes: Successful students will typically: * apply the basic principles of structural analysis in determining the behaviour of simple structures; * analyse relatively complex assemblies of structural components

Module Content:

This module includes shear force-bending moment diagrams, beam theory, combined loading conditions, direct stress/strain, shear stress/strain, torsion of shafts, bending stresses in beams with unsymmetrical sections, and power transmission. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning. Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow students to practice and refine their skills. Topics include: 1. Further studies on shear force and bending moment diagrams, second moment of area, engineers theory of bending, beam theory, combined bending and direct loading. 2. Torsion of shafts, power transmission using circular shaft. 3. Thermal stressing. 4. 2D stress and strain analysis Analysis of stress and strain in two dimensions, Poisson's ratio, Hooke's Law for 2-D stress, Mohr's stress circle. Rosette strain gauge analysis, Mohr's strain circle. 5. Bending stresses in beams with unsymmetrical sections. 6. The failure theories. 7. Integration of moment equation for beam displacements 8. Fundamental strut theory. 9. Effects of support constraints and combined loads, instability of struts, Euler buckling theory, effect of end.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
70%	30%	%

70 Exam 30 ICA The successful candidates are required to pass overall. All Learning Outcomes to be assessed in both Exam and ICA.

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Module name: Sustainable Business of Electronics

Module code: 4ENT1112

Semester: A

Credits: 15

Module Aims:

Develop the responsibilities associated with working in and contributing to a team; acquire an understanding of Intellectual Property Rights (i.e. Copyright, Trademarks, Patents and Designs); acquire an understanding of Regulations and Industry Compliance in European union (CE, RoHS, EMC, WEEE, Energy, ISO9000, 9001 etc); gain knowledge of Ethical, Social and Environmental issues relevant to today's sustainable development focusing on industries within the global market.

Intended Learning Outcomes:

Successful students will typically: * identify ethical, legal, economic, social and environmental issues of an engineering business; * explain the compliance and regulations involved in engineering business for sustainable and energy efficient benchmarks; * describe the position and role of contemporary electronics industries within the global economy. 9b. Skills and Attributes: Successful students will typically: * illustrate a range of Intellectual property rights (IPRs) and EU compliance, regulations, economic, social and environmental issues on global electronic engineering industries; * differentiate between, and compare, the essential features of typical electronics industries with other manufacturing industries.

Module Content:

This module will enable the student to gain an understanding of ethical, legal, social and environmental issues current in the electronics industry. This will be achieved through a combination of lectures by staff and external speakers from industry. Students will develop their team working and communication skills through the design and development of a product to meet customer needs. Finally, a typical example of a global electronics company is examined to give the student an understanding of the wider commercial issues implicit in this industry, including the role of quality and continuous improvement. Ethical, legal, social and environmental issues relating to a sustainable engineering business - use of low

power consumption components, environment friendly power supplies, end of life disposal of electronic

products, environmental issues associated with different methods of PCB production, use of recyclable

materials, effect of miniturisation, commercial and economic context, legal requirements including personnel,

health & safety, eco-friendly and environmental risk issues, customer values.

The above topics should be illustrated by means of case studies and videos where possible.

Identify and translate customer needs into a design, through the application of management and business

techniques-

Market research, questionnaire design, forecasting, company set-up and finance, product costing and project

management.

Recognise the professional responsibilities of working within a team.

Communication methods, appraise individual performance within a team.

Inviting external speakers from Industry to highlight the significance of issues involved in Business of

Engineering (i.e. IPRs, Ethics, Regs & Compliance, Sustainability, Energy Efficiency, Eco-friendly Industries

etc)

Case studies of a typical global electronics market (including e-business) - product range, market size, global

impact, with comparisons to other manufacturing industries.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

Module name: Systems Integration for Biomedical Applications

Module code: 6ENT1048

Semester: B

Credits: 15

Module Aims:

Gain deeper knowledge and develop an understanding of the engineering interactions between various integrated functions related to “In the body”, “On the body” and “Off the body” biomedical systems;

Select and apply appropriate engineering skills to develop and evaluate complex, integrated biomedical systems.

Intended Learning Outcomes:

Successful students will typically:

- * understand the ethical and regulatory requirements for biomedical systems;

Successful students will typically:

- * identify various engineering requirements to integrate engineering components in a biomedical system;

- * use appropriate engineering tools to develop and critically evaluate biomedical systems;

- * demonstrate competency in experimental practice;

- * present, analyse and evaluate findings clearly.

Module Content:

This module aims to introduce the student to systems and instruments used in biomedical applications. It aims

to develop a student’s ability to identify the various engineering requirements necessary and implement

software and hardware in conjunction with biological integration for control of biomedical systems.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
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Academic year 2021-2022

60%	40%	%
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Module name: Telecommunication Systems

Module code: 6ELE0074

Semester: B

Credits: 15

Module Aims:

Further develop their knowledge of telecommunications techniques, with particular reference to digital aspects of communications.

Intended Learning Outcomes:

Successful students will typically:

- * explore the main principles of digital modulation and multi-access techniques.
- * examine typical coding and channel equalisation techniques.

Successful students will typically:

- * analyse, and critically evaluate, in mathematical terms, typical modulation schemes.
- * analyse and critically evaluate typical channel equalisation techniques.

Module Content:

This module further develops students' knowledge of modern telecommunications systems. The emphasis is on

digital aspects of communications, with study of typical digital and multi-user modulation strategies. Also

covered in the module is study of the effect of channel properties and of channel equalisation techniques.

Treatment of the material is analytical, supported by practical study of typical systems

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

Module name: Thermofluid Mechanics

Module code: 5ENT1079

Semester: A

Credits: 15

Module Aims:

Further their understanding of the principles and practical applications of thermodynamics; further their understanding of the principles and practical application of fluid mechanics.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * recognise the practical implications of the second law of thermodynamics and concept of entropy; * describe the nature and behaviour of semi-perfect gases, gaseous mixtures and 3-phase pure substances; * identify a range of practical applications of the vapour and power and refrigeration cycles. Skills and

Attributes: Successful students will typically: * analyse viscous incompressible fluid flow in a range of applications; * analyse and characterise the performance characteristics of heat pumps and heat engines; * utilise water/steam tables & charts and analyse simple water/steam power systems.

Module Content:

This module further extends the student's knowledge and understanding of thermodynamics and fluid mechanics. Topics will include: the second law of thermodynamics; viscous flow systems for incompressible fluids; the nature and behaviour of semi-perfect gases, gaseous mixtures and 3-phase pure substances; water/steam fundamentals and applications to power systems; consideration of a range of practical applications of fluid power cycles; flow round immersed objects, cross stream forces. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning. Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow students to practice and refine their skills. Topics include: Semi-perfect gas: Internal energy as a function of temperature, linear relationship between specific heat capacities and temperature. Equations for the change in entropy for a perfect and semi-perfect gas. Isentropic processes for a perfect gas. Isentropic efficiency. The second law of thermodynamics: Direct and reversed heat engines, supporting evidence and corollaries. Thermodynamic temperature scale, absolute temperature scale. Efficiency of a reversible heat engine in terms of absolute temperature. Definition of entropy as a property of a system. Entropy changes in reversible and irreversible adiabatic processes. Viscous flow: Boundary layer growth, mass flow and momentum of fluid at a section of boundary layer. Displacement and momentum thickness, their practical significance and relevance to numerical schemes. Momentum integral equation. Laminar and turbulent boundary layers. Transition. Flow separation. Factors affecting transition and separation. Flow round immersed bodies: Pressure gradient across a curved streamline. The generation of cross-stream forces. Lift. Drag. Sources of drag and means of reduction. Vortex system of lifting bodies. Free and forced vortices. Vapour power cycles: Carnot and Rankine cycle, relevance to vapour power plants. Refrigeration cycles. Properties of refrigerants. Vapour compression refrigeration cycles involving superheat and undercooling. Heat pumps, use for space heating and cooling.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
70%	30%	%

70 Exam 30 ICA The successful candidates are required to pass overall. All Learning Outcomes to be assessed in both Exam and ICA.

Module name: Thermofluid Mechanics & Heat Transfer

Module code: 6AAD0005

Semester: A

Credits: 15

Module Aims:

Develop an in-depth understanding of all modes of heat transfer and thermodynamics of gas power cycles.

Intended Learning Outcomes:

Successful students will typically:

- * summarise the principles of heat transfer by conduction, convection and radiation;
- * explain combustion in IC engines and gas turbines cycles;
- * identify practical considerations that influence the performance of IC engines and gas turbines;
- * examine in-depth the isentropic and non-isentropic flow in a variable area duct.

Successful students will typically:

- * analyse and calculate the rate of heat transfer from various thermodynamics systems by conduction, convection and radiation;
- * apply the concept of gas power cycles to IC engines and gas turbines;
- * analyse isentropic compressible flow.

Module Content:

Thermodynamics and Heat Transfer - Steady state conduction heat transfer. Natural and forced convection.

Heat transfer by a conduction. Overall heat transfer coefficient through multiple conductors. Thermal radiation

and concepts of black and grey bodies. Stefan-Boltzmann constant and radiation heat transfer estimation.

Principle of combustion. Laminar and turbulent flames. Combustion chemistry and calculations. Wet and dry

analysis of combustion products. Gas power cycles. Joule-Brayton cycle. Real gas turbine cycle and its

performance parameters. Reciprocating internal combustion engine cycles. Processes forming the Otto, diesel

and dual cycles and performance parameters. Engines emission, major pollutants and methods of pollutants

reduction. Turbo and super charging internal combustion engines.

Fluid Mechanics - Isentropic compressible flow in ducts. Subsonic and supersonic flow. Normal shock, oblique

shock, and expansion waves.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

Module name: Vehicle Aerodynamics and Design

Module code: 5ENT1089

Semester: B

Credits: 15

Module Aims:

Develop the process of design and application of validation and measurement, to a product design; in order to provide customer value and assured trouble free use of the product; appreciate how to design vehicle shapes that produce desirable aerodynamics performance.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: describe methods used in wind tunnel testing and recognise the limitations; * demonstrate understanding of the process of developing an automotive product; * explain the benefits of benchmarking and recognise the relationship between function, cost and value. Skills and Attributes: Successful students will typically: * assess the influence of aerodynamic factors on vehicle performance and fuel efficiency

Module Content:

This module introduces students to the fundamental concepts of vehicle aerodynamics and the modelling of aerodynamic performance by wind-tunnel testing. The design section applies the principles of the product development process specifically to the vehicles and automotive components including benchmarking; QFD; design specification; validation plan and project management culminating in the production of engineering solutions, supported by drawings; analysis and calculation. Knowledge and understanding is achieved through the delivery of lectures, tutorials and directed learning. Problem sheets in tutorials, additional problems set as directed learning and laboratory experiments allow students to practice and refine their skills. VEHICLE DESIGN (66) - Benchmarking: collate; analyse; and prioritise customer requirements, to describe a product that the customer would value and want to own. - Specify performance and functional criteria to meet customer requirements, in operating environment, for life. - Awareness of professional liability. - Establish validation plan to prove out product meets requirements, fit, function appearance etc. - Establish project plan to achieve required time to profit. - Manage project and component design versus plan. Analyse; decide; report; and recommend. VEHICLE AERODYNAMICS (34) - Drag; Sources, means of reduction. Influences on design and styling. Economic implications. - Lift: Influence of lift and sideforces on handling and performance. Methods of lift reduction. -Wind-tunnel testing: Sources of error, Reynolds number, blockage, floor boundary layer. Methods of correction and solution. Types of tunnel and facilities, moving floor etc. Instrumentation and testing techniques. - Performance: The influence of aerodynamic factors on performance, road-holding and fuel economy.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Vehicle Design

Module code: 6ENT1067

Semester: A

Credits: 15

Module Aims:

Participate in a group-based major design project (related to degree option); further their understanding of the complete design process from issue through concepts to realisation; further develop creative skills, written and oral communication skills and produce supporting information.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * demonstrate a detailed understanding of the design process; * define appropriate analytical/modelling tools in order to support the design process. Skills and Attributes: Successful students will typically: * identify requirements and develop appropriate solutions within a design; * demonstrate an effective and sustained contribution to the working of a design team; * select appropriate materials, processes and bought-out components and systems appropriate to automotive or motorsport design; * design within constraints such as regulations, cost, weight, performance and sustainability criteria; * present the results of their work.

Module Content:

This module aims to: (i) provide experience of automotive or motorsport design and the interactive requirements of engineering products, (ii) extend the student's experience in the detail design and validation of vehicle components, units and systems, and (iii) encourage a professional attitude to the application of engineering knowledge and skill, with specific reference to market/customer requirements, aesthetics, performance, cost, safety, legal requirements, standards and regulations. It will also address the human issues relating to automotive or motorsport design and promote the innovative element of the design process. It encompasses various individual assignments (addressing specific areas of vehicle engineering technology) and group projects (in groups of 4-6 students, including planning, monitoring and reviewing work done, management of manufacture, testing and presenting the result in written, graphical and oral forms). To an extent group members will be taking on a specialist role within group project work. There is no fixed syllabus for this module. The individual assignments will address specific areas of vehicle engineering technology which may not be covered by the group project. Detailed design schemes with supporting evidence confirming the validity of decisions made will be required. The Group Projects will be handled by groups of 4-6 students. Each group will base its design on an issue in the automotive or motorsport industry today. The design will develop from this general idea and therefore each group will follow a unique path to their design. The project will include planning, monitoring and reviewing work done by the group, including the management of manufacture, the test and presenting the result in written, graphical and oral forms. Groups will be required to meet regularly and discuss progress with tutors. Each member of the group will have specific tasks but will be involved in other tasks as necessary for the efficient fulfilment of the project. Examples of Projects & Assignments Where possible projects and supporting material will be obtained from industry. Assignments would normally be university-based. Typical examples are:- - Major vehicle design study, including concept generation for any chosen issue relating to road transportation or motorsport. - Vehicle component modelling using

CAD design software and any CAE package appropriate to the particular design. - Analysis of the designed component/system using an appropriate CAE technique (CFD, FEA, Crash testing etc). - External lectures including vehicle styling and application of CFD, law, environment and non performance related topics - Application of experimental design within the design process and possible lab-based verification studies.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Vehicle Engineering Design

Module code: 6AAD0022

Semester: A

Credits: 15

Module Aims:

Participate in a group-based major design project (related to degree option); further their understanding of the complete design process from issue through concepts to realisation; further develop creative skills, written and oral communication skills and produce supporting information.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: * demonstrate a detailed understanding of the design process; * define appropriate analytical/modelling tools in order to support the design process. Skills and Attributes: Successful students will typically: * identify requirements and develop appropriate solutions within a design; * demonstrate an effective and sustained contribution to the working of a design team; * select appropriate materials, processes and bought-out components and systems appropriate to automotive or motorsport design; * design within constraints such as regulations, cost, weight, performance and sustainability criteria.

Module Content:

This module aims to: (i) provide experience of automotive or motorsport design and the interactive requirements of engineering products, (ii) extend the student's experience in the detail design and validation of vehicle components, units and systems, and (iii) encourage a professional attitude to the application of engineering knowledge and skill, with specific reference to market/customer requirements, aesthetics, performance, cost, safety, legal requirements, standards and regulations. It will also address the human issues relating to automotive or motorsport design and promote the innovative element of the design process. It encompasses various individual assignments (addressing specific areas of vehicle engineering technology) and group projects (in groups of 4-6 students, including planning, monitoring and reviewing work done, management of manufacture, testing and presenting the result in written, graphical and oral forms). To an extent group members will be taking on a specialist role within group project work. There is no fixed syllabus for this module. The individual assignments will address specific areas of vehicle engineering technology which may not be covered by the group project. Detailed design schemes with supporting evidence confirming the validity of decisions made will be required. The Group Projects will be handled by groups of 4-6 students. Each group will base its design on an issue in the automotive or motorsport industry today. The design will develop from this general idea and therefore each group will follow a unique path to their design. The project will include planning, monitoring and reviewing work done by the group, including the management of manufacture, the test and presenting the result in written, graphical and oral forms. Groups will be required to meet regularly and discuss progress with tutors. Each member of the group will have specific tasks but will be involved in other tasks as necessary for the efficient fulfilment of the project. Examples of Projects & Assignments Where possible projects and supporting material will be obtained from industry. Assignments would normally be university-based. Typical examples are:- - Major vehicle design study, including concept generation for any chosen issue relating to road transportation or motorsport. - Vehicle component modelling using CAD design software and any CAE package appropriate to the particular design. - Analysis of the

designed component/system using an appropriate CAE technique (CFD, FEA, Crash testing etc). - External lectures including vehicle styling and application of CFD, law, environment and non performance related topics - Application of experimental design within the design process and possible lab-based verification studies.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Vehicle Structural Analysis and Manufacture

Module code: 6AAD0023

Semester: B

Credits: 15

Module Aims:

Establish competence in applying appropriate techniques for the analysis of stress and strain in vehicle

structures and components;

Understand the principle methods used to manufacture the automobile.

Intended Learning Outcomes:

Successful students will typically:

- * describe typical automotive forming, joining and finishing processes;
- * identify the principal forms of automotive corrosion;
- * identify the techniques used to analyse automotive sheet formability.

Successful students will typically:

* apply analysis techniques in vehicle design, primarily for the modelling of vehicle frame and body structures

by finite element analysis;

- * apply crash analysis techniques and regulations in the analysis of crashworthiness;
- * use commercial software packages to model automotive components and structures.

Module Content:

The structural analysis section of this module will extend the students' skills learnt in previous modules,

particularly FEA methods, to the analysis of vehicle bodies including the development of body-in-white

modelling, crash worthiness and occupant protection.

The Manufacturing section will further extend the students' understanding of joining, forming and finishing

techniques particularly applied in the modern automotive industry.

Academic year 2021-2022

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
60%	40%	%

Module name: Vision and Image Perception

Module code: 4ENT1084

Semester: B

Credits: 15

Module Aims:

Have a broad understanding of the fundamental concepts underlying the science of human visual image perception, with particular reference to the way in which these concepts relate to modern electronic image data reduction strategies;

Recognise the ways in which the design of selected video systems is influenced by human physiological and cognitive visual processes;

Gain a basic understanding of the generation, manipulation, refinement and encoding of visual material for a variety of media applications.

Intended Learning Outcomes:

Successful students will typically:

- * identify the common parameters used to measure the physical characteristics of images, and relate these

quantities to the human perception of visual data;

- * explain the limitations of human visual processes within the context of digital representation of images;

- * describe the basic concepts involved in representing, manipulating and analyzing image data in digital form.

Successful students will typically:

- * use standard PC-software to make simple measurements and perform statistical analysis of typical image

physical parameters and attributes, such as image luminance and colour, spatial resolution;

- * critically appraise and compare, at an introductory level, the results of examples of image data compression

parameters;

- * present and reflect on the results of work involving the capture, manipulation and encoding of digital visual

artefacts.

Module Content:

This module gives an introduction to the fundamental physical properties of light and to the physiological

processes underlying human perception of images. Also included is an introductory-level examination of how

the characteristics of human perception of images are exploited through contemporary digital media representation and compression strategies. Practical work will provide an introduction to basic video editing

techniques and statistical analysis of image.

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
50%	50%	%

Module name: Visualisation & Animation Technology

Module code: 6ELE0076

Semester: AB

Credits: 30

Module Aims:

Develop their graphics development skills to create and manipulate images of 3-dimensional objects; explore the ways in which 3-dimensional graphics contribute to virtual reality, animation and interactive visualisation techniques.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: evaluate appropriate data structures and algorithms used to represent and render realistic 3-dimensional scenes; relate a range of applications of 3-dimensional graphics to virtual reality, animation and interactive visualisation. **Skills and Attributes:** Successful students will typically: determine and use an appropriate methodology to create and manipulate images of 3-dimensional objects; report upon, both individually and in small groups, the design and implementation of an interactive visualisation incorporating graphics and animation techniques; create and evaluate a simple, interactive, virtual reality environment.

Module Content:

This module builds on the fundamentals of programming and animation/multimedia techniques and extends the students' skills and knowledge into 3-dimensional graphics, animation and virtual reality. The majority of the contact time is spent on a number of practical, laboratory-based, exercises that give the students first-hand experience of 3-D graphics. These exercises are supported by lectures to introduce some of the key concepts. The learning outcomes will be supported by coverage of the following topics, both in lectures and in practical programming exercises: Representation of objects in 3D. Mapping from 3D to 2D representations. Viewpoint transformations. Perspective. Scaling and translation of 3D objects. Rotation around an arbitrary axis. Image Rendering- hidden face elimination, back-face culling, Painter's algorithm, Z-buffer algorithm, colour and shading, ray-tracing, texture mapping. Analysis of state-of-the-art graphics and animation methodology. 3D animation. Sensors and displays for virtual reality systems. The creation of an interactive virtual environment. Examples of real-world applications of virtual reality such as for example, design prototyping, architecture, molecular modelling, games and leisure activities and military training. The mathematics necessary to support content such as 2D to 3D mapping, scaling, translation and rotation etc. will be introduced as required. Group work will be explicitly assessed on this module.

Pre and Co requisites:

None

Total hours: 300

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA

Module name: Web Services

Module code: 5ENT1070

Semester: B

Credits: 15

Module Aims:

Understand the use of web services for application integration in a distributed computing environment; explore alternative web service implementation technologies that are available; extend skills in software development through the creation and use of suitable web services.

Intended Learning Outcomes:

Knowledge and Understanding: Successful students will typically: describe the components and architecture of a typical web service including data representations, messaging protocols and service description; examine the various approaches for implementing any one component or layer within a web service architecture. **Skills and Attributes:** Successful students will typically: create a web service to meet given client requirements; produce an application to generate requests to a web service using appropriately formatted data, and process or display the returned data.

Module Content:

The term "web services" is used to define many different architectures, protocols and technologies, all of which embody the notion of using "standardised" interfaces to allow communication, integration and co-ordination of information between applications distributed over and accessible through a de-centralised network environment. This module introduces the student to the fundamental architectures of web services and the protocols and standards that underpin them. The strengths and weaknesses of alternative implementation technologies will be discussed. As part of this, students will use a range of software tools to construct simple web service clients including the appropriate information and message structures. Lecture and practical project-based work will typically include coverage of: 1. definition, features and benefits of a web service architecture, e.g. loosely coupled systems with high levels of data abstraction that enable flexible application development; 2. the component layers (or technology stack) that make up a web service and that differentiate web services from other web application architectures such as websites; 3. structuring data, using standards such as eXtensible Markup Language (XML), Document Type Definitions (DTDs), the Resource Description Framework (RDF), Dublin Core etc 4. presentation and manipulation of data, using techniques such as eXtensible Stylesheet Language Transformations (XSLT) and Cascading Style Sheets (CSS) etc; 5. messaging through protocols such as Simple Object Access Protocol (SOAP), XML HTTP requests and XML Remote Procedure Calls; 6. specification and brokering using standards such as Web Service Description Language (WSDL) and Universal Description, Discovery and Integration (UDDI); 7. architectures and tools to support web service development, the available types, and factors to consider in their selection. 8. Delivery will be supported through extensive practical, scenario-based, work

Pre and Co requisites:

None

Total hours: 150

Assessment:

Exam	Coursework	Practical
%	100%	%

100 ICA