Module Proforma

Approved, 2022.02

Summary Information

Module Code	6405ELE
Formal Module Title	Power Electronics and Energy Efficient Drives
Owning School	Engineering
Career	Undergraduate
Credits	20
Academic level	FHEQ Level 6
Grading Schema	40

Module Contacts

Module Leader

Contact Name	Applies to all offerings	Offerings
Obrad Dordevic	Yes	N/A

Module Team Member

Contact Name	Applies to all offerings	Offerings

Partner Module Team

Contact Name	Applies to all offerings	Offerings

Teaching Responsibility

LJMU Schools involved in Delivery
Engineering

Learning Methods

Learning Method Type	Hours

Lecture	22
Practical	11
Tutorial	11

Module Offering(s)

Offering Code	Location	Start Month	Duration
JAN-CTY	CTY	January	12 Weeks

Aims and Outcomes

Aims	To develop understanding of switch mode operation of power semiconductors, their application in power electronics converters, and to demonstrate application of converters in dc and ac motor drive applications obtaining energy efficient drives.

Learning Outcomes

After completing the module the student should be able to:

Code	Description
MLO1	Appraise types and topologies of power electronic converters and analyse their operation
MLO2	Assess different methods of speed control of dc and induction motor drives
MLO3	Operate and test variable speed drives supplied from power electronic converters
MLO4	Understand energy efficiency benefits from using variable speed drives when compared to fixed speed drives

Module Content

Outline Syllabus
1. Power electronic devices and basic converter topologiesIntroduction to power electronics and its applications.Diodes, MOSFETs, IGBTs, thyristors, GTOs.Rectifiers, inverters, dc to dc and ac to ac converters.2. Variable speed electric drivesMotoring and braking, load torque types, constant torque and constant power regions in VSDs. Speed control methods for dc and induction machines.3. Applications of power electronic convertersApplication of rectifiers and chopper for variable speed dc machine drive. Application of inverters for variable speed induction machine drive.Energy efficiency benefits of using variable speed drives through analysis of various applications (e.g. fans, pumps, compressors)

Module Overview

Additional Information
UNESCO Sustainable Development GoalsQuality EducationAffordable and Clean EnergyDecent Work and Economic GrowthIndustry, Innovation and InfrastructureSustainable Cities and CommunitiesResponsible Consumption and ProductionClimate ActionUK SPEC AHEP 4CEng. M1 Apply a comprehensive knowledge of mathematics, statistics, natural science and engineering principles to the solution of complex problems. Much of the knowledge will be at the forefront of the particular subject of study and informed by a critical awareness of new developments and the wider context of engineering.M2 Formulate and analyse complex problems to reach substantiated conclusions. This will involve evaluating available data using first principles of mathematics, statistics, natural science and engineering principles, and using engineering judgment to work with information that may be uncertain or incomplete, discussing the limitations of the techniques employed.M3 Select and apply appropriate computational and analytical techniques to model complex problems, discussing the limitations of the techniques employed.M4 Select and critically evaluate technical literature and other sources of information to solve complex problems.M6 Apply an integrated or systems approach to the solution of complex problems.M9 Use a risk management process to identify, evaluate and mitigate risks (the effects of uncertainty) associated with a particular project or activity.M12 Use practical laboratory and workshop skills to investigate complex problems.M18 Plan and record self-learning and development as the foundation for lifelong learning/CPD.IEng.B1 Apply knowledge of mathematics, statistics, natural science and engineeringprinciples to broadly-defined problems. Some of the knowledge will be informed by current developments in the subject of study.B2 Analyse broadly-defined problems reaching substantiated conclusions using first principles of mathematics, statistics, natural science and engineering principles.B3 Select and apply appropriate computational and analytical techniques to model broadly-defined problems, recognising the limitations of the techniques employed.B4 Select and evaluate technical literature and other sources of information to address broadly-defined problems.B6 Apply an integrated or systems approach to the solution of broadly-defined problems.B7 Evaluate the environmental and societal impact of solutions to broadly-defined problems.B9 Use a risk management process to identify, evaluate and mitigate risks (the effects of uncertainty) associated with a particular project or activityB12 Use practical laboratory and workshop skills to investigate broadly-defined problems.B18 Plan and record self-learning and development as the foundation for lifelong learning/CPD.Where this module is part of a Degree Apprenticeship programme, the knowledge learning outcomes are K5, the skills learning outcomes are S5 and S6

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Learning Outcome Mapping
Centralised Exam	Final exam	70	2	MLO2, MLO1, MLO4
Report	Lab report	30	0	MLO3