

Control System Design and Analysis

Module Information

2022.01, Approved

Summary Information

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

Teaching Responsibility

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| LJMU Schools involved in Delivery |
| LJMU Partner Taught |

Partner Teaching Institution

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| Institution Name |
| Changshu Institute of Technology |

Learning Methods

| Learning Method Type | Hours |
|----------------------|-------|
| Lecture | 40 |
| Practical | 8 |

Module Offering(s)

| Display Name | Location | Start Month | Duration Number Duration Unit |
|--------------|----------|-------------|-------------------------------|
| SEP-PAR | PAR | September | 12 Weeks |

Aims and Outcomes

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| 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. |
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After completing the module the student should be able to:

Learning Outcomes

| Code | Number | Description |
|------|--------|---|
| MLO1 | 1 | Demonstrate an understanding of the basic concepts of the automatic control system, the feedback control system and the control mode. |
| MLO2 | 2 | Demonstrate the ability to establish the transfer functions of the control system with typical links and develop a mathematical model and analyse the system dynamic performance index. |
| MLO3 | 3 | Demonstrate an understanding of the basic concept of frequency characteristics, and the relationship between frequency characteristics and system stabilities. |
| MLO4 | 4 | Demonstrate the use the simulation software to analyse the control system and adjust the system performance according to the analysis results. |
| MLO5 | 5 | Simulate control systems with appropriate software and assess system performance. |
| MLO6 | 6 | Demonstrate understanding of system components and controller realisation. |

Module Content

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| 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. |
| Module Overview | |
| Additional Information | The modules develops an understanding of the modelling, application, design and analysis of control systems with Matlab/Simulink. Reports are 2500 maximum word count. Examinations are 2 hour duration. |

Assessments

| Assignment Category | Assessment Name | Weight | Exam/Test Length (hours) | Module Learning Outcome Mapping |
|---------------------|-----------------|--------|--------------------------|------------------------------------|
| Exam | Exam | 60 | 2 | MLO1, MLO2, MLO3, MLO4, MLO5, MLO6 |
| Technology | Programming | 40 | 0 | MLO2, MLO5 |

Module Contacts

Module Leader

| Contact Name | Applies to all offerings | Offerings |
|--------------|--------------------------|-----------|
| Barry Gomm | Yes | N/A |

Partner Module Team

| Contact Name | Applies to all offerings | Offerings |
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