**Liverpool** John Moores University

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|---|---|
| Title: | Control System Design and Analysis |
| Status: | Definitive |
| Code: | **5305MAN** (121981) |
| Version Start Date: | 01-08-2021 |
| Owning School/Faculty: | Engineering |
| Teaching School/Faculty: | Engineering |

| Team | Leader |
|---|---|
| Barry Gomm | Y |
| Dingli Yu | |

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| **Academic Level:** | FHEQ5 | **Credit Value:** | 20 | **Total Delivered Hours:** | 47 |
| **Total Learning Hours:** | 200 | **Private Study:** | 153 | | |

**Delivery Options**
Course typically offered: Semester 1

| Component | Contact Hours |
|---|---|
| Lecture | 33 |
| Practical | 6 |
| Tutorial | 6 |

**Grading Basis:** 40 %

**Assessment Details**

| Category | Short Description | Description | Weighting (%) | Exam Duration |
|---|---|---|---|---|
| Exam | Exam | Exam | 60 | 2 |
| Report | Report | PC Based Assignment | 40 | |

**Aims**

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

## Learning Outcomes

After completing the module the student should be able to:

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|---|---|
| 1 | Demonstrate an understanding of the basic concepts of dynamic system response and closed loop control. |
| 2 | Develop models for simple dynamic plant with appropriate software. |
| 3 | Demonstrate ability to design controllers and analyse system stability. |
| 4 | Simulate control systems with appropriate software and assess system performance. |
| 5 | Demonstrate understanding of system components and controller realisation. |

## Learning Outcomes of Assessments

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

| | | | | | |
|---|---|---|---|---|---|
| Exam | 1 | 2 | 3 | 4 | 5 |
| Report | 2 | 4 | | | |

## Outline Syllabus

*Introduction: control system structure including sensors, controllers, actuators and plants.*
*Matlab/Simulink*
*Modelling & Simulation: introduce transfer function models for different plants, how to use Matlab/Simulink to model a dynamic system, how to simulate a control system with Matlab/Simulink for system analysis and performance assessment.*
*Integration algorithms, State Space representation*
*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.*
*Industrial control: implementation of PID controllers, proportional and derivative kicks, integral controller wind-up and anti-wind-up method.*
*Control system hardware design.*
*Block diagram analysis.*
*Stability: concept of absolute and relative stability, stability analysis.*
*Computer packages will be used to gain experience in applying and simulating techniques.*

## Learning Activities

By a series of lectures, tutorials and computer simulations.

## Notes

This level 5 module develops an understanding of the modelling, application, design

and analysis of control systems with Matlab/Simulink.

In this module, the knowledge learning outcomes are K4.