Module Code	MEU44B19
Module Name	**Mechatronics and Control Systems**
ECTS Weighting	5 ECTS
Semester taught	Semester 2
Module Coordinator/s	Assistant Professor Siyuan Zhan
Module Learning Outcomes with reference to the Graduate Attributes and how they are developed in discipline	On successful completion of this module, students should be able to: LO1. Develop mathematical models, block diagrams, and transfer-function representations for mechatronic and control systems from physical schematics and system descriptions. LO2. Analyse the transient, steady-state, stability, and frequency-domain performance of linear control systems. LO3. Design and justify classical controllers and compensators using root locus, frequency-response, and PID-based methods to meet specified engineering requirements. LO4. Explain the role and characteristics of key mechatronic components in feedback control systems, including sensors, actuators, signal conditioning, data acquisition, and microprocessor-based control. LO5. Use MATLAB and Simulink to model, simulate, analyse, and validate the performance of mechatronic control systems. LO6. Evaluate practical implementation issues in mechatronic control systems, including measurement noise, sampling, actuator limitations, saturation, safety, robustness, and performance trade-offs. **Graduate Attributes: levels of attainment** To act responsibly – Enhanced To think independently – Enhanced To develop continuously – Enhanced To communicate effectively – Enhanced
Module Content	This module introduces the principles of mechatronics and control systems for engineering applications. It combines classical control theory with the practical components required to implement feedback control systems, including sensors, actuators, signal conditioning, data acquisition, and microprocessor-based control. MATLAB and Simulink are used to support system modelling, simulation, controller design, and performance validation. Module Syllabus • Introduction to mechatronic and feedback control systems • Physical system modelling, transfer functions, and block diagrams • Time-domain response, transient specifications, steady-state error, and stability • Frequency-domain analysis using Bode and Nyquist plots • Root locus analysis and compensator design • PID control design, tuning, and implementation • Sensors, actuators, data acquisition, and microprocessor-based control

- MATLAB and Simulink modelling, simulation, and controller validation
- Experiments based on mechatronic control systems

Teaching and Learning Methods

This module uses lectures, tutorials, laboratory sessions, MATLAB/Simulink-based exercises, and self-directed learning to help students achieve the required learning outcomes. Lectures introduce the theoretical principles of mechatronics and control systems, including modelling, analysis, controller design, sensors, actuators, and microprocessor-based implementation. Tutorials support problem solving and application of control methods to engineering systems.

Laboratory and simulation activities allow students to apply the material to practical mechatronic control problems. Students will use MATLAB and Simulink to model systems, analyse performance, design controllers, and evaluate the effects of practical implementation issues such as sensor noise, actuator limitations, sampling, and system uncertainty. Case studies may be used to connect theory with multidisciplinary engineering applications.

Students are encouraged to take a self-directed learning approach through independent reading, problem practice, software exercises, and review of lecture and tutorial materials.

Assessment Details

Assessment Component	Assessment Description	LO Addressed	% of total	Week Due
Written Examination	End-of-semester written examination assessing core principles of mechatronic and control systems.	1-6	70%	Exam period
Written and MATLAB/Simulink Design Assignments	Written and computer-based assignments assessing modelling, analysis, controller design, and simulation of mechatronic and control systems.	1-6	15%	Weeks 1-12
Laboratory Report	Laboratory report assessing practical understanding and application of mechatronic and control systems.	4-6	15%	Weeks 7-12
Self-Learning Exercise	Self-directed learning activities supporting understanding and application	1-6	0%	No submission

		of mechatronic and control systems.			required

	The pass mark is 40% for the Year 4 - MEU44B09, and 50% for the Year 5 / Masters - MEP55B09.
Reassessment Requirements	Written Examination
Contact Hours and Indicative Student Workload	**Contact hours: 35** **2 lecture slots and 1 tutorial per week, plus one 2-hour laboratory session** **Independent Study: 40** **Preparation for course and review of materials** **Independent Study: 50** **Preparation for assessment, including completion of written and MATLAB/Simulink design assignments and laboratory/case-study report**
Recommended Reading List	Control Systems Engineering by Norman S. Nise, Wiley. Reading materials, available in electronic format on Blackboard. E-books may be available via the College Library.
Module Pre-requisite	EEU33C01 Signals and Systems
Module Co-requisite	N/A
Module Website	See Blackboard
Are other Schools/ Departments involved in the delivery of this module? If yes, please provide details.	No
Module Approval Date	
Approved by	
Academic Start Year	
Academic Year of Date	