Liverpool John Moores University

Title:	MODERN CONTROL
Status:	Definitive
Code:	**7014ENG** (105391)
Version Start Date:	01-08-2016
Owning School/Faculty:	Electronics and Electrical Engineering
Teaching School/Faculty:	Electronics and Electrical Engineering

Team	Leader
Dingli Yu	Y

Academic Level:	FHEQ7	**Credit Value:**	20	**Total Delivered Hours:**	38
Total Learning Hours:	200	**Private Study:**	162		

Delivery Options
Course typically offered: Semester 2

Component	Contact Hours
Lecture	24
Tutorial	12

Grading Basis: 50 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1	Examination	70	2
Essay	AS2	Design Study	30	

Aims

To extend the classical control techniques and introduce linear modern control theory and applications in state space.

Learning Outcomes

After completing the module the student should be able to:

1 Understand basic modern control concepts, theory and main areas of applications.
2 Model a dynamic system and analyse system characteristics such as controllability, observerability and stability, etc.
3 Design control systems in both continuous and discrete time using state feedback, observer-based state feedback, and optimal control techniques.
4 Use Matlab/Simulink to aid controller design and assess the performance of the designed control systems.

Learning Outcomes of Assessments

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

Examination	1	2	3	
Design Study	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. System matrix diagnolisation.

System Characteristics: State transition matrix, solution of state equations, controllability, observerbility, stability,

State Feedback Control: Pole placement method in both continuous and discrete forms, observer design in both continuous and discrete forms, observed state feedback, type 0 tracking system, type I tracking system.

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 MATLAB/Simulink and toolboxes.
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.