School of Engineering

Autumn/First Semester Modules **Term: September- December**

Academic Advisors School of Engineering:

Architecture
Academic Advisor
Sharon O'Brien
Tel: +353 51 306190
Email: sobrien@wit.ie

Construction
Academic Advisor
John Carney
Tel: +353 51 302071
Email: jcarney@wit.ie

Electronics
Academic Advisor
Albert Byrne
Tel: +353 51 302033
Email: abyrne@wit.ie

ECTS SUBJECT LISTINGS

This is a provisional guide and modules in this guide are subject to change before the commencement of the academic year 2015-16.

BACHELOR OF ENGINEERING (HONS) IN ELECTRONIC ENGINEERING (WD_EELEC_B) LEVEL 8

Year Two	
Semester 3	**Semester 4**
Analogues Electronic Circuits 2	Analogue Electronic 3
Finite State Machines	Digital Systems
Electric Circuit Theory	Sensors, Fields & Filters
Advance Programming Concepts	Telecommunications 2
Telecommunications 1	Maths Advances calculus
Maths Ordinary Differential Equations	Object Oriented Programming
Year Three	
Semester 5	**Semester 6**
Analogue Control	Industrial Studies Industrial Placement
Advanced Engineering Maths	
Data Structures & Algorithms	
Semiconductor Fundamentals	
Electromagnetic Fields & Waves	
Telecommunications 3	
Year Four	
Semester 7	**Semester 8**
Project 1	Project 2
Microcomputer Hardware	Microcomputer Science
Data Communication (E)	Real – time DSP Imp
IC Design (E)	Digital Comm. Analysis (E)
Applied Electromagnetism (E)	Semiconductor Devices (E)
Telecommunications Engineering (E)	Antennas & Radio Wave Prop (E)
	Applied Embedded Operating Systems (E)
	Digital Control (E)
	(E)= Elective Module

Year 2 – Semester 3 (Sept – Dec)

Code TELE 0006: Telecommunications Theory 1

Credits 5

Description of Module

This is the first telecommunication module in this course. Telecommunications will be covered in other modules in years 2, 3 &4. In this module basic theory of telecommunications is introduced. Description and analysis of different analogue and digital modulation methods are covered then applied to a number of modern telecommunication systems. The module also covers different types of communication receivers. A practical program runs alongside lectures and tutorials to enhance the student understanding of the theory. The student is expected to have very good background in mathematics, electric circuits and analogue & digital electronics.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Have good understanding of the basic theory of telecommunications.
2. Describe and analyse the construction and operation of different types of analogue & digital modulators & demodulators.
3. Demonstrate good background knowledge of different types of communication receivers.
4. Compare between different analogue and digital modulation processes and identify a suitable process for a particular application.

Assessment Methods
1. 70 %: Final 2 hours written examination.
2. 15 %: Continuous Assessment, based on assignments and written tests during semester 3.
3. 15 %: Practical Assessment, based on a series of Laboratory practical and written reports.

Code ADPC 0001: Advanced Programming Concepts

Credits 5
Description of Module
Advanced Programming Concepts module teaches the learner further programming concepts and techniques including strings, arrays, multi-dimensional arrays, recursion, pointers and structures. Further Object Oriented concepts are also introduced in this module.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Describe approaches to programming and problem solving
2. Understand the fundamental concepts of computer programming.
3. Demonstrate ability to write computer programs without the aid of computer software.

Assessment Methods

1. Written (20%) will be a series of graded assessments to cover concepts defined in learning outcomes 1, 2 & 3
2. Practical examination and assessments (80%) to cover concepts defined in learning outcomes 4, 5 & 6
3. Formative assessment will also be used through a 'Demo & Practical' approach as each new concept is introduced.

Code MTHE 0030 - Ordinary Diff Equations

Credits 5

Description of Module

This module gives a rigorous introduction to methods (analytical and numerical) for the solution of ordinary differential equations of first and second order together with necessary background material in multivariable differential calculus and complex variables.

On successful completion of this module, a student will be able to:

1. Check by visual inspection the type of an ordinary differential equation and hence determine whether a unique solution exists.
2. Investigate the general properties of an unseen Special Function using an Engineering handbook or a help file.
3. Recognise standard functions of two variables; find partial derivatives and differentials for such functions.
4. Use standard methods (analytical and numerical) to solve linear and nonlinear ordinary differential equations of first and second order and a system of first order linear equations.
5. Use mathematical software to solve nonlinear ordinary differential equations.

Assessment Methods

1. Final examination (70%).
2. Continuous assessment (30%) will be a number of graded assignment(s) to cover learning outcomes and provide feedback to students regarding progress.

Code ELCT 0001 - Electric Circuit Theory

Credits 5

Description of Module

This course builds on the DC and AC Circuits modules in Year 1 and covers time domain and frequency domain analysis of first and second order electrical systems. It also treats the two-port network approach and the resulting parameters (Z, Y, H, ABCD, and S).

Learning Outcomes

On successful completion of this module, a student will be able to:

1. Illustrate the time and frequency response of 1st and 2nd order passive electrical systems
2. Determine equivalent circuits and component values from given responses
3. Design passive circuits (up to 2nd order) to give desired responses
4. Use two-port network matrices to analyse cascaded circuits etc.

Assessment Methods
1. 70% final examination
2. Practical Assessment (15%) will be a (series of) graded assignment(s) to cover learning outcomes.
3. Laboratory Programme (15%) will permit practical demonstration during the semester of the learning expressed in the outcomes, including technical reports/presentations

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Code FISM 0001 - Finite State Machines

Credits 5

Description of Module

Finite state machines, also known as sequential circuits, are analysed in this module using formal models (Moore and Mealy) to define and specify the system requirements and produce a structured design approach. An appreciation of the problems generated by the absence of a master clock signal in asynchronous circuits will also be developed. Design solutions will be implemented using MSI components and VHDL.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Understand the fundamental concepts of finite state design.
2. Appreciate the relevance of finite state machine optimisation.
3. Generate and test finite state machine implementations and ensure that critical race and hazard conditions, in particular, do not materialise in the asynchronous design options explored.
4. Implement linear sequential circuit applications.
5. Use VHDL as a basis for the description and simulation of finite state machines.
6. Demonstrate an ability to build, test and simulate sequential circuits

Assessment Methods
1. 70%: Written Exam (to assess learning outcomes 1, 2, 3, 4 & 5
2. 30%: Laboratory Practical's (to assess learning outcome 6)

Indicative Content
1. Finite State Machines
2. Synchronous Finite State Machines
3. Asynchronous Finite State Machines
4. VHDL Implementations of Finite State Machines

Code ANEC 0002: Analogue Electronics Circuits 2

Credits 5

Description of Module

The module provides the student with an essential grounding in the areas of Analogue circuit design. The module covers the fundamentals of circuit design and builds on the student's previous knowledge of ideal circuits. The minimisation and control of device induced errors is to the forefront in the teaching of this course.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Demonstrate a sound knowledge fundamental of analogue circuit design
2. Discuss and explain the role of negative feedback in amplifier circuits
3. Discuss the sources of errors in amplifiers constructed from op-amps
4. Show and explain the design of linear op-amp circuits
5. Calculate the frequency response and error response of different circuit designs.
6. Design, build, test and verify the correct operation of circuits related to the theory based lectures

Assessment Methods
1. 70% Final Written Exam
2. 30% Practical Continuous Assessment

Year 2 - Semester 4 (Jan – May)

Code PROG 0081: Object Oriented Programming

Credits 5

Description of Module
This module follows on from the module called Advanced Programming concepts and builds on concepts introduced there. Object Oriented Programming module teaches the student about the Advanced Object Oriented concepts such as classes, inheritance and polymorphism are taught.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Describe approaches to programming and problem solving.
2. Demonstrate ability to write, debug and test well-styled and appropriately-documented programs.
3. Demonstrate the use of OO techniques, using knowledge of the concepts when writing code and when using class libraries.

Assessment Methods
1. Written (20%) will be a series of graded assessments to cover concepts defined in learning outcomes 1 & 3.
2. Practical examination and assessment (80%) to cover concepts defined in learning outcomes 2 & 3.
3. Formative assessment will also be used through a 'Demo & Practical' approach as each new concept is introduced.

Code SEFF 0001: Sensors, Fields & Filters

Credits 5

Description of Module
The course requires DC and AC Circuits modules and follows on from the module called Electric Circuit Theory and builds on concepts introduced there. A survey and analysis of sensors is undertaken. The real transformer is treated. General filter characteristics are considered and design of generic types (Butterworth etc.). A physical and diagrammatic approach is taken to the introduction of Maxwell's eons as a generalisation of the basic electrical laws of 1st yr. (e.g. Ohm's law, Kirchhoff's voltage law, Ampere's circuital law). Physical interpretations of curl, divergence etc. and the surface and line integrals are emphasised.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. To assess sensor merits
2. Explain the significance of phase and magnitude in filter responses
3. Demonstrate an understanding of the quantities B, D, E, H, and J in Maxwell's eons
4. Give a physical interpretation of each of Maxwell's eons and the terms therein
5. Articulate, reason & present clearly in technical reports/ presentations
6. Set up, perform & troubleshoot specified practical experiments, & use simulations

Assessment Methods
1. 70% final examination
2. Practical Assessment (15%) will be a (series of) graded assignment(s) to cover learning outcomes.
3. Laboratory Programme (15%) will permit practical demonstration during the semester of the learning expressed in the outcomes, including technical reports/presentations.

Code TELE 0007: Telecommunications Theory II

Credits 5

Description of Module
This module is a follow up of the module: Telecommunications theory I in semester 3 (TELE 0006). It covers the theory and analysis of data communications, information and noise, the communication channel as well as brief treatment of some

Modern communication systems, such as telephony, satellites, broadcasting and radars. A practical program runs alongside lectures and tutorials to enhance the student understanding of the theory and analysis.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Demonstrate good knowledge and understanding of data communications and data modulation methods, used in modern applications.
2. Analyse information signals and evaluate noise effects on the capacity of a transmission channel.
3. Understand the basic theory and analysis of the communication channel
4. Describe the basic theory, analysis, construction and operation of different modern communication systems.
5. Write meaningful practical reports, in line with a prescribed format, including adequate presentation of practical results, calculations and relevant conclusions.

Assessment Methods
1. 70 %: Final 2 hours written examination.
2. 15 %: Continuous Assessment, based on assignments and written tests during semester 4.
3. 15 %: Practical Assessment, based on a series of laboratory practical and written reports.

Code DSYS 0001: Digital Systems

Credits 5

Description of Module
This module follows on from the module called Finite State Machines and builds on concepts introduced there. As the required size and complexity of digital systems increases, the designer is forced to implement the design using specialised devices called programmable logic devices. These are standard, low-cost components whose logic function can be determined by the end-user. This module will study the options available and examine VHDL in terms of its translation into hardware elements or synthesis. The operating characteristics, manufacturers specifications and applications of D/A and A/D converters will also be investigated and the structure and use of a microcontroller examined.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Explain how ROM and RAM devices operate, how they may be expanded to increase word length and capacity and incorporated in address decoding schemes.
2. Appreciate the flexibility of programmable logic devices and undertake synchronous and asynchronous design solutions using FPGAs, ROM and PAL devices.
3. Use VHDL as a basis for FSM synthesis and simulation.
4. Analyse D/A and A/D conversion techniques, interpret the relevant performance characteristics and recognise typical conversion errors.
5. Understand the basic elements of a microcontroller system.

Assessment Methods
1. 60%: Written Exam (to assess learning outcomes 1, 2, 3, 4 & 4)
2. 40%: Laboratory Practicals / Mini Project (to assess learning outcome 6)

Code MTHE 0031: Maths Advanced Calculus

Credits 5

Description of Module
This module presents a standard course in multivariable calculus (including vector analysis) together with (i) an introduction to the representation of periodic functions with trigonometric series and (ii) a brief introduction to the mathematical analysis of random variables.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Follow discussions on theoretical developments in the literature which are based on concepts from multivariable calculus.
2. Demonstrate competency in algebraic manipulation of expressions involving differential operators.
3. Evaluate iterated integrals, line integrals and surface integrals using hand calculation and using mathematical software.
4. State and use the integral theorems (Divergence, Stokes and Greens).
5. Understand in broad outline the criterion on which the approximation of real periodic functions using trigonometric series is based and to derive an approximation from first principles and to discuss its properties.

Assessment Methods
1. Final examination (70%).
2. Continuous assessment (30%) will be a number of graded assignment(s) to cover learning outcomes and provide feedback to students regarding progress. Indicative Content

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Code ELEC 002 : Analogue Electronic Circuits 3

Credits 5

Description of Module
This module follows on from the module called Analog Electronics 1 and builds on concepts introduced there.
The module provided the student with an essential grounding in the areas of Analogue circuit design. The module covers the fundamentals of circuit design and builds on the students previous knowledge of ideal circuits. The minimisation and control of device induced errors is to the forefront in the teaching of this course.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Demonstrate a sound knowledge of analogue circuit design
2. Discuss positive feedback and oscillators
3. Give examples of filter and oscillator circuit design
4. Demonstrate analogue computation using op-amps
5. Show the design of different types of power supplies
6. Distinguish between different types of noise and explain how pick-up can be minimised.
7. Design, build, test and verify the correct operation of circuits related to lectures.
8. Troubleshoot analogue circuits to obtain correct operation

Assessment Methods
1. 70% Final Written Exam
2. 30% Practical Continuous Assessment

Year 3 - Semester 5 (Sept – Dec)

Code ANCO 0001: Analogue Control

Credits 5

Description of Module
The course aims to demonstrate the techniques used to analyse analogue control systems and to design controllers. These techniques will be demonstrated using examples of practical control systems and will be implemented by the student using MATLAB.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Model analogue control systems.
2. Analyse analogue control systems in the time and frequency domains.
3. Design analogue controllers using classical design techniques.
4. Design analogue controllers using modern design techniques.
5. Use MATLAB for stability analysis and controller design

Assessment Methods
1. 70%: Written Exam (to examine learning outcomes 1 – 4)
2. 30%: Laboratory Practical's and Reports (to examine learning outcome 5)

Code MTHE 0032: Advanced Engineering Maths

Credits 5

Description of Module
To provide an introduction to the theory and techniques of partial differential equations, integral transforms, and the methods needed to develop and implement analytical and numerical solutions to problems arising in electronic engineering applications.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Derive, interpret and apply properties of special functions.
2. Construct and interpret solutions of partial differential equations that arise in engineering problems (see content).
3. Demonstrate knowledge of physical contexts in which various partial differential equations arise and the types of boundary conditions needed for well-posedness.
4. Apply the theory covered in this module in terms of progressing from a physical problem, to selecting and implementing an appropriate solution strategy, and ultimately interpreting and representing the results.

Assessment Methods
1. Final examination (70%): To assess knowledge of the theory, ability to implement the outlined methods and ability to communicate using appropriate notation and precision.
2. Continuous Assessment (30%) to be based on work completed in the tutorial session.

Code DASA 0001: Data Structures & Algorithms

Credits 5

Description of Module
Data Structures and Algorithms module teaches the student the array of data structures available to them to write algorithms and to choose the most suitable algorithm to solve programming problems.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Choose and/or write appropriate algorithms using appropriate data structures
2. Analyse algorithms in order to choose the most appropriate for the problem space
3. Demonstrate the use of object-oriented techniques, using knowledge of the concepts when writing code and when using class libraries.
4. Demonstrate ability to write, debug and test well styled and appropriately documented programs

Assessment Methods
1. Written (20%) will be a series of graded assessments to cover concepts defined in learning outcomes.

2. Practical Examinations and assessment (80%) to cover concepts defined in learning outcomes 3 & 4
3. Formative assessment will also be used through a ‘ Demo & Practical’ approach as each new concept is introduced.

Code SEMF 0001: Semiconductor Fundamentals

Credits 5

Description of Module
The course aims to introduce the student to the fundamentals of solid state theory in support of the analysis and design of semiconductor materials and devices. A comprehensive review of the design, operation and fabrication of schottky, junction and optoelectronic diodes is undertaken. Semiconductor device design and process simulation tools are also concurrently introduced.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Demonstrate knowledge and comprehension of the fundamental concepts of solid state theory as applied in the analysis of carrier transport in semiconductor materials.
2. Demonstrate a knowledge and comprehension of the fundamental physical processes employed in the fabrication of semiconductor diode structures.
3. Demonstrate a knowledge and comprehension of the fundamentals of design, operation and fabrication of schottky, junction and optoelectronic diode devices.
4. Demonstrate an ability to apply the knowledge and comprehension gained in evaluating and relating macroscopic semiconductor diode performance parameters to semiconductor solid state theory and associated fabrication processes.
5. Demonstrate a knowledge and comprehension of the tools and methods employed in carrier transport analysis and process simulation for semiconductor diode structures.

Learning and teaching methods and strategies:
1. Lectures
2. Practical’s / Project Work

Assessment Methods
1. Final Examination (70%): There will be a two hour written paper consisting of four questions. Candidates will be required to complete one compulsory question on the fundamentals of semiconductor theory (representing a maximum of 40 marks out of 100 available for the written paper) along with any two other questions (representing a maximum of 60 marks out of 100 available for the written paper) to test for the learning outcomes as expressed
2. Practical / Project Work (30%)

Code ELFW 0001: Electromagnetic Fields & Waves

Credits 5

Description of Module
This module covers in general the electromagnetic theory. It starts with full analytic treatment of static electric fields and steady magnetic fields, follows by detailed study of the relevant properties of conductors and insulators to electromagnetic fields &
waves. The module continues after that with full theoretical and analytical treatment of time-varying fields & Maxwells equations which lead to the detailed study of wave propagation, reflection, refraction, diffraction and polarization. All material covered by this module is essential for all telecommunications applications. Very good mathematical and analytical skills are essential for this module.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Understand, explain and analyse the behaviour and characteristics of static electrical fields and steady magnetic fields.
2. Describe and analyse the properties of conducting and insulating materials relevant to the behaviour and characteristics of electromagnetic fields & waves.
3. Perform full analysis of time-varying electric and magnetic fields, derive Maxwell's equations and explain their relevance to the electromagnetic theory and applications.
4. Derive the wave equations and apply them to analyse the behaviour of electromagnetic waves regarding their propagation, reflection, refraction, diffraction and polarisation.

Learning and teaching methods and strategies:
1. Lectures
2. Tutorials
3. Laboratory Work
4. Presentations/Seminars

Assessment Methods
1. 70%: Final 2 hour written examination
2. 15%: Continuous Assessment, based on Assignments and Written tests during the semester
3. 15%: Practical Assessment, based on a series of laboratory practicals and written reports.

Code TELE 0008: Telecommunications Theory 3
Credits 5

Description of Module
This builds on material covered in the pre requisite modules. The module aims to cover theoretical concepts that are fundamental to modern wireless digital communication systems. Implementation issues are also taught to give an insight into performance and complexity trade offs for various digital modulation schemes. It is assumed that the student has a sound Knowledge of modulation. Direct Sequence and Frequency Hopped Spread Spectrum are also covered.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Understand and analyse time and frequency domain considerations for signals used in analogue and digital communications
2. Demonstrate a good understanding of noise performance of analogue and digital modulation techniques
3. Demonstrate a solid understanding of optimum receiver structures, matched filters and correlator-type detection
4. Describe and analyse different types of spread spectrum modulation techniques
5. Have a good understanding of the information theory and apply it to different types of source coding
6. Write meaningful practical reports in line with a prescribed format showing adequate presentation of practical results, calculations and conclusions.

Learning and teaching methods and strategies:
1. Lectures
2. Practicals
3. Integrated Worked Examples

Assessment Methods
1. 70%: Written Exam
2 15%: Practical Assessment, based on a series of laboratory practical and written reports.
3 15%**:** Continuous Assessment, based on assignments and written tests during semester 5.

Year 3 - Semester 6 (Jan – May)

Code INDP 0003: Industrial Studies & Placement (limited Spaces)

Credit 30

Description of Module
This module assists the student in procuring suitable work placement and provides information (Health and Safety legislation, Project Management skills, ethical practices for professional engineers) necessary to prepare the student for industrial placement. The student has an opportunity to work like as an engineer outside of the classroom, as well as developing skills in resource management, safety compliance and faithful and concise presentation of work done.

On successful completion of this module, a student will be able to:
1. Create a CV that effectively markets their individual talents, identify potential job opportunities and prepare for interviews.
2. Demonstrate awareness of the relevance of their work placement and how to use this experience to further their careers.
3. Outline the organisation of the host company and identify the student's role within it.
4. Describe the Health and Safety procedures prescribed both for the work being carried out and the general environment in which it occurs.

5. List the key product / output processes within the host institution, describing one and suggesting areas in which it may be improved.
6. Discuss the Quality Assurance requirements, control and practice in the area where the placement takes place.
7. Examine the context of the work, how it impacts locally on the work placement and how it may impact on the general public.
8. List and analyse the skills appropriate to the placement.
9. Define the qualities of an engineer both in a professional and a public context and argue the need for high ethical standards in each case.
10. Recognise the benefits of teamwork participate in teams and recognise the value of peer contributions.

Learning and teaching methods and strategies:
1. Lectures
2. Individual counselling sessions
3. Practical experience of actual job interviews
4. Practical experience of actual employment

Assessment Methods
1. On-site visit during work placement or during conduct of assignment
2. Evaluation of work placement report

Year 4 - Semester 7 (Sept – Dec)

Code PROJ 0094 : Project 1

Credits 5

Description of Module
The aim of the final year project subject is to augment the theoretical material, covered in the course, by exposing the student to circuit design and software development in a work laboratory environment. The benefits derived from co-operating with industry are recognised and where possible industrial based projects will be considered for assigning as student projects. In this semester, the students are encouraged to follow safe systems and working practices and to apply appropriate management techniques (personal and institute resource management, deciding achievable goals and sticking to them, etc.) and to develop their knowledge of the chosen topic, by performing literature and Internet searches and interviewing appropriate staff.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Perform a thorough literature search including on-line scientific engineering databases, in a given area and compile the salient expressions, synopses, alternative techniques and their own proposed approach

2. Write realistic goals, based on available resources, difficulty of tasks and required learning/existing abilities for the
milestones required to finally complete a project
3. Defend a chosen course of action, based on rational reasoning, resources and abilities
4. Present a project context, status quo and projected outcome to peers and staff in an open forum/seminar
5. Organise component orders, within the project budget and complying with the Institute's process for placing orders and
recognising suppliers.
6. Develop and maintain a professional relationship with the supervisor and maintain a log of meetings

Assessment Methods
1. 40%: Interim Report due towards end of semester to include project specification, background and literature research,
resource management plan, plan. overall project management
2. 10%: Demonstration of practical work to date
3. 10%: Project Management
4. 10% Independent learning initiative
5. 30%: Quality of work to date (also includes overall performance, attendance at appointed meetings, (quality of) effort)

Code ENGR 0025 :Telecommunications Engineering

Credits 5

Description of Module
Telecommunications 3 is a prerequisite module. The problems associated with telecommunication channels are considered.
How these problems are overcome in particular systems is treated. For example the terrestrial radio interface (multipath, fading effects, delay spread etc) and the modern techniques employed in mobile comms. and digital broadcasting such as CDMA and COFDM.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Demonstrate an coherent understanding of the channel problems in modern communications
2. Explain in detail how these are overcome in particular systems
3. Assess the merits of the different approaches
4. Appraise the different approaches
5. Demonstrate practical operation of experimental apparatus/simulation for each laboratory session. The student should show a familiarity with the experiment/apparatus & a clear understanding of the procedure topic under consideration.

Assessment Methods
1. 70% final examination (to assess learning outcomes 1, 2 & 3)

2. Practical Assessment (15%) will be a (series of) graded assignment(s) to cover learning outcomes. (to assess learning outcome 4)
3. Laboratory Programme (15%) will permit practical demonstration during the semester of the learning expressed in the outcomes, including technical reports/presentations (to assess learning outcome 5).

Code ENGR 0019 : Microcomputer Hardware
Credits 5

Description of Module
This module aims to teach the skills and techniques used in designing embedded systems hardware. The importance of timing parameters and worst-case design will be emphasised and students will be exposed to system integration and troubleshooting tools.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Use hardware development tools in the design of embedded MPU system.
2. Interpret data sheets and understand the importance of timing parameters
3. Implement a microprocessor systems
4. Test, Debug and Verify the design

Assessment Methods
1. 60 % Written Examination
2. 40% Practical's and mini-project.

Code ENGR 0020: Theory & Applications of DSP

Credits 5

Description of Module
DSP (Digital Signal Processing) techniques are at the heart of many areas of technology. DSP is traditionally a mathematical subject which is concerned with the representation and transformation of signals using digital computation. The module focuses on the fundamentals of DSP and explores the speech processing area as a paradigm for applications of DSP techniques.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Demonstrate knowledge and understanding of digital signals and systems
2. Analyse discrete-time systems to determine system behaviour in the time and frequency domain
3. Demonstrate methodology and computation skills in the design of digital filters
4. Formulate and manipulate equations describing systems and transforms

5. Write simulation programs to analyse, interpret and evaluate discrete-time systems behaviour
6. Apply Digital Signal Processing techniques to speech

Assessment Methods
1. 60% Written examination to assess learning outcomes 1, 2, 3, 4 & 6
2. 40% Practical Examination to assess learning outcome 5

Code COME 0005: Data Communications

Credits 5

Description of Module
This subject complements the Telecommunications taught in the course, by introducing the structures that lie behind and rely on the transmission and reception of a communications' signal. The course explains from the recovery of the transmitted bit/symbol how the original transmitted information may be interpreted in a structured system in order to efficiently communicate.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Describe the implementations of flow and error control in general from the OSI and as they appear in practice Ethernet, in GSM and ATM.
2. Compare the relative merits of packet over circuit switched and of virtual circuit switching over datagram's, assigning a relative importance to each of the points raised.
3. Analyse a data frame and explain, based on the nature and field size, whether it is a datagram or virtual circuit packet.
4. In terms of the Internet Protocol, explain the choices made in Header fields and Routing algorithms, compare the choices and consequent trade-offs and comment on current and future requirements.
5. Describe the requirements of a Transport Layer protocol, when the underlying network protocol is unpredictable in terms of losses and delays.
6. Demonstrate a practical ability to develop, troubleshoot, test, analyse and report on Data Communications
7. Explain, the requirements of an error detection used, to the point where the design of a robust CRC system is possible.

Assessment Methods
1. 70%: End of Semester Examination
2. 30% Series of ongoing work to demonstrate the required practical ability

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Code ENGR 0027: IC Design

Credits 5

Description of Module
This module builds on some of the concepts introduced in the module called Semiconductor Devices. Integrated circuits are a key enabling technology upon which many other leading edge technologies are dependent. The ability to understand integrated circuit design principles and the ability to be able to design circuits using modern MOS IC processes is becoming an increasingly important skill for electronics engineers. This module covers the basics of digital and analogue circuit design using MOS device technology.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. understand the fundamental aspects of integrated circuit technology.
2. analyse and understand the various modes of operation of a MOS device.
3. design basic digital circuits at MOS transistor level.
4. design basic analogue circuits at MOS transistor level.
5. create and analyse MOS circuit simulations using Spice
6. create physical MOS circuit layouts and apply appropriate design rules.

Assessment Methods
1. 60%: End of Module Examination
2. 40%: Design Lab sessions, reports, mini-project, MCQ

Code: ENGR 0024: Applied Electromagnetism

Credits 5

The student is in general expected to have a good understanding of the theory and analysis of electromagnetic fields & waves.
This module covers various applications of electromagnetic fields and waves, which have wide spectrum of implementation in communication systems. This includes comprehensive theoretical, analytical and practical treatment of transmission lines, guided-waves & waveguides, light waves in optical fibres and lasers & non linear optics. A practical program runs alongside the lectures and tutorials.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Have good understanding of the analysis and applications of transmission lines and microwave waveguides
2. Analyse and design different types of passive components/circuits using sections of transmission lines and microwave waveguides.

3. Explain and analyse the propagation, reflection, refraction, diffraction and attenuation of light waves in optical fibres and describe the characteristics and properties of different types of optical fibres used in optical communication systems
4. Understand and explain the quantum theory of radiation, also have good knowledge of laser types and applications.
5. Complete the practical program of this module, write meaningful reports presenting useful results, and conclusions.

Assessment Methods
1. 70% : Final 2 hour written examination
2. 15%: Continuous Assessment, based on Assignments and Written tests during the semester
3. 15%: Practical assessment, based on a series of laboratory practicals and written reports.

Year 4 - Semester 8 (Jan – May)

Code PROJ 0095: Project 2

Credits 5

Description of Module
This module follows on from Project 1 described in the previous semester outline. The student has thus already identified the particular challenges to be overcome and milestones to be achieved in this semester. Because the background work has already been covered through the literature research and the early project efforts, this semester should produce significant advances in terms of attaining the final goal. The work is then faithfully represented in a thesis, which shall include an accurate and concise description of the context, the challenge, the solution and the result of the particular problem posed. All work shall be the student's unless specifically stated otherwise through citation.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Confirm an ability to set and meet achievable milestones
2. Transform the background and contextual knowledge of the previous semester into real progress in terms of knowledge and ability in the project area.
3. Defend a chosen course of action, based on rational reasoning, resources and abilities
4. Present a project context, status quo and projected outcome to peers and staff in an open forum/seminar
5. Accurately and faithfully represent their work in a project report, acknowledging where it occurs the presence and level of input of others

Assessment Methods
1. 40%: Final Report, formatted to specification, with clear references to work or other input of third parties
2. 10%: Final Demonstration
3. 10%: Project Management
4. 10% Independent learning initiative
5. 30%: Quality of final product (also includes overall performance, attendance at appointed meetings, (quality of) effort)

Code COME 0003 : Digital Communication Analysis

Credits 5

Description of Module
This subject builds on material covered in the pre requisite module. Access and multiplexing techniques commonly used in wireless communication systems are covered. Considerable attention is paid to the error performance of various modulation schemes and the effects of noise and interference are discussed and quantified. Information theory is expanded and redundancy reduction codes are presented. Error detection and correction methods are discussed and quantified.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Demonstrate a solid knowledge of Access and Multiplexing Methods and their relative trade-offs
2. Calculate error rates for various modulation schemes and be able to devise a realistic choice of scheme for particular applications
3. Discuss the origin and significance of various noise and interference sources and be able to compose a realistic link budget for Line of Sight applications
4. Discuss the necessity for source coding and be able to determine code solutions and associated parameters
5. Discuss the necessity for channel coding, its parameters and be able to explain the relative strengths of each approach.

Learning and teaching methods and strategies:
1. Lectures
2. Practical's
3. Integrated Worked Examples

Assessment Methods
1. Written Exam 70%
2. Laboratory Work 15%
3. Assignments 15%

Code COME 0004: Microcomputer Software
Credits 5

Description of Module
This module follows on from the module called Microcomputer Hardware and builds on concepts introduced there. This module covers the programming of embedded microprocessor systems using 'C' and assembly language. Software development tools are extensively used with the main emphasis is on application development, testing, debugging and verification. The student will also be exposed to embedded RTOS's.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Use 'C' and assembly language to develop applications for embedded systems
2. Use software development tools effectively and efficiently.
3. Test, Debug and Verify embedded applications.
4. Create and maintain software libraries
5. Document and maintain software applications.
6. Design and use a small Real Time Operating System

Assessment Methods
1. 60% Written Examination
2. 40% Practicals and mini-project **Code**

ENGR 0026 : Real Time DSP Implementation

Credits 5

Description of Module
This module follows on from the module called Theory & Applications of DSP and builds on concepts introduced there. This module is concerned with the implementation of Signal Processing algorithms into a programmable embedded chip for real time processing. The module aims to develop skills required to map Digital Signal Processing theory into technology.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Explain the special features of real-time DSP architectures and their programming instructions
2. Demonstrate understanding of the theory behind DSP algorithms, word length effects, quantisation, overflow and arithmetic of DSP.
3. Demonstrate understanding of the theory and application of scaling techniques to DSP structures
4. Use software development tools, simulation and modelling packages to analyse and evaluate DSP systems and their underlying algorithms.
5. Write programs to implement DSP algorithms in real-time for simulation and real targets

Assessment Methods
1. 60% Written Examination to assess learning outcomes 1, 2, 3 & 5
2. 40% Practical Examination to assess learning outcome 4

Code ENGR 0021: Digital Control

Credits 5

Description of Module
This course aims to introduce modern techniques used in the analysis and design of digital control systems. These techniques will be demonstrated using examples of practical control systems and will be implemented by the student using MATLAB and SIMULINK. The course should give the student the ability to bring modern control techniques to an industrial setting or perform research in state-of-the-art control methods.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Model discrete control systems
2. Perform stability analysis on discrete systems
3. Design digital controllers using transform techniques, direct and state space methods.
4. Evaluate controller designs
5. Implement Digital Controller algorithms
6. Use MATLAB and SIMULINK as part of system analysis and controller design.

Learning and teaching methods and strategies:
1. Written Exam
2. Practical's

Assessment Methods
1. 70% Written Exam to assess learning outcomes 1 to 4
2. 30% Laboratory Practical's and Reports to examine learning outcomes 5 & 6

Code ENGR 0022 : Semiconductor Devices
Credits 5

Description of Module
The course aims to advance the student's knowledge of the fundamentals of solid state theory in respect of the analysis and design of complex semiconductor based transistor structures. A comprehensive review of the design, operation and manufacture of bipolar, metal-oxide-semiconductor and compound transistor structures is undertaken. The use of semiconductor TCAD tools for complex transistor structures is also concurrently introduced.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Demonstrate a knowledge and comprehension of the fundamental concepts of solid state theory as applied in the analysis of carrier transport processes within semiconductor materials and transistor devices.
2. Demonstrate a knowledge and comprehension of the advanced physical processes employed in the fabrication of semiconductor transistor structures.

3. Demonstrate a knowledge and comprehension of the fundamentals of design, operation and manufacture of bipolar, metal-oxide-semiconductor and compound transistor structures.
4. Demonstrate an ability to apply the knowledge and comprehension gained in evaluating and relating macroscopic semiconductor transistor performance parameters to semiconductor solid state theory and the associated fabrication processes.
5. Demonstrate a knowledge and comprehension of the TCAD software tools and methods employed in the design and development of complex transistor structures.

Learning and teaching methods and strategies:
1. Lectures
2. Practical's / Project Work

Assessment Methods
1. Final Examination (70%): There will be a two hour written paper consisting of four questions. Candidates will be required to complete one compulsory question fundamentals of semiconductor theory (representing a maximum of 40 marks out of 100 available for the written paper) along with any two other questions (representing a maximum of 60 marks out of 100 available for the written paper) to test for the learning outcomes as expressed
2. Practical / Project Work (30%)

ENGR 0029 : Antennas & Radio wave Propagation
Credits 5

Description of Module
This module covers the theory, analysis and design of wide variety of antenna types used in a variety of telecommunication systems. The module pairs well with the "Telecommunications Systems Engineering" module in year 4, semester 8 of this course. The coverage of antennas also includes problem-solving and computer-aided design of modern antennas such as phased arrays and micro-strip antennas. The module is concluded with a detailed study of the different types of radio waves, used for different applications. A practical program runs alongside the lectures and tutorials to enhance the student understanding of the theory and analysis.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Have detailed knowledge of the various antenna types and parameters used in modern communication systems.
2. Describe the construction and analyse the properties of different types of antennas.
3. Apply computer-aided design to certain types of antennas, using analytic and numeric techniques.
4. Demonstrate extensive understanding of the propagation of different types of radio waves and their various applications.
5. Complete the practical program of this module successfully, document all relevant results, calculations and design details and relate them to the theory and analysis covered in the lectures and tutorials.

Learning and teaching methods and strategies:
1. Lectures
2. Tutorials
3. Laboratory Work
4. Presentations / Seminars

Assessment Methods
1. 70%: Final 2 hour written examination
2. 15%: Continuous Assessment, based on Assignments and written tests during semester 8
3. 15%: Practical Assessment, based on a series of laboratory practicals

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Code ENGR 0028: Applied Embedded OS's
Credits 5

Description of Module
This module is a practical hands on approach to understanding and working with embedded operation systems. The learner will be introduced to the main components that make up an operating system. This knowledge will then be applied to the development of embedded applications. The modules is lab-based with each learner working on a station consisting of 1) host system running Linux/RTOS with relevant embedded tool chain 2) target board running Linux/RTOS or similar. The project component of this module will be team based.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. understand main components that make up an operating system.
2. apply this understanding to embedded environment
3. use embedded tool chain for target running Linux
4. customize embedded operating system as required for particular application
5. apply services provided by embedded operating system to produce embedded application
6. work as part of a project team

Assessment Methods
1. 50% - Practical (1, 2, 3)
2. 50% - Project (4, 5, 6)

BACHELOR OF ENGINEERING IN ELECTRONIC ENGINEERING

Year One	
Semester 1	**Semester 2**
Embedded Systems Project	Embedded Project Application
Embedded HLL Programming	Embedded Software and RTOS
Industrial Measurement	Industrial Instrumentation
Math. Transform Methods	Linear/Fourier Analysis
Computer Interfacing	Computer Networking
Embedded Arm Development	Embedded Systems Design

BACHELOR OF SCIENCE (HONS) IN APPLIED ELECTRONICS

Year One	
Semester 1	**Semester 2**
Telecommunications	Industrial Studies & Placement
Control Systems	
Topics in Engineering Maths	
Analogue Circuit Design	
Semiconductor Technology	
Embedded Software Development	
Year Two	
Semester 3	**Semester 4**
Data Communications	DSP Fundamentals
Signals & Systems	Applied Embedded Oss
Marketing & Management	Embedded System Design
Embedded Processing	Enterprise Studies
Wireless Communication Theory	Telecommunications Application
Project Specification	Project Implementation

BACHELOR OF ENGINEERING (HONS) IN MECHANICAL& MANUFACTURING ENGINEERING

Year One	
Semester 1	**Semester 2**
Fundamental Engineering Maths	Introduction Calculus
Physics	Electrical Science
Materials 1	Manufacturing Technology 1
Mechanical Systems	Engineering Mechanics
Engineering Drawing	Computer Aided Draughting
Thinking & Learning Skills	Manufacturing Systems
Year Two	
Semester 3	**Semester 4**
Electrical Engineering	Computer-aided Design
Mathematical Methods	Thermodynamics
Engineering Design	Manufacturing Technology 2
Applied Mechanics	Production Systems
Engineering Computing	Advanced Calculus
Materials 2	Electronic Engineering
Year Three	
Semester 5	**Semester 6**
Quality Management	Industrial Studies Industrial Placement
Industrial Power Systems	
Mechanics of Materials	
Dynamics & Vibrations	
Enterprise Resource Management	
Fluid Mechanics	
Year Four	
Semester 7	**Semester 8**
Project 1	Project 2
Heat and Mass Transfer	Advanced materials & Process Selection
FEA & Design Tools	Process Control
Manufacturing Facilities	Supply Chain Management
Facility Simulation & Reliability	Energy Conversion
Operations Strategy	Applied Fluid Mechanics

Year 2 - Semester 3 (Sept – Dec)
Level 8

Code EENG 0001 Electrical Engineering
Credits 5

Description of Module
This module will examine the transmission of electrical power and define the main components and characteristics of the power distribution system, including transformers, ac and dc machines, protection and disturbances. An awareness of the dangers associated with electrical power and the potential dangers within the workplace,will also be developed.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Understand the basic principles of electrical engineering.
2. Perform power calculations in ac circuits.
3. Understand the operation of power distribution systems
4. Describe the operating characteristics of single-phase and three-phase transformer systems.
5. Understand the inherent characteristics of ac and dc machines.
6. Apply the requirements of safe working practices in relation to electrical equipment.

Assessment Methods
1. Final Examination (70%): There will be a one and a half hour written paper.
2. Continuous Assessment (15%): There will be a series of graded assignments to test for the learning outcomes as expressed.
3. Practical's (15%): There will be a series of graded practical's to test for the learning outcomes as expressed.

Code: MTHE 0037: Mathematical Methods
Credits 5

Description of Module
The aim of this unit is to advance the students' knowledge of differential equations, linear programming & statistics

Learnings Outcomes

On successful completion of this module, a student will be able to:
1. Solve first and second order differential equations
2. Apply statistical techniques to engineering problems
3. Optimise linear programming and transportation methods

Learning and teaching methods and strategies:
1. The course will consist of lectures, practical seminars and assessments
2. The emphasis on course delivery will be 'hands-on', problem solving in small class groups using problem-based worksheets, seminars, text-books
3. Self-directed computer-based websites and software (MathCad & MathLab).

Assessment Methods
1. 30% Worksheets & assignments
2. 70% End of module exam

Code MECH 0013: Applied Mechanics
Credits 5

Description of Module
This module develops the learner's skills in applying mechanics techniques. These aid the learner to solve mathematically a range of engineering problems involving both stationary and moving objects. This module has a particular emphasis on dynamics, focussing on the kinematics and kinetics of particles, and analysing the vibration of single degree of freedom systems.

Learnings Outcomes

On successful completion of this module, a student will be able to:
1. apply the principals of mechanics to analyse the kinematics of particles
2. apply the principals of mechanics to analyse the kinetics of particles
3. solve balancing problems
4. analyse and solve systems involving un damped and damped free vibration

Learning and teaching methods and strategies:
1. Lectures
2. Problem Sheets
3. Guided Reading

Assessment Methods
1. Continuous Assessment 20%
2. Final Exam: 80%

Code ENGD 0001: Engineering Design
Credit 5

This module looks at the approach taken to design in engineering. The design process and formal design methods are examined. Design guidelines and knowledge relevant to manufacturing, assembly and ergonomics are described..

Learnings Outcomes

On successful completion of this module, a student will be able to:
1. Describe the engineering design process and explain formal design methods used in that process.
2. Discuss rules and guidelines to be followed when designing components to be manufactured using particular processes.
3. Describe the effect of component design on the injection moulding process and estimate machine sizes.
4. Discuss rules and guidelines to be followed when designing components for assembly.
5. Discuss the effect of ergonomics on product design decision.
6. Describe how the lifecycle of product impacts on the environment.
7. Discuss the role of ethics in engineering design.

Learning and teaching methods and strategies:
1. Lectures

Assessment Methods

1. 50 % Final Exam.
2. 50 % Class Assignments

Code COMP 0046 : Computer Applications
Credits 5

Description of Module
Study of engineering related software including: Labview, PLC programming, Minitab, MS Visual Studio, Matlab. The student will also cover the area of network management.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Demonstrate an understanding of various engineering software products, including: Labview, Minitab, PLC software & Mathcad.
2. Understand the fundamentals of basic network management.

Learning and teaching methods and strategies:
1. Computer laboratory supervised learning.
2. Practical assignments.

Assessment Methods
1. 80% Programming assignments.
2. 20% In-class assessment.

Code MATE 0002: Materials Sci & Eng. 2
Credits 5

Description of Module
This module builds on the introduction to Materials Science and Engineering presented in Module 1 and provides further insight into fundamental microstructure - property relationships for metallic materials with an emphasis on non-equilibrium cooling. This microstructure - property theme is extended to polymeric and ceramic materials. Key aspects of material degradation and materials selection & substitution, together with materials examination and inspection are also covered.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Explain the significance of 'critical cooling rate' as related to continuous cooling and infer from CCT diagrams the microstructure of given metallic materials exposed to different cooling rates.
2. Explain the underlying reason for the inverse relationship between hardenability and weldability; and assess these through Jominy hardenability and 'carbon equivalent' data respectively.
3. Differentiate between coherent and incoherent precipates and explian the significance of these in dispersion strengthened materials and how they may be achieved.
4. Explain the underlying mechanisms of elastic and plastic deformation that govern the stress-strain behaviour of semicrystalline thermoplastic polymers.

Learning and teaching methods and strategies:
1. Lectures and laboratory practical's & reports

Assessment Methods
End of module exam plus laboratory reports

Code MATE 0002: Materials Sci & Eng. 2
Level 6 - Semester 3
Credit 5

Essential Material
1. Callister, W. D., (2003), Materials Science and Engineering: An Introduction, 6th Edition, John Wiley & Sons, Inc.
2. Askeland, D. R., (2005), Science and Engineering of Materials, 5th Edition, Chapman & Hall

Supplementary Material
1. Shackelford, J. F., (2004), Introduction to Materials Science for Engineers, 6th Edition, Prentice Hall

2. Smith, W. F., (2004), Foundations of Materials Science and Engineering, McGraw-Hill
3. SchafferJ. P., (1999), The Science and Design of Engineering Materials, 2nd Edition, McGraw-Hill

Resources

Data projector for lectures. Tensile testing machines with three point bend and fracture toughness testing capabilities,
Rockwell hardness testing machine, creep testing apparatus, optical microscope with computerised image analysis capability,heat treatment furnace, grinding and polishing facilities.

Year 2 - Semester 4 (Jan – May)

Code CCAE 0001: Computer Aided Design
Level 8 - Credits 5

This module covers the basic techniques required to generate technical drawings to represent design intent and provide instructions to the manufacturing function. The module focuses on using modern 3D computer aided modelling software to produce a full set of instructions (drawings) for the manufacturing function. The integration of design with manufacture through CAM is also examined.

Learning Outcomes

On successful completion of this module, a student will be able to:

1. Demonstrate an ability to communicate basic engineering design information via technical drawings.
2. Demonstrate an ability to interpret technical information from an engineering drawing.
3. Produce intermediate level 2D and 3D drawings using CAD software.
4. Understand basic concepts behind 3D modelling
5. Apply various drawing standards, principles and techniques.
6. Examine properties of components such as weight, centre of gravity, principle moments of inertia and check interferences using CAD software.
7. Specify and include standard parts in designs.
8. Produce intermediate level assemblies and detail drawings including tolerancing, materials and finish specifications.
9. Work in groups and collaborate with other on design projects.
10. Be aware of the links between the design and manufacturing functions and be able to transfer CAD from one to the other.

Assessment Methods

1. 100 % Continuous Assessment
2. Drawing Portfolio 60 % - Examines learning outcomes 1, 2, 3, 5, 6 & 8
3. Group Design Projects 30 % - Examines learning outcomes 7, 8 & 9
4. In class assessment 10 % - Examines learning outcomes 5 & 10

Code ICTE 0014 : Thermodynamics
Level 7 - Semester 4
Credits 5

Description of Module
This module takes an analytical approach to the subject of thermodynamics including the areas of system definition, energy and the first law of thermodynamics. The second law of thermodynamics plus entrophy will also be covered in this module.
Other areas introduced will include: Vapour power systems and refrigeration.

Learning Outcomes

On successful completion of this module, a student will be able
1. Explain the fundamental elements of the gas and thermodynamic laws, and solve standard associated calculations.
2. Explain the concepts of thermal efficiency and entropy and conduct energy analysis calculations.
3. Describe various vapour power systems and perform required calculations for such cycles
4. Identify refrigeration systems and refrigerant properties and perform analysis of these systems.

Learning and teaching methods and strategies:
1. Lectures
2. Practicals

Assessment Methods
1. 50% written exam
2. 50% Continuous Assessment consisting of Practicals and written reports

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Code MTEC 0002 : Manufacturing Technology 2
Level 8
Semester 4 Credits 5

Description of Module
This module encompasses the forming of polymers and composites, joining and assembly, advanced machining and fabrication and, cleaning and surface treatments together with coating and deposition processes. A common theme running through the module is the influence of process variables on (i) the energy requirements and (ii) the quality and integrity of the resultant product or component; the primary goal is to acquire an insight into the fitness for purpose of the various processes.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Determine the flow capacity, back pressure flow and resultant volume flow rate of a polymer melt in an extruder

barrel; determine the maximum head pressure, volume flow rate and head pressure at the operating point in the extrusion of polymeric materials and, determine the required screw speed in order to achieve a given production rate.
2. Calculate the shear rate of a polymer melt at the wall of a runner, and the pressure required to drive the melt through the runner in order to achieve a required throughput; determine for a given injection moulding layout the required total
volume flow rate, the pressure loss in the runners and gates, the total pressure loss and the pressure available at the mould cavities.
3. Determine for an extrusion blow moulding operation, the wall thickness of the resultant container and the maximum stress in the inflated parison; outline the advantages of injection stretch-blow moulding over extrusion blow moulding together with key considerations regarding material requirements.
4. Assess the compatibility of matrices and reinforcements in the production of composite materials and select appropriate manufacturing routes for polymeric, metallic and ceramic matrix composites based on fitness-for-purpose criteria.

Learning and teaching methods and strategies:

1. Lectures and laboratory/workshop practicals

Assessment Methods

1. End of module exam plus laboratory/workshop exercises and reports.

Code PROD 0011 : Production Systems
Level 8 - Semester4
Credits 5

Description of Module

This module takes an analytical approach to specific elements of Production Systems including production planning andcontrol, productivity, and work measurement. It provides a means of modelling and analysing generic production system
elements including assembly lines and automated material handling systems, and provides a foundation for the ergonomic aspects of their design.

Learning Outcomes

On successful completion of this module, a student will be able to:

1. Establish the fundamental elements of production planning and control, and solve standard associated calculations.
2. Formulate a concept of productivity and generate useful productivity measures in different situations.
3. Assess different methods of work measurement, select the appropriate method in a given situation, and calculate
standard times.
4. Identify important factors in workplace comfort and apply them to the design of work environments and facilities.
5. Analyse standard modelling techniques and apply them in the design of production systems.

Learning and teaching methods and strategies:
1. Lectures
2. Assignment

Assessment Methods
1. 20% Project assignment (based on production system design, incorporating presentation)
2. 10% MCQ assessment
3. 70% Final exam

Code MTHE 0038 : Advanced Calculus
Level 8 - Semester 4
Credits 5

Description of Module
The aim of this unit is to further the students' competence in advanced calculus, matrix manipulation and to introduce Laplace
transforms and mathematical elements of control theory

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Apply further methods integration to engineering problems
2. Use advanced matrix algebra
3. Evaluate Laplace transforms
4. Apply mathematical elements of control theory

Learning and teaching methods and strategies:
1. The course will consist of lectures, practical seminars and assessments
2. The emphasis on course delivery will be ‘hands-on’, problem solving in small class groups using problem-based
worksheets, seminars, text-books. Self-directed computer-based websites and software (MathCad & MathLab).

Assessment Methods
1. 30% Worksheets & assignments
2. 70% End of module exam

Code ELEC 0009: Electronic Engineering
Level 8 - Semester 4
Credits 5

Description of Module
The analysis and design of basic analogue and digital circuits will be covered in this module. The analogue element will focus on linear and non-linear operational amplifier circuits and an appreciation of the performance limitations associated with them

will be generated. The digital element will concentrate on the fundamental combinational and sequential logic circuits found in most digital systems such as adders, decoders, counters and registers.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Apply the fundamental concepts of combinational logic design.
2. Understand the difference between asynchronous and synchronous sequential circuits and implement counter and register applications.
3. Interpret data sheets and display a good understanding of the main characteristics of the different logic families used in digital circuit implementations.
4. Define, analyse and design linear and non-linear analogue circuits.
5. Appreciate the performance limitations associated with operational amplifier circuits.

Learning and teaching methods and strategies:
1. Lectures
2. Continuous Assessment
3. Practicals

Assessment Methods
1. Final Examination (70%): There will be a one and a half hour written paper.
2. Continuous Assessment (15%): There will be a series of graded assignments to test for the learning outcomes as expressed.
3. Practical's (15%): There will be a series of graded practical's to test for the learning outcomes as expressed.

Year 3 - Semester 5 (Sept – Dec)

Code QUAL 0013: Quality Management
Level 8
Credits 5

Description of Module

The area of quality is extremly important to all engineers, this module focuses on the various quality tools which are in use in manufacturing environments today. These include: sampling (AQL, LTPD, AOQ, AOQL), process control (XBar, R, C, U, P,
NP charts), vendor rating, quality systems (ISO 9000, QS 9000, Six Sigma, TQM), tools (Poka Yoke, Benchmarking, QFD, FMEA, SPC, etc) and experts (Deming, Juran, Taguchi, Crosby, Feigenbaum).

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Understand the fundamentals of process control and apply this understanding to manufacturing
2. Apply their knowledge of sampling to a variety of manufacturing senarios

3. Explain a variety of quality management tools
4. Explain the contribution of a number of quality management experts and their relevance to current quality thinking

Learning and teaching methods and strategies:
1. Lectures
2. Computer based practicals

Assessment Methods
1. 70% written exam
2. 20% Written assignments
3. 10% Practical's

Code IPSY 0001: Industrial Power Systems
Credits 5

Description of Module
This module introduces power systems and robotics. The module focuses on the design and control of pneumatics and hydraulic circuits. The module also covers fundamental robotic technology, including sensors, manipulators, positional control and programming.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Design multi-actuator pneumatic and hydraulic circuits.
2. Control multi-actuator pneumatic and hydraulic circuits using logic and PLC's.
3. Apply engineering principals to the design of pneumatic and hydraulic circuits.
4. Differentiate between a range of robot manipulator configurations discuss the performance of each
5. Discuss the operation and performance of a range of internal and external sensors used robotics.
6. Evaluate the suitability of robots for particular applications, integrating issues such as safety into the evaluation.
7. Produce basic robot programs for simple applications
8. Demonstrate an ability to work in a team, to respect team members and their opinion.

Learning and teaching methods and strategies:
1. Lectures
2. Practicals
3. Guided Reading
4. Problem Sheets

Assessment Methods
Continuous Assessment:
1. Practical 20%
2. MCQ Tests 10%
3. Final Exam: 70%

Code MECH 0014: Mechanics of Materials
Credits 5

Description of Module
Mechanics of Materials is a branch of mechanics that studies the relationships between the external loads applied to a deformable body and the intensity of internal forces acting within the body. The subject also involves computing the deformations of the body and provides a study of the bodies stability when the body is subject to external forces. Students will be able to design simple mechanical devices and components confident that they will not fail.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Design Mechanical Components, Devices and Structures
2. Predict the Failure of Mechanical Components and Structures
3. Demonstrate an Understanding of Three Dimensional States of Stress
4. Apply the concepts of Fatigue and Creep to real design Scenarios

Learning and teaching methods and strategies:
1. Lectures

Assessment Methods
1. 80 % for end of Semester Exam – Examines learning outcomes 1 - 10
2. 20 % for In Class Assessment – This is for formative assessment to provide feedback to learners – Examines learning outcomes 1 – 10

Code MEAS 0001: Dynamics & Vibrations
Credits 5

Description of Module
This module focuses on advanced mechanics. In particular an analysis of the kinematics and kinetics of rigid bodies is covered in detail. This is followed by more in depth coverage of vibrations, analysing damped and undamped forced vibration of systems, including systems with more than one degree of freedom.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Analyse the kinematics of rigid bodies
2. Analyse the kinetics of rigid bodies
3. Analyse the motion and behaviour of vibrating systems with undamped and damped, free and forced vibration

Learning and teaching methods and strategies:
1. Lectures and laboratory practical's.
2. Problem Sheets

Assessment Methods
1. Continuous Assessment 30%
2. Final Exam 70%

Code ENRM 0001: Enterprise Resource Management
Credits 5

Description of Module
Enterprise Resource Management brings together a knowledge of production and inventory control systems with emerging manufacturing database skills. A significant practical element requires students to set up and maintain their own database, simulating the effects of orders on their own manufacturing operations.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Solve order quantity and production quantity problems.
2. Distinguish between dedicated, multi-, and mixed-model line balancing, and solve complex line balancing problems.
3. Apply math models to the solution of standard production control calculations, and formulate plans to improve production control.

Learning and teaching methods and strategies:
1. Lectures
2. Laboratory Practical

Assessment Methods
1. Final Report 40% - Learning outcome 4
2. In-class assessment 10% - Learning outcome 1, 2, 3
3. Final exam 50% - Learning outcome 1, 2, 3

Code FLUM 0001 : Fluid Mechanics
Credits 5

Description of Module
Fluid mechanics introduces the student to the statics and dynamics of liquids and gasses. The analysis of the behaviour of fluids is based upon the fundamental laws of mechanics, including conservation of mass-energy and the force-momentum equation. This module provides the theoretical background and allows the solution of fluid mechanics problems.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Apply the fundamental aspects of fluid motion.
2. Expand on the basic analysis methods.
3. Analyse problem parameters confidently and accurately.

Learning and teaching methods and strategies:
1. Lectures 100%

Assessment Methods
1. Final exam 50%
2. Continuous Assessment 50% (Learning outcomes 1, 2 & 3)

Year 3 - Semester 6

Code INDP 0004 : Industrial Studies & Placement
Credits 30

Description of Module
This module assists the student in procuring suitable work placement and provides information (Health and Safety legislation,
Project Management skills, ethical practices for professional engineers) necessary to prepare the student for industrial placement. The student has an opportunity to work like as an engineer outside of the classroom, as well as developing skills in resource management, safety compliance and faithful and concise presentation of work done.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Create a CV that effectively markets their individual talents, identify potential job opportunities and prepare for interviews.
2. Demonstrate awareness of the relevance of their work placement and how to use this experience to further their careers.
3. Outline the organisation of the host company and identify the student's role within it.
4. Describe the Health and Safety procedures prescribed both for the work being carried out and the general environment in which it occurs.
5. List the key product / output processes within the host institution, describing one and suggesting areas in which it may be improved.

Assessment Methods
1. On-site visit during work placement or during conduct of assignment.

Year 4 - Semester 7 (Sept – Dec)

Code THER 0004 : Heat & Mass Transfer
Credits 5

Description of Module
This module introduces the student to the areas of Heat Transfer, heat exchanger design and mass transfer building on the student's thermodynamic knowledge base (acquired in Thermodynamics, Semester 4). An in-depth study of steam plant and turbines will also be covered.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Explain the fundamental elements of conduction, convection & radiation and solve standard associated calculations
2. Explain the concept of heat transfer and perform heat exchanger performance calculations.

3. Analyse mass transfer systems and perform required calculations
4. Perform in-depth analysis of steam plant and gas power systems
5. Analyse convective heat & mass transfer.

Learning and teaching methods and strategies:
1. Lectures
2. Assignments

Assessment Methods
1. 70% Written exam
2. 30% Continuous Assessment

Code FEAD 0001: FEA & Design Tools
Credits 5

Description of Module
There are a range of computer tools available to help in the design process. One of the most important of these is Finite
Element Analysis. There are also other tools that simulate manufacturing processes (Moldflow) and contain Design for
Manufacture knowledge (SolidEdge Sheetmetal). Standard computer tools such as Excel can also be used to optimise designs.
This module will study the use of these tools

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Use software tools to design mechanical devices
2. Specify where software tools can used in the design process
3. Demonstrate an understanding of Finite Element Analysis theory
4. Use FEA software to analyse mechanical and heat transfer problems
5. Demonstrate an understanding of the application of simulation software to plastics injection moulding
6. Explain the processes and application of Rapid Prototyping.

Assessment Methods
1. 50 % Final Exam (Examines learning outcomes 2, 3, 5 & 6)
2. 40 % Continuous Assessment consisting of Practicals (examines learning outcomes 1, 3 & 4)
3. 10% In Class Assessment (This is formative assessment to provide feedback to learners, learning outcomes 2, 3, 5 & 6)

Code MFAC 0001: Manufacturing Facilities
Credits 5

Description of Module
This module has two elements, the first including a comprehensive study of investment appraisal and the factors affecting
long-term planning in manufacture. The second element investigates the construction and function of cleanrooms, and piped and ducted systems, along with related issues such as maintenance and energy management, and health and safety.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Explain and analyse the strategic influences on decision-
2. Making processes in manufacturing.
3. Assess capital investment decisions using standard investment appraisal techniques.
4. Describe the various capacity planning and forecasting models in use in manufacturing.
5. Analyse location and layout planning techniques with particular emphasis on modem manufacturing environments
6. Explain the functions and construction details of
7. Manufacturing facilities such as dean-rooms, and piped and ducted systems, and perform routine related calculations.
8. Critique the structure and strategies associated with a maintenance management system, and perform related standard
calculations.
9. Describe, and specify a method of auditing, the energy usage of a manufacturing facility.
10. Explain the rights and responsibilities assigned under current health and safety legislation.

Learning and teaching methods Assessment Methods
1. Lectures 1. Final Exam 70%
2. Cont Assessment 30% (10% MCCrs, 20% assignment

Code PROC 0004 : Process Control
Credits 5

Description of Module
Process Control introduces the students to modem manufacturing control implementations and requirements. It covers the currently most popular control types in both analogue and digital forms. Tuning these controllers for various performance
qualities and introducing them into multi-variable systems is outlined. Feed Forward Control and the reduction / elimination of plant disturbance and dead-time are detailed. Finally, analysing the stability of any control system is also explained.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Choose from the possible P-, I- and D- controller combinations to suit any given process requirements

2. List and describe various digital PID tuning techniques and propose and implement one, based on specified needs.
3. Solve any transfer function and analyse its sensitivity to perturbations in any of its parameters.
4. Explain the need for and application of feed forward control and suggest a suitable implementation with feedback.
5. Analyse a system for stability and be able to determine the margin of stability of any system.

Assessment Methods
1. 70% for end-of semester written examination
2. 20% for laboratory programme
3. 10% for assignment/continuous assessment

Code OPST 0001 : Operations Strategy
Credits 5

Description of Module
This module will address the principal strategic issues affecting modem Manufacturing Operations Management and will give the student a framework for assessing a firm's strategic position in relation to present day trends.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Describe the evolution of Operations Strategy up to the present day.
2. Illustrate the underlying strategic principles with appropriate examples
3. Demonstrate the Importance of various management initiatives such as JIT, TOM, BPR, Concurrent Engineering, Employee Empowerment, and others in Improving operational competitiveness
4. Illustrate the effectiveness of the above initiatives with appropriate examples
5. Critically assess current literature related to Manufacturing Operations Management

Learning and teaching methods and strategies:
1. Lectures
2. Research & Technical Report Writing

Assessment Methods
1. 80% final examination
2. 20% continuous assessment consisting of a report and an oral presentation

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Code PROJ 0048: Project 1
Credits 5

Description of Module
Project is a significant element of the Year 4 schedule primarily providing students with the opportunity to apply engineering and related theory. In Project 1 students are required to prioritise activities and schedule their project, and develop a view of where their work fits into existing academic and industrial contexts. A research element is required, and specific and measurable objectives are inherent in the process.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Define, prioritise, and schedule individual project milestones and objectives.
2. Evaluate where the project work fits into ongoing related work by other academics and practitioners.

Learning and teaching methods and strategies:
1. Project-based activities, specific to the nature of the project.
2. Weekly report from student, with feedback from lecturer.
3. Project participation.

Assessment Methods
1. Continuous assessment - weekly updates - 50%
2. Project participation - 50% (placement presentation and activities related to the nature of project).

Year 4 - Semester 8 (Jan – May)

Code AMAT 0001: Advanced Materials & Process Selection
Credits 5

Description of Module
This module comprises of two components, (i) Advanced Materials focuses on evolving engineered materials including novel composites and cellular/foamed materials. (Ii) Materials & Process Selection focuses on the selection of the most appropriate materials for use in products/components.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Evaluate key mechanical and physical properties of advanced composite and cellular materials based on polymeric, metallic and ceramic matrices.
2. Differentiate between, and explain, the underlying mechanisms responsible for the 'smart' response in various systems.
3. Design shape memory actuators such as springs, and assess the structural health monitoring capability of optical fibre

Bragg grating sensors embedded In host materials with particular reference to strain sensitivity and the achievement of enhanced distributed strain / temperature sensing capability.
4. Predict the percentage improvement in yield strength that may be expected in metallic materials through the reduction in grain size from micro-scale to nano-scale, and evaluate key processing benefits and parameters for bulk nanostructured materials.
5. Outline the unique mechanical properties and deformation characteristics of bulk metallic glasses.
6. Derive appropriate performance and material indices for load bearing members frequently encountered in mechanical design, and use appropriate materials selection charts to Identify a subset of materials that would enable performance to be maximised.
7. Learning and teaching methods and strategies:
8. Lectures and demonstrations, i.e. of Cambridge Engineering Selector Software.

Assessment Methods

1. End of module exam 100%

Code FSIM 0001 : Facility Simulation & Reliability
Credits 5

Description of Module

This module incorporates two subjects; Facility Simulation which introduces the student to practical simulation techniques as applied to manufacturing and business planning and control. Reliability will familiarise the student with the theory and methods associated with industrial reliability issues such as stress testing and failure rate estimation.

Learning Outcomes

On successful completion of this module, a student will be able to:

1. Explain properties and methods of objects used in discrete event simulation models.
2. Build computer models of basic manufacturing layouts
3. Interpret the results of simulation runs.
4. Identify and make use of basic principles of reliability and commonly used parameters.
5. Explain important design for reliability concepts, and explain the role of accelerated stress testing in estimating characteristics component data.
6. Analyse and interpret industrial reliability test data.

Learning and teaching methods and strategies:

1. Classroom lectures.
2. Written Assignments.
3. Computer laboratory supervised learning.
4. Practical computer-based assignments.

Assessment Methods

1. 60% Final Examination
2. 40% Continuous Assessment

Code SPCM 0001: Supply Chain Management
Credits 5

Description of Module
This module will address the broader strategic issues affecting modem supply chain management and the strategies being adopted by today's organisations in response to global competition.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Identify the components of supply chain management and outline the financial and strategic impact of effective management of these activities
2. Demonstrate an understanding of the importance of channel management and Customer Service.
3. Calculate the Impact of savings in supply chain costs on overall profitability and ROA.
4. Demonstrate an understanding of the importance of Inventory management and the technological advances made in this area In recent years

Learning and teaching methods and strategies:
1. Lectures
2. Research and technical report writing

Assessment Methods
1. 80% final examination
2. 20% continuous assessment consisting of a written report and an oral presentation

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Code PROC 0002: Energy Conversion
Credits 5

Description of Module
This module builds on the students' knowledge of thermodynamics concentrating on such topics as cogeneration, trigeneration, heat pumps and combustion. The student is also exposed to the area of renewable energy sources utilising the traditional thermodynamic tools to help in this analysis.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Analyse cogeneration and tri generation systems
2. Describe and model various industrial processes
3. Analyse Heat pump performance
4. Explain and analyse the combustion process and determine the performance of a range of boilers and furnaces
5. Perform in-depth analysis of a variety of renewable energy sources
6. Analyse a variety of gas cycles

Learning and teaching methods and strategies:

1. Lectures
2. Assignments

Assessment Methods
1. 70% Written Exam
2. 30% Continuous Assessment

Code ROBO 0001: Applied Fluid Mechanics
Credits 5

Description of Module
The course establishes the relevance of fluid mechanics to Mechanical & Manufacturing engineering. It develops the principles underlying the subject and demonstrates how these are used for the design of hydraulic components and systems.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Evaluate the fundamental elements of Fluid Mechanics, and solve standard associated calculations.
2. Appraise the concepts of fluid properties and dimensional analysis.
3. Apply and resolve pressure measurement, continuity equation and Bernouili equation calculations.
4. Formulate calculations relevant to statistics, dynamics and real fluids

Learning and teaching methods and strategies:
1. Lectures
2. Assignments
3. Laboratories

Assessment Methods
1. Practical Labwork 20%
2. MCQ Assessment 10%
3. Final Exam 70%

Code PROJ 0049: Project 2
Credits 5

Description of Module
Project is a significant element of the Year 4 schedule primarily providing students with the opportunity to apply engineering and related theory. In Project 2 students are required to develop a solution for their assignment, present their findings, and write a final report for the project client and supervisor. Implementation of the solution is encouraged.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Professionally present project findings In written and aural manner.
2. Define, prioritise, and schedule individual project milestones and objectives.
3. Demonstrate the application of pertinent knowledge, in a flexible manner, to the solving of a problem susceptible to engineering treatment.
4. Evaluate where the project work fits into ongoing related work by other academics and practitioners.

Learning and teaching methods and strategies:
1. Weekly report from student, with feedback from lecturer.
2. Presentation of findings.
3. Final report of findings.
4. Assessment Methods
5. Final exam 100%

Indicative Content
1. Continuous assessment - weekly updates 20%
2. Presentation 20%
3. Final Report 60%

HIGHER CERTIFICATE IN ENGINEERING IN MECHANICAL ENGINEERING

Level: 6

Year One	
Semester 1	**Semester 2**
Electrical Technology	Production Technology 1
Learnig Skills	Engineering Drawing /CAD
Workshop 1	Mechanical Science
Machine Systems	Engineering Science
Materials Technology 1	Introductory Calculus
Fundamental Engineering Maths	Machine Control & Assembly
Year 2	
Semester 3	**Semester 4**
Mathematics Methods	Calculus
Engineering Drawing /Design	Electronics & Control
Applied Computing	Power Systems
Materials Technology 2	Productions Technology 2
Production Plant	Engineering Design Analysis
Workshop 2	Project

BACHELOR OF ENGINEERING IN MANUFACTURING ENGINEERING

Year One	
Semester 1	**Semester 2**
Engineering Design Process	Engineering Design Operation
Manufacturing Technology	Mechatronics 2
Mechatronics 1	Process Control
Operations Management	Robotics & Materials Handling
Different Equations	Dynamics & Control
Project 1	Project 2

BACHELOR OF SCIENCE (HONS) IN MANUFACTURING ENGINEERING

Year One	
Semester 1	**Semester 2**
Software Engineering	Networks & Facility Simulation
CAE	Process Evaluation
Advanced Manufacturing	Operation Management
Process Control	Design for Manufacture
Process Technology	Manufacturing Technology
Project 1	Project 2

BACHELOR OF ENGINEERING IN ELECTRICAL ENGINEERING

Year One	
Semester 1	**Semester 2**
Fundamental Engineering Maths	Introduction Calculus
Electrical Science 1	Electrical Science 2
Electronic Devices & Theory	Discrete Active Circuits
Engineering Science 1	Electrical Engineering 1
Computer Aided Electrical Engineering 1	Computer Aided Electrical Engineering 2
Learning Skills / Communications	Electrical Workshop
Year Two	
Semester 3	**Semester 4**
Further Calculus & Probability	Linear Algebra & ODEs
Engineering Software Tools	Building Services
Instrumentation & Measurement	Robotics & Control
Electrical Engineering 2	Electrical Machines
Security System Design	Power Systems
Applied Electrical Engineering Project	Electrical Control Project
Year Three	
Semester 5	**Semester 6**

Maths Transform Methods	Linear & Fourier Analysis
Mechatronics	Lighting & Daylight Design
Industrial Electronics	Industrial Automation
Electrical Services Design	Sustainable Heat & Power Generation
Electrical Power Engineering	Engineering Management & Enterprise
Electrical Engineering Project 1	Electrical Engineering Project 2

BACHELOR OF ENGINEERING (HONS) IN ELECTRICAL ENGINEERING

Year One	
Semester 1	**Semester 2**
Topics in Engineering Maths	Industrial Placement
Semiconductor Technology	
Telecommunications	
Electrical Power Systems	
Fundamental Smart Grid Technology	
HLL Programming	
Year Two	
Semester 3	**Semester 4**
Analogue Control	Digital Control
Electrical Signals and Systems	Robotics and Vision
Data Communications	Energy management of Buildings
Algorithms and Applications	Smart Grid/Renewable Energies
Industrial Standards and Legislation	Operations Management
Project Specification	Project Implementation

Bachelor of Architecture – WD_CBARC_B – YEAR 4

Architectural Design - Urban Complexities

Programme and Module Code: Bachelor of Architecture – WD_CBARC_B – YEAR 4
Module Code: ARCH 0031

Credits: 10 – Semester 7

Learning Outcomes
On successful completion of this module the student will be able to:

- List and discuss the requirements and demands of designing high-density buildings in complex urban contexts.
- Adapt more complex design responses to different urban settings
- Categorise urban typologies and styles of architecture between buildings.
- Respond creatively to the requirements of architectural competition.
- Present high quality design work both visually and verbally.

Assessment method: 100% Continuous Assessment

Architectural Design - Rural Complexities

Programme and Module Code: Bachelor of Architecture – WD_CBARC_B – YEAR 4
Module Code: ARCH 0029

Offered: Semester 2 (Jan – May) Credits: 15

Learning Outcomes
On successful completion of this module the student will be able to:

- List and discuss the limitations on design solutions which are imposed by a complex rural and conservation context.
- Give examples of best contemporary practice in this area.
- Demonstrate continued improvement in the quality of the visual and verbal presentation of work.
  Present high quality design work both visually and verbally.

Assessment method: 100% Continuous Assessment

Cultural Contents - Urban Design

Programme and Module Code: Bachelor of Architecture – WD_CBARC_B – YEAR 4
Module Code: DESG 0054

Offered : Semester 1 (Sept – Dec) Credits: 5

Learning Outcomes
On successful completion of this module the student will be able to:

- Give examples of the economic, social and cultural forces that shape our urban environment.
- Describe a range of urban design typologies, both contemporary and historic, national and international
- Discuss the principles of successful design interventions in urban environments.
- Explain key principles in the design of successful public spaces.

Assessment method: 50% Continuous Assessment & 50% Final Exam

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Landscape Design

Programme and Module Code: Bachelor of Architecture – WD_CBARC_B – YEAR 4
Module Code: DESG 0053
Offered: Semester 2 (Jan – May)
Credit: 5

Learning Outcomes
On successful completion of this module the student will be able to:

- Discuss the aesthetic value and design potential afforded by an integrated approach to building and landscape design.
- Design simple landscape concepts.
- Identify and select appropriate plants to suit the overall design concepts for small projects.
- Select hard and soft materials appropriate for integration in a particular landscape concept.

Assessment method: 50% Continuous Assessment & 50% Final Exam

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TSE7, Technology, Structure Environmental Science

Programme and Module Code: Bachelor of Architecture – WD_CBARC_B – YEAR 4
Module Code: ARCH 0051

Offered: Semester 1 – Credit: 5

Learning Outcomes
On successful completion of this module the student will be able to:

- Appreciate the interdisciplinary nature of building design
- Clarify design intentions through choice of materials and systems

- Analyse criteria for selecting appropriate technologies, including cladding designs
- Choose infrastructure and structural systems appropriate to an urban/brown field site
- Develop architectural designs with an awareness of the interconnection of technological, environmental and sustainable issues

Assessment method: 100% Continuous Assessment

TSE 8, Technology, Structure Environmental Science

Programme and Module Code: Bachelor of Architecture – WD_CBARC_B – YEAR 4
Module Code: ARCH 0053
Offered: Semester 2
Credit: 5

Learning Outcomes
On successful completion of this module the student will be able to:

- Be responsible for natural resources in the design of the built environment
- To assess micro environments in rural and landscapes settings
- Understand appropriate building technologies in complex rural designs
- Prepare a dissertation on the analysis of integration of technologies in one piece of architecture (3,000 words plus 30 annotated illustrations)
- Evaluate energy assessments of buildings using software
- Integrate at a practical level the design of structures and services into studio work.

Assessment method: 100% Continuous Assessment

HIGHER CERTIFICATE IN ELECTRONIC ENGINEERING - YEAR 2 - EELEC_C_Y2

Linear Amplifiers & Oscillators

Programme Code: HIGHER CERTIFICATE IN ELECTRONIC ENGINEERING - YEAR 2 - EELEC_C_Y2
Module Code: ELTR 0020
Offered: Semester 1
Credits: 5
Learning Outcomes
On successful completion of this module the student will be able to:

- Understand the ideal and non- ideal characteristics of operational amplifiers and perform relevant calculations.
- Know the fundamental linear operational amplifier circuits (AC and DC) and be able to build, derive, understand and perform gain, bandwidth and input/output signal calculations.
- Be able to compare different discrete amplifier devices and understand the different classes of amplification.

- Recognise various single and cascaded discrete amplifier circuits and be able to build, derive, understand, and perform gain and input/output signal calculations.
- Be familiar with oscillator circuits, perform relevant calculations and know the applications for the different circuits
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Assessment method: 40% Continuous Assessments & 60% Final Exam

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Sequential Digital Systems

Programme Code: HIGHER CERTIFICATE IN ELECTRONIC ENGINEERING - YEAR 2 - EELEC_C_Y2
Module Code: ELTR 0021
Offered: Semester 1
Credits: 5

Learning Outcomes

On completion of this subject, students will:

- Understand digital sequential systems and feedback.
- Distinguish between different flipflop operations
- Recognise different flipflop types
  Ripple Counter Design
- Synchronous Counter Design
- Shift Register Circuit Design
- Synchronous Sequential Logic Design

Assessment method: 30% Continuous Assessments & 70% Final Exam

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Telecommunications Fundamental

Programme Code: HIGHER CERTIFICATE IN ELECTRONIC ENGINEERING - YEAR 2 - EELEC_C_Y2
Module Code: TELE 0001

Offered : Semester 1 – Credit: 5

Learning Outcomes
On completion of this subject, students will:
- Perform calculations based on frequency and amplitude modulation formulae.
- Reproduce and analyse circuits to perform ampllitude and frequency modulation and demodulation
- Describe basic telecommuncation signals and how they are affected by transmission and noise
- Be able to identify and explain the operation of the main elements of radio receivers and transmitters

Assessment method: 40% Continuous Assessments & 60% Final Exam

PROGRAMME: BENG ELECTRONIC ENGINEERING (WD_EELEC_D) – YEAR 3

Embedded ARM Development

Programme Code: PROGRAMME: BENG ELECTRONIC ENGINEERING (WD_EELEC_D) – YEAR 3
Module Code: EMAD 0001
Offered: Semester 1
Credits: 5

Learning Outcomes
On completion of this subject, students will:

- Demonstrate knowledge and understanding of architectural features of the ARM core family and its programming model.
- Demonstrate understanding of the ARM instruction set, addressing modes, and exception processing
- Write programs in Assembly Language for a variety of tasks including I/O and associated devices
- Use software development tools to implement a program, run it and debug it, on a development board.

Assessment method: 30% Continuous Assessments & 70% Final Exam

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PROGRAMME: BACHELOR OF SCIENCE (HONS) IN ELECTRONIC ENGINEERING (WD_EELEC_B) – YEAR 3

Analogue Circuit Design

Programme Code: BSc (HONS) IN ELECTRONIC ENGINEERING (WD_EELEC_B) Yr3
Module Code: ANCD 0001
Offered: Semester 1
Credits: 5

Learning Outcomes
On completion of this subject, students will:

- Compare the various types of bridge sensor/transducer configurations and analyse their performance characteristics.
- Compare and contrast the operation and characteristics of different A/D and D/A converter architectures and calculate performance parameters.
- Compare and contrast the operation and characteristics of different A/D and D/A converter architectures and calculate performance parameters.
- Design basic analogue and digital circuits at MOS transistor level.

Assessment method: 100% Continuous Assessment

Control Systems

Programme Code: BSc (HONS) IN ELECTRONIC ENGINEERING (WD_EELEC_B) Yr3
Module Code: CSYS 0001
Offered: Semester 1
Credits: 5

Learning Outcomes
On completion of this subject, students will:

- Understand the technology of control system actuators.
- Model analogue control systems.
- Analyse analogue control systems in the time domain.
- Design analogue controllers using time domain analysis.
- Have a knowledge of Computer Control and Industrial Communications.
- Program a PLC for control applications.

Assessment method: 30% Continuous Assessments & 70% Final Exam

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Telecommunications 3

Programme Code: BSc (HONS) IN ELECTRONIC ENGINEERING (WD_EELEC_B) Yr3
CRN Number: TELE 0004
Offered: Semester 1
Credits: 5

Learning Outcomes
On completion of this subject, students will:

- Perform analysis and calculations of different types of transmission lines, including the use of smith-chart for different applications.
- Demonstrate good knowledge and understanding of the different types and characteristics of radio waves including their propagation , reflection and refraction.
- Describe, analyze and design basic types of antennas used for different applications.
- Have good knowledge and understanding of the effects of the transmission medium on digital signals and of the reduction techniques of such effects.
- Write good practical reports , in line with a prescribed format , including adequate presentation of the practical results calculations and conclusions

Assessment method: 30% Continuous Assessments & 70% Final Exam

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PROGRAMME: BACHELOR OF SCIENCE (HONS) IN ELECTRONIC ENGINEERING (WD_EELEC_B) – YEAR 4

Data Communications

Programme Code: BSc (HONS) IN ELECTRONIC ENGINEERING (WD_EELEC_B) Yr4
Module Code: DCOM 0001
Offered: Semester 1
Credits: 5
Learning Outcomes
On completion of this subject, students will:

- Describe the implementations of flow and error control in general from the OSI and as they appear in practice in Frame Relay, ISDN, GSM and ATM.
- Compare the relative merits of packet over circuit switched and of virtual circuit switching over datagrams, assigning a relative importance to each of the points raised.
- Analyse a data frame and explain, based on the nature and field size, whether it is a datagram or virtual circuit packet.
- In terms of the Internet Protocol, explain the choices made in Header fields and Routing algorithms, compare the choices and consequent trade-offs and comment on current and future requirements.

Assessment method: 30% Continuous Assessments & 70% Final Exam

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Wireless Communication Theory

Programme Code: BSc (HONS) IN ELECTRONIC ENGINEERING (WD_EELEC_B) Yr4
Module Code: WCOM 0001
Offered: Semester 1
Credits: 5

Learning Outcomes
On completion of this subject, students will:

- Discuss and differentiate between modulation and access schemes in terms of implementation and spectral efficiency.
- Demonstrate a solid understanding of coherent and no coherent receiver structures and be able to discuss the concept of matched filter and correlator type detection.
- Demonstrate a core understanding of error performance parameters in Gaussian Noise and be able to illustrate knowledge on the trade off's between transmit power, channel bandwidth and receiver implementation.
- Develop a comprehensive link budget for Line of Sight wireless systems accounting for common sources of loss and interference in the transmission channel and in the receiver.
- Explain the unique characteristics of Spread Spectrum Modulation and perform basic analysis of performance parameters.

Assessment method: 40% Continuous Assessments & 60% Final Exam

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Signals & Systems

Programme Code: BSc (HONS) IN ELECTRONIC ENGINEERING (WD_EELEC_B) Yr4
Module Code: SSYS 0001
Offered: Semester 1
Credits: 5

Learning Outcomes
On completion of this subject, students will:

- Derive the characteristic 1st and 2nd order differential equation governing passive RLC circuits and by obtaining the roots of that equation predict the step response of the circuit - under damped, over damped or crictally damped. They will be able to relate the step response to the impulse response.
- Use laplace transforms to analyse 2nd and higher order passive circuits transforming the circuits
- Obtain the transfer functions of passive analog systems and thereby obtain the pole zero plots and bode plots of the systems and interpret their behaviour from these plots.
- Design and analyse active filters such as Butterworth , Chebyshev , Bessell and Elliptic.

Assessment method: 30% Continuous Assessments & 70% Final Exam

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Embedded Processing

Programme Code: BSc (HONS) IN ELECTRONIC ENGINEERING (WD_EELEC_B) Yr4
Module Code: EMBP 0001
Offered: Semester 1
Credits: 5

Learning Outcomes
On completion of this subject, students will:

- Demonstrate knowledge and understanding of architectural features of DSP chips, programming instructions and DSP arithmetic.
- Write programs in assembly and high level languages to implement simple processing structures and perform housekeeping tasks.
- Demonstrate knowledge and understanding of the FPGA architectures and IP core concepts.
- Write HDL programs to synthesise simple signal processing structures.
- Use development tools and design flow methodology pertaining to signal processors and FPGA.

Assessment method: 50% Continuous Assessments & 50% Final Exam

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PROGRAMME: BACHELOR OF ENGINEERING (HONS) IN ELECTRONIC ENGINEERING (WD_EEELC_B)

Electronic Circuits 2

Programme Code: BSc (HONS) IN ELECTRONIC ENGINEERING (WD_EEELC_B) Yr2
Module Code: ANEC 0002
Offered: Semester 1
Credits: 5

Learning Outcomes
On completion of this subject, students will:
- Demonstrate a sound knowledge fundamentals of analogue circuit design.
- Discuss and explain the role of negative feedback in amplifier circuits.
- Discuss the sources of errors in amplifiers constructed from op-amps.
- Show and explain the design of linear op-amp circuits.
- Calculate the frequency response and error response of different circuit designs.

Assessment method: 30% Continuous Assessments & 70% Final Exam

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Finite State Machines

Programme Code: BSc (HONS) IN ELECTRONIC ENGINEERING (WD_EEELC_B) Yr2
Module Code: FISM 0001
Offered: Semester 1
Credits: 5

Learning Outcomes
On completion of this subject, students will:
- Understand the fundamental concepts of finite state design.
- Appreciate the relevance of finite state machine optimisation.
- Generate and test finite state machine implementations and ensure that critical race and hazard conditions, in particular, do not materialise in the asynchronous design options explored.
- Implement linear sequential circuit applications.
- Use VHDL as a basis for the description and simulation of finite state machines.

Assessment method: 30% Continuous Assessments & 70% Final Exam

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Electric Circuit Theory

Programme Code: BSc (HONS) IN ELECTRONIC ENGINEERING (WD_EEELC_B) Yr2
Module Code: ELCT 0001
Offered: Semester 1
Credits: 5

Learning Outcomes

On completion of this subject, students will:

- Illustrate the time and frequency response of 1st and 2nd order passive electrical systems.
- Determine equivalent circuits and component values from given responses.
- Design passive circuits (up to 2nd order) to give desired responses.
- Use two-port network matrices to analyse cascaded circuits etc.
- Articulate, reason & present clearly in technical reports/ presentations.
- Set up, perform & troubleshoot specified practical experiments, & use simulations.

Assessment method: 30% Continuous Assessments & 70% Final Exam

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Advance Programming Concepts

Programme Code: BSc (HONS) IN ELECTRONIC ENGINEERING (WD_EEELC_B) Yr2
Module Code: ADPC 0001
Offered: Semester 1
Credits: 5

Objectives
On completion of this subject, students will:

- Describe approaches to programming and problem solving.
- Understand the fundamental concepts of computer programming.
- Demonstrate ability to write, debug and test well-styled and
- Appropriately documented programs.
- Demonstrate an understanding of the fundamentals of programming.
- Analyse different programming concepts and choose appropriate concepts for a particular programming problem.

Assessment method: 100% Continuous Assessments

Telecommunications 1 Code: BSc (HONS) IN ELECTRONIC ENGINEERING (WD_EEELC_B) Yr2

Module Code: TELE 0006
Offered: Semester 1
Credits: 5

Learning Outcomes

On completion of this subject, students will:

- Have good understanding of the basic theory of telecommunications.
- Describe and analyze the construction and operation of different types of analogue & digital modulators & demodulators.
- Demonstrate good background knowledge of different types of communication receivers.
- Compare between different analogue and digital modulation processes and identify a suitable process for a particular application.

- Write meaningful practical reports, in line with a prescribed format, showing adequate presentation of practical results, calculations and drawn conclusions.

Assessment method: 30% Continuous Assessments & 70% Final Exam

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PROGRAMME: BACHELOR OF ENGINEERING (HONS) IN ELECTRONIC ENGINEERING (WD_EEELC_B)

Semiconductor Fundamental

Programme Code: Bachelor of Engineering (Hons) in Electronic Engineering (WD_EEELC_B) Yr3
Module Code: SEMF 0001
Offered: Semester 1
Credits: 5

Learning Outcomes

On completion of this subject, students will:

- Demonstrate knowledge and comprehension of the fundamental concepts of solid state theory as applied in the analysis of carrier transport in semiconductor materials.
- Demonstrate a knowledge and comprehension of the fundamental physical processes employed in the fabrication of semiconductor diode structures.
- Demonstrate a knowledge and comprehension of the fundamentals of design, operation and fabrication of schottky, junction and optoelectronic diode devices.
- Demonstrate an ability to apply the knowledge and comprehension gained in evaluating and relating macroscopic semiconductor diode performance parameters to semiconductor solid state theory and associated fabrication processes.

Assessment method: 30% Practical & 70% Final Exam

Data Structures & Algorithms

Programme Code: Bachelor of Engineering (Hons) in Electronic Engineering (WD_EEELC_B) Yr3
Module Code: DASA 0001
Offered: Semester 1
Credits: 5

Learning Outcomes

On completion of this subject, students will:

- Choose and/or write appropriate algorithms using appropriate data structures.
- Analyse algorithms in order to choose the most appropriate for the problem space.
- Demonstrate the use of object-oriented techniques, using an knowledge of the concepts when writing code and when using class libraries.

Assessment method: 20% Continuous & 80% Practical

PROGRAMME: BACHELOR OF SCIENCE (HONS) IN MECHANICAL & MANUFACTURING ENGINEERNG (WD_EMSEN_B)

Industrial Power Systems

Programme Code: BSc (Hons) in Mechanical & Manufacturing Engineering (WD_EMSEN_B) Yr3
Module Code: ISPY 0001
Offered: Semester 1
Credits: 5

Learning Outcomes

On completion of this subject, students will:

- Identify pneumatic and hydraulic system components, their symbols, their function, and describe their basic operation.
- Interpret multi-actuator pneumatic and hydraulic circuits diagrams.
- Design multi-actuator pneumatic and hydraulic circuits.
- Control multi-actuator pneumatic and hydraulic circuits using logic and PLC's.
- Apply engineering principals to the design of pneumatic and hydraulic circuits.

Assessment method: 10% Continuous Assessment, 20% Practical & 70% Final Exam

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Mechanics of Materials

Programme Code: BSc (Hons) in Mechanical & Manufacturing Engineering (WD_EMSEN_B) Yr3
Module Code: MECH 0014
Offered: Semester 1
Credits: 5

Learning Outcomes

On completion of this subject, students will:

- Design Mechanical Components, Devices and Structures.
- Predict the Failure of Mechanical Components and Structures.
- Demonstrate an Understanding of Three Dimensional States of Stress.
- Apply the concepts of Fatigue and Creep to real design scenarios.

Assessment method: 20% Continuous Assessment & 80% Final Exam

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Fluid Mechanics

Programme Code: BSc (Hons) in Mechanical & Manufacturing Engineering (WD_EMSEN_B) Yr3
Module Code: LUM 0001
Offered: Semester 1
Credits: 5

Learning Outcomes
On completion of this subject, students will:
- Apply the fundamental aspects of fluid motion.
- Expand on the basic analysis methods.
- Analyse problem parameters confidently and accurately.
- Select and apply problem solving techniques.

Assessment method: 50% Continuous Assessment & 50% Final Exam

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Dynamics & Vibrations

Programme Code: BSc (Hons) in Mechanical & Manufacturing Engineering (WD_EMSEN_B) Yr3
Module Code: ENGR 0068
Offered: Semester 1
Credits: 5

Learning Outcomes
On completion of this subject, students will:
- Quantify the spread of given measurements, evaluate the errors associated with the particular measurements and the level of uncertainty, formulate a statement of uncertainty and assess the adequacy or otherwise of the acquired data in fulfilling the intended purpose.
- Undertake measurement using a CMM in accordance with best practice procedures relating to the selection of the number of measurement points, sampling criteria for standard features, cleanliness and environmental conditions.
- Undertake measurement using a CMM in accordance with best practice procedures relating to the selection of the number of measurement points, sampling criteria for standard features, cleanliness and environmental conditions.
- Assess the accuracy of a CMM, explain the advantages of the various probes and stylus configurations, and appraise software functionality in relation to drawing requirements and good metrology practice when using CMMs with CAD data to inspect parts
- Explain the underlying principles of dimensional measurement using vision systems with particular reference to image formation and resolution, image capture and aberrations in the image forming system, pixel calibration, setting the correct detection threshold, and quantifying the effects of distortion and magnification errors.

Assessment method: 30% Continuous Assessment & 70% Final Exam

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Enterprise Resource Management

Programme Code: BSc (Hons) in Mechanical & Manufacturing Engineering (WD_EMSEN_B) Yr3
Module Code: ENRM 0001
Offered: Semester 1
Credits: 5

Learning Outcomes

On completion of this subject, students will:

- Solve order quantity and production quantity problems.
- Distinguish between dedicated, multi-, and mixed-model line balancing, and solve complex line balancing problems.
- Apply math models to the solution of standard production control calculations, and formulate plans to improve production control.
- Model a product and production system (including BOM, production routings, inventory, and related data) and assess within a manufacturing database the impact of customer orders on resource requirements.

Assessment method: 10% Continuous Assessment & 40% Project & 50% Final Exam

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Quality Management

Programme Code: BSc (Hons) in Mechanical & Manufacturing Engineering (WD_EMSEN_B) Yr3
Module Code: QUAL 0013
Offered: Semester 1
Credits: 5

Learning Outcomes

On completion of this subject, students will:

- Understand the fundamentals of process control and apply this understanding to manufacturing.
- Apply their knowledge of sampling to a variety of manufacturing scenarios.
- Explain a variety of quality management tools.
- Explain the contribution of a number of quality management experts and their relevance to current quality thinking.

Assessment method: 30% Continuous Assessment & 70% Final Exam

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PROGRAMME: BACHELOR OF SCIENCE (HONS) IN MECHANICAL & MANUFACTURING ENGINEERNG (WD_EMSEN_B) – YEAR 4

Process Control

Programme Code: BSc (Hons) in Mechanical & Manufacturing Engineering (WD_EMSEN_B) Yr4
Module Code: PROC 0004
Offered: Semester 2
Credits: 5

Learning Outcomes

On completion of this subject, students will:

- Choose from the possible P-, I- and D- controller combinations to suit any given process requirements
- List and describe various digital PID tuning techniques and propose and implement one, based on specified needs.
- Solve any transfer function and analyse its sensitivity to perturbations in any of its parameters.

- Explain the need for and application of feedforward control and suggest a suitable implementation with feedback.
- Analyse a system for stability and be able to determine the margin of stability of any system.

Assessment method: 15% Continuous Assessment, 15% Practical Exam & 70% Final Exam

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Operations Strategy

Programme Code: BSc (Hons) in Mechanical & Manufacturing Engineering (WD_EMSEN_B) Yr4
Module Code: OPST 0001
Offered: Semester 1
Credits: 5

Learning Outcomes
On completion of this subject, students will:
- Describe the evolution of Operations Strategy up to the present day.
- Illustrate the underlying strategic principles with appropriate examples.
- Demonstrate the importance of various management initiatives such as JIT, TQM, BPR, Concurrent Engineering, Employee Empowerment, and others in improving operational competitiveness.
- Illustrate the effectiveness of the above initiatives with appropriate examples.
- Critically assess current literature related to Manufacturing Operations Management.

Assessment method: 20% Continuous Assessment, & 80% Final Exam

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Manufacturing Facilities

Programme Code: BSc (Hons) in Mechanical & Manufacturing Engineering (WD_EMSEN_B) Yr4
Module Code: MFAC 0001
Offered: Semester 1
Credits: 5

Learning Outcomes
On completion of this subject, students will:
- Explain and analyse the strategic influences on decision-making processes in manufacturing.
- Describe the various capacity planning and forecasting models in use in manufacturing.
- Describe the various capacity planning and forecasting models in use in manufacturing.
- Analyse location and layout planning techniques with particular emphasis on modern manufacturing environments.
- Explain the functions and construction details of manufacturing facilities such as clean-rooms, and piped and ducted systems, and perform routine related calculations.
- Critique the structure and strategies associated with a maintenance management system, and perform related standard calculations.

- Describe, and specify a method of auditing, the energy usage of a manufacturing facility.
- Explain the rights and responsibilities assigned under current health and safety legislation.

Assessment method: 30% Continuous Assessment, & 70% Final Exam

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FEA & Design Tools

Programme Code: BSc (Hons) in Mechanical & Manufacturing Engineering (WD_EMSEN_B) Yr4
Module Code: FEAD 0001
Offered: Semester 1
Credits: 5

Learning Outcomes
On completion of this subject, students will:
- Use software tools to design mechanical devices.
- Specify where software tools can used in the design process.
- Demonstrate an understanding of Finite Element Analysis theory.
- Use FEA software to analyse mechanical and heat transfer problems.
- Demonstrate and understanding of the application of simulation software to plastics injection moulding.
- Explain the processes and application of Rapid Prototyping.

Assessment method: 50% Continuous Assessment, & 50% Final Exam

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PROGRAMME: BSC (Hons) in Construction Management (WD_CCONM_B) YR 3

Measurement & Costing

Module Code: COST 0002
Programme Code: BSc (Hons) in Construction Management (WD_CCONM_B) Yr3
Offered: Semester 1
Credits: 5

Learning Outcomes
On completion of this subject, students will:
- Measure quantities and prepare minor sub-contract tender packages.
- Prepare a cash flow forecast.
- Analyse and compare sub-contractors quotations and prices.
- Develop income and expenditure S-curves.
- Understand the main financial clauses in contracts.

Assessment method: 40% Continuous Assessment, & 60% Final Exam

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Construction Health & Safety

Programme Code: BSc (Hons) in Construction Management (WD_CCONM_B) Yr3
Module Code: COHS 0003
Offered: Semester 1
Credits: 5

Learning Outcomes
On completion of this subject, students will:

- Apply knowledge of Safety legislation to plan a safe system of work and to ensure effective management of health and safety.
- Prepare Safety Statements, construction safety plans and safety files.
- Develop safe systems of work and safe operating procedures for construction related activities.
- Appreciate the hazards and risks associated with construction.
- Prepare and evaluate a construction site safety auditing system.

Assessment method: 30% Continuous Assessment, & 70% Final Exam

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Construction Technology Systems

Programme Code: BSc (Hons) in Construction Management (WD_CCONM_B) Yr3
Module Code: CTEC 0001
Offered: Semester 1
Credits: 5

Learning Outcomes

- Recognise the need for more complex construction solutions.
- Classify architectural and engineering materials and techniques.
- Develop solutions for problems on building and engineering projects.
- Examine the unique requirements of process engineering construction.

Assessment method: 30% Continuous Assessment, & 70% Final Exam

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Site Surveying

Programme Code: BSc (Hons) in Construction Management (WD_CCONM_B) Yr3
Module Code: SURV 0002
Offered: Semester 1
Credits: 5

Learning Outcomes
On completion of this subject, students will:

- Make the necessary calculations to set out the horizontal and vertical positions of straight or curved construction works.
- Use a range of surveying instruments including laser levels, the odolites and total stations to set out the positions of buildings, roads and drains.

- Input setting out information to electronic equipment and download surveyed data to computer.
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Assessment method: 50% Continuous Assessment, & 50% Final Exam

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Engineering Structures

Programme Code: BSc (Hons) in Construction Management (WD_CCONM_B) Yr3
Module Code: ENST 0001
Offered: Semester 1
Credits: 5

Learning Outcomes
On completion of this subject, students will:
- Understand the interfaces between design and construction.
- Design selected structures and assess any construction implications.
- Comprehend design criteria for design of prestressed concrete and the issues raised in transportation and placing.
- Compare different design and construction solutions and assess the impact of design and construction data and restrictions.

Assessment method: 30% Continuous Assessment, & 70% Final Exam

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Materials Science & Engineering 1

Programme: BEng (Hons) in Mechanical & Manufacturing Engineering
Module: MATE 0001
Offered: Semester 1
Credits: 5

Description of Module
This module serves as an introduction to Materials Science and Engineering and provides an insight into fundamental microstructure - property relationships. The module will focus primarily on metallic materials and will provide a platform for the study of other classes of materials to be undertaken in the follow-on module 'Materials Science and Engineering 2'.

On successful completion of this module, a student will be able to:
1. Explain how stability is achieved in each of the primary chemical bonds and identify the types of elements involved (metallic / non-metallic), types of materials formed (metallic / ceramic / polymeric) and, characteristic properties of these materials.
2. Describe the methods of extraction and refining of metals.
3. Analyse stress-strain diagrams for metallic materials and evaluate key properties including modulus of elasticity, yield strength and proof stress, tensile strength, ductility (elongation to failure and reduction in area) and true stress at fracture.

4. Identify and explain the underlying features and mechanisms responsible for deformation in metallic materials together with the methods through which the strength of single phase metallic materials may be improved.
5. Analyse equilibrium phase diagrams for binary isomorphous and binary eutectic systems and determine the phases present, their composition and amounts.

Learning and teaching methods and strategies:
1. Lectures and laboratory practicals & reports1.
Assessment Methods
1. End of module exam plus laboratory reports

Engineering Drawing

Programme: : BEng (Hons) in Mechanical & Manufacturing Engineering
Module: DRAW 0003
Offered: Semester 1
Credits: 5

Description of Module
The aim of this module is to develop the student's knowledge, understanding, and practical skills associated with engineering drawing, problem solving and critical thinking. The programme assumes no prior knowledge of the subject.

On successful completion of this module, a student will be able to:
1. Demonstrate an ability to communicate effectively (in writing, verbally and through technical drawings).
2. Prepare technical drawings that comply with internationally recognised standards and conventions.
3. Apply the principles, concepts, terminology and methodologies associated with engineering drawing
4. Utilise freehand sketching, both two and three dimensional, as a means of communication

Learning and teaching methods and strategies:
1. The weekly sessions will typically, involve a short lecture element/demonstration followed by a hands-on practical session in the drawing studio.
2. Students are expected to continue with the practical tasks in their own time between scheduled sessions.
3. Learning is achieved by a mix of listening, individual/group work supervised and free practice supplemented by feedback on progress.
4. Extensive use will be made of the artefacts available in the drawing studio, textbook and on-line drawing material.

Assessment Methods
1. The program is 100% continually assessed by in-course assigned work assessed as follows:
2. 60% Engineering Drawing Portfolio: Students work through a series (10-14) of problems solving tasks thereby demonstrating their level of mastery of the topics concerned and covering the appropriate learning outcomes.
3. 30% Project: a substantial individual or group project in response to a design brief with guidelines.
4. 10% Attendance

Mechanical Systems

Programme: BEng (Hons) in Mechanical & Manufacturing Engineering
Module: SYST 0005
Offered: Semester 1
Credits: 5

Description of Module
This module introduces the learner to a range of mechanical devices, systems and machines. The basic theory and mathematical analysis of their operation is covered. Topics include: mechanisms, engines, pneumatics, hydraulics, power transmission, bearings and lubrication.

On successful completion of this module, a student will be able to:
1. Analyse simple mechanisms and their performance
2. Describe the construction and operation of different types of internal combustion engines
3. Perform basic calculations regarding the design and performance of engines
4. Identify basic pneumatic and hydraulic components, their symbols, function, and describe their basic operation
5. Interpret simple single actuator pneumatic and hydraulic circuits diagrams
6. Explain how various power transmission components work, and perform simple design calculations for them
7. Explain the fundamentals of lubrication, and the use of various bearing types

Learning and teaching methods and strategies:
1. Lectures
2. Guided Reading
3. Computer Animations
4. Problem Sheets
5. Hydraulics: Basic scientific principals; Pumps and their operation; Actuators and valve; Simple single actuator circuits
6. Transmission of Power: Clutches - types, sizing; Universal Joints and Couplings; Final Drives - differentials; Brakes Systems -types, operation, sizing
7. Bearings: Types, construction, loading, application examples
8. Oils and Lubricants: Viscosity; Composition of oils: mineral, semi-synethic, synethic; Hydraulic oils; Oil additives

Learning and teaching methods and strategies:
1. The course will consist of lectures, practical seminars and assessments
2. The emphasis on course delivery will be 'hands-on', problem solving in small class groups using problem-based worksheets, seminars, text-books
3. Self-directed computer-based websites and software & MathLab).

Assessment Methods
1. 10% each for three worksheets (every three weeks)
2. 10% Attendance
3. 60% End of module exam

Computer Aided Draughting

Programme: BEng (Hons) in Mechanical & Manufacturing Engineering
Module: DRAW 0004
Offered: Semester 2
Credits: 5

Description of Module
All major manufacturing companies and their suppliers use CAD software to design parts and evaluate them with respect to form and function. This course introduces the student to industry standard CAD software, in particular AutoCAD and Solid Edge. Students will learn the theory and practice related to 2D-CAD draughting and 3D-CAD modelling.

On successful completion of this module, a student will be able to:
1. Understand how CAD technology can be used in the design process.
2. Demonstrate communication, critical thinking, research and problem solving skills.
3. Utilise Computer Aided Design (CAD) systems to draw components in two and three dimensions.
4. Design a part or assembly of parts using Computer Aided Design software.
5. Produce simple animations.
6. Appreciate the need for lifelong learning in the context of computer aided design packages.

Learning and teaching methods and strategies:
1. The weekly sessions will involve short lecture element/demonstration followed by a hands-on practical session in theCAD studio.
2. Students are expected to continue with practical tasks in their own time between scheduled sessions.

Assessment Methods
1. 50% CAD Portfolio: coursework drawings/designs demonstrating mastery of CAD skills.
2. 30% CAD Project: a substantial individual or group project in response to a design brief with guidelines.
3. 10% CAD Test: multiple choice questions using Moodle.
4. 10% Attendance.

PROGRAMME: BACHELOR OF ARCHITECTURE (HONS)

Year One	
Semester 1	**Semester 2**
Design Studio: 'The Concept & Graphics	Design Studio: ' Everything but the Building' & CAD
Cultural Context: 'A history of Architectural Ideas'	Cultural Context: : The history of the Human Habitat
Technology & the Environment: 'Introduction to structures'	Technology & the Environment: 'Technology & Materials'
Analytic Design Skills	Communication & Introduction to ICT
Year Two	
Semester 3	**Semester 4**
CORE: Design Studio: 'The House & l' & Computers	**CORE:** Design Studio: @ Housing & Collectivity' & Computers
Cultural Context: ' History of the House'	Cultural Context: 'A History of Collective Building Types'
Technology & Environment: 'Environment Science l'	Technology & the Environment: 'Technology & Materials 2
ELECTIVES: Language	**ELECTIVES:** Language
Intensive design	Life Drawing
Publications	Publications
Year Three	
Semester 5	**Semester 6**
CORE: Design Studio: 'The Old & the New ' & Computers	**CORE:** Design Studio: ' The Building in Context' & Communication Skills'
Cultural Context: 'Conservation 1'	Cultural Context: 'A History of Public & Ritual Buildings'
Technology & the Environment: 'Environment Science 2'	Professional Practice 1
ELECTIVES: Language	**ELECTIVES:** Language
Life Drawing	Life Drawing
Project Management	Project Management

Year Four	
Semester 7	**Semester 8**
CORE: Architectural Studio 7 Urban Communities	**CORE:** Architectural Studio 8 Rural C
Research Methodologies	Architectural Computing 4
Urban design	Architectural Research
Technology & Materials 3	Architectural Structure 2
ELECTIVES: European Landscape 5	**ELECTIVES:** European Landscape 6
Life Drawing 1	Modular Building
Life Drawing 2	Brief development
Photography	The Modern Movement – Art, Design
Environmental Science 4	
Care of Irish Architecture heritage	
Year Five	
Semester 9	**Semester 10**
Architectural Studio 9 Thesis	Architectural studio 10 "Apotheosis"
TSE 10 (Technology, Structures, Environment)	TSE 10 (Technology, Structures, Environmental)
Leadership & Project Management	Professional Practice
International Project	Tutoring
	Note: Language + French, German, Italian or Spanish. Students choose one elective subject in each semester subject to availability

PROGRAMME: Bachelor of Science (HONS) ARCHITECTURAL & BUILDING INFORMATION MODELLING TECHNOLOGY (NEW)

PROGRAMME: Bachelor of Science (HONS) ARCHITECTURAL TECHNOLOGY

Year One	
Semester 1	**Semester 2**
Introduction to House Design	Technical House design
Introduction to House Construction Technology	House Construction – Building Regulations
Introduction to Graphics	Environment Science (1)
Maths & Linear Surveying	Introduction to architecture
Introduction to ICT	Introduction to CAD
Year Two	
Semester 3	**Semester 4**
Framed Construction Projects	Small Commercial Buildings
Framed Construction – Building Regulations	Framed Construction – Cladding
Architectural Communications (1)	Materials & Detailing (1)
Design & Designers	Environmental science(2)
European language (1) / Levelling	European Language (2) / International Studies
Year Three	
Semester 5	**Semester 6**
Materials & detailing (2)	Urban development Projects
Environmental Science (3)	Environmental Science (3)
Architectural Communication (3)	Management & Law
Architectural Communication (2)	European Language (4) / Site Surveying
Conservation (1)	
European Language (3) / Business Project	

PROGRAMME: Bachelor of Engineering in CIVIL ENGINEERING

Level 7

Year One	
Semester 1	**Semester 2**
Surveying 1	Surveying 2
Civil & Structural Graphics	Civil Engineering BIM
Civil Engineering Mathematics 1	Civil Engineering mathematics 2
Statics & Dynamics	Structural mechanics
Communications & Study Skills	Materials technology 1
	Engineering Science
Year Two	
Semester 3	**Semester 4**
Soil Mechanics	Surveying 3
Civil Engineering BIM 2	Intro to Project management
Civil Engineering Mathematics 3	Civil & Structural Draughting
Design of structures 1	Fluid mechanics
Management for civil Engineering	Design of structures 2
ELECTIVE	ELECTIVE
Year Three	
Semester 5	**Semester 6**
Design of Structures 3	Energy Performance of Buildings
Surveying 4	Project
Research Skills	Civil Engineering mathematics 5
Construction Health & Safety	Structural Analysis 1
Civil Engineering mathematics 4	Civil engineering Technology
ELECTIVE	Environment Engineering 1

Programme Handbook – Stage/Year 3

Dear Student,
Welcome to the third stage/year of the CME programme based in the Department of the Built Environment at WIT. The information enclosed in this handbook is as follows:

PROGRAMME: Bachelor of Science (Hons) in CONSTRUCTION

MANAGEMENT & ENGINEERING

Year One	
Semester 1	**Semester 2**
Construction measurement	Construction Economics
Introduction to management	Management studies
Mathematics	Theory of structures
Construction technology	Engineering services
Introduction to ICT	Intro to construction materials
Communication & Study Skills	Introduction to BIM
YEAR TWO	
Semester 3	**Semester 4**
Intro to Construction law	Tendering & Estimation
Services technology	Into to project management
Geotechnical Engineering	Design of structures
Construction Methods	Introduction to Surveying
Procurement Strategy	Integrated Project
ELECTIVE	ELECTIVE
Year Three	
Semester 5	**Semester 6**
Engineering structure	Research methods Industrial Placement
Site Surveying	
Construction tech Systems	
Constructions health & safety	
Measurement & costing	
ELECTIVE	
YEAR FOUR	
Semester 7	**Semester 8**
Development Economics	Construction Law
Projects & Corporate management	Marketing & Finance
Temporary Works Design	Quality & HRM
Service Techn & Integration	Innovation technology
Dissertation	Dissertation
Industrial Placement	ELECTIVE

Stage 3 Semester 5 (Sept – Dec)

Code COST 0002: Measurement & Costing - Level 8
Credits 5

Description of Module
This module introduces the agreed rules of measurement ARM3, and Buildsoft computer software is applied for measurement and costing. Appraisal of tenders, final accounts, variations and day works are included.

Learnings Outcomes

On successful completion of this module, a student will be able to:
1. Measure quantities and prepare minor sub-contract tender packages
2. Prepare a cash flow forecast
3. Analyse and compare sub-contractors quotations and prices
4. Develop income and expenditure S-curves
5. Examine the main financial clauses in contracts

Learning and teaching methods and strategies:
Lectures and tutorials in the computer laboratory.

Assessment Methods
1. 60% Final Exam
2. 40% Continuous Assessment (Practical)

Code COHS 0003: Construction Health & Safety - Level 8
Credits 5

Description of Module
This module will introduce the student to Safety, Health and Welfare in construction. It presents an opportunity for students to evaluate the impact of relevant legislation on construction activities, including the impact of relevant legislation on construction activities, including the management structures and competency in preparing Safety Statements, Safety plans and Safety Audits. It will incorporate the one-day FAS Safe Pass course, which is a requirement for Industrial Placement in the next semester.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Apply knowledge of safety legislation to plan a safe systems of work and to ensure effective management of health and safety
2. Prepare Safety Statements, construction safety plans and safety files
3. Develop safe systems of work and safe operating procedures for construction related activities
4. Appreciate the hazards and risks associated with construction
5. Prepare and evaluate a construction site safety auditing system

Learning and teaching methods and strategies:
Lectures, tutorials and Safe Pass training.

Assessment Methods
1. 70% Final Exam
2. 20% Continuous Assessment
3. 10% Project

Code ENST 0001: Engineering Structures Level 8
Credits 5

Description of Module
This module emphasis construction engineering with examples of structures likely to be encountered on construction sites by the Construction Manager & Engineer.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Recognise the interfaces between design and construction
2. Design selected structures and assess any construction implications involved in structural design
3. Identify the relationship between geotechnical and structural design and apply to design and construction situations
4. Prepare bending schedules and interpret reinforced concrete drawings
5. Analyse the forces in a truss and design a steel roof truss

Learning and teaching methods and strategies:
Lectures and tutorials.

Assessment Methods
1. 70% Final Exam
2. 30% Continuous Assessment (Written)

Code SURV 0002 : Site Surveying - Level 8
Credits 5

Description of Module
This module again includes levelling and progress to setting out, using theodolites and total stations. Emphasis is placed on gaining adequate knowledge of digital surveying to enable the student to be confident of using the latest instruments in Industrial Placement in the following semester.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Calculate the horizontal and vertical positions of straight or curved construction works
2. Use a range of surveying instruments including laser levels, theodolites and total stations to set out the positions of buildings, roads and drains
3. Input setting out information to electronic
4. Set out and interpret any work which might be required in the course of any project or industrial placement

Learning and teaching methods and strategies:
Lectures, tutorials and fieldwork using surveying equipment.

Assessment Methods
1. 50% Final Exam
2. 20% Continuous Assessment (Practical)
3. 30% Continuous Assessment (Written)

Code CTEC 0001 : Construction Technology Systems - Level 8 Credits 5

Description of Module
The aim of this module is to enable the student to understand systems of working and prepare them to solve problems that may be encountered in carrying out building and civil engineering works.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Select an appropriate technology system for a variety of construction works
2. Identify problems associated with building and civil engineering works
3. Propose remedial techniques for defects in structure and fabric of existing buildings
4. Critically analyse cladding systems in terms of construction performance and project suitability

Assessment Methods
70% Final Exam, 30% Assessment

Code EMTR 0022: Entrepreneurship - Level 8
Credits 5

Description of Module
The purpose of this module is to introduce the concept of entrepreneurship and business planning to the student.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Identify, research and develop an entrepreneurial idea
2. Create a written strategic business plan
3. Analyse financial data and prepare an operating budget
4. Present and defend their ideas and plans

Learning and teaching methods and strategies:
The module is a combination of lectures, multimedia resources, class discussion and student presentations.

Assessment Methods
100% Project

Code EMTR 0022: Spanish B1.1 Level – 8
Credits 5
Description of Module

Students will be expected to meet the learning outcomes for oral production, written production, aural reception and visual reception detailed in the WIT Language Modules Guide for Common European Framework Level B1.1 in Spanish.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Understand the main points of clear standard input on familiar matters regularly encountered in work, school, leisure etc
2. Deal with rehearsed situations likely to arise whilst travelling in an area where the language is spoken
3. Produce simple connected text on topics which are familiar or of personal interest
4. Describe experiences and narrate simple sequences of events

Assessment Methods
1. 50% Final Exam
2. 30% Continuous Assessment (Written)
3. 20% Continuous Assessment (Practical)

Code FREN 0028 : French B2.1 - Level 7
Credits 5

Description of Module
Students will be expected to meet the learning outcomes for oral production, written production, aural reception and visual reception detailed in the WIT Language Modules Guide for Common European Framework Level B2.1 in French.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Interpret the main ideas of complex text on both concrete and abstract topics, including technical discussions in his / her field of specialisation
2. Engage in spontaneous discussion in the target language
3. Produce clear detailed text on a wide range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options
4. Demonstrate a level of intercultural and sociolinguistic competence appropriate to interaction with native speakers in a variety of everyday situations
5. Use a good lexical range appropriate to the skills required at this level

Learning and teaching methods and strategies:
Lectures and tutorials.

Assessment Methods
1. 50% Final Exam
2. 30% Continuous Assessment (Written)
3. 20% Continuous Assessment (Practical)

Stage 3 Semester 6 (Jan – May)

Code INDP 0002: Industrial Placement 1 - Level 8
Credits 5

Description of Module
The student typically works in an engineering or management role with a construction organization for thirty weeks. She/he will work under the direction of the company's industrial placement supervisor and will also report to the WIT supervisor.
Progress in placement is assessed by the WIT supervisor and the employer and forms part of the degree award in final year

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Recognise the main aspects of construction management & engineering principles as they apply to practice in the construction industry
2. Apply problem solving techniques to construction and engineering situations

3. Make informed decisions in selecting career paths within the construction industry
4. Realise the importance of Health & Safety in construction and civil engineering projects
5. Recognise the importance of professional standards in a project/organisational/industrial setting

Assessment Methods
1. 100% Continuous Assessment (Practical)
- Monthly Progress Reports 35%
- Academic Supervisor's Report 20%
- Industrial Supervisor's Report 15%
- Final Placement Report 10%
- Powerpoint Presentation 20%

Code RESE 0004: Research Methods - Level 8
Credits 5

Description of Module
This module aims to introduce a research and development ethos into the programme and to train the student to be an independent learner. Students will be instructed on the preparation of research proposals and the subsequent execution of a research project. Quantitative and qualitative research methodologies will be outlined with the merits of both highlighted. The module will provide the student with sufficient knowledge of research methodology to enable him/her to successfully complete a dissertation\research project.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Use appropriate techniques for communicating information (i.e. preparing and presenting research reports) related to research and development projects.
2. Critically evaluate research reports and assess the significance of research findings and their practical application.
3. Apply knowledge of research methodology to enable successful completion of the required dissertation\research project.
4. Clearly articulate objectives, present and defend a detailed and feasible research proposal on a specific topic of interest
5. Be capable of designing and programming a research proposal for both theoretical and applied research projects

Learning and teaching methods and strategies:
Lectures and tutorials.

Assessment Methods
1. 100% Continuous Assessment (Written)

Year 2 - Semester 3 (Sept – Dec)

Code CLAW 0001: Introduction to Construction Law - Level 8 Credits 5

Description of Module
The aim of this module is to introduce the students to the legal system and the principles of land law as well as aspects of corporate law relevant to the construction industry.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Apply their knowledge of legal systems to the construction industry
2. Determine the fundamentals principles of land and property law including the classification of property and title to land.
3. Assess the methods of forming and dissolving various corporate bodies used as vehicles for business in the construction industry.

Learning and teaching methods and strategies:
Lectures and tutorials.

Assessment Methods
1. 70% Final Exam
2. 30% Continuous Assessment

Code BUSE 0003 : Procurement Strategy Level 8 Credits 5

Description of Module
This module deals with inter personal skills, self management, teams and groups, needs / wants and motivation.

Learning Outcomes

On successful completion of this module, a student will be able to:
Identify and appreciate client needs in relation to building procurement
Critically evaluate and select an appropriate procurement path for a building project
Identify appropriate tender documents
Understand and appreciate the range of methods and procedures needed for the effective selection and reimbursement of contractors

Learning and teaching methods and strategies:
Lectures and tutorials.

Assessment Methods
1. 100% Continuous Assessment

IL 0008 : Geotechnical Engineering - Level 8
Credits 5

Description of Module
This module introduces students to soils engineering as a basis for design and construction of foundations. The main emphasis will be on an overall understanding of the module which will be backed by a series of laboratory experiments undertaken by each student.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Classify a soil
2. Analyse soil composition based on weight and volume relationships
3. Predict the effects of compaction on soil properties
4. Determine the total, neutral and effective stresses in the soil
5. Estimate the magnitude and rate of settlement of soils
6. Determine the shear strength of soils under certain conditions
7. Conduct experiments, analyse and Interpret laboratory test data
8. Communicate technical data effectively in written form

Learning and teaching methods and strategies:
Lectures and laboratory experiments

Assessment Methods
1. 60% Final Exam
2. 40% Continuous Assessment (Practical)

Code Cons 0017: Construction Methods - Level 8

Credits 5

Description of Module
This module introduces students to substructure foundation techniques, soil stabilisation, piling and basement construction together with superstructure elements such as building frame, roofing and cladding systems.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Identify modem building systems and foundations
2. Differentiate between effective and unsuitable building technologies
3. Prepare details of building finishes and connections
4. Compare and evaluate structural solutions for specified building types
5. Distinguish between structure and cladding and comprehend the requirement for separation
6. Interpret and apply traditional building techniques

Assessment Methods
1. 70% Final Exam
2. 15% Project
3. 15% Continuous Assessment (Written)

Code STEC 0002 : Services Technology - Level 8
Credits 5

Description of Module
This module introduces the student the concept of services technology, with an emphasis on large buildings.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Demonstrate a basic understanding of buildings on the environment
2. Express a basic understanding of the technology used in the integration of services equipment into buildings
3. Explain the principals of sustainable urban drainage systems
4. Calculate basic sizes of building services equipment
5. Describe the interaction of the external environment with the internal build environment
6. Solve flow and pressure calculations for water supply and drainage

Learning and teaching methods and strategies:
Lectures and tutorials.

Assessment Methods
1. 70% Final Exam
2. 15% Project
3. 15% Continuous Assessment (Written)

Code COMM 0027 : Intercultural Communications - Level 8
Credits 5

Description of Module
This module aims to provide the student with an appreciation of intercultural communications within a construction context.
Emphasis is placed upon the application of theoretical frameworks to real-world construction scenarios.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Demonstrate and understanding of the importance of intercultural interaction
2. Define culture and account for variations across cultures
3. Identify cultural universals and understand how these are translated into functioning systems in a variety of different societies
4. Understand and apply different frameworks for classifying cultures

Assessment Methods
1. 70% Final Exam
2. 30% Project

Code SPAN 0008 : Spanish: A1 Level 8
Credits 5

Description of Module
Students will be expected to meet the learning outcomes for oral production, written production, aural reception and visual reception detailed in the WIT Language Modules Guide for Common European Framework Level A1 in Spanish.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Use familiar everyday expressions and very basic phrases aimed at the satisfaction of needs of a concrete type
2. Introduce him / herself and others
3. Ask and answer questions about personal details such as where they live, people they know & things they have.
4. Interact in a simple way provided the other person talks slowly and clearly and is prepared to help

Learning and teaching methods and strategies:
Lectures and tutorials.

Assessment Methods
1. 70% Continuous Assessment (Written)
2. 30% Continuous Assessment (Oral)

Code FREN 0013 : French B1.3 Level 8
Credits 5

Description of Module
Students will be expected to meet the learning outcomes for oral production, written production, aural reception and visual reception detailed in the WIT Language Modules Guide for Common European Framework Level B1.3 in French.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Understand the main points of clear standard input on familiar matters regularly encountered in work,
school, leisure etc
2. Deal with most situations likely to arise whilst travelling in an area where the language is spoken
3. Produce connected, detailed texts on topics which are familiar or of personal interest
4. Describe experiences, dreams, hopes and ambitions and give reasons and explanations for opinions and plans

Learning and teaching methods and strategies:
Lectures and tutorials.
Assessment Methods
1. 70% Continuous Assessment (Written)
2. 30% Continuous Assessment (Oral)

Year 2 - Semester 4 (Jan – May)

Code TEND 0001: Tendering & Estimating - Level 8
Credits 5

Description of Module
This module will give the student knowledge of measurement applications and techniques. This will include worked examples on groundwork foundations, concrete and blockwork. Preparation of a typical tender, preliminaries and contingencies will be discussed and their impact on the construction project.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Analyse the complex relationships involved in preparing a competitive tender
2. Identify the need to use a logical and systematic procedure to ensure that the most accurate cost prediction possible is arrived at
3. Interpret the terminology related to the preparation of unit rates
4. Identify and analyse the cost elements of unit rates
5. Adopt a systematic approach to pricing unit rates in the measured work section of the bill of quantities
6. Calculate representative examples of each major trade in construction activity
7. Incorporate specialist quotations and the associated supervision and attendances into the overall tender amount
8. Define the extent of project overheads on a typical contract
9. Recognise the importance of planning techniques in determining the extent of project overhead resources
10. Identify the considerations and process involved in converting an estimate into a tender

Learning and teaching methods and strategies:
Lectures and tutorials.

Assessment Methods
1. 70% Final Exam
2. 30% Project

Code PMGT 0001 : Introduction to Project Management - Level 8
Credits 5

Description of Module
This module introduces students to the concepts of projects and project management. Students will learn about the different stages in a project and the parties involved at each stage. They will be introduced to techniques used for planning and control of projects and get hands on experience of using software packages.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Describe the elements of construction project teams
2. Identify the relationships between members of the project team
3. Apply techniques required for planning and controlling projects
4. Use project planning software programming and scheduling construction projects
5. Understand the importance of and types of decisions that managers have to make

Learning and teaching methods and strategies:
Lecture and tutorials in the computer laboratories.

Assessment Methods
1. 70% Final Exam
2. 30% Project

Code DSTR 0003 : Design of Structures - Level 8
Credits 5

Description of Module
This module concentrates on the calculation of sizes of structural members in both steel and reinforced concrete using BS and Euro codes. .

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Calculate the loads on a structure
2. Design concrete beams, slabs and columns
3. Design steel beams, columns and connections
4. Analyse the behaviour of structures under building load
5. Assess the relevance of structural design to construction on site

Learning and teaching methods and strategies:
Lectures and tutorials.

Assessment Methods
1. 70% Final Exam
2. 30% Continuous Assessment (Written)

Code SURV 0001 : Introduction to Surveying - Level 8
Credits 5

Description of Module
This module introduces the student to the basic principles of surveying and levelling. Students will learn the techniques, calculations and checks required to complete a level survey and calculate the results. Approximately 50% of the student's time is spent in the field.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Make a three dimensional linear survey of a small area of ground
2. Recognise the accuracies achievable for different tasks
3. Apply the principles of good practice in levelling
4. Make a level survey and calculate the results relative to a chosen datum
5. Construct a contour plan of an area of ground
6. Determine from a contour plan, gradients, intervisibility, watershed and limits of earthworks
7. Prepare longitudinal and cross sections

Learning and teaching methods and strategies:
Lectures and tutorials.

Assessment Methods
1. 50% Final Exam
2. 50% Continuous Assessment (Practical)

Code PROJ 0054 Integrated Project - Level 8
Credits 5

Description of Module
The Integrated Project is undertaken in a group of 3 or 4 students. The project stimulates actual project development with exposure to the various professional disciplines in construction. Groups take the role of Design and Build teams who submit their written project and make a powerpoint presentation. Current projects in Waterford are used and access is provided to the sites.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Recognise the importance of team participation
2. Demonstrate communication and management skills learnt through the project process
3. Determine the roles of design and construction teams on building projects
4. Research, analyse and present information
5. Evaluate project proposals in terms of technical suitability, best value, and management structure
6. Discover the issues associated with project completion and learning from feedback
7. Work effectively in teams through interpersonal relationships and group dynamics
8. Agree goals and plans, and review progress

Learning and teaching methods and strategies:
Tutorials.

Assessment Methods
1. 100% Project

Code CULT 0002 : Cultural Diversity Management Level 8
Credits 5

Description of Module
This module aims to provide the student with an understanding of cultural diversity and the importance of adopting appropriate techniques in managing multicultural workforces in the construction industry.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Demonstrate an understanding of how differences in cultural values influence the operations of multicultural teams
and organizations and the success or failure of cross cultural business negotiations
2. Show an awareness of strategies for perceiving cultural diversity and multicultural teams and organizations
3. Explain how general management theories (e.g. theories in relation to motivation, leadership etc) can relate to
different cultural settings and to multicultural work environments
4. Demonstrate an understanding of the different strategies that can be used to manage multicultural teams and
organizations, including strategies for the formation, motivation and leadership of groups and teams, strategies for ensuring
successful decision making, strategies for conducting negotiations and meetings, and strategies for conflict resolution

Learning and teaching methods and strategies:
Lectures and tutorials.

Assessment Methods
1. 70% Final Exam
2. 30% Project

Code SPAN 0007: Spanish A2 - Level 8
Credits 5

Description of Module
Students will be expected to meet the learning outcomes for oral production, written production, aural reception and visual reception detailed in the WIT Language Modules Guide for Common European Framework Level A2 in Spanish.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Demonstrate an understanding sentences and frequently used expressions related to areas of most immediate relevance, for example very basic personal and family information, shopping, local geography and environment
2. Communicate in simple and routine tasks requiring a simple and direct exchange of information on familiar and routine matters

3. Describe in simple terms aspects of their background, immediate environment & matters in areas of immediate need

Learning and teaching methods and strategies:
Lectures and tutorials

Assessment Methods
1. 70% Continuous Assessment (Written)
2. 30% Continuous Assessment (Oral)

Code FREN 0012 :French B1.4 - Level 8
Credits 5

Description of Module
Students will be expected to meet the learning outcomes for oral production, written production, aural reception and visual reception detailed in the WIT Language Modules Guide for Common European Framework Level A2 in French.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Demonstrate an understanding sentences and frequently used expressions related to areas of most immediate relevance, for example very basic personal and family information, shopping, local geography and environment
2. Communicate in simple and routine tasks requiring a simple and direct exchange of information on familiar and routine matters
3. Describe in simple terms aspects of their background, immediate environment & matters in areas of immediate need

Learning and teaching methods and strategies:
Lectures and tutorials.
Assessment Methods

1. 70% Continuous Assessment (Written)
2. 30% Continuous Assessment (Oral)

PROGRAMME: Bachelor of Science (Hons) in QUANTITY

SURVEYING Level 8

Year One	
Semester 1	**Semester 2**
Introduction to Management	Introduction to Economics
Measurement & Estimation (1)	Measurement & Estimation (2)
Mathematics for Surveyors	Management studies
Residential Technology (1)	Residential Technology (2)
Communications & Study Skills	Introduction to Land surveying
Introduction to ICT	Introduction to BIM
Year Two	
Semester 3	**Semester 4**
Procurement Strategy	Cost Planning
Measurement & Estimation (3)	Measurement & Estimation (4)
Introduction to Construction Law	Introduction to project management
Commercial technology (1)	Commercial technology (2)
Services Technology (1)	Integrated Project
ELECTIVE	ELECTIVE
Year Three	
Semester 5	**Semester 6**
Construction administration	Research methods Industrial Placement
Measurement & Estimating (5)	
Contracts Studies	
Construction health & Safety	
Advanced Technology	
ELECTIVE	
Year Four	
Semester 7	**Semester 8**
Development Economics	QS Professional Practice
Value management	Marketing & Finance
Project & corporate management	Construction Law
Services technology & Integration	Advanced measurement
Dissertation	Dissertation
Industrial Placement 2	ELECTIVE

PROGRAMME: Bachelor of Engineering (HONS) SUSTAINABLE CIVIL ENGINEERING Level 8

Year ONE	
Semester 1	**Semester 2**
Structural Analysis	Mathematical Modelling
Civil Engineering Mathematics 6	Research Methods
Statistics for Scientists	Energy Performance of Buildings 2
Geotechnical Engineering 1	Placement 1
Construction Technology Systems	
Clean Energy Technologies	
Year Two	
Semester 4	**Semester 5**
Structural Analysis & Design	Structural Design
Hydraulics	Geotechnical Engineering 2
Project & Corporate management	Hydrology for sustainability
Sustainable Energy	Professional Practice
Placement 2	Innovative Technologies
Dissertation	Dissertation

PROGRAMME: Bachelor of Engineering (HONS) in SUSTAINABLE ENERGY ENGINEERING Level 8

Year One	
Semester 1	**Semester 2**
Fundamentals Engineering Maths	Introduction Calculus
Sustainable Energy & Engineering Science 1	Intro to Energy & the Environment
Intro to graphics	Building Services CAD 1
Construction Technology	Sustainable Energy & Engineering Science 2
Intro to Building Services	Mechanical Systems
Learning Skills/Communication	Fabrication Technology
Year Two	
Semester 3	**Semester 4**
Mathematical Methods Fluids	Advanced Calculus
Building Energy design Tools	Building Services Design Software
Mechanical Plant Technology	Building Performance & Energy
Heat Transfer in Buildings	Thermodynamics
Materials for Sustainable Design	Electrical Plant Technology
	Energy Design Project
Year Three	
Semester 5	**Semester 6**
Statistics for Scientists	Research methods
Intro to Construction Law	BER Dwellings
Energy Policy & legislation	Dynamic Thermal simulation
Lighting & Daylighting Design	Industrial Placement/Energy Surveying
Sustainable heat and Power Generation	
Elective Module	
Year Four	
Semester 7	**Semester 8**
Dissertation	Professional Practice

Project & corporate Management	Dissertation
BER Comm & services Simulation	Energy Management of Buildings
Control of Energy Systems	Feasibility Project
Passive Building Design strategies	Sustainable Energy Recovery & Utilisation
Elective Module	Advanced Heat Transfer & Thermal Imaging

Year 4 - Semester 7 (Sept – Dec)

Code DISS 0070 : Dissertation
Credits 5

Learning Outcomes

On successful completion of this module the student will be able to:
1. Plan and execute a theoretical or laboratory based research project
2. Design secondary and primary research requirements
3. Write a research dissertation that complies with good writing practice (as outlined in the dissertation brief)
4. Present and defend their research findings to a panel of supervisors

Indicative Syllabus
Building upon the research methods module, this module requires each student to undertake a significant piece of research on a relevant related topic. The student is required to demonstrate ability as an independent learner to write a dissertation that exhibits concise reporting of the research process. Emphasis is placed on evidence of evaluative work and rigorous research of the topic.

1. Attendance at weekly meetings with dissertation supervisor (Compulsory)
2. Develop & prepare project brief
3. Critical review of academic literature & referencing in accordance with Harvard System
4. Design and execution of research methodology
5. Presentation, analysis & discussion of research results
6. Dissertation writing skills
7. Presentation skills

The principal milestones are:
1. Submission of Research Proposal – End of September
2. Submission of Literature review – Mid November
3. Interview – Early December
4. Final Interview – Early May
5. Submission of Softbound – End March
6. Submission of Hardbound – Early May

Code PROJ 0123 : Project & Corporate Management
Credits 5

Learning Outcomes

On successful completion of this module the student will be able to:
1. Understand a range of potential project environments and the consequences of operating within those environments.
2. Apply various project planning techniques in scheduling construction projects
3. Critically review construction systems and methods of implementation including characteristics, constraints and
difficulties that together form the criteria for the development and optimisation of the various methodologies available.

Indicative Syllabus
This module explains current and evolving project management philosophy. It will help the student gain an understanding of the range of potential project environments and the consequences of operating within those environments. Students will understand network analysis, resource allocation, cost optimisation and other scheduling techniques. The student, on completion, should know the procedural and substantive aspects of corporate strategy. The student will on completion demonstrate that s/he has the critical analytical skills necessary to make decisions at a corporate level.

1. The contextual setting of projects. Projects as determined by economic conditions, industrial structure, client's requirements.
2. Techniques for planning and control of projects
3. Computer Applications in Project Management and control - introduction to project Management Software – MS Project,
Primavera etc
4. Introduction to project Management Software – MS Project, Primavera etc
5. Business Strategy Overview and the Strategic Management Process
6. Environmental Analysis for the Construction Industry
7. Implementing Business Strategies in the Construction Industries

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Code ENGR 0061 : BER Commercial & Services Simulation
Credits 5

Description of Module
The aim of this module is to provide the knowledge and skill to use dynamic thermal simulation software for the generation of
building energy ratings of commercial buildings and analysis of building energy consumption by modification of the building
envelope, plant and systems.

Learning Outcomes

On successful completion of this module, students should be able to:

1. Differentiate between different modelling techniques and applications.
2. Collect appropriate data to generate a BER for a level 4* non-domestic building.
3. Collect appropriate data to generate a BER for a level 5** non-domestic building.
4. Evaluate how building energy consumption is influenced by location, form, fabric and services systems.
5. Propose design improvements and modifications to improve annual energy consumption
6. Form concepts, develop ideas and reflect on energy consumption data

Learning and teaching methods and strategies
1. Lectures
2. Presentations
3. Exercises

Assessment Methods
Continuous Assessment – 100%
1. Assessment 1 Commercial BER Level 4 Building Learning Outcome 1, 2
2. Assessment 2 Commercial BER Level 5 Building Learning Outcome 1, 3
3. Reflective learning Report 1 Energy Consumption Analysis Learning Outcome 4
4. Reflective learning Report 2 Energy Consumption Improvement Learning Outcome 4, 5

Code ENGR 0062 : Control of Energy Systems
Credits 5

Description of module
The aim of this module is to provide a broad and specialised knowledge of the control of energy systems.

Learning Outcomes

On successful completion of this module, students should be able to
1. Evaluate the application of control methods, and control components and devices.
2. Derive and apply control transfer functions.
3. Analyse problems involving the control of mechanical and electrical machines.
4. Formulate a technique to optimise the control of energy systems.
5. Prepare recommendations for the design and implementation of data acquisition systems.
6. Form energy concepts and develop ideas in relation to control strategies

Assessment methods
Final Exam – 100% **(**4 Questions, complete 3) – To address learning outcomes 1, 2, 3, 4, 5 & 6.

Year 4 - Semester 8 (Jan – May)

Code CONS 0037: Professional Practice
Credits 5

Description of Module

The aim of this module is to enhance the student's knowledge and ability to understand the professional requirement within the industry. The student will also gain an appreciation for the ethics and ethical behaviour of construction professionals

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Understand the term 'professional' civil engineer and the associated requirements
2. Understand the route and requirement to obtain chartered status with Engineers Ireland
3. Understand the role of other professionals in the construction industry and their respective professional institutes
4. Communicate effectively with clients and other stakeholders within the construction industry
5. Develop skills in ethical decision making
6. Consider social and global impacts of decisions
7. Corporate and social responsibility
8. Be aware of the different role of responsibilities within an organisation
9. Understand the process of appointment of professionals and the liabilities arising

Learning and teaching methods and strategies:
1. Lectures

Assessment Methods
1. 70% Final Exam
2. 30% Continuous Assessment (written)

Code DISS 0071: Dissertation
Credits 5

Learning Outcomes

On successful completion of this module the student will be able to:
1. Plan and execute a theoretical or laboratory based research project
2. Design secondary and primary research requirements
3. Write a research dissertation that complies with good writing practice (as outlined in the dissertation brief)
4. Present and defend their research findings to a panel of supervisors

Indicative Syllabus
Building upon the research methods module, this module requires each student to undertake a significant piece of research on a relevant energy related topic. The student is required to

demonstrate ability as an independent learner to write a dissertation that exhibits concise reporting of the research process. Emphasis is placed on evidence of evaluative work and rigorous research of the topic.

1. Attendance at weekly meetings with dissertation supervisor (Compulsory)
2. Develop & prepare project brief
3. Critical review of academic literature & referencing in accordance with Harvard System
4. Design and execution of research methodology
5. Presentation, analysis & discussion of research results
6. Dissertation writing skills
7. Presentation skills

Code ENGR 0063: Energy Management of Buildings
Credits 5

Description of module
The aim of this module is to provide a broad and specialised knowledge of the energy management of buildings.

Learning Outcomes

On successful completion of this module, students should be able to
1. Develop and evaluate energy policies.
2. Derive and apply solutions to minimise the consumption of energy in buildings
3. Analyse problems involving monitoring and targeting in commercial and industrial buildings.
4. Formulate a procedure to undertake an energy audit and survey of a large building.
5. Prepare recommendations and conclusions to introduce renewable energy technologies into new and existing buildings.

Learning and teaching methods and strategies
1. Lectures
2. Presentations
3. Practical
4. Reading
5. Exercises
6. Discussion

Assessment methods
1. Final Exam – 100% **(**4 Questions, complete 3) – To address learning outcomes 1, 2, 3, 4 & 5.

Code PROJ 0124 : Feasibility Project
Credits 5

Description of module
The aim of this project is to expose the students to situations, as they exist in professional practice, and to encourage them to evaluate and solve problems using initiative, analysis, good judgement and ethics. Projects will be an area related to energy use and reduction. Students will be expected to demonstrate management skills, independent learning and show and ability to work within a team.

Learning Outcomes

On successful completion of this module, students should be able to
1. Apply verbal and written communication skills, from design preparation and project planning to progress and final reporting.
2. Demonstrate an ability to work as an individual and perform tasks as part of a team.
3. Analyse data in an attempt to define a particular engineering problem.
4. Devise an appropriate solution using established engineering methods.
5. Prepare a final report, design file, calculations and drawings appropriate to the project.

Learning and teaching methods and strategies
1. Studio
2. Problem- based learning
3. Independent learning
4. Design brief and diary Sheets

Assessment Methods
1. 30% Reflective Learning Log – To address learning outcomes 1, 2, 3 & 4.
2. 70% Final Report – To address learning outcomes 3, 4 & 5.

Code ENGR 0064: Sustainable Energy Recovery & Utilisation
Credits 5

Description of module
The aim of this module is to provide a broad and specialised knowledge of sustainable energy recovery and utilisation in all of the main energy sectors.

Learning Outcomes

On successful completion of this module, students should be able to
1. Evaluate the application of sustainable energy recovery technologies.
2. Derive and apply solutions to problems involving the recovery and utilisation of energy.
3. Analyse the characteristics and performance of energy recovery components.
4. Formulate and conceptualise a strategy to optimise the design of sustainable energy systems.
5. Recognise the climatic impact of energy use, and prepare recommendations and conclusions for energy use by sector.
6. Consider relative costs of different systems

Learning and teaching methods and strategies
1. Lectures
2. Presentations
3. Interactive Practicals
4. Reading
5. Exercises
6. Discussion

Assessment methods
1. Final Exam – 100% **(**4 Questions, complete 3)

Code ENGR 0065 : Advanced Heat Transfer & Thermal Imaging Credits 5

Description of module
The aim of this module is to provide a broad and specialised knowledge of advanced heat transfer and thermal imaging.

Learning Outcomes

On successful completion of this module, students should be able to
1. Evaluate the application of multi dimensional steady state conduction in buildings.
2. Derive transient thermal performance characteristics of building elements.
3. Analyse problems involving combined modes of heat transfer.
4. Formulate a technique to determine the heat transfer performance of renewable energy systems.
5. Prepare conclusions and recommendations based on the results of thermographic surveys.

Learning and teaching methods and strategies
1. Lectures
2. Presentations
3. Interactive Practicals
4. Reading
5. Exercises
6. Discussion

Assessment methods
1. Final Exam – 100% **(**4 Questions, complete 3

Year 3 - Semester 5 (Sept – Dec)

Code STAT 0042 : Statistics for Scientists - Level 6
Credits 5

Description of Module
Collection, presentation, analysis and interpretation of statistical data, including measures of centre and spread, confidence intervals for means and variances, relationships between variables, confidence intervals for differences between means and variances and analysis of outliers.

Learning Outcomes

On successful completion of this module, a student will be able to:
1. Recognise and name the patterns that are found in data, and construct tables and stem and leaf plots.
2. Select and apply appropriate sampling techniques.
3. Use formula and calculators to calculate measures of centre and spread, and interpret the answers.
4. Use probability concepts correctly.
5. Use formula and statistical tables to calculate confidence intervals for the mean and variance and interpret the answers.
6. Use formula and statistical tables to calculate the parameters of the simple linear regression equation and interpret the answers.
7. Use formula and statistical tables to calculate the correlation coefficient, and interpret the answers.
8. Use formula & statistical tables to calculate confidence intervals for differences between means & variances, & interpret the answers.
9. Interpret the results of hypothesis tests.
10. Identify outliers in data

Learning and teaching methods and strategies:
1. Lectures
Assessment Methods
1.5 hour exam

Code LAWB 0090 : Introduction to Construction Law
Credits 5

Learning Outcomes
On successful completion of this module the student will be able to:

1. Determine the fundamentals of contract law which forms the basis of legally binding agreements in the construction industry
2. Assess relevant aspects of commercial law as it applies to the construction industry
3. Apply their knowledge of legal systems to the construction industry

Indicative Syllabus
The aim of this module is to introduce the students to the legal system and the principles of contract law that form the basis for all commercial agreements as well as aspects of corporate and commercial law relevant to the construction industry.
1. Legal Systems – this part of the syllabus introduces the student to the historical development of Irish law and the four main sources of Irish law, namely: the Constitution, legislation, judicial precedent and EU sources. The hierarchical structure and jurisdiction of the courts is also examined.
2. Fundamentals of Contract Law – this section of the syllabus examines the fundamental principles underlying contract law. The essential elements required for contract formation, the form a legally binding agreement may take, and factors having a vitiating effect on a contract such as illegality, incapacity, mistake, misrepresentation, duress and undue influence are considered in this section, along with the discharge of contracts and remedies for breach of contract.
3. Corporate & Commercial Law – this segment of the syllabus looks at how companies and partnership are formed. Under the corporate law heading the separate legal personality of bodies corporate is examined along with the contractual capacity of companies. On the commercial side the workings of a number of common contracts are considered including insurance, agency, credit & leasing and commercial lending.

Essential Material
1. Doolan, B. (2007); Principles of Irish Law, 7th Edition, Gill & Macmillan

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Code LAWB 0091: Energy Policy & Legislation - Level 7
Credits 5

Description of Module
The aim of this module is to provide an overview of key issues within; National, EU and International energy policies and their implications in terms of security of supply, environmental protection and cost competitiveness.

Learning Outcomes

On successful completion of this module, students should be able to
1. To have an enhanced appreciation of key global challenges and issues in the context of security of supply and carbon related issues.
2. To critically appraise Irish energy policy framework, strategies and support mechanisms in a broader European and international context.
3. Critically assess and evaluate the aims of a number of energy policies at different levels (local, regional, national and international)
4. Identify and critically evaluate energy sector strategic responses to global challenges and initiates.
5. Critically analyse energy policies from around the globe.
6. Critically analyse concepts and options for terming energy and water savings

Learning and teaching methods and strategies
1. Lectures
2. Presentations
3. Reading
4. Exercises
5. Discussion

Assessment Methods
1. Final Exam – 100% (4 Questions, complete 3) – To address learning outcomes 1, 2, 3, 4, 5 , and 6.

Code DESG 0065 : Lighting & Daylighting Design - Level 7 Credits 5

Description of module
The aim of this module is to provide a specialised knowledge of lighting and daylighting design for buildings, and design of external lighting.

Learning Outcomes

On successful completion of this module, students should be able to
1. Explain the principles of lighting design for both building interiors and exteriors.
2. Analyse the characteristics and performance of lighting equipment.
3. Apply standard calculation techniques to solve artificial lighting and daylighting problems.
4. Demonstrate an understanding of the energy consumption and control of lighting.
5. Recognise and understand the comparative cost benefits of different types of artificial lighting and daylighting schemes.
6. Use lighting and daylighting software to analyse lighting systems

Learning and teaching methods and strategies
1. Lectures
2. Presentations
3. Interactive Practicals
4. Reading
5. Exercises
6. Discussion

Assessment methods
1. Final Exam – 50% (4 Questions, complete 3) – To address learning outcomes 1, 2, 3, 4 & 5
2. Continuous Assessment – 50% - To address learning outcomes 6

Code ENGR 0044: Sustainable Heat & Power Generation - Level 7 Credits 5

Description of module
The aim of this module is to provide a specialised knowledge of sustainable heat and power generation.

Learning Outcomes

On successful completion of this module, students should be able to
1. Explain the principles of heat and power generation.
2. Analyse the characteristics and performance of alternative energy systems.
3. Apply standard calculation techniques to solve problems involving energy supply and demand.
4. Demonstrate an understanding of energy storage technology.
5. Recognise and understand the comparative cost benefits of different low and zero carbon technologies.
6. Conceive and develop new ideas in relation to sustainable heat & power generation

Learning and teaching methods and strategies
1. Lectures
2. Presentations
3. Interactive Practicals
4. Reading
5. Exercises
6. Discussion

Assessment methods
1. Final Exam – 100% (4 Questions, complete 3) – To address learning outcomes 1, 2, 3, 4 & 5

Year 3 - Semester 6 (Jan – May)

Code RESA 0123: Research Methods - Level 6
Credit 5

Learning Outcomes

On successful completion of this module the student will be able to:
1. Use appropriate techniques for communicating information (i.e. preparing and presenting research reports) related to research and development projects.
2. Critically evaluate research reports and assess the significance of research findings and their practical application.
3. Apply knowledge of research methodology to enable successful completion of the required dissertation\research project.
4. Clearly articulate objectives, present and defend a detailed and feasible research proposal on a specific topic of interest
5. Be capable of designing and programming a research proposal for both theoretical and applied research projects

Indicative Syllabus
This module aims to introduce a research and development ethos into the programme and to train the student to be an independent learner. Students will be instructed on the preparation of research proposals and the subsequent execution of a research project. Quantitative and qualitative research methodologies will be outlined with the merits of both highlighted. The

module will provide the student with sufficient knowledge of research methodology to enable him/her to successfully complete a dissertation\research project.
1. Research introduction: definitions, modes, process and output, field and laboratory based research
2. Selecting a research topic; problem definition; narrowing focus and developing research questions
3. The development and structure of a research proposal to include aim, objectives and hypothesis
4. Sources of information: library, databases and other information sources;
5. Library Learning Support Tutorial
6. Reviewing literature, critical analysis, plagiarism
7. Primary data collection and analysis: quantitative and qualitative methodologies
8. Academic writing and presentational skills: structuring and drafting; abstract writing
9. The use of information technology in research work.
10. Harmd Referencing System
11. Reflective Learning Journal

Code ENGR 0045: BER Dwellings (DEAP) - Level 6
Credits 5

Description of Module
The aim of this module is to enable the student to undertake and provide a BER and accompanying advisory report for a dwelling, for delivery to the owner or builder, prospective buyer or tenant, when the dwelling is constructed, sold or rented.

Learning Outcomes

On successful completion of this module, students should be able to
1. Explain key objectives and the background to the EPBD.
2. Demonstrate the ability to undertake limitation of primary energy use and or CO2 emission calculations required by the Building Regulations Part L and as outlined in the associated Technical Guidance Document to the Building Regulations Part L.
3. Demonstrate the ability to accurately collect data from plans, specifications and physical surveys to correctly calculate BERs and associated CO2 emissions performance using the DEAP software for both new and existing dwellings of varying complexity.
4. Produce BER Certificates and Advisory Reports for dwellings.
5. Explain the significance, in BER terms, of varying the specifications for dwellings.

Learning and teaching methods and strategies
1. Lectures
2. Presentations
3. Exercises
4. Discussion

Assessment Methods
Continuous Assessment – 100%
1. Assignment 1: U-values 10%
2. Assignment 2: BER assessment from plans achieving a specified improvement 15%

3. Assignment 3: BER of an existing dwelling (trainer selected dwelling) 15%
4. Assignment 4: BER of an existing dwelling (student selected dwelling) 10%
5. Short Answer Questions 10%
6. Class based practical examination 40%

Code ENGR 0046: Dynamic Thermal Simulation - Level 7
Credits 5

Description of Module
The aim of this module is to provide the knowledge and skill to use dynamic thermal simulation software in the analysis energy consumption of buildings by modification of the building envelope.

Learning Outcomes

On successful completion of this module, students should be able to
1. Evaluate the data required for application to dynamic thermal modelling.
2. Generate a 3-dimensional building model using design software.
3. Integrate thermal parameters to building model envelope elements.
4. Integrate thermal parameters and occupancy profiles to building model zones.
5. Appraise solar related data.
6. Integrate natural ventilation openings to a building model zones.
7. Compare different building designs to improve thermal comfort and reduce annual energy consumption.
8. Appraise generated data.
9. Form concepts and develop ideas in relation to building energy use.

Learning and teaching methods and strategies
1. Lectures
2. Presentations
3. Reading
4. Exercises
5. Discussion

Assessment Methods
Continuous Assessment – 100%
Assessment 1 Learning Outcome 1, 2
Assessment 2 Learning Outcome 3, 4, 5
Assessment 3 Learning Outcome 6, 7
Assessment 4 Learning Outcome 7, 8,9

Code PLAC 0105 : Industrial Placement / Energy Survey - Level 7 Credits 5

Description of module
In industrial placement the student typically works for a period of between 12 and 24 weeks in one of the following areas related to energy; energy management, design consultation, facilitates management, renewable energy specialist, local authority or primary energy providers and utilities. She/he will work under the direction of the company's industrial placement supervisor and will also report to the WIT supervisor. Progress in placement is assessed by the WIT supervisor and the employer. If a student fails to obtain relevant industrial placement s/he will be required to undertake energy surveys, audits or monitoring of the WIT building stock.

Learning Outcomes

On successful completion of this module, students should be able to
1. Recognise the main aspects of energy production, consumption and reduction as they apply building design, operation and maintenance.
2. Apply problem solving techniques to situations encountered in the building energy and renewables sector.
3. Explain the management and technical aspects of the industrial placement.
4. Make informed decisions in selecting career paths within the energy sector.

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Learning and teaching methods and strategies
1. Indepentant Learning
2. Exercises
3. Practical Work
4. Problem Based Learning.

Assessment methods
1. Monthly Progress Reports 35%
2. Academic Supervisor's Report 20%
3. Industrial Supervisor's Report 15%
4. Final Placement Report 10%
5. Powerpoint Presentation 20%