

## Liverpool John Moores University

Title: Mechatronics  
Status: Definitive  
Code: **5507MECBHG** (128783)  
Version Start Date: 01-08-2021

Owning School/Faculty: Engineering  
Teaching School/Faculty: Beaconhouse IC Islamabad

Team	Leader
Russell English	Y

**Academic Level:** FHEQ5      **Credit Value:** 20      **Total Delivered Hours:** 26  
**Total Learning Hours:** 200      **Private Study:** 174

### Delivery Options

Course typically offered: Semester 2

Component	Contact Hours
Practical	24
Tutorial	2

**Grading Basis:** 40 %

### Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Practice	AS1	Practical - lab based exercises	100	

### 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:

- 1 Select appropriate sensors for an application and demonstrate an understanding of their characteristics, and practical interfacing requirements
- 2 Select appropriate actuators for an application and demonstrate an understanding of their characteristics, and drive requirements
- 3 Determine an appropriate control system structure for an engineering application and demonstrate an understanding of the characteristic dynamic response of a system.
- 4 Demonstrate an applied understanding of hardware interfaces and methods of programming.

## Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

Practical assessments in a lab      1      2      3      4

## Outline Syllabus

*The list below provides an overview of topics which may be covered in this module:*

### *Sensors*

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

### *Actuators and Indicators*

- *Electro-mechanical Actuators*
  - o *Motors*
  - o *Solenoids*
- *Indicators and Displays*
  - o *LED Lights*
  - o *LED Displays*

## *Embedded Systems Hardware*

- *Micro-controllers*
- *Characteristics of I/O*
  - *Analogue Voltage (e.g. Typical Ranges: 0-5v, +/-10v)*
  - *Digital (e.g. Typical Voltages: 3.3v, 5v, 12v, 24v)*
- *Serial Interfaces*
  - *i2c and UART*
- *Signal Conditioning & Filtering*
  - *Amplifiers*
  - *Filters*
  - *Protection*

## *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*

## **Learning Activities**

Tutorial and Practical activities supported by on-line resources.

## **Notes**

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.