Module Definition Form (MDF)

Module code: MOD007946	**Version:** 3 **Date Amended:** 13/Jun/2024

1. Module Title
Analogue and Digital Electronics

2a. Module Leader
Alireza Sanaei

2b. School
School of Engineering and the Built Environment

2c. Faculty
Faculty of Science and Engineering

3a. Level
4

3b. Module Type
Standard (fine graded)

4a. Credits
15

4b. Study Hours
150

5. Restrictions

Type	Module Code	Module Name	Condition
Pre-requisites:	None		
Co-requisites:	None		
Exclusions:	None		
Courses to which this module is restricted:	None		

LEARNING, TEACHING AND ASSESSMENT INFORMATION

6a. Module Description

This module introduces you to the fundamental principles of both analogue and digital electronic circuits and provides the foundation of all analysis and design in industry.

The first half of the module reviews the fundamentals of analogue components including resistors, capacitors and inductors, and shows how simple circuits are designed using these components. It introduces various forms of diodes, transistors and operational amplifiers and explains their equivalent circuit models. It also introduces the measurement and analysis tools used in the electronics industry. The operating principles of all circuit elements are covered by lectures and tutorials, supplemented by practical experiments using both hardware and circuit simulation software. This enables you to compare actual measured results with theory as well as illustrating the effects of component tolerances. The practical work will also give you the experience of the presentation and interpretation of manufacturers' data for real components helping you to explore the limitations of laboratory techniques and instruments.

During the second half of the module, digital devices and the fundamentals of Boolean logic are examined. The different logic gates are explained, techniques are introduced for generating and simplifying logical expressions using Boolean algebra and Karnaugh maps. Practical applications are examined, including the design of fundamental circuits such as decoders, encoders and arithmetic circuits. This is followed by examining how sequential logic techniques allow us to design circuits with memory. Different types of memory are explained, along with their applications.

6b. Outline Content

- Introduction to laboratory instruments
- Review of DC circuit theory
- Reactance
- Resonance
- Filters
- Diodes (physics, types and applications)
- Operational amplifiers
- Bipolar transistors (physics and analysis)
- Introduction to other commonly used components
- Introduction to analogue transducers
- Boolean algebra (truth tables, gates, axioms, De Morgan's theorem).
- Logic families (TTL, CMOS, ECL).
- Combinational logic (SOP's, POS's, Karnaugh maps).
- Number systems (binary, octal, denary, hexadecimal), representations of negative numbers.
- Arithmetic circuits (adders, subtractors, overflow).
- Decoders and encoders.
- Sequential logic (SR, D, JK memory elements), counters.
- Instrument specification, errors.
- Circuit simulation software

6c. Key Texts/Literature

The reading list to support this module is available at: https://readinglists.aru.ac.uk/

6d. Specialist Learning Resources
Electronics laboratory with components and test equipment. PC laboratory with circuit simulation software.

7. Learning Outcomes (threshold standards)		
No.	**Type**	**On successful completion of this module the student will be expected to be able to:**
1	Knowledge and Understanding	Understand the fundamentals of analogue & digital electronic building blocks, circuit theory, and wider applications and trends in the topic.
2	Knowledge and Understanding	Use the theory to analyse and design analogue and digital electronic circuits; Appreciate the tolerance of practical component values.
3	Intellectual, practical, affective and transferrable skills	Apply knowledge of mathematics and natural sciences to solve complex problems in analogue and digital systems.
4	Intellectual, practical, affective and transferrable skills	Conduct practical experiments to investigate and analyse complex problems in analogue and digital systems.

8a. Module Occurrence to which this MDF Refers				
Year	**Occurrence**	**Period**	**Location**	**Mode of Delivery**
2025/6	ZZF	Template For Face To Face Learning Delivery		Face to Face

8b. Learning Activities for the above Module Occurrence			
Learning Activities	**Hours**	**Learning Outcomes**	**Details of Duration, frequency and other comments**
Lectures	12	1, 3	1 hours lecture x 12 weeks
Other teacher managed learning	24	2, 4	2 hours lab x 12 weeks
Student managed learning	114	1-4	Self-Study
TOTAL:	150		

9. Assessment for the above Module Occurrence					
Assessment No.	**Assessment Method**	**Learning Outcomes**	**Weighting (%)**	**Fine Grade or Pass/Fail**	**Qualifying Mark (%)**
010	Examination Chelmsford	1, 3	50 (%)	Fine Grade	30 (%)
One hour and 30 minutes Examination, the equivalent of 1500words, maps to Engineering Council Learning Outcome C1					
Assessment No.	**Assessment Method**	**Learning Outcomes**	**Weighting (%)**	**Fine Grade or Pass/Fail**	**Qualifying Mark (%)**
011	Coursework	1-4	50 (%)	Fine Grade	30 (%)
Coursework, total of 1500 words, maps to Engineering Council Learning Outcome C1, C12					

In order to pass this module, students are required to achieve an overall mark of 40% (for modules at levels 3, 4, 5 and 6) or 50% (for modules at level 7*).

In addition, students are required to:
(a) achieve the qualifying mark for each element of fine graded assessment as specified above
(b) pass any pass/fail elements

[* the pass mark of 50% applies for all module occurrences from the academic year 2024/25 – see Section 3a of this MDF to check the level of the module and Section 8a of this MDF to check the academic year]