

## Liverpool John Moores University

Title: CONTROL SYSTEMS  
Status: Definitive  
Code: **6010ENG** (106215)  
Version Start Date: 01-08-2016

Owning School/Faculty: Electronics and Electrical Engineering  
Teaching School/Faculty: Electronics and Electrical Engineering

Team	Leader
Barry Gomm	Y

**Academic Level:** FHEQ6  
**Credit Value:** 24  
**Total Delivered Hours:** 87  
**Total Learning Hours:** 240  
**Private Study:** 153

### Delivery Options

Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	48
Practical	12
Tutorial	24

**Grading Basis:** 40 %

### Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1	Examination	70	3
Essay	AS2	Coursework	15	
Essay	AS3	Coursework	15	

### Aims

*To extend the basic concepts of control in level 2 in the design and analysis of continuous and digital control systems.*

### Learning Outcomes

After completing the module the student should be able to:

- 1 Analyse and design dynamic compensation employing frequency analysis
- 2 Construct root locus of closed-loop system response and design systems using root locus technique
- 3 Examine and evaluate system stability
- 4 Apply the state space concept and characteristics of linear systems
- 5 Apply state feedback control with pole-placement method
- 6 Obtain discrete transfer functions for dynamic systems
- 7 Analyse and synthesize sampled-data systems in the z-domain
- 8 Design and simulate control systems using computer software, e.g. Matlab/Simulink

### Learning Outcomes of Assessments

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

EXAM	1	2	3	4	5	6	7
CW	1	2	8				
CW	6	7	8				

### Outline Syllabus

*Root locus: root locus concepts and construction. analysis and design with root locus. Frequency analysis: Nyquist criterion, Bode plots, design criteria in frequency domain.*

*State space: state variables and state space models, diagonalisation of system matrix, solving state equation, controllability and observability, pole placement by state feedback, state observers.*

*Digital systems: sampled-data systems, pulse transfer function, closed-loop transfer function, stability analysis, direct synthesis method, discrete system simulation.*

### Learning Activities

Combination of lectures, tutorials, and laboratory work

### Notes

This level 3 module extends level 2 concepts into continuous control design using frequency response, root locus and state space methods. It also extends level 2 concepts into discrete control system modelling and controller design by mathematical analysis and synthesis.