Instrumentation and Control Engineering

Module Information

2022.01, Approved

Summary Information

Module Code	5405ELE
Formal Module Title	Instrumentation and Control Engineering
Owning School	Engineering
Career	Undergraduate
Credits	20
Academic level	FHEQ Level 5
Grading Schema	40

Teaching Responsibility

LJMU Schools involved in Delivery
Engineering

Learning Methods

Learning Method Type	Hours
Lecture	22
Practical	11
Tutorial	11

Module Offering(s)

Display Name	Location	Start Month	Duration Number Duration Unit
JAN-CTY	CTY	January	12 Weeks

Aims and Outcomes

Aims	To develop an understanding of components and the principles of control systems, basic design and analysis techniques, and practice some control applications.

After completing the module the student should be able to:

Learning Outcomes

Code	Number	Description
MLO1	1	Analyse measurement devices for temperature, position and force.
MLO2	2	Demonstrate an understanding of the basic concepts of dynamic system response and closed loop control.
MLO3	3	Develop models for simple dynamic plant.
MLO4	4	Design controllers and analyse system performance.
MLO5	5	Simulate control systems with appropriate software and assess system performance.

Module Content

Outline Syllabus	Temperature measurement: thermometers, thermistors and thermo-couples Force and weight measurement: strain gauges and bridge circuit Displacement measurement: potentiometers, LVDT (linear variable difference transformer) P&ID Diagrams Introduction: control system structure including sensors, controllers, actuators and plants. Matlab/Simulink Modelling & Simulation: introduce transfer function models for different plants, how to simulate a control system with Matlab/Simulink for system analysis and performance assessment. Block diagram analysis. Stability analysis: pole location method and Routh method Time response analysis: characteristics for first order and second order systems, response to step and ramp input. Controller design: design specification in time domain, functions of P, I and D control, empirical controller parameter setting method. State space representation Computer packages will be used to gain experience in applying and simulating techniques.
Module Overview	
Additional Information	This level 5 module develops an understanding of the modelling, application, design and analysis of control systems with Matlab/Simulink. General Notes UNESCO Sustainable Development GoalsGood Health and WellbeingQuality EducationAffordable and Clean EnergyDecent Work and Economic GrowthIndustry, Innovation and InfrastructureSustainable Cities and CommunitiesResponsible Consumption and ProductionUK 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.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.M13 Select and apply appropriate materials, equipment, engineering technologies and processes, recognising their limitations.M17 Communicate effectively on complex engineering matters with technical and non-technical audiences, evaluating the effectiveness of the methods used.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.B6 Apply an integrated or systems approach to the solution of 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.B13 Select and apply appropriate materials, equipment, engineering technologies and processes.B17 Communicate effectively with technical and non-technical audiences.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 skills learning outcomes is K5.

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Module Learning Outcome Mapping
Centralised Exam	Exam	60	2	MLO1, MLO2, MLO3, MLO4
Report	Report	40	0	MLO1, MLO3, MLO5

Module Contacts