

### Summary Information

|                            |                                    |
|----------------------------|------------------------------------|
| <b>Module Code</b>         | 5305ELE                            |
| <b>Formal Module Title</b> | Control System Design and Analysis |
| <b>Owning School</b>       | Engineering                        |
| <b>Career</b>              | Undergraduate                      |
| <b>Credits</b>             | 20                                 |
| <b>Academic level</b>      | FHEQ Level 5                       |
| <b>Grading Schema</b>      | 40                                 |

### Module Contacts

#### Module Leader

| Contact Name | Applies to all offerings | Offerings |
|--------------|--------------------------|-----------|
| Qian Zhang   | Yes                      | N/A       |

#### Module Team Member

| Contact Name | Applies to all offerings | Offerings |
|--------------|--------------------------|-----------|
|--------------|--------------------------|-----------|

#### Partner Module Team

| Contact Name | Applies to all offerings | Offerings |
|--------------|--------------------------|-----------|
|--------------|--------------------------|-----------|

### Teaching Responsibility

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|--|
| <b>LJMU Schools involved in Delivery</b> |
| Engineering                              |

### Learning Methods

| Learning Method Type | Hours |
|----------------------|-------|
|----------------------|-------|

|           |    |
|-----------|----|
| Lecture   | 22 |
| Practical | 11 |
| Tutorial  | 11 |

### Module Offering(s)

| Offering Code | Location | Start Month | Duration |
|---------------|----------|-------------|----------|
| JAN-CTY       | CTY      | January     | 12 Weeks |

### Aims and Outcomes

|             |  |
|-------------|--|
| <b>Aims</b> | 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:

| Code | Description  |
|------|--|
| MLO1 | Demonstrate an understanding of the basic concepts of dynamic system response and closed loop control. |
| MLO2 | Develop models for simple dynamic plant with appropriate software.                                     |
| MLO3 | Demonstrate ability to design controllers and analyse system stability.                                |
| MLO4 | Simulate control systems with appropriate software and assess system performance.                      |
| MLO5 | Demonstrate understanding of system components and controller realisation.                             |

### Module Content

| Outline Syllabus   |
|--|
| <p>Introduction: control system structure including sensors, controllers, actuators and plants. Matlab/Simulink Modelling &amp; 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.</p> |

### Module Overview

This module aims to develop your understanding of the modelling, application, design and analysis of control systems with Matlab/Simulink. You will learn to demonstrate an understanding of the basic concepts of dynamic system response and closed loop control, alongside the developing ability to design controllers and analyse system stability.

### Additional Information

This level 5 module develops an understanding of the modelling, application, design and analysis of control systems with Matlab/Simulink. Where this module is part of a Degree Apprenticeship programme, the skills learning outcomes is S9

### Assessments

| Assignment Category | Assessment Name | Weight | Exam/Test Length (hours) | Learning Outcome Mapping |
|---------------------|-----------------|--------|--------------------------|--------------------------|
| Centralised Exam    | Exam            | 60     | 2                        | MLO5, MLO3, MLO1, MLO2   |
| Report              | Report          | 40     | 0                        | MLO2, MLO4               |