

Summary Information

Module Code	5509ICBTEL
Formal Module Title	Electrical Machines and Drives
Owning School	Engineering
Career	Undergraduate
Credits	15
Academic level	FHEQ Level 5
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	35
Practical	10
Tutorial	15

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_NS-PAR	PAR	September (Non-standard start date)	12 Weeks

Aims and Outcomes

Aims	This module introduces the student to basics of Electrical Machines and appropriate control techniques. In particular, student is introduced to steady state and transient modelling of synchronous machines.
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After completing the module the student should be able to:

Learning Outcomes

Code	Number	Description
MLO1	1	Evaluate the single-phase equivalent circuit representations and operation of the transformer, induction and synchronous machine and perform load calculation.
MLO2	2	Explain the operation and characteristics of step-up and step-down DC-DC converters and phase-controlled AC-DC converters, including switching losses.
MLO3	3	Calculate the operating conditions and sketch the waveforms for set-up and step-down DC-DC converters and phase controlled AC-DC converters and analyse the input current of single-phase rectifiers and determine the power factor, input displacement factor and distortion factor.
MLO4	4	Recognize harmonic distortion produced by power electronic circuits

Module Content

Outline Syllabus	Single-Phase Transformers. Principles of operation. Equivalent circuit. Load calculations. Open- and short-circuit. Tests. Regulation. Loss mechanisms. Uses of transformers. Construction (including high-frequency). Basic design principles and example. Induction Machines. Production of a rotating field. Induced EMF in the rotor, the concept of slip. Equivalent circuit. Performance calculations. Loss mechanisms. Efficiency. Torque/speed characteristics. Load curves and speed of operation. Speed control by classical means. The need for variable frequency. Synchronous Machines. Machine topologies and construction. Equivalent circuit. Performance. Phasor diagrams. Simple operating charts. Stability. DC-DC Converters. Principle of switched-mode power conversion. Power MOSFET and IGBT devices. Step-up and step-down chopper circuits. Inductive switching waveforms and switching losses. AC-DC Converters. Single-phase, half and full-wave rectifier circuits with inductive DC filter. Thyristor characteristics. Single-phase, phase-controlled operation - rectification and inversion modes - applications. Power transfer to non-linear loads, harmonics, power factor, input displacement factor and distortion factor.
Module Overview	
Additional Information	

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Module Learning Outcome Mapping
Exam	Examination	70	2	MLO3, MLO1, MLO4
Practice	Practical/Workshop	30	0	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
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