Liverpool John Moores University

Title:	Control Systems
Status:	Definitive
Code:	**7123MSE** (120745)
Version Start Date:	01-08-2018
Owning School/Faculty:	Electronics and Electrical Engineering
Teaching School/Faculty:	Electronics and Electrical Engineering

Team	Leader
Dingli Yu	Y
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Academic Level:	FHEQ7	**Credit Value:**	10	**Total Delivered Hours:**	44
Total Learning Hours:	100	**Private Study:**	56		

Delivery Options
Course typically offered: Semester 2

Component	Contact Hours
Lecture	24
Practical	6
Tutorial	12

Grading Basis: 50 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	Exam	Exam	70	2
Essay	AS1	System design using Matlab/Simulink	30	

Aims

This module aims to let students learn state space control method for dynamic system modelling, control and analysis.

Learning Outcomes

After completing the module the student should be able to:

1	Construct a state space model for a dynamic system based on its ODEs
2	Analyse system characteristics and design state feedback control systems
3	Design state observers and observer based state feedback control systems
4	Evaluate the control systems using Matlab/Simulink

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

Exam	1	2	3	
System design Matlab/Simulink	1	2	3	4

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.

Learning Activities

Lectures supported by handouts.
Tutorials supported by handouts and using appropriate software.
An individual student report is required for the coursework.

Notes

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.