Module Proforma

Approved, 2022.01

Summary Information

Module Code	5520USST
Formal Module Title	Mechatronics 2
Owning School	Engineering
Career	Undergraduate
Credits	20
Academic level	FHEQ Level 5
Grading Schema	40

Module Contacts

Module Leader

Contact Name	Applies to all offerings	Offerings
Dante Matellini	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

LJMU Schools involved in Delivery
LJMU Partner Taught

Partner Teaching Institution

Institution Name
University of Shanghai For Science and Technology

Learning Methods

Learning Method Type	Hours
Practical	33
Tutorial	11

Module Offering(s)

Offering Code	Location	Start Month	Duration
JAN-PAR	PAR	January	12 Weeks

Aims and Outcomes

Aims	To develop a practical understanding of how sensors and actuators may be used, along with embedded systems, to control and monitor mechanical engineering systems.

Learning Outcomes

After completing the module the student should be able to:

Code	Description
MLO1	Select appropriate sensors for an application and demonstrate an understanding of their characteristics, and practical interfacing requirements.
MLO2	Select appropriate actuators for an application and demonstrate an understanding of their characteristics, and drive requirements.
MLO3	Determine an appropriate control system structure for an engineering application and demonstrate an understanding of the characteristic dynamic response of a system.
MLO4	Demonstrate an applied understanding of microcontroller hardware interfaces and methods of programming them.

Module Content

Outline Syllabus

Sensors:

- Measured Physical Quantity
  - Temperature
  - Position, Displacement and Velocity
  - Acceleration
  - Pressure and Force
- Signal Type
  - Analogue
  - Digital
- Characteristics
  - Range and Span
  - Sensitivity
  - Precision, Accuracy, Repeatability

Actuators and Indicators:

- Electro-mechanical Actuators
  - Motors
  - Solenoids
- Indicators and Displays

Embedded Systems Hardware:

- Microcontrollers
- Characteristics of I/O
  - Analogue voltage (e.g. typical ranges: 0-5v, +/-10v)
  - Digital (e.g. typical voltages: 3.3v, 5v, 12v, 24v)

Programming Embedded Systems:

- Common programming design patterns using While loops and conditional statements
- Reading from, and writing to hardware ports.

Control:

- Control Objectives
  - Set-point
  - Tracking
  - Stabilisation
- Closed-loop Control
- Feed-forward control
- ON/OFF (Bang-Bang) Control

Module Overview

Additional Information
Delivery: This model incorporates elements of flipped delivery in order to encourage engagement. The source of primary knowledge for this module will be via material made available through the VLE, while understanding will be developed through a tutorial and significant practical content. UN Sustainable Development Goals: Due to its multidisciplinary nature, this module includes content which relates to the following UN Sustainable Development Goals: SDG 3: Good Health and Well-being. This module will consider how drone technology can be used to deliver medicinal supplies in remote areas. SDG 11: Sustainable Cities and Communities. This module will consider how sensors, actuators and control systems can be used to reduce the energy impact and there increase the sustainability of cities. SDG 12: Responsible Consumption and Production. This module will consider how sensors, actuators and automation can be used to produce more effective production techniques. SDG 14: Life underwater. This module will consider how unmanned underwater robot can be used to monitor eDNA for example. SDG 15: Life on land. This module will consider how sensors deployed on drones can been used to monitor wildlife and its habitat on land.

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Learning Outcome Mapping
Portfolio	Lab Portfolio	100	0	MLO1, MLO2, MLO3, MLO4