MODULE TITLE	**Electrical Energy Conversion and Transport**	**CREDIT VALUE**	**15**
MODULE CODE	**CSM2177**	**MODULE CONVENER**	**Prof Mohammad Abusara (Coordinator)**

DURATION: TERM	**1**	**2**	**3**
DURATION: WEEKS		**10**	

Number of Students Taking Module (anticipated)	**78**

DESCRIPTION - summary of the module content

This module aims to develop your basic knowledge of topic, by introducing you to electrical machines, including DC, synchronous and induction, and to instrumentation and control techniques. Building upon the previous knowledge you gained from the Electrical and Electronic Principles module, this is a fundamental course in electrical engineering for the BEng Mining Engineering degree and BSc in Renewable Energy degrees. It is also a prerequisite for the Network Engineering, Modelling and Management module (third year Renewable Energy only).

AIMS - intentions of the module

This course takes a theoretical, practical and multidisciplinary approach, to enable you to develop a broad understanding of electrical machines, measurements and control of electric energy. By the end of this module, you will have confidence in your fundamental understanding, applications and practical knowledge of electrical machines, electrical energy conversion and transport. Furthermore, you will have an improved insight into instrumentation and control systems.

INTENDED LEARNING OUTCOMES (ILOs) (see assessment section below for how ILOs will be assessed)

On successful completion of this module, **you should be able to**:

Module Specific Skills and Knowledge:
1 understand the analysis and design of different electric machines and energy conversion;
2 apply computer-based models and assess the limitations of particular cases;
3 comprehend a wide range of engineering materials and components used in electrical engineering
Discipline Specific Skills and Knowledge:
4 adopt a systems approach to engineering problems.
5 grasp the design processes and methodologies.
6 generate an innovative design for products, systems, components or processes to fulfill new needs.
Personal and Key Transferable / Employment Skills and Knowledge:
7 use and integrate knowledge and understanding of other disciplines to support study of their own engineering discipline.
8.utilise technical literature and other information sources.

SYLLABUS PLAN - summary of the structure and academic content of the module

- introduction: a simple AC generator, A simple DC generator, DC generators or dynamos, AC generators or alternators, DC motors, AC motors, Universal motors;

- fundamentals of electricity, magnetism, and circuits: magnetic field intensity H and flux density B, B-H curve of vacuum, B-H curve of an magnetic material;

- DC machines: series generator, shunt generator, compound generator, separately excited generator, improving the waveshape, induced voltage, no-load operation and saturation curve, load characteristics;

- transformers: elementary transformer, polarity of a transformer, ideal transformer at no-load, equivalent circuit of practical transformer, losses and transformer rating, voltage regulation, measuring transformer impedances, analysis of transformers;

- induction machines: construction of induction motors, types of induction motors, operation of induction motors, rotating field, starting characteristics, acceleration of a motor, motor under load, synchronous speed, slip, rotor frequency, estimating the currents, active power flow, speed control, braking of induction motors, torque/speed curve, effect of rotor resistance;

- synchronous machines: number of poles, main features of the stator, main features of the rotor, field excitation, equivalent circuit of an ac generator;

- synchronous machines: no-load saturation curve, synchronous reactance, synchronous generator under load, voltage regulation, synchronisation of a generator, synchronous generator on an infinite bus, active power flow, synchronous motors;

- measurement and instrumentation: measurement and conversion techniques, transducers, signal conditioning and digital sampling (ADC and DAC), and applications

- control systems: introduction to control systems, open loop and closed loop, analogue and digital control techniques, linear, non-linear, PID, PLC, and applications.

LEARNING AND TEACHING

LEARNING ACTIVITIES AND TEACHING METHODS (given in hours of study time)

Scheduled Learning & Teaching Activities	40.00	**Guided Independent Study**	110.00	**Placement / Study Abroad**	

DETAILS OF LEARNING ACTIVITIES AND TEACHING METHODS

Category	Hours of study time	Description
Scheduled learning and teaching activities	36	Lectures with integrated tutorials
Scheduled learning and teaching activities	4	Laboratory sessions
Guided independent study	110	Lecture and assessment preparation; prviate study

ASSESSMENT

FORMATIVE ASSESSMENT - for feedback and development purposes; does not count towards module grade

Form of Assessment	Size of Assessment (e.g. duration/length)	ILOs Assessed	Feedback Method
Tutorial exercises	Covered in the tutorial/lecture sessions	1-8	Students are given answers/solutions to self-assess

SUMMATIVE ASSESSMENT (% of credit)

Coursework	30	Written Exams	70	Practical Exams	

DETAILS OF SUMMATIVE ASSESSMENT

Form of Assessment	% of Credit	Size of Assessment (e.g. duration/length)	ILOs Assessed	Feedback Method
Examination	70	2 hours	1-8	Exam mark
Coursework: Laboratory report (20%) - plus online quiz assessment (10%) based on practical laboratories exercises	30	1500 words equivalent	1-8	Written comments (Report) and Instant Feedback (ELE Online Quiz)

DETAILS OF RE-ASSESSMENT (where required by referral or deferral)

Original Form of Assessment	Form of Re-assessment	ILOs Re-assessed	Time Scale for Re-assessment
Summative assessment	Additional summative assessment	As above	August Ref/Def period
Examination	Additional examination	As above	August Ref/Def period

RE-ASSESSMENT NOTES

As above 1 piece of CW (30%) and/or 1 Exam (70%)

RESOURCES

INDICATIVE LEARNING RESOURCES - The following list is offered as an indication of the type & level of information that you are expected to consult. Further guidance will be provided by the Module Convener

Basic reading:

ELE: http://vle.exeter.ac.uk/

Web based and Electronic Resources:

Other Resources:

Reading list for this module:

Type	Author	Title	Edition	Publisher	Year	ISBN	Search
Set	Theodore Wildi	Electrical Machines, Drives, And, Power Systems	6th	Pearson International Edition	2006	10: 0131969188	[Library]
Set	Allan R. Hambley	Electrical Engineering: Principles and Applications		Prentice Hall	2013	10: 0131989227	[Library]
Set	Jimmie J. Cathey	Electric Machines: Analysis and Design Applying MATLAB		McGraw-Hill	2001	10: 0072423706	[Library]
Set	N. S. Nise	Control Systems Engineering	4th	John Wiley	2004	0-471-44577-0	[Library]
Set	Chapman, Stephen J.	Electrical Machinery and Power System Fundamentals		McGraw-Hill	2002	10: 0072291354	[Library]
Set	Bhag S. Guru and Hseyin R. Hiziroglu	Electric Machinery and Transformers	3rd	Oxford University Press	2000	10: 0195138902	[Library]

CREDIT VALUE	15	ECTS VALUE	7.5
PRE-REQUISITE MODULES	None		
CO-REQUISITE MODULES	None		
NQF LEVEL (FHEQ)	5	AVAILABLE AS DISTANCE LEARNING	No
ORIGIN DATE	Tuesday 10 July 2018	LAST REVISION DATE	Tuesday 10 July 2018
KEY WORDS SEARCH	Electrical energy; conversion; electrical machines.		