REM master basic syllabus

Title:
EE2016 Electrical Power Engineering I

Credit value:
5 ECTS

Mandatory/Optional:
Optional

Semester:
1

Lecturer/s:
Dr. Pádraig Cantillon-Murphy

University:
University College Cork

Department:
School of Engineering

Rationale:
This module aims to introduce students power machines and systems based on magnetic fields.

Objectives:
On successful completion of this module, students should be able to:

- *Apply the laws of electromagnetism to magnetic circuits and systems;*
- *Characterize these magnetic circuits and systems for their electrical properties;*
- *Apply these principles to suitable circuits and applications including permanent magnetic and wound-field DC machines;*
- *Work in groups to test, characterise and report experimental performance of commonly-used magnetic circuits and machines.*

Skills: *(according to the list of skills provided)*

Subject skills	REM Master Skills						
	L2.1	**L2.2**	**L2.3**	**L2.4**	**L2.5**	**L2.6**	**L2.7**
L3.1. Apply the laws of electromagnetism to magnetic circuits and systems	X			X			
L3.2. Characterize these magnetic circuits and systems for their electrical properties		X	X		X		X
L3.3. Apply these principles to suitable circuits and applications including permanent magnetic and wound-field DC machines		X			X	X	X
L3.4 Work in groups to test, characterise and report experimental performance of commonly-used magnetic circuits and machines			X			X	X

Teaching and learning methods:

The teaching method is based on a series of lectures where the lecturer explains the main concepts through power point presentations and worked out examples on the board. The students are also presented with a variety of issues of practical nature during the lectures. The module also includes a site visit to an operational wind farm. Students must write a written report on the site visit. There is also a group design assignment – students work in small groups to develop a wind farm layout, estimate energy yield, apply measure-correlate-predict to estimate long term variability, and consider environmental constraints. The design assignment is supported by tutorial sessions.

Allocation of student time:

	Attendance (classroom, lab,…)	**Non attendance (lecture preparation, self study…)**
Lectures	24 hours	10 hours
Tutorials (optional)	8 hours	4 hours
Laboraotory work	12 hours	4 hours
Private study		-

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Assessment:

Total Marks 100: Formal Written Examination 70 marks; Continuous Assessment 30 marks (Power Laboratory sessions (20 marks); in-class written examination (10 marks).).

Assessment Matrix:

Subject skills	**Assessment method**					
	Exam	**Class test**	**Coursework**	**Report**	**…**	**…**
All	70%	-	30%	-		

Programme:

Lesson 1	Introduction to electromagnetism
Lesson 2	Faraday's and Gauss' Laws
Lesson 3	Ferromagnetism and hysteresis
Lesson 4	Self-inductance (2 hours)
Lesson 5	Relucatance and energy storage
Lesson 6	Core and copper loss
Lesson 7	Introduction to lab safety and equipment (2 hours)
Lesson 8	Permanent magnets
Lesson 9	Forces and the electromagnet ss examination
Lesson 10	The transformer
Lesson 10	The capacitor
Lesson 11	Ampere's force law
Lesson 12	Introduction to DC machines
Lesson 13	Motors and generators (2 hours)
Lesson 14	Case Study: Electric vehicle powertrain

Lesson 15	Case Study: Mars Rover
Lesson 16	Examination Review (2 hours)

Resources:

A classroom, equipped with a blackboard and audio-visual resources (laptop/computer and Internet connection + projector), for the lectures.
Laboratory assignments take place in the IT Laboratories at the Electrical Engineering building

Bibliography:

Class reader (provided to students)
Transformers and Inductors for Power Electronics by WG Hurley and WHWolfe
Principles of Electrical Machines and Power Electronics by PC Sen
Electromagnetic Field Theory: A Problem Solving Approach by M Zahn

Further comments: