

WM299-15 Robot Power and Intelligent Control

27/28

Department

WMG

Level

Undergraduate Level 2

Module leader

Rob Thornton

Credit value

15

Module duration

10 weeks

Assessment

100% coursework

Study location

University of Warwick main campus, Coventry

Description

Introductory description

Building on material in 'Electrical Power and Motors' in first year, expanding on the complexity of electro-mechanical systems and introducing further actuation methods, and the integration of intelligent control with sensors and microcontrollers for robotic systems.

Module aims

The aim of this module is to learn the working principles and capabilities of a more powerful and more intelligent electromechanical systems to design appropriate control strategies for optimal performance. On completion of this module, the students will be able to propose how to control a typical robotic system.

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.

- Laplace Transforms, transfer functions, introduction to Fourier Series.
- Control systems (open-loop, closed-loop, PID) and controller tuning.
- Introduction to signal processing in control. (Sampling Rate, Filtering and Data Acquisition Boards)
- Introduction to different methods of control (intelligent, adaptive, sliding, fuzzy logic, etc.)
- Motor drives including H-bridge. Intelligent control of drive systems.
- Actuator control characteristics and thermal and mechanical considerations of actuators.

Example of the design of a robot: modelling, control and system structure.

Learning outcomes

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

- Design appropriate control strategies for real-time applications [AHEP:4-C1, C2].
- Identify actuators for robotic systems [AHEP:4-C13].
- Analyse the performance of simulated motor control systems [AHEP:4-C3].
- Implement the main concepts of intelligent control to tune motion control systems [AHEP:4-C6].

Indicative reading list

[Reading lists can be found in Talis](#)

Subject specific skills

Maths content : Laplace Transforms, Introduce Fourier Series

Evaluate the pros and cons of different actuators and control strategies.

Develop an understanding of the characteristics of the different control systems and actuators present in electromechanical systems.

Transferable skills

This module will contribute to the development of the following from the Warwick Core Skills framework:

Communication: Professional writing

Critical Thinking: Interpreting, analysing

Digital literacy: IT skills

Problem Solving: Problem creation, logical reasoning

Study

Study time

Type	Required
Lectures	12 sessions of 1 hour (8%)
Seminars	12 sessions of 1 hour (8%)
Practical classes	6 sessions of 1 hour (4%)
Online learning (independent)	30 sessions of 1 hour (20%)
Private study	30 hours (20%)
Assessment	60 hours (40%)
Total	150 hours

Private study description

Online learning (independent): Engagement with provided study materials and signposted resources - review, interpretation and application to example problems and case studies.

Private study: Creation of own study materials - e.g. notes, flashcards, summaries, etc.

Engagement with self-identified materials - industry reports, technical videos, podcasts, journal articles, etc.

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A

	Weighting	Study time	Eligible for self-certification
Assessment component			
Assessment 1	30%	18 hours	No
Computer-based exam covering mathematical principles, control systems theory and actuator selection.			

Reassessment component is the same

	Weighting	Study time	Eligible for self-certification
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Assessment component			
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Assessment 2	70%	42 hours	Yes (extension)
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Individual report on the design and simulation of an industry-relevant motion control system.

Reassessment component			
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Assessment 2 reassessment			No
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Individual report on the design and simulation of an industry-relevant motion control system.

Feedback on assessment

Formative: Verbal feedback during interactive class sessions and practical sessions; (Automated) individual feedback for computer-based tests; Verbal feedback during ad hoc meetings.

Summative: Cohort level summary feedback for formal tests / exams; Written feedback and marks aligned with University 20 point marking scale.

Availability

There is currently no information about the courses for which this module is core or optional.