ES3H8-15 Electrical Machines and Drives

24/25

Department
School of Engineering
Level
Undergraduate Level 3
Module leader
Mark Dooner
Credit value
15
Module duration
10 weeks
Assessment
30% coursework, 70% exam
Study location
University of Warwick main campus, Coventry

Description

Introductory description

Electrical machines and drives are the core enabling technology which allows conversion between electrical and mechanical energy. This module considers the operation of a variety of electrical machines (such as synchronous, induction, dc and reluctance machines) and their control.

Module aims

This module will develop an advanced understanding of the present state of practice and future developments of electrical machines and drives

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Review of Maxwell's equations. Magnetic circuits and quantities. Rotating magnetic fields Synchronous machines, Induction Machines , DC Machines, Reluctance Machines, Permanent Magnet Machines

Reference frame theory of AC machines for control
Dynamic analysis of electrical machines
Open and closed-loop control of electrical machines
Review of power electronic converters and pulse width modulation for drives

Learning outcomes

By the end of the module, students should be able to:

- Demonstrate advanced understanding of AC machines
- Demonstrate advanced understanding of DC machines
- Design DC electrical drive control systems
- Design AC electrical drive control systems
- Perform measurements and characterisation of electrical machines
- Program and test electrical drives

Indicative reading list

Electric Machinery Fundamentals, S.J. Chapman, 5th edition, McGraw-Hill, 2012.
Vector Control of Three-Phase AC Machines - System Development in the Practice, 2nd edition, N.P. Quang, J.-A. Dittrich, Springer, 2015.
Analysis of electric machinery and drive systems, P. Krause, O. Wasynczuk, S. Sudhoff, S. Pekarek, Wiley, 2013.

Interdisciplinary

Employs systems (control) and electrical engineering knowledge to consider electromechanical systems.

Subject specific skills

Communicate technical information with others at all levels, including technical reports and the use of digital tools.
Follow a methodical approach to engineering problem solving.
Establish and report engineering design briefs.
Select the design solution for a given electro-mechanical engineering application and environment using data to inform their decisions.
Use appropriate equipment to develop and execute test plans to support electro-mechanical product validation and approval.
Write and document structured programming code for electro-mechanical systems.
Assemble, wire, program and test electrical equipment, motors and control systems.
Communicate effectively on complex engineering matters with technical and non-technical audiences.

Transferable skills

Hold paramount the health and safety of themselves and others, and model health and safety conscious behaviour.
Self-motivated, work independently and take responsibility for their actions. Set themselves challenging personal targets and make own decisions.
Communicate confidently to create and maintain working relationships. Be respectful.
Prioritise quality. Follow rules, procedures and principles in ensuring work completed is fit for purpose, and pay attention to detail / error checks throughout activities.
Adjust to different conditions, technologies, situations and environments and to new and emerging technologies.
Exercise responsibilities in an ethical manner, with openness, fairness and honesty.
Commit to personal learning and professional development.

Study

Study time

Type	Required
Lectures	17 sessions of 1 hour (11%)
Seminars	10 sessions of 1 hour (7%)
Tutorials	2 sessions of 2 hours (3%)
Supervised practical classes	4 sessions of 2 hours (5%)
Work-based learning	30 sessions of 1 hour (20%)
Online learning (independent)	4 sessions of 2 hours (5%)
Private study	73 hours (49%)
Total	150 hours

Private study description

73 hours guided independent learning (including VLE use).

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group D1

	Weighting	Study time	Eligible for self-certification

Assessment component

Laboratory Report	30%	Yes (extension)

Laboratory Report on Practical Machines Lab and Simulated Machine Control Lab (2000 or equivalent)

Reassessment component is the same

Assessment component

Online Examination	70%	No

QMP examination with submission of workings (answer book is required)

~Platforms - AEP,QMP

- Students may use a calculator
- Engineering Data Book 8th Edition
- Online examination: No Answerbook required

Reassessment component is the same

Feedback on assessment

Support through advice and feedback hours.
Cohort-level feedback on final exam.
Feedback on lab assignment reports

Past exam papers for ES3H8

Availability

Courses

This module is Core for:

- Year 4 of DESA-H360 Undergraduate Electromechanical Engineering (Degree Apprenticeship)