Wrexham glyndŵr UNIVERSITY

MODULE SPECIFICATION

Module Title:	**Electrical Science**	**Level**:	4	**Credit Value**:	20

Module code:	ENG459	**Is this a new module?** No	**Code of module being replaced**:	

Cost Centre:	GAAE	**JACS3 code**:	H600

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

School:	Applied Science, Computing & Engineering	**Module Leader:**	Reg Holme

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) Aeronautical & Mechanical Engineering	✓	☐
BEng (Hons) Mechanical Manufacturing	✓	☐
BEng (Hons) Applied Product Design	✓	☐
BEng (Hons) Automotive Engineering	✓	☐
BEng (Hons) Drone Technology & Operations	✓	☐
BEng (Hons) Renewable and Sustainable Engineering	✓	☐
BEng (Hons) Electrical & Electronic Engineering	✓	☐
BEng (Hons) Automation Engineering	✓	☐
BEng (Hons) Optoelectronics & Holography	✓	☐
BEng (Hons) Aerospace and Modern Optics	✓	☐

Pre-requisites
None

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

Wrexham glyndŵr UNIVERSITY

MODULE SPECIFICATION

Module Aims
1. To understand and predict electrical circuit variables, both ac and dc in standard circuit configurations (series/parallel circuits) and specify circuit components to satisfy electrical circuit design; 2. To develop theoretical and practical analysis techniques in order to predict behaviour of various configurations of electrical/electronic circuits (ac and dc) by means of calculation, laboratory 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	Define fundamental electrical variables in dc and ac circuits	KS10	
		KS3	
2	Select and use appropriate methods to analyse electrical circuit behaviour	KS10	
		KS9	
3	Apply the theoretical principles to practical circuit conditions	KS10	
4	Use appropriate software packages to simulate and predict circuit performance	KS10	KS5
		KS4	

Transferable/key skills and other attributes

1. Solving engineering problems;
2. Mathematical applications;
3. Application of experimental methods;
4. Application of software.

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:

Assessment One is by means of course work covering outcomes 3 and 4. Which will examine the level of knowledge and understanding the student has attained relating to the principles, theory and practical aspects of the module.

Assessment Two: is by means of an unseen time-constrained exam covering outcomes 1, and 2.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)	Duration (if exam)	Word count (or equivalent if appropriate)
1	3, 4	Coursework	50		2000
2	1, 2	Examination	50	2 hrs	

Learning and Teaching Strategies:

The module will be presented to students through lectures, tutorials and laboratory experiments. Learning materials including computer tools will be used together with demonstrations and directed learning opportunities.

Formative assessment takes place throughout the module during tutorials and feedback is given during these tutorials.

Syllabus outline:

Properties of resistive and reactive Components: Resistivity, Resistors, capacitors, inductors, batteries. Use of reference data (catalogues, CD-ROM, data sheets) for parameters.

DC Circuit Variables and Elements: Define variables: charge, current, resistance, pd and emf, power, energy, capacitance, inductance, Ideal voltage and current sources..

DC Circuit Analysis: Circuit configurations; Series, parallel and Series/parallel combinations; Circuit analysis using: Ohm's Law and Kirchhoff's Laws, voltage and current division, superposition, Thevenin and Norton's theorems.

AC Waveforms: AC waveforms and variables: sinusoidal, instantaneous value, maximum, mean, RMS, frequency. AC circuits: resistance, reactance, impedance, conductance, susceptance, admittance.

AC Circuits: Analysis of RL, RC and RLC Series circuits using phasor diagrams and mathematical analysis; phase angle, impedance, power, power factor.

AC Circuit Analysis: Series, parallel and series/parallel circuits; Circuit analysis using complex notation: power dissipation in circuits - real/apparent/reactive. Power factor correction methods.

Resonance: Series resonance, Quality factor. Phasor and mathematical analysis of parallel RL, RC, RLC circuits; parallel resonance, Q-factor, effective Q-factor, bandwidth; Imperfect capacitors - equivalent circuits, loss angle, power loss.

Polyphase Voltages: Generation of 3 phase voltages; balanced star and delta systems; Unbalanced star loads and neutral current; phasor diagrams; calculation of line and phase variables; use of complex numbers in the solution of problems.

Bibliography:

Essential reading

Bird, J. (2013) *Electrical Circuit Theory and Technology,* 5th Edn., Newnes.

Other indicative reading

Floyd, T. (2009) *Electric Circuit Fundamentals*, 8th Edn, Prentice Hall.
Hughes, E. (2012) *Electrical and Electronic Technology*, 11th Edn, Prentice Hall.

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