Module Code	EEU11E06
Module Name	Electrical Engineering
ECTS Weighting[1]	5 ECTS
Semester taught	Semester 2
Module Coordinator/s	Dr Jin Zhao
Module Learning Outcomes with reference to the Graduate Attributes and how they are developed in discipline	On successful completion of this module, students should be able to: 1. Explain the fundamental concepts of electricity and magnetism and their importance. 2. Apply fundamental circuit theory and laws to DC resistive circuits. 3. Analyse the operation of basic non-linear circuits and diodes. 4. The concept of electromagnetic and the foundation of DC machines. 5. Convert between binary and decimal representations and carry out binary addition, subtraction, and multiplication. 6. Manipulate Boolean expressions so as to minimise the number of literals using algebra or Karnaugh maps. 7. Design standard and iterative combinational logic circuits. 8. Evaluate the complexity and speed of combinational designs. 9. Report experimental findings from a laboratory in a clear, concise, and communicative manner, interpreting the findings. Students are expected to be self-motivated and take joint responsibility for their learning and demonstrate this through reading and engaging with the additional course material referenced throughout the course. The course covers foundational material essential to all branches of engineering. **Graduate Attributes: levels of attainment** To act responsibly - Attained To think independently - Attained To develop continuously - Introduced To communicate effectively - Enhanced

[1] TEP Glossary

Module Content

Simple DC circuits

- DC resistive circuits. Resistors in series and parallel; Kirchhoff's voltage and current laws; power dissipation; the ideal voltage source and current source.
- DC circuits analysis. Nodal-voltage analysis; Mesh analysis; Thevenin/Norton theorem; superposition; power dissipation
- Non-linear circuit analysis and capacitors. Non-linear devices and diodes; capacitance and capacitors.

Electromagnetism

- Electromagnetic induction, Fundamental relations, Faraday's law, Lenz's Law, simple applications: solenoids and relays
- Ampère's force law and DC machines

Digital Systems and Binary Numbers

- Digital signals and systems
- Number systems
- Positive/negative representation
- Binary arithmetic

Boolean Algebra

- Definitions and basic theorems
- Algebraic simplification
- Sum of products and product of sums formulations
- Gate primitives
- Karnaugh maps

Combinational Logic

- Combinational design
- Assessment of complexity and speed
- Code converters, multiplexors, decoders
- Addition circuits, priority encoder

Teaching and Learning Methods	The module is taught using a combination of lectures, tutorials and one supporting laboratories. The tutorials will develop students problem-solving skills by tackling problems based on the lecture material. Students are expected to attempt tutorial questions in advance of attending tutorial sessions. Students should use the course texts to supplement their problem solving practice.

Assessment Details[2]

Please include the following:

- **Assessment Component**
- **Assessment description**
- **Learning Outcome(s) addressed**
- **% of total**
- **Assessment due date**

Assessment Component	Assessment Description	LO Addressed	% of total	Week due
Lab	DC Circuits Laboratory	1,2,8	7.5	2 weeks after taken
Mastering	MCQ Tests	1-7	5	Week 6, Week 12
Assignment	Digital Assignment	5,6	2.5	Week 12
Exam	End of Year Exam	All	85	As per timetable

Reassessment Requirements	100% Exam based

Contact Hours and Indicative Student Workload[2]

Contact hours: 45 (33hr Lecture, 10hr Tutorial, 2hr Lab)
Independent Study (preparation for course and review of materials): 2hr Lab prep, 2 hour lab write-up [4] 3 hrs/week to review lectures and attempt tutorials in advance [33]
Independent Study (preparation for assessment, incl. completion of assessment): 4 hr additional study in advance of class tests [8] Exam Preparation 10-25 hours

Recommended Reading List	Electrical and Electronic Technology, Hughes, 9th edition, Pearson, Prentice-Hall, 2005. Electrical Engineering: Principles & Applications, seventh edition, Allan R. Hambley, 2019. Foundations of Analog and Digital Electronic Circuits, Anant Agarwal and Jeffrey H. Lang, 2005. Digital Design, 5th edition, MM Mano and MD Ciletti, Pearson, Prentice Hall, 2013.

[2] TEP Guidelines on Workload and Assessment

	Videos and links as given in lectures.
Module Pre-requisite	Leaving Cert Honours Mathematics (or equivalent)
Module Co-requisite	
Module Website	On Blackboard
Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.	No
Module Approval Date	
Approved by	Prof. Naomi Harte
Academic Start Year	September 2025
Academic Year of Date	2025/2026