NCUK
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International Year One (IYOne)

Engineering
Programme Overview

TABLE OF CONTENTS

PROGRAMME OVERVIEW

INTRODUCTION

The NCUK International Year One in Engineering (IYOne Engineering) programme is a first-year undergraduate equivalent programme that builds students' knowledge and skills in the Engineering field. It prepares and qualifies international students for entry to the third year (FHEQ Level 5[1]) of appropriate undergraduate degree courses offered by NCUK Universities.

NCUK Universities recognise the programme as meeting their entry requirements for international students, with progression contingent on students satisfying the performance criteria published in the NCUK Course Finder. The list of accepting universities can be seen on the university pages of the NCUK website.

NCUK guarantees students a place on a programme of study at one of the NCUK Universities provided that the student performs to the level specified by the NCUK Guarantee.

AIMS

The aims of the NCUK IYOne Engineering programme are to:

- ⇒ To provide students with knowledge of engineering concepts and applications at first year undergraduate level (FHEQ Level 4).
- ⇒ To prepare students for progression to second year (FHEQ Level 5) undergraduate study in engineering or related disciplines in NCUK partner universities.
- ⇒ To enhance the subject knowledge, learning skills and English language proficiency of students to enable them to communicate and study engineering and related subjects effectively and confidently in a UK or other university where English is the medium of instruction.
- ⇒ To cultivate a commitment to good practice in academic work, and in particular an awareness of the serious adverse implications of plagiarism and other areas of academic malpractice.
- ⇒ To provide students with the necessary personal and key skills to enable them to develop as independent, autonomous learners.
- ⇒ To give students experience of different approaches to teaching and learning and to the methods that are used to assess learning.

[1] Framework for Higher Education Qualifications. The FHEQ is published by the Quality Assurance Agency (QAA), which is the organisation responsible for assuring the quality of university degree provision in England, Wales and Northern Ireland.

GENERAL LEARNING OUTCOMES

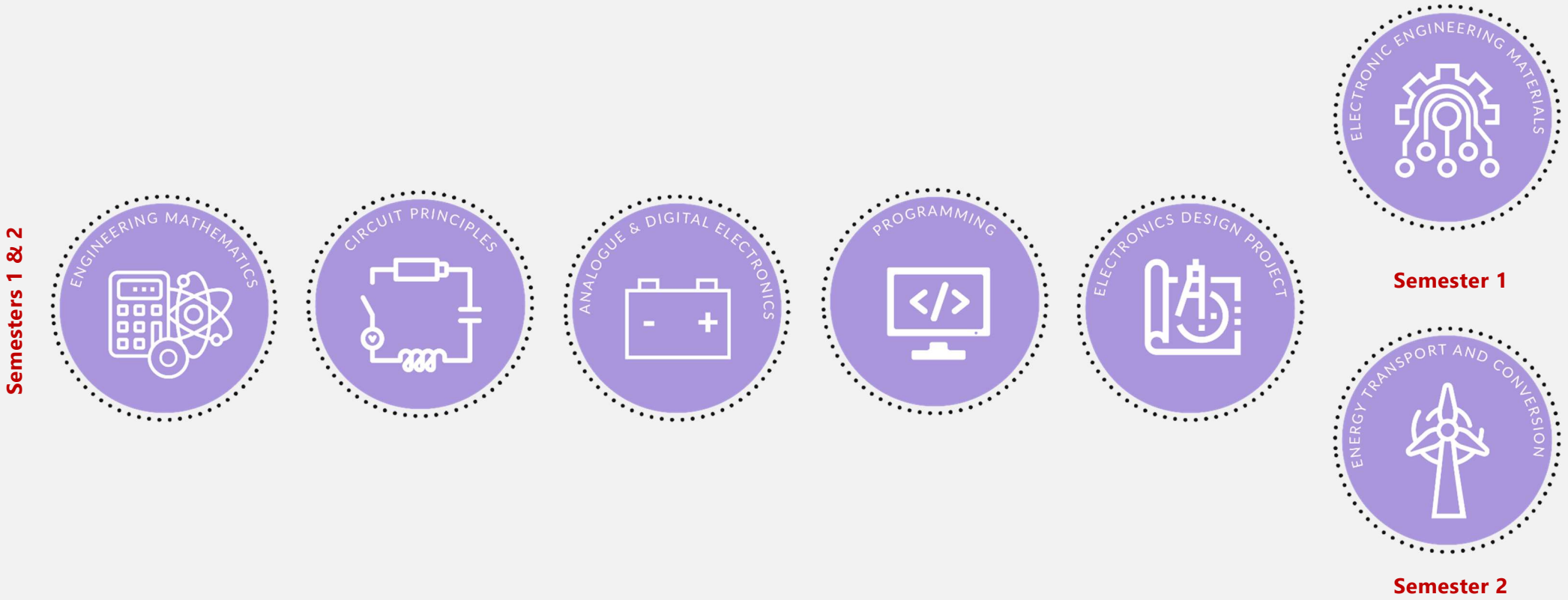
On successful completion of this programme, students should be able to:

- ⇒ Learn effectively, conform to accepted academic practice and integrate rapidly into undergraduate engineering courses in NCUK partner universities.
- ⇒ Demonstrate specific subject knowledge appropriate to their chosen routes, including the ability to make sound judgements in accordance with the basic concepts and theories of engineering, at a level comparable to that of 'home' students at the time of entry to the second year of appropriate degree courses.
- ⇒ Solve analytical engineering problems, present, and evaluate data and use equipment in the laboratory and, where appropriate, in the field.
- ⇒ Make effective use of a range of generic and subject specific study skills and information and communication technologies.
- ⇒ Demonstrate their learning through a range of learning assessment methods.
- ⇒ Use general, academic, and engineering-related technical English confidently in a Western academic environment and demonstrate a proficiency in English language to a standard of at least NCUK EAP grade 'C'.

PROGRAMME STRUCTURE

The NCUK IYOne Engineering consists of 1200 hours of study in total (600 guided learning hours, 600 independent study) and is generally delivered over one academic year (other teaching patterns are also possible).

⇒ Students on the Electrical & Electronic route will study 7 compulsory modules.



PROGRAMME GRADING

⇒ Assessment for each module will be via a combination of coursework and examination

⇒ Each subject module is awarded a percentage grade calculated according to the student's performance in the summative assessments. The table below presents a simplified marking criteria

⇒ Students will be awarded 15 credits for each passed module i.e. an overall module mark above 40%

Mark (%)	Criteria
70 +	Excellent – demonstrated learning of a high standard with clear evidence of application and synthesis.
60 – 69	Good – demonstrated competence, well-developed approach to the subject. Ability to apply concepts and synthesise material.
50 - 59	Satisfactory – competent performance, demonstrated strengths and weaknesses. Reasonable knowledge and understanding of the subject.
40 – 49	Adequate – acceptable performance. Work characterised by errors and omissions. Some misunderstandings of basic concepts and principles. **40% is the module pass mark**
Less than 40 marks	Inadequate performance. Weak understanding of conceptual frameworks. Many errors and omissions, confused exposition of issues. Insufficient understanding of class notes and/or little evidence of independent study.

⇒ A classification is awarded for the programme on completion as shown below:

Distinction	Overall programme mean mark is **70%** or above with 120 credits being awarded.
Pass	Overall programme mean mark is **40%** or above with a minimum of 90 credits being awarded.
Unclassified	Failure to meet the pass criteria, which may be due to either or both of: ⇒ An overall mean mark of less than 40% ⇒ Fewer than 90 credits awarded

BENCHMARK STATEMENTS

The International Year One in Engineering is at FHEQ Level 4[2]. Students at this level, upon successful completion should be able to:

⇒ Evaluate the appropriateness of different approaches to problem solving related to their area of study.
⇒ Communicate the results of their studies both accurately and reliably within structured, coherent arguments.
⇒ Take responsibility for their studies at intermediate level (FHEQ Level 5) within a structured and managed environment.

ENTRY TO THE PROGRAMME

To register the International Year One Engineering applicants must meet all of the following entry conditions; these conditions constitute *standard* entry:

⇒ Have achieved at least an NCUK EAP 'D' grade or hold an acceptable equivalent alternative English language qualification (see www.ncuk.ac.uk).

And have also:

⇒ obtained a minimum of 48 NCUK foundation points with a D in at least 2 subjects following study of the NCUK IFY programme (students must have a grade D in both Maths and Physics)

OR

⇒ obtained a minimum of grade 'D' in two relevant UK recognised 'A' level's (including Maths and Physics)

OR

⇒ met one of NCUK's country-specific entry requirements, which can be found on the NCUK website

The centre is responsible for assessing and verifying standard entry qualifications, which are subject to audit as part of NCUK's quality assurance processes.

Non-standard entry: applicants with qualifications other than NCUK's published entry requirements may be admitted to the International Year One programme. The centre must report any non-standard entry qualifications to NCUK's Non-Standard Entry Team (nse@ncuk.ac.uk). NCUK will consider the application and decide whether the student can be admitted to the International Year One Engineering programme.

NCUK reserves the right to require applicants with non-standard qualifications to take one or more entrance tests before admission to the International Year One Engineering programme.

Note: Non-standard academic qualifications might include successful completion of a first or second year of a four-year undergraduate degree course in an NCUK approved university, successful completion of an NCUK approved international foundation programme or the completion of other country-specific qualifications that are not published on NCUK's website.

[2] Level 5 benchmark statements taken from 'QAA The Frameworks for Higher Education Qualifications of UK Degree-Awarding Bodies, 2nd edition' February 2024, page 18,, accessed at https://www.qaa.ac.uk/docs/qaa/quality-code/the-frameworks-for-higher-education-qualifications-of-uk-degree-awarding-bodies-2024.pdf?sfvrsn=3562b281_11

PROGRAMME DELIVERY

The IYOne Engineering programme is specified to be delivered over a single academic year. The programme is divided into two semesters of 15 weeks' duration, comprising 14 teaching weeks and a final assessment week. Normally teaching weeks will have a timetabled class contact time of at least 20 hours per week.

The programme may be delivered over shorter or longer periods of time. Additional guidance for Study Centres on how to appropriately timetable the programme is given in Appendix B.

NCUK specifies minimum timetabled contact hours for its programmes but does not set a maximum class contact or total study time; it is recognised that many Study Centres will apply higher than minimum contact times to meet the learning needs of their students.

	Electrical & Electronic
Total Number of modules	7 modules
Total number of weeks	28 weeks of directed study over 2 semesters plus 2 weeks dedicated to examinations
Directed Study Hours per module per week	3 hours 20 mins per module
Directed Study Hours per week	6 modules x 3 hours 20 mins = 20 hours
Total Directed Study Hours	20 hours per week x 30 weeks = 600 hours
Independent Study Hours	Approximately 20 hours per week Total = 20 hours x 30 = 600 hours
Total Learning Activity	600 directed study hours + 600 independent study hours = 1200 hours

The duration of each semester may vary according to the timing of local public holidays. Semesters may be interrupted by periods of holiday where necessary.

The programme may be delivered face-to-face or in blended/online modes as agreed with the Study Centre at the time of accreditation.

CLASS SIZES

Subject class sizes may be varied according to the activity e.g. lecture, seminar and tutorial. The principle to be applied to timetabling and class size should be to give students the opportunity to experience different forms of learning and to maximise opportunities for small-group work and for the development of independent learning skills. In general, NCUK would not expect tutorial or seminar groups to exceed 16 students but class sizes for lectures may be larger.

Staffing of the programme should allow for some one-to-one contact for each student.

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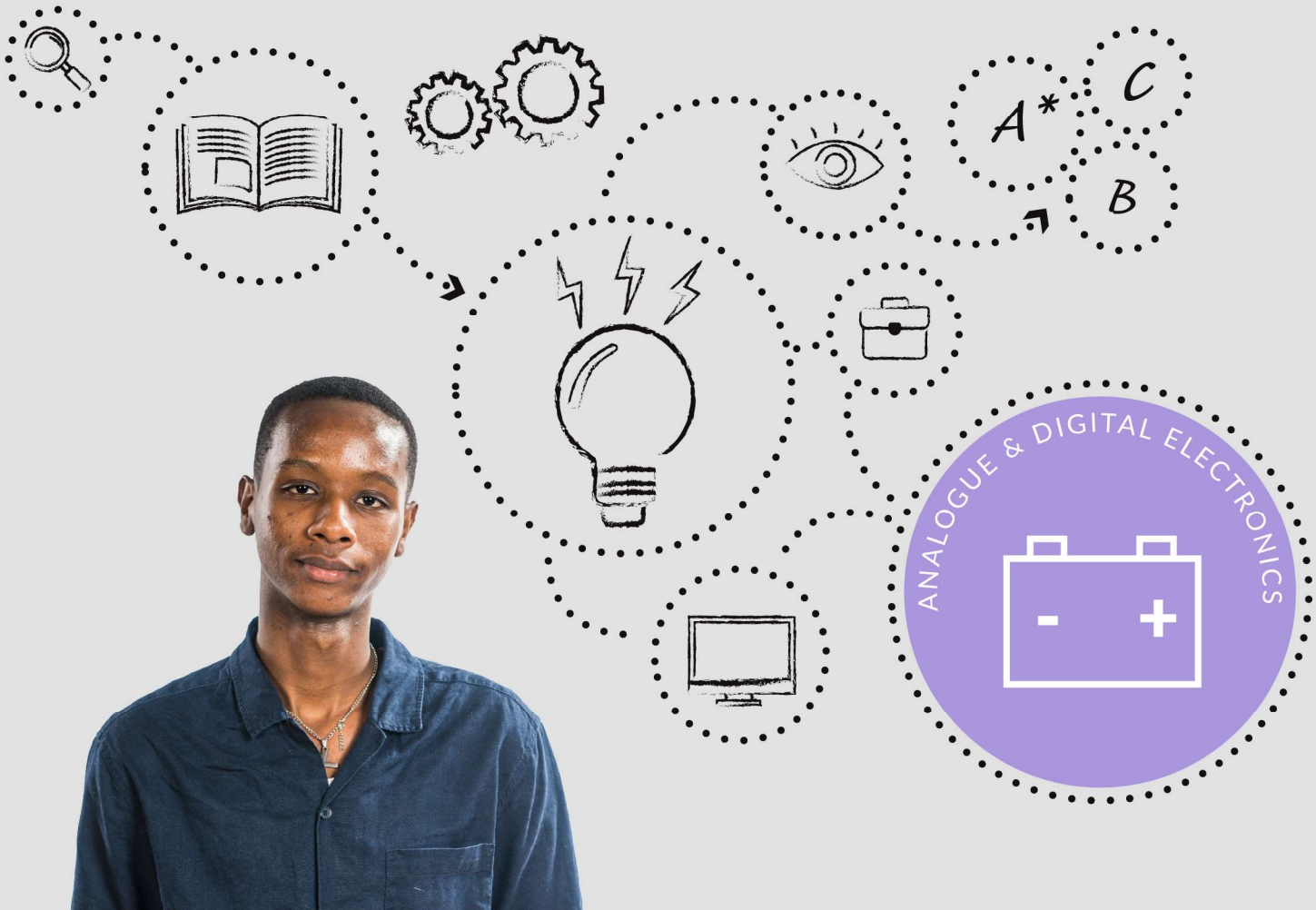
MODULE OVERVIEWS

IDEAD001

ANALOGUE & DIGITAL ELECTRONICS

MODULE OVERVIEW

INTERNATIONAL YEAR ONE ENGINEERING (IYOne Engineering)



SYLLABUS OVERVIEW

Module Code	IDEAD001
Module Name	Analogue & Digital Electronics
Programme Name	International Year One Engineering
Credits	20
Percentage breakdown of Coursework	40%
Percentage breakdown of Exam/Test	60%
Delivery period	The syllabus will usually be delivered over two 15-week semesters.
Semester(s)	1 & 2
Recommended minimum teaching hours	3 hours 20 mins per week (over 30 weeks) 100 hours in total
Recommended minimum independent study hours	3 hours 20 mins per week (over 30 weeks) 100 hours in total

AIMS

The aims of this module are to:

- ⇒ Introduce students to active (amplifying) circuit elements in analogue electronics.
- ⇒ Introduce students to digital components and there use in the development of digital logic circuits.
- ⇒ Provide students with a solid grounding of theory in the mathematical analysis of circuits.
- ⇒ Offer illustrative practical applications of theoretical concepts.

TOPICS OF STUDY

- ⇒ Diodes
- ⇒ Transistors
- ⇒ Operational Amplifiers
- ⇒ Logic Gates
- ⇒ Combinational Logic
- ⇒ Flip Flops

ASSESSMENT

Coursework 1: Lab-based assessment	**What is Assessed?**	Topics A-C
	Duration/Word Count	2 hours 20 mins / 1200 words.
	Total Marks	100
	Rubric	⇒ An assessed piece of laboratory practical work followed by a report.
	Contribution to Overall Grade	20%

Coursework 2: Lab-based assessment	**What is Assessed?**	Topics D-F
	Duration/Word Count	2 hours 20 mins / 1200 words.
	Total Marks	100
	Rubric	⇒ An assessed piece of laboratory practical work followed by a report.
	Contribution to Overall Grade	20%

Final Examination	**What is Assessed?**	Topics A-F
	Duration/Word Count	2 hours 10 mins
	Total Marks	60
	Rubric	⇒ Students answer 3 multi-part questions from a choice of 4 (20 marks each)
	Contribution to Overall Grade	60%

GENERAL LEARNING OUTCOMES

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

Knowledge and understanding	⇒ Describe and explain the functions of components and elementary circuits in analogue and digital electronics, using correct terminology and mathematics as appropriate.
Transferable skills	⇒ Circuit analysis and design skills, including the use of simple mathematical models of components and circuits. ⇒ The use of circuit simulators for analysis and design of analogue and digital electronic circuits.
Intellectual skills	⇒ Understand the operation of standard analogue electronic components; bipolar transistors, FETs, and operational amplifiers, and the operation of standard digital electronic components; logic gates and flip flops. ⇒ The design of analogue electronic circuits using transistors and operational amplifiers to a given specification. ⇒ The design of digital circuits incorporating logic gates and flip flops to a given specification.
Practical skills	⇒ Perform calculations required in analogue and digital electronic circuit analysis and design. ⇒ Assemble simple circuits from circuit diagrams and to carry out basic laboratory tests on the circuits.

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IDECR001

CIRCUIT PRINCIPLES
MODULE OVERVIEW

INTERNATIONAL YEAR ONE ENGINEERING (IYOne Engineering)

SYLLABUS OVERVIEW

Module Code	IDECR001
Module Name	Circuit Principles
Programme Name	International Year One Engineering
Credits	20
Percentage Breakdown of Semester 1 Exam	20%
Percentage Breakdown of Coursework	20%
Percentage Breakdown of Exam/Test	60%
Delivery period	The syllabus will usually be delivered over two 15-week semesters.
Semester(s)	1 & 2
Recommended minimum teaching hours	3 hours 20 mins per week (over 30 weeks) 100 hours in total
Recommended minimum independent study hours	3 hours 20 mins per week (over 30 weeks) 100 hours in total

AIMS

The main aim of this module is to introduce students to the concept of simple circuit elements in electrical and electronic systems, with DC and transient (step) excitation. The module also seeks to provide students with a solid theoretical grounding in the mathematical analysis of circuits and offer illustrative practical applications of theoretical concepts.

TOPICS OF STUDY

- ⇒ Resistors, Resistance and Conductance
- ⇒ Circuit Theory
- ⇒ Energy Storage Elements
- ⇒ Transient Analysis
- ⇒ Constant Frequency RL, RC & RLC Circuits
- ⇒ Variable Frequency AC Circuits
- ⇒ Mutual Inductance

ASSESSMENT

Semester 1 Examination	**What is Assessed?**	Topics: A-D
	Duration/Word Count	1 hour 10 mins
	Total Marks	50
	Rubric	⇒ 40 questions comprising multiple choice questions (MCQ) and short answer questions (SAQ)
	Contribution to Overall Grade	20%

Coursework 1: Laboratory	**What is Assessed?**	Topics: E
	Duration/Word Count	Section A - 2 hours, Section B – 1,500 words
	Total Marks	80
	Rubric	A lab-based assessment consisting of two sections: ⇒ Section A: 7 experimental procedure tasks to be completed under exam conditions. 30 marks. ⇒ Section B: A word processed laboratory report based on the previously conducted experiment. 50 marks.
	Contribution to Overall Grade	20%

Final Examination	**What is Assessed?**	Topics A-G
	Duration/Word Count	2 hours 10 mins
	Total Marks	60
	Rubric	⇒ Students select and answer 3 questions (20 marks each) from a choice of 4.
	Contribution to Overall Grade	60%

GENERAL LEARNING OUTCOMES

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

Knowledge and understanding	⇒ Describe, explain and interpret the concepts and parameters relating to circuit analysis of both direct current (DC) and alternating current (AC) circuits, using correct English language and technical terms, and using mathematics as/when appropriate.
Transferable skills	⇒ Analyse and design circuits, including the use of computer simulation of AC and DC circuits.
Intellectual skills	⇒ Use concepts and skills in ways which have not hitherto been encountered, including the solution of problems.
Practical skills	⇒ Perform calculations to analyse and design both AC and DC circuits.

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IDEEE003

ELECTRONIC ENGINEERING MATERIALS

MODULE OVERVIEW

INTERNATIONAL YEAR ONE ENGINEERING (IYOne Engineering)

SYLLABUS OVERVIEW

Module Code	IDEEE003
Module Name	Electronic Engineering Materials
Programme Name	International Year One Engineering
Credits	10
Percentage breakdown of Coursework	30%
Percentage breakdown of Exam/Test	70%
Delivery period	The syllabus will usually be delivered over a single 15-week semester
Semester(s)	1
Recommended minimum teaching hours	3 hours 20 mins per week (over 15 weeks) 50 hours in total
Recommended minimum independent study hours	3 hours 20 mins per week (over 15 weeks) 50 hours in total

AIMS

The module aims to enable students to:

- ⇒ Understand the Band Structure concept within electronic conduction in materials.
- ⇒ Understand the properties of semiconductor materials and how these properties can be adjusted to form p-type and n-type materials.
- ⇒ Explain the structure and operation of semiconductor diodes and transistors.
- ⇒ Describe the structure and properties of dielectric materials.
- ⇒ Understand and analyse the performance of magnetic materials.
- ⇒ Explain the structure and operation of semiconductor LEDs, Lasers and optical fibres.
- ⇒ Apply and practice ICT skills in the context of the study of electronic engineering materials.

TOPICS OF STUDY

- ⇒ Material Structures
- ⇒ Semiconductors
- ⇒ Dielectric Materials
- ⇒ Magnetic Materials
- ⇒ Optical Materials

ASSESSMENT

Coursework: Lab-based assessment	**What is Assessed?**	Topics A & B
	Duration/Word Count	1250–1500-word report
	Total Marks	100
	Rubric	A lab-based assessment consisting of two sections: ⇒ Section A: 7 experimental procedure tasks to be completed under assessment conditions. (50 marks.) ⇒ Section B: A word processed laboratory report based on the previously conducted experiment. (50 marks.)
	Contribution to Overall Grade	30%

Final Examination	**What is Assessed?**	Topics A-E
	Duration/Word Count	2 hours 10 mins
	Total Marks	60
	Rubric	⇒ Students answer 3 multi-part questions from a choice of 4 (20 marks each)
	Contribution to Overall Grade	70%

GENERAL LEARNING OUTCOMES

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

Knowledge and understanding	⇒ Understand the concept of Band Structures in materials and their application in conduction. ⇒ Understand the principles of operation of semiconductor diodes and transistors. ⇒ Understand the principles of operation of semiconductor LEDs and Lasers. ⇒ Select appropriate magnetic materials for use in real-world applications.
Transferable skills	⇒ Communicate effectively using engineering terminologies. ⇒ Work effectively as a member of a small team.
Intellectual skills	⇒ Classify materials as Conductors, Semiconductors or Dielectrics based upon their electronic Band Structure. ⇒ Determine the performance of simple BJT transistor amplifiers. ⇒ Determine the characteristics of Magnetic circuits. ⇒ Determine the performance of simple optical systems.
Practical skills	⇒ Use laboratory equipment to construct simple electronic circuits, perform measurements and record results. ⇒ Assemble simple circuits and carry out basic laboratory tests on circuits.

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IDEEP001

ELECTRONICS DESIGN PROJECT

MODULE OVERVIEW

INTERNATIONAL YEAR ONE ENGINEERING (IYOne Engineering)

SYLLABUS OVERVIEW

Module Code	IDEED001
Module Name	Electronics Design Project
Programme Name	International Year One Engineering
Credits	20
Percentage breakdown of Coursework	100%
Percentage breakdown of Exam/Test	0%
Delivery period	The syllabus will usually be delivered over two 15-week semesters.
Semester(s)	1 & 2
Recommended minimum teaching hours	3 hours 20 mins per week (over 30 weeks) 100 hours in total
Recommended minimum independent study hours	3 hours 20 mins per week (over 30 weeks) 100 hours in total

AIMS

This module aims to give students and understanding of the processes involved in the design, implementation, production and commercial development of electronic products or systems and to emphasise the need to develop such products or systems in a sustainable manner. Students will gain an understanding of the basic principles underpinning modern electronic systems as well as an appreciation of the ways in which electronic systems form an essential role in modern life. Students will develop a range of practical skills which enable them to construct basic circuits, carry out experimental testing, record results and report their findings via presentations and high-quality technical reports. The module also seeks to give students initial exposure to a number of higher level management techniques (Level 6).

TOPICS OF STUDY

- ⇒ Project Management
- ⇒ The Engineer in Society
- ⇒ Technical Design
- ⇒ IT Skills
- ⇒ Lab Skills and Techniques

ASSESSMENT

Coursework 1: Group Presentation & Individual Report	**What is Assessed?**	Topics A-D
	Duration/Word Count	10-minute group presentation, 1250–1500-word report
	Total Marks	100
	Rubric	⇒ Students undertake a critical review of a selected electronic product or system and produce: ○ A group presentation worth 40 marks. ○ An individually written report worth 60 marks.
	Contribution to Overall Grade	30%

Coursework 2: Lab-based Assessment	**What is Assessed?**	Topics C-E
	Duration/Word Count	1250–1500-word report
	Total Marks	100
	Rubric	A lab-based assessment consisting of two sections: ⇒ Section A: 7 experimental procedure tasks to be completed under assessment conditions. 50 marks. ○ Section B: A word processed laboratory report based on the previously conducted experiment. 50 marks.
	Contribution to Overall Grade	35%

Coursework 3: Lab-based Assessment	**What is Assessed?**	Topics C-E
	Duration/Word Count	1250–1500-word report
	Total Marks	100
	Rubric	A lab-based assessment consisting of two sections: ⇒ Section A: 7 experimental procedure tasks to be completed under assessment conditions. 50 marks. ⇒ Section B: A word processed laboratory report based on the previously conducted experiment. 50 marks.
	Contribution to Overall Grade	35%

GENERAL LEARNING OUTCOMES

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

Knowledge and understanding	⇒ Understand the basic principles of project management. ⇒ Describe the technical and management processes involved in designing electronic products and systems. ⇒ Understand the basics of project costing, budgeting and scheduling. ⇒ Understand the wider aspects of electronic product design including sustainability and the responsibility of the engineer in the total life cycle of a product. ⇒ Selectively use research material from a variety of sources. ⇒ Produce a basic project plan which includes a risk assessment.
Transferable skills	⇒ Use the appropriate software for technical information retrieval, data collection, presentation and word processing. ⇒ Work effectively as a member of a small team.
Intellectual skills	⇒ Understand the principles of testing and development in relation to electronic circuits. ⇒ Compare test results with predicted values. ⇒ Interpret circuit diagrams. ⇒ Apply the basic principles of project management.
Practical skills	⇒ Use laboratory equipment to construct and test circuits and record results. ⇒ Construct simple electronic circuits from circuit diagrams. ⇒ Develop simple test schedules.

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IDEET004

ENERGY TRANSPORT & CONVERSION

MODULE OVERVIEW

INTERNATIONAL YEAR ONE ENGINEERING (IYOne Engineering)

SYLLABUS OVERVIEW

Module Code	IDEET004
Module Name	Energy Transport & Conversion
Programme Name	International Year One Engineering
Credits	10
Percentage breakdown of Coursework	20%
Percentage breakdown of Exam/Test	80%
Delivery period	The syllabus will usually be delivered over a single 15-week semester.
Semester(s)	2
Recommended minimum teaching hours	3 hours 20 mins per week (over 15 weeks) 50 hours in total
Recommended minimum independent study hours	3 hours 20 mins per week (over 15 weeks) 50 hours in total

AIMS

The Energy Transport and Conversion Module aims to introduce key concepts relating to energy conversion, energy transport systems and their applications. It provides the students with an introduction to the mechanisms used in electrical engineering to transform mechanical energy into electrical energy and vice versa.

The module aims to give students an overall view of the transmission of produced electrical energy over a power system to the point of utilisation together with distribution network and demand-side management in a simple treatment.

TOPICS OF STUDY

- ⇒ Mechanics
- ⇒ Electro-Mechanical Conversion
- ⇒ Electrical Power Generation & Demand
- ⇒ Electrical Power Transport

ASSESSMENT

Coursework: Lab-based Assessment	**What is Assessed?**	Topics A-C
	Duration/Word Count	2 hours 10 mins / 1200 word report
	Total Marks	100
	Rubric	⇒ An assessed piece of laboratory practical work followed by a report.
	Contribution to Overall Grade	20%

Final Examination	**What is Assessed?**	Topics A-D
	Duration/Word Count	2 hours 10 mins
	Total Marks	60
	Rubric	⇒ Students select and answer 3 questions from a choice of 4 (20 marks each)
	Contribution to Overall Grade	80%

GENERAL LEARNING OUTCOMES

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

Knowledge and understanding	⇒ Demonstrate a firm understanding of the concept of energy and power. ⇒ Describe the methods by which mechanical energy is converted to electrical energy and vice versa.
Transferable skills	⇒ Describe, in simple terms, the underlying principles which govern the operation of the major renewable and non-renewable energy systems.
Intellectual skills	⇒ Solve simple problems and perform basic analytical tasks which relate to electrical power generation, power systems and devices.
Practical skills	⇒ Carry out practical tasks in the laboratory comprising measurement related to electrical engineering, and reporting on the outcome.

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IDEEM001

ENGINEERING MATHEMATICS

MODULE OVERVIEW

INTERNATIONAL YEAR ONE ENGINEERING (IYOne Engineering)

SYLLABUS OVERVIEW

Module Code	IDEEM001
Module Name	Engineering Mathematics
Programme Name	International Year One Engineering
Credits	20
Percentage breakdown of Coursework	0%
Percentage breakdown of Exam/Test	50% for Semester 1 examination, 50% for Final examination
Delivery period	The syllabus will usually be delivered over two 15-week semesters
Semester(s)	1 & 2
Recommended minimum teaching hours	3 hours 20 mins per week (over 30 weeks) 100 hours in total
Recommended minimum independent study hours	3 hours 20 mins per week (over 30 weeks) 100 hours in total

AIMS

The module aims to introduce the students to key mathematical principles and equip them with the skills to excel in an engineering degree. This module builds on students' previous mathematical knowledge and covers more advanced mathematical theories and techniques.

The module aims to:

- ⇒ Affirm the students' knowledge of fundamental topics (pre-calculus).
- ⇒ Establish the need for differential and integral calculus and show how both can be used to solve engineering problems.
- ⇒ Provide students with knowledge of the application of calculus using numerical methods for solving engineering problems.
- ⇒ Provide students with a foundation in matrix algebra to include the description of complex engineering systems using sets of equations to find their solutions.
- ⇒ Introduce the principle of complex numbers and understand how they can be used in the analysis of physical systems.
- ⇒ Demonstrate the principle, and use of the Laplace transforms.
- ⇒ Equip students with mathematical abilities to solve first and second-order differential equations and understand the use of these in engineering applications.
- ⇒ Extend and improve the students' knowledge and use of the correct mathematical vocabulary and syntax to communicate effectively with other engineers, scientists and mathematicians.

TOPICS OF STUDY

- ⇒ Fundamental Concepts of Calculus
- ⇒ Derivatives of Common Functions
- ⇒ The Derivative for Various Applications
- ⇒ Integrals of Common Functions
- ⇒ Integrals for Various Applications
- ⇒ Numerical Integration Algorithms
- ⇒ Basic Concepts in Matrix Theory
- ⇒ Simultaneous Equations
- ⇒ Basic Concepts of Complex Number Theory
- ⇒ Differential Equations
- ⇒ The Laplace Transform of a Given Function
- ⇒ Solving Engineering Problems

ASSESSMENT

Semester 1 Examination	**What is Assessed?**	Topics A-F
	Duration/Word Count	1 hours 30 mins
	Total Marks	100
	Rubric	⇒ Four compulsory questions broken down into a number of sections.
	Contribution to Overall Grade	50%

Final Examination	**What is Assessed?**	Topics A-L
	Duration/Word Count	2 hours 10 mins
	Total Marks	100
	Rubric	⇒ Four compulsory multi-part questions. ⇒ Students must show their working to illustrate how they arrive at the solutions
	Contribution to Overall Grade	50%

GENERAL LEARNING OUTCOMES

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

Knowledge and understanding	⇒ Use a range of advanced mathematical techniques when solving engineering problems. ⇒ Present the analysis and its results using the correct mathematical notation.
Transferable skills	⇒ Describe and formulate a problem in mathematical terms, particularly complex and dynamic systems. ⇒ Analyse and interpret available data and adjust the approach taken, where required.
Intellectual skills	⇒ Demonstrate an understanding of mathematics and to be able to use for qualitative and quantitative analysis.
Practical skills	⇒ Approach complex problems to establish a solution using advanced mathematical techniques.

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