Wrexham glyndŵr UNIVERSITY

MODULE SPECIFICATION

Module Title:	**Electrical Power Engineering**	**Level**:	5	**Credit Value**:	20

Module code:	ENG565	**Is this a new module?**	No	**Code of module being replaced**:	

Cost Centre:	GAEE	**JACS3 code**:	H630

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

School:	Applied Science, Computing & Engineering	**Module Leader:**	Yuriy Vagapov

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 and Electronic Engineering	☐	✓
BEng (Hons) Renewables and Sustainable Engineering	✓	☐

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. Current provision in the generation, distribution, protection and utilisation of electrical energy and; 2. The customers' needs - and their effects - in terms of mains power distribution.

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 the supply needs of the modern industrial consumer	KS3	
		KS4	
2	Survey the strategies and techniques available for supplying these requirements	KS4	
3	Analyse the equipment and systems used in producing these supplies	KS3	
4	Use appropriate methods of calculation to install, maintain and provide these systems	KS3	
		KS4	

Transferable/key skills and other attributes

1. System analysis and design;
2. Apply design
3. Apply Technology

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 a portfolio of problem-solving activities and practical laboratory investigations exploring all topics of electrical power engineering. It covers outcomes 1 and 2.

Assessment Two: is by means of an examination covering outcomes 3 to 4. It is an unseen time-constrained examination with a fixed number of questions, typically five, where students are required to answer only three out of the five possible.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)	Duration (if exam)	Word count (or equivalent if appropriate)
1	1,2	Portfolio	40		2000
2	3,4	Examination	60	2 Hours	

Learning and Teaching Strategies:

The module will be delivered through lectures, tutorials and practical exercises. The module will be presented to students through a specific structure of lectures and interactive tutorials. Leaning will be reinforced and extended by directed self-study via a set of problem-solving activities and practical laboratory investigations.

Syllabus outline:

Networks - Two-port (four-terminal networks): "Four Terminal" parameters; T and Pi sections, ladder networks and attennuators; iterative impedance; image impedance; characteristic impedance; propagation coefficient; attenuation and phase change coefficients; the Neper; insertion loss. Symmetrical attenuators of T and Pi section; construction to particular specification; Passive symmetrical prototype filters: purely reactive elements, calculation of cut-off frequency, characteristic impedance and attenuation. Filter design. Transmission Line equivalent circuits.

Three Phase Systems and Power Factor: Generation of three-phase e.m.fs, Star and delta connected loads, Balanced and unbalanced three phase systems, Three phase transformers, Star and delta connection of three phase transformer windings, Active, reactive and apparent powers, Power factor, Measurement of three-phase power and power factor, Methods of power factor improvement, Per unit system of measurement.

Electricity Generation and Tariffs: Power plants, Economics of electricity supply, Cost of electricity, Structure of tariffs, Maximum demand, Load factor, Diversity factor.

Synchronous Generators: Construction, Operation, Per phase equivalent circuit, Phasor diagram, Excitation, Losses, Power flow diagram, Efficiency, Voltage regulation, External characteristics, Synchronous generator tests, Performance under different power factor conditions, Parallel operation, Operation on infinite busbars.

Transmission: Types of transmission lines, Impedance of transmission line, Equivalent circuit of transmission line, Losses, I^2t factor, Maximum power flow, Line loadability.

Distribution and Electrical Power Protection: Industrial supplies and installation. Protection of industrial plants, Circuit breakers, Fuses, Isolators and switches; Calculation of a balanced and unbalanced short circuit fault, Smart grids.

Power System Control: Power flow control, Generator-voltage control, Turbine-governor control, Load-frequency control.

Bibliography:

Essential reading

Wildi, T. (2014) Electrical Machines, Drives and Power Systems, 6th Edn., Harlow: Pearson Education.

Other indicative reading

Weedy, B. M. (2012) Electric Power Systems, 5th Edn., Chichester: Wiley.
Kirtley. J. L. (2010) Electric Power Principles: Sources, Conversion, Distribution and Use, Chichester: Wiley.