Electromechanical Energy Conversion

Module Information

2022.01, Approved

Summary Information

Module Code	4500ICBTEL
Formal Module Title	Electromechanical Energy Conversion
Owning School	Engineering
Career	Undergraduate
Credits	15
Academic level	FHEQ Level 4
Grading Schema	40

Teaching Responsibility

LJMU Schools involved in Delivery
LJMU Partner Taught

Partner Teaching Institution

Institution Name
International College of Business and Technology

Learning Methods

Learning Method Type	Hours
Lecture	45
Off Site	6
Tutorial	9

Module Offering(s)

Display Name	Location	Start Month	Duration Number Duration Unit
APR-PAR	PAR	April	12 Weeks

JAN-PAR	PAR	January	12 Weeks
SEP-PAR	PAR	September	12 Weeks

Aims and Outcomes

Aims	This module introduces the fundamental concepts of energy and power by recall the physics and mathematics. The basic electro mechanical principles illustrated by using examples from electricity generation, distribution and storage. Finally industrial focus is given to introduce the electro mechanical system in real engineering.

After completing the module the student should be able to:

Learning Outcomes

Code	Number	Description
MLO1	1	Demonstrate an understanding of the basic principles of singly exited electromechanical system and energy conversion.
MLO2	2	Solve problems related to electromagnetism, transformers, dc and ac machines, three phase systems, Betz limit.
MLO3	3	Demonstrate the knowledge of understanding the operation of electromechanical devices available in the industry from a field visit.
MLO4	4	Apply the knowledge of practical skills to troubleshoot and rewind a dc machine and test in the laboratory or industry.

Module Content

Outline Syllabus	Electro-mechanical energy conversion, Kinematics, Newton's laws of motion and force. Circular motion.Work, kinetic and potential energy, and power. Conservation of energy. Basic electromagnetism. Electric charge: conductors, insulators and semiconductors. Electric field and Electrostatic potential energy. Magnetic field of an infinitely long straight wire, magnetic flux density.Forces on a current carrying conductor on a magnetic field. Force on charged particles in a magnetic field. Electromagnetic induction: Faraday's law and Lenz's law. Electric generator.Three phase power and power electronic devices.Production of three-phase power. Phase and line voltages and currents in star and delta systems. Earthing on low-voltage systems. Measurements of three-phase power.Introduction to single-phase transformer: principle, construction, referring of impedances, losses and efficiency, and equivalent circuit. Power electronic switching devices: Rectifiers, MOSFET, transistor, IGBT, and thyristor. Single-phase rectifier circuits.Power generation, energy efficiency and energy storage.Conventional power generation: gas and coal-fired power stations, combined heat and power, IGCC, nuclear power. Generating plant performance. Load curve and load factor. Fundamentals of power transmission and distribution. Wind energy and the Betz limit. Solar spectrum, p-n junction, solar photovoltaics, solar thermal. Introduction to marine technologies. Efficiency of renewable energy systems. Energy storage technologies.Introduction to electro-mechanical device and system.Introduction to industrial motors.Basic operation of AC – DC Motors.
Module Overview	
Additional Information	

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Module Learning Outcome Mapping

Portfolio	Portfolio	40	0	MLO3, MLO4
Exam	Exam	60	1.5	MLO1, MLO2

Module Contacts

Module Leader

Contact Name	Applies to all offerings	Offerings
Karl Jones	Yes	N/A

Partner Module Team

Contact Name	Applies to all offerings	Offerings