

Digital and Analogue Electronics

Module Code:	ELE4011-B
Academic Year:	2018-19
Credit Rating:	20
School:	Department of Biomedical and Electronics Engineering
Subject Area:	Electrical Engineering
FHEQ Level:	FHEQ Level 4
Module Leader:	Dr James Noras

Additional Tutors:

Pre-requisites:

Co-requisites:

Contact Hours

Type	Hours
Lectures	24
Tutorials	24
Laboratory	24
Directed Study	126
Examinations DO NOT USE	2

Availability Periods

Occurrence	Location/Period
NLA	Namal College / Academic Year (Sept - May)
BDA	University of Bradford / Academic Year (Sept - May)

Module Aims

To introduce analogue electronic devices and circuits, the principles of digital logic, and digital system design.

Outline Syllabus

Introduction to the electronic age, communications, technology, manufacturing, semiconductor industry, basic structures of semiconductors and devices, fabrication, FPGAs, Moore's law. Analogue and digital signals, analogue and digital circuits and devices. Quantization and number systems, fixed point, floating point, binary for positive numbers. Logic gates and truth tables, Boolean algebra, de Morgan, minimisation for speed and size, Karnaugh maps, hardware description language VHDL for combinational circuits. Digital design of computer elements, multiplexers and decoders for the control path. Binary addition and circuits for addition, negative numbers, two's complement and subtraction. The design process: an adder/subtractor. Synchronous circuits, data storage, state tables, flip-flops, buffers, registers, counters, VHDL for combinational circuits. Technologies: CMOS, rise, fall, set-up, hold, clock speeds, power. TTL and interfacing, comparisons, noise margin. Electrical basics of semiconductors, electrons and holes, pn junctions, ideal diode. Diode circuits: ideal diode, circuit characteristics, actual diode. Diode Applications: regulators, rectifiers, limiting and clamping circuits. Bipolar transistors: operation of bipolar transistors, large and small signal models. Bipolar amplifiers: input and output impedances, biasing, DC analysis, small signal analysis, operating point analysis. Amplifier technologies: Common-Emitter stage, Common-Base stage and Emitter-Follower. MOS amplifiers: general concepts, realisation of current sources.

Module Learning Outcomes

On successful completion of this module, students will be able to...

- 1 Identify, describe and explain the behaviour of a range of analogue and digital devices and their use in the construction of a number of standard circuit configurations
- 2 Analyse and model the behaviour of a range of analogue and digital circuits. Design, simulate, prototype and test straightforward analogue and digital circuits to perform to given specifications. Use data sheets to understand the behaviour of electronic devices.
- 3 Analyse problems logically.
- 4 Review basic design specifications and apply top-down and bottom-up solutions as appropriate.

Learning, Teaching and Assessment Strategy

LO1 will be addressed largely through lectures and seminars, but also using laboratory exercises and computer simulations to allow students to become familiar with the uses and attributes of a range of devices and design techniques.

LO2 will have theoretical aspects covered in lectures and seminars, but will be mainly developed by practical experience of laboratory exercises, and computer-based design, simulation and analysis sessions. The creative analysis and design aspects (LO3 and LO4) represent the more advanced objectives, and will be covered by stretching and developmental components of lectures, computer exercises and lab-work. The examination will mainly assess LO1 and LO3, with others assessed mainly in practical work.

Supplementary assessment: repair deficiency in original assessment.

Mode of Assessment

Type	Method	Description	Length	Weighting	Final Assess'
Summative	Examination - closed book	Examination - closed book 2 hours	2 hours	50%	Yes
Summative	Coursework	Portfolio of coursework	0 hours	50%	No

Legacy Code (if applicable)

CM-0133L

Reading List

To view Reading List, please go to [rebus:list](#).