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PRIFYSGOL GLYNDŴR WRECSAM
GLYNDŴR UNIVERSITY WREXHAM

MODULE SPECIFICATION FORM

Module Title:	**AC Machines**	Level:	**5**	Credit Value:	**10**

Module code: (if known)	**ENG50F**	Cost Centre:	**GAEE**	JACS2 code:	**H360**

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 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 students' abilities to analyse techniques and performance of synchronous, induction and special machines by an in-depth knowledge of the principles of operation in order to exercise the ability to select a machine for a given task .

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 a.c. rotating machines;
2. Define the operating characteristics of a.c. rotating machines and transformers;
3. Analyse and select appropriate a.c. rotating machines and transformers for given applications;
4. Evaluate the various types of a.c. machine used in industry and select the appropriate machine for optimum efficiency. *(KS 3, 5)*

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 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	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:

Three-Phase Synchronous Motors: Construction, Operation, Per phase equivalent circuit, Phasor diagram, Excitation, Losses, Power flow diagram, Efficiency, Characteristics, Performance under different power factor conditions.

Induction Motors: Construction and principle of operation of three phase induction motor, Wound rotor induction motor, Squirrel cage induction motor, Generation of a rotating magnetic field, Synchronous and asynchronous speeds, Slip, Rotor e.m.f., Equivalent circuit, Dynamic resistance, Approximation of equivalent circuit, Losses, Power flow diagram, Efficiency, Torque/slip characteristics, Determination of equivalent circuit parameters, No-load test, Blocked rotor test, Starting techniques and skin effect, NEMA type consideration, Principle of operation and performance of single phase induction motor. Three phase induction motor operating as a single phase induction motor.

Induction Generator: Principle of operation of induction generator, Self-exciting conditions, Double feed induction generator.

Special Motors: Construction, operation, performance and applications of Stepper motor, Brushless dc motor and Permanent magnet synchronous motor.

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.