

# Control Systems

## Module Information

2022.01, Approved

### Summary Information

Module Code	7302ELEM
Formal Module Title	Control Systems
Owning School	Engineering
Career	Postgraduate Taught
Credits	20
Academic level	FHEQ Level 7
Grading Schema	50

### Teaching Responsibility

LJMU Schools involved in Delivery
Engineering

### Learning Methods

Learning Method Type	Hours
Lecture	22
Practical	6
Tutorial	11

### Module Offering(s)

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

### Aims and Outcomes

Aims	This module aims to let students learn state space control method for dynamic system modelling, control and analysis.
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**After completing the module the student should be able to:**

### Learning Outcomes

Code	Number	Description
MLO1	1	Construct a state space model for a complex dynamic system based on its ODEs
MLO2	2	Critically analyse system characteristics and design state feedback control systems
MLO3	3	Design state observers and observer based state feedback control systems
MLO4	4	Critically evaluate the control systems using Matlab/Simulink

### Module Content

Outline Syllabus	System Modelling: State space modelling for electrical and electronic systems, mechanical systems, process systems, etc. Transformation from state space model to transfer function model, Transformation between continuous and discrete state space models, state space model standard form. System Characteristics: State transition matrix, solution of state equations, controllability, observability, stability, State Feedback Control: Pole placement method in both continuous and discrete forms, observer design in both continuous and discrete forms, observed state feedback. Optimal Control: Quadratic performance index, Lyapunov equation, quadratic optimal control with Riccati equation.
Module Overview	This module extends your experience of classical control techniques to modern state space control techniques for linear systems. The emphasis is on the understanding of design techniques for control system design for both single-input single-output and multi-input multi-output dynamic systems. You will learn to apply the techniques both theoretically and practically to industrial systems by simulation. The module aims to let you learn state space control method for dynamic system modelling, control and analysis.
Additional Information	This level 7 module extends a prospective student's experience of classical control techniques to modern state space control techniques for linear systems. The emphasis is on the understanding of design techniques for control system design for both single-input single-output and multi-input multi-output dynamic systems. Students will learn to apply the techniques both theoretically and practically to industrial systems by simulation.

### Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Module Learning Outcome Mapping
Centralised Exam	Exam	70	2	MLO1, MLO2, MLO3
Report	System design Matlab/Simulink	30	0	MLO1, MLO2, MLO3, MLO4

### Module Contacts

#### Module Leader

Contact Name	Applies to all offerings	Offerings
Dingli Yu	Yes	N/A

#### Partner Module Team

Contact Name	Applies to all offerings	Offerings
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