

MODULE SPECIFICATION FORM*

Module Title: Electric Drives	Level: 6	Credit Value: 10
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Module code: ENG679 (if known)	Cost Centre: GAEE	JACS2 code: H650
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Semester(s) in which to be offered: 1	With effect from: July 2015
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Office use only: To be completed by AQSU:	Date approved: July 2015 Date revised: Version No: 1
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Existing/New: Existing	Title of module being replaced (if any):
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Originating Academic area: Engineering and Applied Physics	Module Leader: Y. Vagapov
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Module duration (total hours) 100	Status: Free-standing 10-credit component comprising half of ENG645 (Power Electronics and Electric Drives).
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%
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Programme(s) in which to be offered: Engineering European Programme (Non Award Bearing)	Pre-requisites per programme (between levels): None
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<p>Module Aims:</p> <p>To develop the students' abilities to analyse techniques and performance of ac and dc electric drives by an in-depth knowledge of the principles of operation in order to exercise the ability to select an appropriate system for a given task.</p>
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<p>Expected Learning Outcomes</p> <p><u>Knowledge and Understanding:</u> At the completion of this module, the student should be able to:</p> <ol style="list-style-type: none"> Analyse the operating characteristics of the dc and ac electric drives with interaction to mechanical loads; <i>(KS 10)</i> Evaluate the various types of electric drives used in industry and select the appropriate system for optimum performance. <i>(KS 5)</i> <p><u>Key skills for employability</u></p> <table style="width: 100%;"> <tr> <td style="vertical-align: top;"> <ol style="list-style-type: none"> Written, oral and media communication skills, Leadership, team working and networking skills Opportunity, creativity and problem solving skills Information technology skills and digital literacy Information management skills Research skills </td> <td style="vertical-align: top;"> <ol style="list-style-type: none"> Intercultural and sustainability skills Career management skills Learning to learn (managing personal and professional development, self management) Numeracy </td> </tr> </table>	<ol style="list-style-type: none"> Written, oral and media communication skills, Leadership, team working and networking skills Opportunity, creativity and problem solving skills Information technology skills and digital literacy Information management skills Research skills 	<ol style="list-style-type: none"> Intercultural and sustainability skills Career management skills Learning to learn (managing personal and professional development, self management) Numeracy
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Assessment: Please indicate the type(s) of assessment (eg examination, oral, coursework, project) and the weighting of each (%).

Assessment is by means of a written examination covering all outcomes. It is an unseen time-constrained exam.

(This corresponds to one-half (part B) of the examination of ENG645.)

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

Learning and Teaching Strategies:

The module will be delivered through lectures, tutorials and student-driven investigative work. A significant amount of the content is to be achieved through individual study. Approximately one third of the timetabled time will be devoted to formal lectures. The remainder of the time will be allocated to tutorials and to individual study but also with some programmed access to lab/computer facilities, for practical investigation and analysis activities.

Syllabus outline:

Introduction to Electric Drives: Mechanical system requirement for electric drives, Torque, speed and inertia in electric drive systems, Steady state and dynamic conditions, Coupling mechanisms, Rotary to linear motion, Gears, Optimum gear ratio, Types of load, Four quadrant operation.

Industrial Motor Control: Control devices, Induction motor control applications: Across-the-line starter, Reversing the direction of rotation, Primary resistance starting, Star-delta starting.

DC Electric Drives: Methods of speed control of dc motors, Speed control by controlled rectifiers, Dynamic model of dc motor, Block diagram and transfer function of dc motor, Dynamic behaviour of dc motor, Torque, speed and position sensors and feedbacks, Closed loop torque, speed and position control, Resistance starting, Dynamic braking.

AC Electric Drives: Methods of speed control of ac motors, Variable frequency converter and cycloconverter, Speed control of squirrel cage induction motor by static voltage regulator, Speed control of wound rotor induction motor with recovering slip power.

Motor Selection: Power range, Load requirements, Thermal consideration, duty cycle and rating, Enclosures and cooling, Dimension standards, Energy saving applications

Bibliography:

Essential reading:

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

Recommended reading:

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

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

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