glyndŵr
PRIFYSGOL GLYNDŴR WRECSAM
GLYNDŴR UNIVERSITY WREXHAM

MODULE SPECIFICATION FORM

Module Title:	**Electrical Power Systems**	Level:	**5**	Credit Value:	**10**

Module code: (if known)	**ENG520**	Cost Centre:	**GAEE**	JACS2 code:	**H630**

Semester(s) in which to be offered:	**2**	With effect from:	**July 2015**

Office use only: To be completed by AQSU:	Date approved: **July 2015** Date revised: Version No: 1

Existing/New: **new**	Title of module being replaced (if any): N/A

Originating Academic area:	**Engineering and Applied Physics**	Module Leader:	**Y Vagapov**

Module duration (total hours)	100	**Status:** core/option/elective (identify programme where appropriate):	**Free-standing 10-credit component comprising second half of ENG565 (Electrical Power Engineering)**
Scheduled learning and teaching hours	36		
Independent study hours	64		
Placement hours	0		

Percentage taught by Subjects other than originating Subject (please name other Subjects):	**0%**

Programme(s) in which to be offered: **Enginering European Programme** (Non Award Bearing)	Pre-requisites per programme (between levels):	**None**

Module Aims:

To provide an in-depth understanding of:

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.

Expected Learning Outcomes

Knowledge and Understanding:
At the completion of this module, the student should be able to:

1. Analyse the supply needs of the modern industrial consumer; *(KS 7)*
2. Survey the strategies and techniques available for supplying these requirements;
3. Analyse the equipment and systems used in producing these supplies;
4. Use appropriate methods of calculation to install, maintain and provide these systems. *(KS 3, 10)*

Key skills for employability

1. Written, oral and media communication skills,
2. Leadership, team working and networking skills
3. Opportunity, creativity and problem solving skills
4. Information technology skills and digital literacy
5. Information management skills
6. Research skills
7. Intercultural and sustainability skills
8. Career management skills
9. Learning to learn (managing personal and professional development, self management)
10. Numeracy

Assessment: *Please indicate the type(s) of assessment (eg examination, oral, coursework, project) and the weighting of each (%).*

Assessment is by means of an examination covering all outcomes. It is an unseen time-constrained one with a fixed number of questions, typically five, where students are required to answer only three out of the five possible.
(This corresponds to Assessment 2 of ENG565 – Electrical Power Engineering)

Assessment number (use as appropriate)	Learning Outcomes met	Type of assessment	Weighting	Duration (if exam)	Word count (if coursework)
Assessment One:	1, 2, 3, 4	Examination	100%	2 hr	

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:

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, I2t 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.

Sustainable Energy: Wind turbines, Solar panels, Fuel cells, Microgenerators, Microgrids.

Bibliography:

Essential Reading

Chapman, S. J. (2011) *Electric Machinery Fundamentals*, 5th Edn., New York: McGraw-Hill.

Wildi, T. (2005) *Electrical Machines, Drives and Power Systems*, 6th Edn., Englewood Cliffs: Prentice-Hall.

Recommended reading:

Mohan, N. (2012) *Electric Machines and Drives: A First Course*, Hoboken: Wiley.

Hubert, C.I. (2002) *Electric Machines: Theory, Operating Applications and Control*, 2nd Edn., Englewood Cliffs: Prentice-Hall.