Liverpool John Moores University

Title:	MECHATRONICS
Status:	Definitive
Code:	**5068ENG** (115888)
Version Start Date:	01-08-2018
Owning School/Faculty:	Maritime and Mechanical Engineering
Teaching School/Faculty:	Maritime and Mechanical Engineering

Team	Leader
Christian Matthews	Y

Academic Level:	FHEQ5	**Credit Value:**	20	**Total Delivered Hours:**	74
Total Learning Hours:	200	**Private Study:**	126		

Delivery Options
Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	21
Practical	8
Tutorial	42

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1	Examination	60	3
Report	AS2	Laboratory Excercise	40	

Aims

This module will deliver a combination of taught and project based learning to give Level 2 students an introduction to creating Mechatronic Systems. Students will learn about, and apply, electrical and mechanical engineering principles which are required to implement electro-mechanical systems with an element of electronic control. Students will be introduced to modern methods for rapid prototyping mechatronic systems using industry relevant tools.

Learning Outcomes

After completing the module the student should be able to:

1	Identify appropriate sensors and actuators and signal conditioning for a range of mechatronic systems, describe how they work and how they integrate them with mechanical plant and electronic control hardware
2	Apply modelling and simulation techniques to the design and analysis of mechatronic systems
3	Apply open and closed loop control techniques to both real and simulated mechatronic systems

Learning Outcomes of Assessments

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

EXAM	1	2	3
Laboratory Exercise	3		

Outline Syllabus

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Mechanics and Dynamics of Mechanisms: An overview of how common mechanisms and mechanical components are utilised in mechatronic systems. An introduction to simple dynamic system modelling.

Electrical: Practical examples used to learn about important electrical systems such as signal conditioning and power power supplies. Signals (Digital, PWM, FM, Analogue).

Electronics: An introduction to modern embedded electronics hardware with emphasis on capabilities and limitations, practical implementation and operation.

Control: An introduction to the structure and implementation of Open Loop and Closed Loop control systems. The role of control in Mechatronic systems. The Proportional, Integral, Differential (PID) controller, tuning and stability.

Model Based Design: An introduction to the role of 'Model Based Design' (MBD) for developing mechatronic systems. The role of special software and hardware tools in the development cycle. An overview of Model-in-the-Loop (MIL), Hardware-in-the-Loop (HIL) and Rapid Control Prototyping (RCP) methodologies.

Sensors: An introduction to a range of sensors which are commonly used in modern Mechatronic systems (e.g. Optical Encoders, Potentiometers, Accelerometer, Variable Reluctance, Ultrasonic, Gyroscopic). Emphasis is on practical implementation along with an appreciation for mode of operation, strengths and limitations.

Actuators: An introduction to a range of actuators which are commonly used in modern Mechatronic systems (e.g. DC Motors, Stepper Motors, Solenoids, Linear Electro-Mechanical). Emphasis is on practical implementation along with an appreciation for mode of operation, strengths and limitations.

Multiplexing: Serial, CAN, EtherNet.

Industry Applications: Case-studies of industry applications of Mechatronics including analysis of the processes followed and tools used to develop them. Relevant industry jobs and roles.

Learning Activities

Lectures, tutorials, case studies and practical assignments.

Notes

This module develops the practical and theoretical principles underpinning the design of mechatronic systems encountered in a modern engineering environment.