ES2F7-15 Mechatronics and Systems Control

23/24

Department
School of Engineering
Level
Undergraduate Level 2
Module leader
Matt Sokola
Credit value
15
Module duration
10 weeks
Assessment
100% coursework
Study locations
University of Warwick main campus, Coventry Primary
Distance or Online Delivery

Description

Introductory description

The module aims to provide the students with fundamental concepts and tools for understanding mechatronic systems and principal control design methodologies in modern industry.

Module aims

This module aims to provide the students with an understanding of key concepts and elements of modern mechatronic systems found in a range of engineering applications. Building on several Y2 subjects, it equips students with knowledge and skills to perform mathematical modelling and simulation analyses of subsystems and overall mechatronic systems.

Examples, case studies and simulation work span a number of system-oriented disciplines within the engineering sector.

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.

- Introduction to mechatronics
- Signal conditioning, data presentation and display systems
- Mechanical and electrical actuation systems
- Embedded systems
- System models, dynamic responses of systems
- Closed-loop control systems, application of controllers
- Analysis of a robot as a mechatronic system

Learning outcomes

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

- Demonstrate knowledge and understanding of various mechatronics-based embedded systems
- Examine the relationship of physical parameters and model parameters
- Apply mathematical and analytical skills to analyse, model and simulate first-order and second-order subsystems, both mechanical and electrical
- Analyse mechatronic systems and sub-systems as well as their closed-loop performance
- Compare the characteristics of different mechatronic systems with respect to functionality, performance, power level, power medium and automation level.

Indicative reading list

1. W. Bolton: “Mechatronics: A multidisciplinary approach", (Pearson), ISBN: 9780273742869, (2012).
2. R. Isermann "Mechatronic systems: fundamentals", (Springer E-Book), ISBN: 9781846282591 , (2005).
3. B. Siciliano: "Robotics: modelling, planning and control", (Springer E-book), ISBN: 9781846286421 (2009)
4. S.J.Dods:"Feedback control : linear, nonlinear and robust techniques and design with industrial applications", (Springer e-book), ISBN: 9781447166757 (2015).
5. A.S.Morris, R. Langari: "Measurement and instrumentation : theory and application", (Academic press e-book), ISBN: 9780128011324 (2015).

View reading list on Talis Aspire

Subject specific skills

- Communicate technical information with others at all levels, including technical reports and the use of digital tools: using simulation - SIMULINK.
- Follow a methodical approach to engineering problem solving: Mathematical modelling of linear models.
- Model real-world mechanical systems efficiently: Modelling of mass-spring-damper systems.
- Select the design solution for a given electro-mechanical engineering application and environment using data to inform their decisions: Choosing a suitable controller for a robotic

arm.
- Comply with statutory and organisational safety requirements: Within practical demonstrations/exercises.

Transferable skills

- Hold paramount the health and safety of themselves and others, and model health and safety conscious behaviour: Within practical demonstrations/exercises.
- Communicate confidently to create and maintain working relationships. Be respectful: Write the IMA and PMA reports.
- Work collaboratively as a team player. Able to work effectively within a team and interact with /help others when required: Teamwork when solving the problems in the in-module assignment.
- Adjust to different conditions, technologies, situations and environments and to new and emerging technologies: Using Matlab/Simulink to validate systems' performance, problem solving,

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Study

Study time

Type	Required
Lectures	15 sessions of 1 hour (10%)
Seminars	4 sessions of 1 hour (3%)
Demonstrations	(0%)
Practical classes	8 sessions of 1 hour (5%)
Work-based learning	35 sessions of 1 hour (23%)
Online learning (scheduled sessions)	5 sessions of 1 hour (3%)
Online learning (independent)	(0%)
Private study	83 hours (55%)
Total	150 hours

Private study description

30 hours guided independent learning (including VLE use).

- Pre-module reading list given on Moodle to encourage flipped learning approach,
- Online tutor-recorded videos (asynchronous),
- Online forum for discussing queries with course peers and tutor ((asynchronous),
- Online consulting session for providing one to one support to help students while completing post-module assignment (synchronous),
- Distance learning support using technology enhanced learning.

- Self-study: reading around the materials that will support the post-module assignment
  53 hours for work on assessments

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A1

	Weighting	Study time	Eligible for self-certification
Assessment component			
Portfolio Assignment	30%		Yes (extension)
A portfolio showing the completion of daily activities during the teaching days. Group work but submitted individually.			
Reassessment component is the same			
Assessment component			
Assignment	70%		Yes (extension)
An individual report on modelling and analysing a mechatronic system.			
Reassessment component is the same			

Feedback on assessment

Feedback will be given as appropriate to the assessment type:

- individual verbal formative feedback on seminars and presentations,
- individual written feedback on the in-module assignment,
- individual written summative feedback on the post-module assignment.

Availability

Courses

This module is Core for:

- Year 3 of DESA-H360 Undergraduate Electromechanical Engineering (Degree Apprenticeship)