



**HNC Computer Aided Design**  
**HNC/D Mechanical Engineering**  
**HNC/D Mechatronics**  
**HNC/D Electronics**  
**BSc Electrical and Electronic Engineering**

# **Course Information**

(English)

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# Technology

## Awards Available

|   |               |
|---|---------------|
| BSc Electrical and Electronic Engineering         | 3 Year Course |
| Higher National Diploma Mech. Engineering         | 2 Year Course |
| Higher National Diploma Mechatronics              | 2 Year Course |
| Higher National Diploma Electronics               | 2 Year Course |
| Higher National Certificate Computer Aided Design | 1 Year Course |
| Higher National Certificate Mech. Engineering     | 1 Year Course |
| Higher National Certificate Mechatronics          | 1 Year Course |
| Higher National Certificate Electronics           | 1 Year Course |

## Structure of Awards

*Higher National Certificate* is a qualification in its own right and can also count as the first year of a degree programme. Students are normally expected to achieve 15 HN credits = 60 ECTS = 120 Scotcat credits during the academic year. The academic year is divided into two semesters (See college calendar).

*Higher National Diploma* is a qualification in its own right and can also count as the second year of a degree programme. Students are normally expected to achieve 15 HN credits = 60 ECTS = 120 Scotcat credits during the academic year. The academic year is divided into two semesters (See college calendar).

*Bachelor of Science Electrical and Electronic Engineering Year 3* is the third year of the degree programme. Students are expected to achieve 120 Scotcat credits = 60 ECTS in the course of the academic year. The course consists a core project (double credit) plus two other core subjects plus four options.

## Teaching Methods

Classes consist of lectures, tutorials and practical sessions. Occasionally lectures may be delivered by videoconferencing.

## Assessment Procedures

### *Higher National Certificate*

The course is assessed using continuous assessment for each subject including project work and tests.

### *Higher National Diploma*

The course is assessed using continuous assessment for each subject including project work and tests.

### *Bachelor of Science Electronic and Electrical Engineering Year 3*

Subjects are assessed according to the following pattern:

Project work, laboratory work and end of term examinations.

Exams take place in December and May

## Recommended Reading

For information regarding background reading and other course information please contact

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## Coordinators

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# Course Information - Technology

|   | HN<br>Credits | ECTS | Scotcat<br>Credits |
|---|---------------|------|--------------------|
| <b>Mechanical Engineering (Semester One)</b>    |               |      |                    |
| Information Technology Applications 1           | 1             | 4    | 8                  |
| Engineering Project                             | 2             | 8    | 16                 |
| Computer Aided Draughting                       | 1             | 4    | 8                  |
| Mechanical Engineering Principles: Thermofluids | 1             | 4    | 8                  |
| ME principles: Statistics and Dynamics          | 1             | 4    | 8                  |
| Engineering Design                              | 1             | 4    | 8                  |
| Electronic Construction Skills                  | 1             | 4    | 8                  |

|  | HN<br>Credits | ECTS | Scotcat<br>Credits |
|--|---------------|------|--------------------|
| <b>Mechanical Engineering (Semester Two)</b> |               |      |                    |
| Communication                                | 1             | 4    | 8                  |
| Fundamentals of Quality Assurance            | 1             | 4    | 8                  |
| Introductory Maths for Engineers             | 1             | 4    | 8                  |
| Drawing and Communication                    | 1             | 4    | 8                  |
| Computerised 3D Modelling                    | 1             | 4    | 8                  |
| Component Manufacturing Skills               | 1             | 4    | 8                  |
| Product Assembly Skills                      | 1             | 4    | 8                  |

|   | HN<br>Credits | ECTS | Scotcat<br>Credits |
|---|---------------|------|--------------------|
| <b>Computer Aided Design (Semester One)</b> |               |      |                    |
| Computer Aided Draughting                   | 1             | 4    | 8                  |
| Operating Systems for CAD Users             | 1             | 4    | 8                  |
| Computerised 3D Modelling                   | 1             | 4    | 8                  |
| CAD Systems Management                      | 2             | 8    | 16                 |
| Architectural CAD                           | 2             | 8    | 16                 |
| CAD and Databases                           | 1             | 4    | 8                  |

|   | HN<br>Credits | ECTS | Scotcat<br>Credits |
|---|---------------|------|--------------------|
| <b>Computer Aided Design (Semester Two)</b> |               |      |                    |
| Solid Modelling                             | 2             | 8    | 16                 |
| CADD Project                                | 2             | 8    | 16                 |
| Presenting Complex Communications           | 1             | 4    | 8                  |
| Customised Programming for CAD              | 1             | 4    | 8                  |
| Design Drawing and Communication            | 1             | 4    | 8                  |

|  | HN<br>Credits | ECTS | Scotcat<br>Credits |
|--|---------------|------|--------------------|
| <b>Electronics and Mechatronics (Semester One)</b> |               |      |                    |
| Electrical Principles                              | 1             | 4    | 8                  |
| Analogue Devices                                   | 1             | 4    | 8                  |
| Electrical Test Instruments                        | 1             | 4    | 8                  |
| Engineering Project                                | 2             | 8    | 16                 |
| Introduction to Power Systems                      | 1             | 4    | 8                  |
| Control Theory                                     | 1             | 4    | 8                  |
| Fault Finding                                      | 1             | 4    | 8                  |
| Material Selection and Testing                     | 1             | 4    | 8                  |
| Measurement Systems                                | 1             | 4    | 8                  |
| Application of PLC's                               | 1             | 4    | 8                  |
| Introduction to Design                             | 1             | 4    | 8                  |

|  | <b>HN<br/>Credits</b> | <b>ECTS</b> | <b>Scotcat<br/>Credits</b> |
|--|-----------------------|-------------|----------------------------|
| <b>Electronics and Mechatronics (Semester Two)</b> |                       |             |                            |
| Combination Logic                                  | 1                     | 4           | 8                          |
| Product Assembly Skills                            | 1                     | 4           | 8                          |
| Engineering Project                                | 2                     | 8           | 16                         |
| Fundamentals of Quality Assurance                  | 1                     | 4           | 8                          |
| Pneumatic and Hydraulic Systems                    | 1                     | 4           | 8                          |
| Systems Monitoring                                 | 1                     | 4           | 8                          |
| Sequential Logic                                   | 1                     | 4           | 8                          |
| Engineering Business Studies                       | 1                     | 4           | 8                          |
| Telecommunication Fundamentals                     | 1                     | 4           | 8                          |
| Robotic Systems                                    | 1                     | 4           | 8                          |
| Microelectronics                                   | 1                     | 4           | 8                          |
| Engineering Programming                            | 1                     | 4           | 8                          |

### **BSc Electronic & Electrical Engineering**

| <b>Module</b>                         | <b>Core /Option</b> | <b>Semester</b>  | <b>ECTS</b> | <b>Scotcat Credits</b> |
|---------------------------------------|---------------------|------------------|-------------|------------------------|
| Engineering Project (Electrical)      | Core                | Semester 1 and 2 | 15          | 30                     |
| Engineering Management                | Core                | Semester 1       | 7.5         | 15                     |
| Applied Mathematics for Engineering   | Core                | Semester 1       | 7.5         | 15                     |
| Analogue & Digital Telecommunications | Option              | Semester 2       | 7.5         | 15                     |
| Power and Machines                    | Option              | Semester 2       | 7.5         | 15                     |
| Power Electronics                     | Option              | Semester 1       | 7.5         | 15                     |
| Instrumentation                       | Option              | Semester 2       | 7.5         | 15                     |
| Analogue Electronics                  | Option              | Semester 1       | 7.5         | 15                     |
| Digital Electronics                   | Option              | Semester 1       | 7.5         | 15                     |
| Microprocessor Systems                | Option              | Semester 2       | 7.5         | 15                     |
| Work Based Initiative                 | Option              | Semester 1 and 2 | 7.5         | 15                     |
| Free Elective                         | Option              | Semester 1 or 2  | 7.5         | 15                     |

# Subject Description

## **HNC/HND Electronics Engineering**

### **Information Technology Apps. 1 (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Using a computer system to run applications software – Use operating environment to manage applications; Produce formatted documents; Model prescribed situations; Store and retrieve information.

### **Introductory Maths for Engineers (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Developing mathematical skills necessary to achieve advanced awards in engineering through the use and application of fundamental mathematical techniques – Apply standard algebraic techniques to solve equations and to manipulate expressions occurring in engineering theory; Analyse trigonometric functions and their graphs; Differentiate and integrate simple functions.

### **Communication HN Credits (1 = 4 ECTS = 8 Scotcat Credits)**

Producing specific complex communication for vocational purposes – Produce a complex written business document; Deliver a formal presentation on a complex vocational issue; Organise and participate in a formal meeting.

### **Fundamentals of Quality Assurance (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Explaining the fundamental quality management principles and practices which are used to establish and manage the customer's requirements for a product or service – Explain the fundamental principles of quality assurance; Explain the methods of controlling the purchase of manufactured products and services; Explain the methods of identifying and recording manufactured products and services.

### **Engineering Project (HN Credits 2 = 8 ECTS = 16 Scotcat Credits)**

Completing a project involving the integration and application of technological, organisational, communication and interpersonal skills – Plan the project; Implement the project safely within given parameters; Evaluate the project within given parameters; Present project information,

### **Electronic Testing Skills (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Basic testing and fault finding on electronic circuits – Select and use electronic test equipment; Demonstrate a disciplined approach to fault finding; Complete a small electronic construction and test project.

### **Electronic Construction Skills (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Interpreting electronic circuit symbols, recognising electronic components and demonstrating electronic construction skills in the design, manufacture and assembly of a printed circuit board using an electronic design software package – Select components and wiring for an electronic circuit; Use an electronic design software package to design and manufacture a printed circuit board; Populate a printed circuit board.

### **Product Assembly Skills (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Performing mechanical assembly skills - Select and set up equipment for the assembly of given components - Assemble given components to specification using mechanical assembly skills; Take measurements and evaluate results.

### **Electrical Networks (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Applying network theorems, measurement and reduction techniques to electrical networks – Apply reduction techniques to evaluate an electrical network; Apply network theorems to solve network problems; Use measurement techniques to analyse electrical networks.

### **Electronic Test Instruments (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Using electronic test instruments for measuring electrical signals- Use analogue and digital multi-meters to perform measurements in electronic circuits; Measure waveforms in electronic circuits using a cathode ray oscilloscope (CRO); Use function generators and frequency counters in testing electronic circuits; Use basic digital test instruments to trace signals through combinational and sequential logic circuits.

**Analogue Electronic Devices (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Analysing the use of diodes and transistors in analogue applications – Analyse the operating characteristics and applications of semi-conductor diodes; Analyse the properties and operation of npn and pnp bipolar transistors; Analyse the properties and operation of Field Effect Transistors (FET).

**Combinational Logic (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Designing and building combinational logic circuits – Describe the characteristics of combinational digital logic functions; Explain the features of logic families; Design and simulate a combinational logic circuit using Karnaugh maps; Build and test a combinational logic circuit.

**Single Phase AC Networks (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Applying complex notation and measurement techniques to analyse single phase ac networks – Apply complex notation to phasor quantities; Solve ac network problems using complex notation; Use measurement techniques to produce reports relating to single phase ac networks; Analyse series resonant ac networks; Analyse parallel resonant ac networks.

**Operational Amplifiers (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Understanding the operating principles of operational amplifiers and designing and constructing operational amplifier circuits – Explain the characteristics of ideal and practical operational amplifiers; Design, construct and test operational amplifier circuits; Specify operational amplifier frequency dependent characteristics.

## **2<sup>nd</sup> Year HND**

### **Mathematics for Engineering (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Using algebra and trigonometry to solve problems – Carry out operations involving complex numbers; Apply algebraic methods in problem solving; Apply trigonometric methods in problem solving; Differentiate and integrate functions.

### **Material Selection and Testing (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Selecting materials and test procedures for particular applications – Describe the properties of materials; Identify the properties of materials important to given applications; Select suitable materials for given applications; Specify the testing procedures to ensure that the materials properties meet the given design specifications.

### **Engineering Business Studies (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Explaining the external and internal environments associated with the operation of engineering business organisations – Explain the nature of business activity; Explain the factors influencing the internal organisation of a business; Explain interpersonal relationships and the responsibilities of staff in engineering organisations; Explain accounting statements and financial measures used in business.

### **Applied Engineering Computing (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Using a range of computer software applications for the control of engineering systems – Using a range of computer applications for the control of engineering systems – Explain the hardware and software concepts necessary to achieve a computer controlled engineering system; Use and evaluate a range of pre-written programs, the code being complex enough to show the main features of the high level language being used, to control a range of engineering systems; Use an industrial relevant graphical simulation/control package to simulate/control an engineering system; Develop a solution for the computer control of an engineering system.

### **Sequential Logic (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Designing, implementing and testing sequential logic circuits – Explain the principles of operation of sequential circuits; Analyse simple sequential logic devices; Design and implement synchronous sequential circuits using bistables; Design and implement synchronous sequential circuits using medium scale integration (MSI) chips.

### **Introduction to Power Electronics (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Explaining the characteristics and applications of power electronic devices – Explain the operation of thyristors; Explain the operation of power transistors; Describe the techniques for the safe operation of power electronics systems; Test and diagnose faults in a power electronic system.

### **Analogue Circuit Techniques (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Applying analogue principles and design techniques to electronic circuits – Analyse the application of negative feedback in analogue circuits; Evaluate the application of positive feedback in analogue circuits; Analyse the noise performance in circuit design and layout; Use analogue integrated circuits.

### **Power supply Circuits (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Analysing the operation of power supplies – Analyse the operation of unregulated power supplies; Analyse the operation of full-wave smoothed linear regulated power supplies; Analyse the operation of a switched mode power supply; Locate a fault in a regulated power supply.

### **D/A and A/D Converters (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Explaining the operation of devices and circuits used in analogue to digital and digital to analogue interfacing – Explain the operation of digital to analogue converters (DAC); Explain the operation of analogue to digital converters (ADC); Explain the operation of associated circuits used in interfacing; Test digital to analogue converters and analogue to digital converters and demonstrate the principle of aliasing.

### **Electronic Fault Finding (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Applying a structured approach to the identification of faults in electronic assemblies – Explain the techniques of fault diagnosis in electronic circuits and systems; Implement a fault location strategy in an electronic system; Locate faults to component level in digital and analogue circuits.

**Measurement Systems (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Applying transducer systems for measurement within industrial processes – Explain the principles of measurement systems; Apply transducers to measure typical process variables; Apply transducers to measure motion and position variables; Use signal-conditioning circuits.

**Application of PLC's (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Solving industrial related problems by applying programmable logic controller (PLC) – Explain and classify PLC hardware; Describe the operation of PLC hardware; Describe the operation of PLC software; Prepare and operate a program for a PLC; Solve an industrial related control problem by the safe application of PLC technology.

**Control System Theory (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Evaluating the behaviour of closed loop systems and using controllers to suitably modify the loop behaviour – Demonstrate the modelling of closed loop systems; Predict the steady state and transient behaviour of closed loop systems; Apply frequency response methods to the analysis of control systems; Apply three term controllers to closed loop control systems.

**System Monitoring (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Selecting and using data acquisition and logging systems – Specify the characteristics of analogue interfacing hardware; Justify system monitoring techniques; Install and use condition monitoring hardware for a real time application; Select and use data logging systems.

**Telecommunication Fundamentals (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Describing the properties of a communication channel, the elements of each part of a communication system and specifying suitable communications media for a given specification – Describe the properties of a communication channel; Describe the elements of each part of a communication system; Specify a suitable communications system for a given requirement.

**Industrial Plant Services: Pneumatics & Hydraulics (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Identifying the operation and maintenance requirements of pneumatic and hydraulic systems – Describe the operation and maintenance requirements of compressed air generators; Describe the operation and maintenance requirements of compressed air distribution systems; Design, assemble and test a pneumatic power and control circuit; Describe the operation of a hydraulic system.

*All the units above are subject to change.*

# Subject Description

## HNC/HND Mechatronics

### **Introductory Maths for Engineers (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Developing mathematical skills necessary to achieve advanced awards in engineering through the use and application of fundamental mathematical techniques – Apply standard algebraic techniques to solve equations and to manipulate expressions occurring in engineering theory; Analyse trigonometric functions and their graphs; Differentiate and integrate simple functions.

### **Communication (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Producing specific complex communication for vocational purposes – Produce a complex written business document; Deliver a formal presentation on a complex vocational issue; Organise and participate in a formal meeting.

**Engineering Project (HN Credits 2 = 8 ECTS = 16 Scotcat Credits)** Completing a project involving the integration and application of technological, organisational, communication and interpersonal skills – Plan the project; Implement the project safely within given parameters; Evaluate the project within given parameters; Present project information,

### **Electronic Testing Skills (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Basic testing and fault finding on electronic circuits – Select and use electronic test equipment; Demonstrate a disciplined approach to fault finding; Complete a small electronic construction and test project.

### **Electronic Construction Skills (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Interpreting electronic circuit symbols, recognising electronic components and demonstrating electronic construction skills in the design, manufacture and assembly of a printed circuit board using an electronic design software package – Select components and wiring for an electronic circuit; Use an electronic design software package to design and manufacture a printed circuit board; Populate a printed circuit board.

### **Product Assembly Skills (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Performing mechanical assembly skills - Select and set up equipment for the assembly of given components - Assemble given components to specification using mechanical assembly skills; Take measurements and evaluate results.

### **Applied Engineering Computing (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Using a range of computer software applications for the control of engineering systems – Using a range of computer applications for the control of engineering systems – Explain the hardware and software concepts necessary to achieve a computer controlled engineering system; Use and evaluate a range of pre-written programs, the code being complex enough to show the main features of the high level language being used, to control a range of engineering systems; Use an industrial relevant graphical simulation/control package to simulate/control an engineering system; Develop a solution for the computer control of an engineering system.

### **Basic Eng. Principles: Mechatronics (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Applying basic electrical and mechanical principles to system design – Solve problems involving force power, torque and speed; Solve DC network problems; Solve AC network problems; Evaluate the operation of DC power supplies.

### **Mechatronic Systems (HN Credits 2 = 8 ECTS = 16 Scotcat Credits)**

Designing and using mechatronic systems – Explain and operate a range of mechatronic systems; Connect and use a range of transducers and sensors; Select and use a range of actuating devices; Explain the control concepts of mechatronic systems; Use software for control purposes; Produce a specification for a mechatronic system.

### **Microelectronics (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Using analogue and digital devices as interfacing units to microprocessor systems – Analyse and construct digital circuits; Analyse and construct analogue devices; Evaluate digital interfacing; Evaluate analogue interfacing.

### **Application of PLC's (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Solving industrial related problems by applying programmable logic controller (PLC) – Explain and classify PLC hardware; Describe the operation of PLC hardware; Describe the operation of PLC software; Prepare and operate a program for a PLC; Solve an industrial related control problem by the safe application of PLC technology.

**Robotic Systems (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Evaluating and using robotic systems and associated equipment for general industrial applications – Review the main attributes of robots; Appraise sensors, control techniques, and programming; Select a suitable robot and associated equipment for a given application; Program and operate a robotic system.

**Electronic Test Instruments (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Using electronic test instruments for measuring electrical signals- Use analogue and digital multi-meters to perform measurements in electronic circuits; Measure waveforms in electronic circuits using a cathode ray oscilloscope (CRO); Use function generators and frequency counters in testing electronic circuits; Use basic digital test instruments to trace signals through combinational and sequential logic circuits.

## 2<sup>nd</sup> Year HND

### **Mathematics for Engineering (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Using algebra and trigonometry to solve problems – Carry out operations involving complex numbers; Apply algebraic methods in problem solving; Apply trigonometric methods in problem solving; Differentiate and integrate functions.

### **Information Technology Apps. 1 (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Using a computer system to run applications software – Use operating environment to manage applications; Produce formatted documents; Model prescribed situations; Store and retrieve information.

### **Material Selection and Testing (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Selecting materials and test procedures for particular applications – Describe the properties of materials; Identify the properties of materials important to given applications; Select suitable materials for given applications; Specify the testing procedures to ensure that the materials properties meet the given design specifications.

### **Fundamentals of Quality Assurance (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Explaining the fundamental quality management principles and practices which are used to establish and manage the customer's requirements for a product or service – Explain the fundamental principles of quality assurance; Explain the methods of controlling the purchase of manufactured products and services; Explain the methods of identifying and recording manufactured products and services.

### **Engineering Business Studies (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Explaining the external and internal environments associated with the operation of engineering business organisations – Explain the nature of business activity; Explain the factors influencing the internal organisation of a business; Explain interpersonal relationships and the responsibilities of staff in engineering organisations; Explain accounting statements and financial measures used in business.

### **Engineering Programming (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Applying a structured technique to the development of high level language software which drives a hardware interface – Use top-down design/stepwise refinement to develop pseudo code for software which drives a hardware interface; Implement designed code in a high level language; Test the code to check that the specification is met; Supply documentation for completed software product.

### **Engineering Principles: Mechatronics (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Applying electrical and mechanical principles to system design – Solve simple stress and strain problems; Solve simple mechanism design problems; Analyse the performance of motors used in control systems; Investigate the application of a range of power electronic devices and circuits.

### **Introduction to Engineering Design (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Applying the concepts of the design function – Prepare a design specification with consideration of the factors determining the function; Generate proposals to meet a design specification; Evaluate design proposals and select the optimum.

### **Measurement Systems (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Applying transducer systems for measurement within industrial processes – Explain the principles of measurement systems; Apply transducers to measure typical process variables; Apply transducers to measure motion and position variables; Use signal-conditioning circuits.

### **Control System Theory (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Evaluating the behaviour of closed loop systems and using controllers to suitably modify the loop behaviour – Demonstrate the modelling of closed loop systems; Predict the steady state and transient behaviour of closed loop systems; Apply frequency response methods to the analysis of control systems; Apply three term controllers to closed loop control systems.

### **Industrial Plant Services: Pneumatics & Hydraulics (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Identifying the operation and maintenance requirements of pneumatic and hydraulic systems – Describe the operation and maintenance requirements of compressed air generators; Describe the operation and maintenance requirements of compressed air distribution systems; Design, assemble and test a pneumatic power and control circuit; Describe the operation of a hydraulic system.

**Computer Aided Draughting (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Producing two-dimensional engineering drawings and schematics using a computer aided draughting package – Create and manipulate graphical data using CAD systems commands; From an existing drawing create in stages a final drawing using edit and store commands; Create composite drawings by using customised menus and block manipulation; Produce a major drawing(s) using a commercial CAD system.

**System Monitoring (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Selecting and using data acquisition and logging systems – Specify the characteristics of analogue interfacing hardware; Justify system monitoring techniques; Install and use condition monitoring hardware for a real time application; Select and use data logging systems.

**D/A and A/D Converters (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Explaining the operation of devices and circuits used in analogue to digital and digital to analogue interfacing – Explain the operation of digital to analogue converters (DAC); Explain the operation of analogue to digital converters (ADC); Explain the operation of associated circuits used in interfacing; Test digital to analogue converters and analogue to digital converters and demonstrate the principle of aliasing.

**Design Drawing & Communication for Engineers (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Applying draughting principles and communication techniques to engineering products – Produce drawings of engineering components and assemblies; Produce circuit diagrams to illustrate the use of engineering symbols; Prepare a parts list.

**Telecommunication Fundamentals (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Describing the properties of a communication channel, the elements of each part of a communication system and specifying suitable communications media for a given specification – Describe the properties of a communication channel; Describe the elements of each part of a communication system; Specify a suitable communications system for a given requirement.

*All the units above are subject to change.*

# Subject Description

## HNC/HND Mechanical Engineering

### **Engineering Design (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Appreciation and analysis of design methodologies and factors to be taken into account in the production of specification and final design documentation – Outline industrial design methodologies; Examine the appropriate factors to be considered in the design of a product or system; Analyse the documentation and design confirmation requirements for manufacture.

**Information Technology Applications 1 (HN Credits 1 = 4 ECTS = 8 Scotcats)** Using a computer system to run applications software - Manage applications; Produce formatted documents; Model prescribed situations; Store and retrieve information.

### **Fundamentals of QA (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Explaining the fundamental quality management principles and practices which are used to establish and manage the customer's requirements for a product or service – Explain the fundamental principles of quality assurance; Explain the methods of controlling the purchase of manufactured products and services; Explain the methods of identifying and recording manufactured products and services.

### **Component Manufacturing Skills (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Performing manufacture and mechanical workshop skills – Select and set up equipment for the manufacture of given components; Manufacture components to a specification; Take measurements and evaluate results.

### **Computer Aided Draughting (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Producing two-dimensional engineering drawings and schematics using a computer aided draughting package – Create and manipulate graphical data using CAD systems commands; From an existing drawing create in stages a final drawing using edit and store commands; Create composite drawings by using customised menus and block manipulation; produce a major drawing(s) using commercial CAD system.

### **Computerised 3D Modelling (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Producing three-dimensional (3D) models using a computer-aided draughting system – Create 2½D wire-frame models; Create 3D wire-frame models; Create 3D surface models; Display 3D models in multi-view layout; Display 3D models in perspective view.

### **Eng. Drawing and Communication (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Applying draughting principles and communication techniques to engineering products – Produce drawings of engineering components and assemblies; Produce circuit diagrams to illustrate the use of engineering symbols; prepare a parts list.

### **Electronic Construction Skills (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Interpreting electronic circuit symbols, recognising electronic components and demonstrating electronic construction skills in the design, manufacture and assembly of a printed circuit board using an electronic design software package.

### **Engineering Project (HN Credits 2 = 8 ECTS = 16 Scotcat Credits)**

Completing a project involving the integration and application of technological, organisational, communication and interpersonal skills – Plan the project; Implement the project safely within given parameters; Evaluate the project within given parameters; Present project information.

### **Introductory Maths for Engineers (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Developing mathematical skills necessary to achieve advanced awards in engineering through the use and application of fundamental mathematical techniques – Apply standard algebraic techniques to solve equations and to manipulate expressions occurring in engineering theory; analyse trigonometric functions and their graphs; Differentiate and integrate simple functions.

**Mech.Eng.Principles: Static's and Dynamics (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Applying the fundamental concepts of static's and dynamics to the solution of engineering problems – Analyse planar equilibrium problems; Quantify the effect of direct and shear forces in situations of engineering significance; Solve kinematic problems for linear and angular motion; Solve rigid body problems using Newton's second law of motion.

**Mech. Eng. Principles: Thermo fluids (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Solving problems involving thermo-fluids principles – Evaluate properties and changes of state for perfect gases and vapours; Evaluate energy transfers for perfect gases and vapours; Calculate pressures, pressure differences and hydrostatic forces; Apply energy, continuity and momentum principles to non-compressible steady flow processes.

**Product Assembly Skills (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Performing mechanical assembly skills – Select and set up equipment for the assembly of given components; Assemble given components to specification using mechanical assembly skills; Take measurements and evaluate results.

**Communication 1 (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Producing specific complex communication for vocational purposes – Produce a complex written business document; Deliver a formal presentation on a complex vocational issue; Organise and participate in a formal meeting.

*All the units above are subject to change.*

**HND Mechanical Engineering****Health and Safety in Industry (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Explaining the individual's duties with regard to current Health and Safety legislation and the current method of Accident Reporting and First Aid Procedures – Explain the individual's duties with regard to current legislation governing Health and Safety in the workplace; Outline the correct procedures to be followed during manual handling operations; Explain the correct procedures and actions to be followed on dealing with an accident or dangerous occurrence.

**Calculus 1 for Engineering (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Using basic calculus to support applications in engineering – Solve problems involving differentiation of functions of one variable; Solve problems involving integration of functions of one variable.

**Applied Thermodynamics–Basic Processes (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Applied thermodynamic design and operation principles to the of simple plant systems – Solve problems involving energy transfer; Solve problems involving thermodynamic cycles; Evaluate performance of internal combustion engines.

**Control Fundamentals (HN Credits 0.5 = 2 ECTS = 4 Scotcat Credits)**

Appreciating methods of control, and the fundamental characteristics of control systems – Explain system components and signals; Describe the structure and behaviour of control systems.

**Customised Computer Aided Draughting (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Using computer applications to increasing design productivity – Create and use library; Create and use macros; Create a bill of materials; Create and use customised menus.

**Design for Manufacture (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Relating design principles to the manufacture of discrete products – Outline the design process; Initiate the design process for a particular product; Confirm the design and prepare relevant documentation.

**Engineering Business Studies (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Explaining the external and internal environments associated with the operation of engineering business organisations – Explain the nature of business activity; Explain the factors influencing the internal organisation of a business; Explain interpersonal relationships and the responsibilities of staff in engineering organisations; Explain accounting statements and financial measures used in business.

**Eng. Mechanics and Strength of Materials: Gen. (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Analysing beam and shaft systems for stress and deflection; and applying kinetic principles to the solution of impact and variable acceleration problems – Compute bending stresses in statically determinate beam systems; Compute shear stresses in statically determinate shaft systems; Determine the deflection of simply supported and cantilever beams; Solve problems using the concepts of linear and angular impulse and momentum; Solve problems using the concepts of work, energy and power.

**Eng. Mechanics and Strength of Materials: Adv. (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Applying principles of dynamics to planar link mechanisms and simple vibrating systems. Analysing 2-dimensional and 3-dimensional engineering systems for stress distribution and factors of safety – Apply the principles of dynamics to planar link mechanisms; Solve single degree of freedom vibration problems; Analyse 2-dimensional stress systems; Determine the stress distribution in simple and compound thick walled cylinders; Apply theories of elastic failure to predict factors of safety for engineering components.

**Fundamental Electrical and Electronic Principles (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Applying fundamental electrical network theory to solve DC and AC problems, and applying fundamental semiconductor devices to implement common electronic functions – Solve DC electrical network problems; Solve AC electrical network problems; Design and implement combinational logic circuits; Apply diodes and operational amplifiers to common applications.

**Heat Transfer and Fluid Mechanics (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Evaluating incompressible flow and heat transfer – Explain flow patterns in elementary applications; Solve problems involving incompressible flow in pipe systems; Identify appropriate flow measurement systems; Evaluate heat transfer rates through insulated pipe walls, flat surfaces and heat exchangers.

**Industrial Plant Services: Pneumatics and Hydraulics (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Identifying the operation and maintenance requirements of pneumatic and hydraulic systems – Describe the operation and maintenance requirements of compressed air generators; Describe the operation and maintenance requirements of compressed air distribution systems; Design, assemble and test a pneumatic power and control circuit; Describe the operation of a hydraulic system.

**Materials Selection and Testing (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Selecting materials and test procedures for particular applications – Describe the properties of materials; Identify the properties of materials important to given applications; Select suitable materials for given applications; Specify the testing procedures to ensure that the materials properties meet the given design specifications.

**Principles and Techniques of Quality Management (HN Credits 2 = 8 ECTS = 16 Scotcat Credits)**

Explaining the factors contributing to total quality management – Explain the principles of quality assurance in modern management strategy; Describe the use and maintenance of a quality system; Explain the concepts and practices of quality system auditing; Explain the classification and requirements of quality costs; Explain the principles of total quality management (TQM).

**Transducers (HN Credits 0.5 = 2 ECTS = 4 Scotcat Credits)**

Explaining the principles of operation and application of transducers used to measure engineering quantities – Explain the basic principles of operation of transducers; Describe the use and operation of transducers in measurement systems.

**Mathematics for Engineering (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)** Using algebra and trigonometry to solve problems – Carry out operations involving complex numbers; Apply algebraic methods in problem solving; Apply trigonometric methods in problem solving; Differentiate and integrate functions.

*All the units above are subject to change.*

**30 HN Credits are required for the award of HND Mech. Eng.**

# Subject Description

## HNC CADD

### **Computer Aided Draughting (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Producing two-dimensional engineering drawings and schematics using a computer aided draughting package - Create and manipulate graphical data using CAD system commands; From an existing drawing create in stages a final drawing using edit and store commands; Create composite drawings using menus and block manipulation; Produce a major drawing(s) using a commercial CAD system.

### **Operating Systems for CAD Users HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Using operating systems commands to maintain CAD files and work discs and identify the main components of a CAD system - Prepare and maintain CAD directories/folders; Prepare and maintain CAD work discs; Use operating systems commands; Use a text editor; Recognise the function of the hardware elements of CAD systems and the user software interface to CAD systems; Evaluate a Computer Aided Draughting system.

### **Computerised 3D Modelling HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Producing three-dimensional (3D) models using a computer-aided draughting system - Create 2<sup>1/2</sup>D wire frame models; Create 3D wire frame models; Create 3D surface models; Display 3D models in a multi-view layout; Display 3D models in perspective view.

### **Solid Modelling (HN Credits 2 = 8 ECTS = 16 Scotcat Credits)**

Producing solid model drawings and extracting detailed drawing information from solid model composites using a computer-aided draughting package - Create drawings from solid primitives; Create solid model composite drawings using Boolean operations; Create solid models from regions; Extract drawing details from a solid composite; Create an assembled solid model composite drawing using previously created solid models; Create drawing layouts from a solid composite.

### **CADD Project (HN Credits 2 = 8 ECTS = 16 Scotcat Credits)**

Carrying out a project involving the integration and application of computer aided draughting skills - Plan the project to ensure completion within a given timescale; Develop a project brief; Complete the CADD work in terms of the project brief; Write a project report.

### **Communication (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Producing specific complex communication for vocational purposes - Produce a complex written business document; Deliver a formal presentation on a complex vocational issue; Organise and participate in a formal meeting.

### **CAD System Management (HN Credits 2 = 8 ECTS = 16 Scotcat Credits)**

Using a computer-aided draughting system to extract text information from drawings, customise linetypes, hatch patterns, shapes and menus, create a simple animation and create drawings from blocks and externally referenced objects- Extract text information for 2D drawings; Create and use customised linetypes and hatch patterns; Create and use customised shapes; Create and use customised menus; Create and use slides with a script file to show a sequence; Create drawings from blocks and externally referenced objects.

### **Architectural Computer Aided Draughting (HN Credits 2 = 8 ECTS = 16 Scotcat Credits)**

Producing architectural drawings and extracting information from architectural drawings using a computer-aided draughting software package - Create an outline design for a multi-levelled roomed structure; Create a multi-level roomed structure using architectural draughting tools; Add additional structural detail to a multi-levelled structure; Produce scaled plots of section and elevation detail from a multi-level structure; Insert fittings/fixtures into rooms of a multi-level structure, and extract attribute information for those fittings/fixtures; Produce perspective views of rooms with fittings/fixtures added and produce an animated walkthrough; Add symbols, notes, schedules and annotation to an architectural drawing and produce scaled plots of the completed drawing.

### **Architectural Computer Aided Draughting (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Producing architectural drawings using a computer-aided draughting software package - Create an outline design for a multi-levelled roomed structure; Create a multi-level roomed structure using architectural draughting tools; Add additional structural detail to a multi-levelled structure; Add symbols, notes, schedules and annotation to an architectural drawing and produce scaled plots of the completed drawing.

**CAD and Databases ( HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Integrating 2D drawing extraction data with a database software package - Use database management software; Extract information from 2D drawings using a CAD system; Input CAD extraction data to a database; Use the database search facilities; Produce reports from the database.

**Customised Programming for CAD (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Producing 2D drawings and schematics by customised programming using a computer-aided draughting system - Write and use statements for arithmetic and logic operations; Write and use programme statements to enter data; Write and use programme statements containing loops; Write and use programme statements to set system variables; Use programmes which read data from data files; Write and use programme statements containing user choice items.

**Design, Drawing and Comm'n for Engineers (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Applying draughting principles and communication techniques to engineering products - Produce drawings of engineering components and assemblies; Produce circuit diagrams to illustrate the use of engineering symbols; Prepare a parts list.

**Architectural Drawing and Design (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Applying graphical techniques and selected architectural data to building design - Illustrate basic architectural concepts and elements; Explain and illustrate the relationship of architectural form, function and mass; Apply basic ergonomic and anthropometric data.

**Introduction to Design (HN Credits 1 = 4 ECTS = 8 Scotcat Credits)**

Applying the concepts of the design function and its application - Prepare a design specification; Rank the design parameters in order of importance with appropriate weighting of non-essential parameters to generate design criteria; Use the design specification to generate proposals; Analyse, evaluate and select the optimum proposal.

*All the units above are subject to change.*

# Subject Description

## **BSc Electronic and Electrical Engineering Year 3**

### **Engineering Project (Electrical) (Core Module) (15 ECTS = 30 Scotcat Credits)**

To undertake a technically demanding individual engineering project, involving the integration and application of technological, organisational, communication and interpersonal skills.

### **Engineering Management (Core Module) (7.5 ECTS = 15 Scotcat Credits)**

To extend the student's knowledge of the skills required by middle managers in the engineering industry. To undertake an extended team exercise intended to develop wider personal and professional skills.

### **Applied Mathematics for Engineering (Core Module) (7.5 ECTS = 15 Scotcat Credits)**

To predict the behaviour of engineering systems under complex and transient conditions by the use of mathematical modelling and analysis techniques.

### **Analogue and Digital Telecommunications (Optional Module) (7.5 ECTS = 15 Scotcat Credits)**

To carry out the quantitative investigation of common communication signals and systems. An in depth practical investigation of communication circuits.

### **Power and Machines (Optional Module) (7.5 ECTS = 15 Scotcat Credits)**

To provide the student with an understanding of electrical power, DC machines, AC machines and protection systems.

### **Power Electronics (Optional Module) (7.5 ECTS = 15 Scotcat Credits)**

To provide the student with an understanding of Power Electronic circuits and their application to AC and DC machines.

### **Analogue Electronics (Optional Module) (7.5 ECTS = 15 Scotcat Credits)**

To provide an understanding of a variety of real-world electronic circuits and systems. Designing analogue circuits and systems employing contemporary technology. Use of Computer Aided Design tools to analyse and design analogue electronic circuits and systems.

### **Digital Electronics (Optional Module) (7.5 ECTS = 15 Scotcat Credits)**

To develop an in-depth knowledge of the analysis and design techniques for digital circuits and systems. Construction of digital circuits and systems and the use of Computer Aided Design tools for the analysis and design of circuits. An understanding of various logic families and circuits associated with data acquisition will also be gained.

### **Instrumentation (Optional Module) (7.5 ECTS = 15 Scotcat Credits)**

To provide the student with an understanding of the composition, function and performance of typical instrumentation systems.

### **Microprocessor Systems (Optional Module) (7.5 ECTS = 15 Scotcat Credits)**

To enable engineering students to understand the link between software and hardware. To use assembly language programming to aid the student's understanding of a microprocessor's internal architecture. To produce and evaluate an assembly language program that will interface a microprocessor with "real world" devices.

### **Work Based Initiative (Optional Module)(7.5 ECTS = 15 Scotcat Credits)**

Intended to give credit to candidates who can demonstrate an advanced level of competence in undertaking a work based development or initiative. In addition the module allows a candidate to reflect critically on the outcome of the activities carried out.

### **Free Elective (Optional Module) (7.5 ECTS = 15 Scotcat Credits)**

This can be chosen from across the UHI network taking account of prerequisites and logistics. Many students prefer to choose another engineering module occasionally from the area of Mechanical Engineering.







(1) **Course unit code:**

Refer to the ECTS information Package

(2) **Duration of course unit:**

Y = 1 full academic year

1S = 1 semester                      2S = 2 semesters

1T = 1 term/trimester            2T = 2 terms/trimesters

(3) **Description of the institutional grading system:**

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(4) **ECTS grading scale:**

| ECTS Grade | % of successful students normally achieving the grade | Definition (only of failing grades)                             |
|------------|---|---|
| A          | 10  |   |
| B          | 25  |   |
| C          | 30  |   |
| D          | 25  |   |
| E          | 10  |   |
| FX         | -   | FAIL – some more work required before the credit can be awarded |
| F          | -   | FAIL – considerable further work is required                    |

(5) **ECTS credits:**

1 full academic year = 60 credits

1 semester = 30 credits

1 term/trimester = 20 credits