Prifysgol Wrecsam
Wrexham University

Module specification

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Module Code	ENG4AK
Module Title	Electronics Technology
Level	4
Credit value	20
Faculty	FACE
HECoS Code	100165
Cost Code	GAME
Pre-requisite module	None

Programmes in which module to be offered

Programme title	Core/Optional/Standalone
BEng (Hons) Mechatronics Engineering	Core

Breakdown of module hours

Learning and teaching hours	60 hrs
Placement tutor support hours	0 hrs
Supervised learning hours e.g. practical classes, workshops	0 hrs
Project supervision hours	0 hrs
Active learning and teaching hours total	**0** hrs
Placement hours	0 hrs
Guided independent study hours	140 hrs
Module duration (Total hours)	200 hrs

Module aims

To enhance the knowledge of analogue and digital electronic elements and circuits in typical engineering applications, by evaluating the design and performance of a range of circuit functions analytically, by computer simulation, and by practical investigation.

Module Learning Outcomes

At the end of this module, students will be able to:

1	Analyse and compare the performance of typical Electronic circuit functions.
2	Produce designs and select appropriate components for analogue and digital functions.
3	Use computer modelling techniques and practical experiments to verify and assess theoretical predictions.

Assessment

Indicative Assessment Tasks:
This section outlines the type of assessment task the student will be expected to complete as part of the module. More details will be made available in the relevant academic year module handbook.

Assessment 1: A 2-hour examination covering outcomes 1 and 2. It is an unseen time-constrained.

Assessment 2: A portfolio including elements of design, simulation and practical construction, covering learning outcomes 3. This evidence should be gathered throughout the duration of the module. An example of such evidence to be included in the portfolio would be the design, modelling and building of analogue and/or a digital electronic system.

Assessment number	Learning Outcomes to be met	Type of assessment	Duration/Word Count	Weighting (%)	Alternative assessment, if applicable
1	1, 2	Examination	2 hrs	50%	
2	3	Portfolio	2000	50%	

Derogations

None

Learning and Teaching Strategies

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

Learning materials will include in-class and on-line lecture notes, exercises and tutorials, and The students will have access to practical Laboratory facilities and ECAD.

The assignment will provide an element of formative assessment, enabling students to improve their understanding of circuit design, whilst providing the student with the opportunity to demonstrate their skills of circuit design, computer modelling and testing.

Extensive use will be made of VLE to supplement learning materials.

Welsh Elements

Programme is delivered in English and Chinese, however students can submit assessments in Welsh.

Indicative 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.

Power Semiconductor Devices: Operation, characteristics, ratings, applications of diodes, thyristors, MOSFETs, IGBTs. Darlington-pair configuration, transistor as a switch.

Indicative Bibliography

Please note the essential reads and other indicative reading are subject to annual review and update.

Essential Reads:

Bird, J. (2017) Electrical and Electronic Principles and Technology, 6th Edn., Routledge.

Other indicative reading:

Hughes, E. et al. (2012) Electrical and Electronic Technology, 11th Edn., Pearson.

Key Website References: Khan Academy: http://www.khanacademy.org/

Administrative Information

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With effect from date	24/09/2020
Date and details of revision	22/07/2025 revalidated, updated template, removed derogation
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