FACULTY OF ENGINEERING

MODULE DESCRIPTION FORM

EE107 - Electronic & Electrical Principles 1

Module Code: EE107	Module Title: Electronic & Electrical Principles 1	
Module Registrar:		
Other Staff Involved:	Credit Weighting: 20	Semester: 1/2
Compulsory/optional/elective class: NE	Academic Level: 1	
Pre-requisites:		
Required For:		

Module Format and Delivery (hours):

Lectures	Tutorial	Assignments	Laboratories	Private Study	Total
66	50	0	0	84	200

Educational Aim

This Module aims to:

Develop a firm grounding in the understanding, analysis and design of analogue and digital circuits.

Learning Outcomes

On Completion of the module, the student is expected to be able to:

LO 1: Demonstrate the ability to apply fundamental circuit analysis techniques to DC and AC circuits. LO 2: Understand the fundamentals of amplifiers and feedback, and the basic principles and design of operational amplifier circuits. LO 3: Demonstrate an understanding of combinational logic circuit design, analysis and synthesis. LO 4: Understand the behaviour, design and application of specific combinational and sequential logic circuits.

(UK SPEC suggests no more than 4 learning outcomes per module. Statements must be broad and be syllabus free and link in with the intended learning outcomes on the programme specifications.)

Syllabus

The module will teach the following:

Fundamentals:- Units of measurement, SI units, symbols and notations; charge flow and current; voltage drop; resistivity, resistance and Ohm's law, I-V characteristics of resistors; I-V characteristics of non-linear devices; open and short circuits; power and energy. DC Circuits:- Kirchhoff's laws; the application of Ohm's and Kirchhoff's laws to DC circuit analysis, series, parallel and series-parallel resistive circuits; voltage division and current division; Thévenin's Theorem, Norton's Theorem and source conversion; maximum power transfer theorem; circuit analysis using superposition; mesh analysis of circuits. AC Circuits:- Phasors and complex algebra; properties of capacitors and inductors; reactance of capacitors and inductors; impedance and admittance; phasor diagrams; extension of DC circuit analysis techniques to AC circuits; RMS values, power and energy, power factor. Passive Circuits:- Input impedance; output impedance; insertion losses; voltage transfer function, frequency response of magnitude and phase. Amplifier Fundamentals:- Gain, input and output impedance; amplifier modelling; amplifiers in cascade; frequency response. Feedback:- Introduction to negative feedback, multiple feedback configurations. Operational Amplifiers:- Introduction to the operational amplifier, the differential stage, inverting and non-inverting

configurations, common amplifier circuits. Introduction to Digital Systems:- Binary, decimal and hexadecimal numbering systems; arithmetical operations and negative numbers in binary; comparisons and relationships between analogue and digital systems. Digital Analysis:- Boolean algebra, Karnaugh and inverse maps; minimisation of Boolean expressions, basic logic gates, analysis of circuits containing logic gates; timing diagrams and propagation delay. Design:- Design procedures; design of combinational logic circuits; use of “don’t care” terms; Binary Coded Decimal (BCD); minterms and maxterms; design of circuits containing only NAND or only NOR gates; design of basic digital systems. MSI Devices and Sequential Logic:- Introduction to the adder, comparator, multiplexer and decoder devices; active-low and active-high inputs and outputs; introduction to sequential circuits, S-R latches and flip-flops, D latches and flip-flops, J-K flip-flops and counters.

Assessment of Learning Outcomes - Criteria

LO1 C 1: Describe and employ circuit analysis tools such as voltage and current division, Kirchhoff's laws. C 2: Demonstrate ability to use simplification techniques such as source conversion and reduction. C 3: Apply mesh analysis, superposition, Thevenin's and Norton's theorems to solve circuits. C 4: Manipulate complex numbers in the solution of AC problems using phasors. LO2 C 1: Understand the fundamentals of amplifiers and feedback. C 2: Understand and apply top-down design to amplifier circuits. C 3: Demonstate the ability to design operational amplifier circuits. C 4: Analyse the behaviour of circuits by way of finding their transfer function in standard form. LO3 C 1: Understand and apply the laws of Boolean algebra to simplify expressions. C 2: Employ truth tables, Karnaugh and inverse maps to the solution of combinational logic problems. C 3: Analyse combinational logic circuits and build Boolean expressions and truth tables describing the overall behaviour. C 4: Apply design procedures to synthesise digital circuits, including: minterms; maxterms; don’t care terms; implementation using universal NAND and NOR gates.
LO4 C 1: Show an understanding of various MSI circuits, including adders, comparators, multiplexers, decoders. C 2: Employ MSI circuits appropriately in the design of digital circuits and solution of basic digital problems. C 3: Show an understanding of sequential logic circuits including S-R Latches, J-K flip-flops, counters. C 4: Employ sequential logic circuits in the design of digital circuits and solution of basic digital problems.

The standards set for each criterion per Module Learning Outcome to achieve a pass grade are indicated on the assessment sheet for all assessment.

Principles of Assessment Feedback

Students sit a formative class test (multiple-choice quiz), via myplace in week 7 of semester 1, with feedback provided by worked solutions made available on myplace. Formal feedback on the summative class tests is provided in lectures or tutorials. In all cases, students then have the opportunity to discuss the solutions with teaching staff in tutorials, completing the feedback loop.

Assessment Method(s) Including Percentage Breakdown and Duration of Exams

To Pass the module, students need to gain a summative mark of:					40%
Examination	Duration	2.0	Weighting 70.00%	Semester 2	Exam Period
Coursework	Number	1	Weighting 15.00%	Semester 1	Exam Period
Coursework	Number	2	Weighting 15.00%	Semester 2	Week 6

Additional Information

The coursework consists of two summative class tests - in the exam period at the end of semester 1, and in week 6 of semester 2 - each worth 15% of the final mark. Class tests are used to assess interim progress.

Recommended Reading

Robert L Boylestad, “Introductory Circuit Analysis”, Latest Edition, Pearson Education ISBN-13 978-1292098951
Thomas L Floyd, "Digital Fundamentals", Latest Edition, Pearson Education ISBN-13 978-1292075983