Electric Machines

Module Information

2022.01, Approved

Summary Information

Module Code	5502EDLBHG
Formal Module Title	Electric Machines
Owning School	Engineering
Career	Undergraduate
Credits	20
Academic level	FHEQ Level 5
Grading Schema	40

Teaching Responsibility

LJMU Schools involved in Delivery
LJMU Partner Taught

Partner Teaching Institution

Institution Name
Beaconhouse Group

Learning Methods

Learning Method Type	Hours
Online	55
Practical	6

Module Offering(s)

Display Name	Location	Start Month	Duration Number Duration Unit
JAN-PAR	PAR	January	12 Weeks

Aims and Outcomes

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

After completing the module the student should be able to:

Learning Outcomes

Code	Number	Description
MLO1	1	Identify and apply to problems the laws of electromagnetism
MLO2	2	Outline the principles of electromechanical energy conversion.
MLO3	3	Discuss, analyse and evaluate steady-state operating characteristics of rotating electrical machines.
MLO4	4	Apply transformer models in the analysis of normal electrical system operation.
MLO5	5	Use standard tests on electrical machinery and analyse the results.

Module Content

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.
Module Overview	
Additional Information	It is expected that students undertaking this modules have a solid understanding of basic circuit theory

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Module Learning Outcome Mapping
Exam	Exam	60	2	MLO1, MLO2, MLO3, MLO4
Essay	Practical and theory	40	0	MLO3, MLO5

Module Contacts

Module Leader

Contact Name	Applies to all offerings	Offerings
Russell English	Yes	N/A

Partner Module Team

Contact Name	Applies to all offerings	Offerings