Liverpool John Moores University

Title:	Electric Machines
Status:	Definitive
Code:	**5302ELE** (121424)
Version Start Date:	01-08-2021
Owning School/Faculty:	Engineering
Teaching School/Faculty:	Engineering

Team	Leader
Martin Jones	Y

Academic Level:	FHEQ5	**Credit Value:**	20	**Total Delivered Hours:**	63
Total Learning Hours:	200	**Private Study:**	137		

Delivery Options
Course typically offered: Semester 2

Component	Contact Hours
Lecture	33
Practical	6
Tutorial	22

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	Exam	Examination	60	2
Portfolio	Portfollio	Practical lab report	40	

Aims

This module is intended to achieve the following programme aims within the field of Electrical Engineering:

To enhance knowledge and understanding of the broad scientific and technological principles underpinning operation of electrical machinery.
To rehearse practical skills in the use of mathematical methods for modelling and

analysing problems related to rotating electrical machines and transformers. The use of relevant test and measurement equipment by undertaking experimental laboratory work.
In particular to enhance the knowledge of electromagnetism and electromechanical energy conversion

Learning Outcomes

After completing the module the student should be able to:

1	Identify and apply to problems the laws of electromagnetism
2	Outline the principles of electromechanical energy conversion.
3	Discuss, analyse and evaluate steady-state operating characteristics of rotating electrical machines.
4	Apply transformer models in the analysis of normal electrical system operation.
5	Use standard tests on electrical machinery and analyse the results.

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

Exam	1	2	3	4
Practical and thoery	3	5		

Outline Syllabus

1. Fundamentals of electromagnetism: force and torque in magnetic field, induced electromotive force. Inductance and magnetic circuits: self-inductance, mutual and leakage inductance; magnetic circuits and reluctance of the magnetic path, B-H curve of magnetic material, cores with air-gap. Induced electromotive force: induction in stationary systems with time varying fields and in systems with movable parts in time dependent and time independent fields. Losses in ferromagnetic materials.

2. Electromechanical energy conversion: motoring and generating, time-domain modelling, torque and average torque, types of machines, rotating field.

3. Transformers: non-ideal single-phase transformer, equivalent circuit, voltage drop, losses and efficiency; three-phase transformers, winding connections.

4. Steady-state analysis of dc machines: types, circuits and equations, speed-torque curve. Steady-state analysis of induction machines: operating principle, equivalent circuit, phasor diagram, torque speed curve, losses and efficiency. Steady-state analysis of synchronous motors/generators: operating principles, active and reactive power, phasor diagrams, equivalent circuits, power and torque versus load angle curves.

Learning Activities

A series of lectures tutorials and practical lab sessions

Notes

It is expected that students undertaking this modules have a solid understanding of basic circuit theory