glyndŵr
PRIFYSGOL GLYNDŴR WRECSAM
GLYNDŴR UNIVERSITY WREXHAM

MODULE SPECIFICATION FORM

Module Title:	**Electromagnetism and DC Machines**	Level:	**5**	Credit Value:	**10**

Module code: (if known)	**ENG50E**	Cost Centre:	**GAEE**	JACS2 code:	**H360**

Semester(s) in which to be offered:	**1**	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 first half of ENG564 (Electrical Machines).**
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 develop the theory and operation of electric machines and the properties of electric and magnetic materials used in their construction; to apply these ideas to the operation and application of dc machines and transformers.

Expected Learning Outcomes

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

1. Identify and explain the electromagnetic principles of, and the operation and construction of, a range of d.c. machines amd a.c. transformers;
2. Define the operating characteristics of d.c. rotating machines and a.c. transformers;
3. Analyse and select appropriate d.c. rotating machines and a.c. transformers for given applications;
4. Evaluate the various types of d.c. machine used in industry and select the appropriate machine for optimum efficiency. *(KS 1, 3)*

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 a portfolio of problem-solving activities and practical laboratory investigations exploring all topics of electric machinery. It covers all outcomes.

(This corresponds to Assessment 1 of ENG564 – Electrical Machines)

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	Portfolio	100%		2000

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:

Electromagnetism and Electromechanical Energy Conversion: Magnetic field, Force on current currying wire, Magneto-motive force, Magnetic circuits, Analogy between magnetic and electrical circuits, Assumptions to calculate magnetic circuit, Faraday law, Magnetic materials, Magnetisation curve and hysteresis, Hysteresis loss, Eddy current loss, Permanent magnet, Torque, Load, Rotational speed, Angular velocity, Mechanical power.

DC Machines: Principles of operation, Construction, Induced e.m.f. equation, Magnetisation curve of dc machines, Commutation, Armature reaction.

DC Generators: Types of dc generators, Power flow diagram, Efficiency, Voltage regulation, Performance and characteristics of Separately excited, Shunt and Series dc generators.

DC Motors: Types of dc motors, Developed torque and power, Power flow diagram, Efficiency, Performance and characteristics of Permanent magnet, Separately excited, Shunt and Series dc motors.

Transformers: Principles, Ideal transformer, Transformer ratio of turns, e.m.f. equation, Equivalent circuit, Referred parameters, Phasor diagram, Determination of transformer parameters, Copper and core losses, Power flow diagram, Efficiency, Voltage regulation.

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.