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| <b>Module Code</b>                                                                                                                                 | MEU44B09                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Module Name</b>                                                                                                                                 | Control Engineering 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>ECTS Weighting<sup>1</sup></b>                                                                                                                  | 5 ECTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Semester taught</b>                                                                                                                             | Semester 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Module Coordinator/s</b>                                                                                                                        | Prof. Henry Rice                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b><a href="#">Module Learning Outcomes</a> with reference to the <a href="#">Graduate Attributes</a> and how they are developed in discipline</b> | <p>On successful completion of this module, students should be able to:</p> <p>LO1. Draw a block diagram for a control system starting with a schematic of the system and find the overall transfer function for the system</p> <p>LO2. Identify and analyse the performance of 1<sup>st</sup> and 2<sup>nd</sup> order systems using s-plane analysis</p> <p>LO3. Use the root locus as a design tool to alter the response of a control system/ plant by introducing a compensator</p> <p>LO4. Use Matlab Control Systems Toolbox to analyse and design control systems</p> <p>LO5. Understand how to apply PID Control to a DC motor</p> <p><b>Graduate Attributes: levels of attainment</b><br/> To act responsibly - Enhanced<br/> To think independently - Enhanced<br/> To develop continuously - Enhanced<br/> To communicate effectively - <b>Enhanced</b></p> |
| <b>Module Content</b>                                                                                                                              | <p>This course introduces the student to various systems of continuous control of electrical, electronic, mechanical and combined systems. First and second order systems are studied, with extensions to higher order systems using approximate methods and computer modelling (using Matlab). Aspects of control systems which are discussed include stability, steady state error and frequency response. Techniques covered include transfer functions, block diagram algebra, the root-locus method and frequency response design methods.</p>                                                                                                                                                                                                                                                                                                                     |

**Teaching and Learning Methods**

This module uses Blackboard, podium lectures, self learning, a laboratory session and tutorials to help students achieve the required learning outcomes.

In the current Covid-19 situation or in a new lockdown situation, the following changes to the normal teaching methods apply:

1. All lectures and tutorials will be delivered online.
2. Recorded lectures will be available on Blackboard
3. The end of semester exam will be online.

**Assessment Details<sup>2</sup>**

Please include the following:

- **Assessment Component**
- **Assessment description**
- **Learning Outcome(s) addressed**
- **% of total**
- **Assessment due date**

| Assessment Component   | Assessment Description        | LO Addressed | % of total | Week due (provisional)        |
|------------------------|-------------------------------|--------------|------------|-------------------------------|
| Written Examination    | End of Semester examination   | LO1-LO4      | 85%        | Exam Period                   |
| Laboratory Exercise    | Staggered throughout semester | LO4-LO5      | 15%        | Staggered throughout Semester |
| Self Learning Exercise | Entire Semester               | LO1-LO4      | 0          | No submission required        |

**Reassessment Requirements**

Written Examination

**Contact Hours and Indicative Student Workload<sup>2</sup>**

**Contact hours: 46 (33 Lectures, 11 tutorials, 1 Lab)**

**Independent Study (preparation for course and review of materials): 30**

**Independent Study (preparation for assessment, incl. completion of assessment): 40**

**Recommended Reading List**

Control Systems Engineering by Norman S. Nise, Wiley.

E-book is available via the College Library

**Module Pre-requisite**

None

**Module Co-requisite**

None

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|---------------------------------------------------------------------------------------------------------------|------------|
| <b>Module Website</b>                                                                                         | Blackboard |
| <b>Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.</b> | No         |
| <b>Module Approval Date</b>                                                                                   |            |
| <b>Approved by</b>                                                                                            |            |
| <b>Academic Start Year</b>                                                                                    |            |
| <b>Academic Year of Date</b>                                                                                  |            |