Wrexham glyndŵr UNIVERSITY

MODULE SPECIFICATION

Module Title:	**Analogue and Digital Electronics**	**Level**:	4	**Credit Value**:	20

Module code:	ENG467	**Is this a new module?** No	**Code of module being replaced**:	

Cost Centre:	GAEE	**JACS3 code**:	

Trimester(s) in which to be offered:	1 & 2	**With effect from:**	September 17

School:	Applied Science, Computing & Engineering	**Module Leader:**	Andrew Sharp

Scheduled learning and teaching hours	60 hrs
Guided independent study	140 hrs
Placement	0 hrs
Module duration (total hours)	200 hrs

Programme(s) in which to be offered	Core	Option
BEng (Hons) Electrical & Electronic Engineering	✓	☐
BEng (Hons) Optoelectronics & Holography	✓	☐

Pre-requisites
None

Office use only
Initial approval February 17
APSC approval of modification Version 1
Have any derogations received Academic Board approval? Yes ✓ No ☐

Module Aims
1. Develop designs and apply basic knowledge of analogue electronic circuits and design and evaluate a range of analogue systems both practically by construction and by computer simulation. 2. Develop designs and apply basic knowledge of digital electronic circuits and design and evaluate a range of digital systems both practically by construction and by computer simulation.

Intended Learning Outcomes

Key skills for employability

KS1	Written, oral and media communication skills
KS2	Leadership, team working and networking skills
KS3	Opportunity, creativity and problem solving skills
KS4	Information technology skills and digital literacy
KS5	Information management skills
KS6	Research skills
KS7	Intercultural and sustainability skills
KS8	Career management skills
KS9	Learning to learn (managing personal and professional development, self-management)
KS10	Numeracy

At the end of this module, students will be able to		Key Skills	
1	Analyse and compare the performance of fundamental components and circuits for both digital and analogue electronics.	KS5	
2	Produce designs for simple analogue and combinational and sequential digital circuits.	KS3	
3	Use computer modelling techniques and practical experiments to verify and assess theoretical predictions.	KS4	

Transferable/key skills and other attributes
1. Solving engineering problems 2. Practical application of theory to design

Derogations

A derogation from regulations has been approved for this programme which means that whilst the pass mark is 40% overall, each element of assessment (where there is more than one assessment) requires a minimum mark of 30%.

Assessment:

Portfolio of Analogue and Digital practical work each with a brief report of findings. Examples of assessment evidence are: determination of operational amplifier performance, BJT amplifier biasing, designing and simulating a 7- segment display decoder and a 4-bit counter. The portfolio should also include the opportunity for the student to demonstrate an underpinning knowledge of analogue and digital electronics for instance by answering knowledge based quiz questions.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)	Duration (if exam)	Word count (or equivalent if appropriate)
1	1,2,3	Portfolio	100		3000

Learning and Teaching Strategies:

This module will be presented to the students through a series of lectures, tutorials, practical lab work and ECAD investigations.

Learning materials will include in-class and on-line lecture notes, exercises and tutorials.

Access to practical Laboratory facilities and ECAD will be available to students. It is preferred that students study both the analogue and digital elements in parallel, throughout the year, so that students are exposed to the differences and similarities in both fields and are able to better reflect on their experiences.

Extensive use will be made of VLE (Moodle) to supplement learning materials and provide on-line quizzes for formative assessment.

Syllabus outline:

Analogue Electronics

Properties of semiconductors: P-type and N-type material: P-N junction - doping levels, majority and minority carriers.
Diode characteristics: small signal, power, voltage reference diodes, circuit applications.
Operation of transistors: Bipolar and JFET transistors biasing configurations using load lines and dc models. Class A, B etc. Common emitter, common base and common collector circuits (e.g.: using h parameter models, software modelling packages, practical measurements) and JFET equivalents. Gain, bandwidth, impedances, input/output loading, and Miller feedback.
Operational amplifier: ideal, open loop, closed loop, inverting, non-inverting configurations. Gain, impedance and bandwidth. Positive and negative feedback.
Operational amplifiers applications: amplifiers, mixers, integrator, differentiator, comparator, low pass and high pass filters.

Digital Electronics

Digital representation: number systems and codes.
The transistor: as a switching element. Biasing, characteristics and properties.
Combinational logic: gates, Boolean algebra, truth tables, minimisation, Karnaugh maps, static and dynamic hazards, including propagation delay.
Sequential logic: synchronous/asynchronous, flip-flops, counters, shift registers. State diagrams and tables, timing diagrams. Monostables, multiplexers, memory elements, tri-state interfaces.
Circuit analysis and comparison of different families: TTL; CMOS; ECL, BiCmos and LV, etc. Power, speed, cost, fan-out, loading, interfacing.

Bibliography:

Essential reading

Agarwal, A. and Lang, J. (2005) *Foundations of Analog and Digital Electronic Circuits*, Morgan Kaufmann.

Other indicative reading

Fortney, L.R. (2005) *Principles of Electronics: Analog and Digital Electronics,* Oxford University Press.

Hughes, E. et al. (2008) *Electrical and Electronic Technology*, 10th Edn., Prentice Hall.

Tokheim, R.L. (2007) *Digital Electronics: Principles and Applications*, McGraw Hill.