Module Proforma

Approved, 2022.02

Summary Information

Module Code	7301BEUG
Formal Module Title	Sensors, Control and Applications
Owning School	Civil Engineering and Built Environment
Career	Postgraduate Taught
Credits	20
Academic level	FHEQ Level 7
Grading Schema	50

Module Contacts

Module Leader

Contact Name	Applies to all offerings	Offerings
Jeffrey Cullen	Yes	N/A

Module Team Member

Contact Name	Applies to all offerings	Offerings
Badr Abdullah	Yes	N/A
Muhammad Ahmad	Yes	N/A

Partner Module Team

Contact Name	Applies to all offerings	Offerings

Teaching Responsibility

LJMU Schools involved in Delivery
Civil Engineering and Built Environment

Learning Methods

Learning Method Type	Hours
Lecture	12
Practical	12
Tutorial	12

Module Offering(s)

Offering Code	Location	Start Month	Duration
SEP-CTY	CTY	September	12 Weeks

Aims and Outcomes

Aims	To provide the theoretical and practical skills required to design, develop and implement sensor systems in practical applications.

Learning Outcomes

After completing the module the student should be able to:

Code	Description
MLO1	Specify and demonstrate understanding of sensor and control system operation across a range of applications
MLO2	Characterise and critically appraise the performance of such systems
MLO3	Design and construct a sensor/control system of relevance to their specific discipline area

Module Content

Outline Syllabus

Introduction to the principles of sensing, the types of sensors available, their operational principles and the data available from them. Common “off-shelf” sensor systems will be discussed in detail, including those for monitoring temperature, humidity, stress/strain, sound and gases. Discussion of less well-known/used sensor technology will also be covered, including electrochemical, spectroscopy methods (e.g. microwave, optical, Raman, etc.) and imaging in order to broaden student awareness of possibilities. Methods and theoretical underpinning of sensors, including accuracy, precision, sensitivity, and repeatability will be considered. The relevance of signal-to-noise ratio, hysteresis, sampling frequency, drift, analogue vs. digital and environmental factors will be discussed, in addition to practical issues such as placement. Interfacing and relevant electronic principles will be introduced to enable connection of sensors to typical microcontroller based systems, and important considerations in this process (e.g. signal conditioning) will be considered. Control systems will be introduced as a means to make effective use of sensors for automation purposes (e.g. in buildings, manufacturing, etc.). Types of control including logic, on-off, linear, proportional, PID (proportional, integral, derivative), fuzzy logic will be introduced and methods of calculating/characterising performance demonstrated. Building management and automation systems will be discussed in detail. Further examples may be drawn from automotive, construction and manufacturing industries. Practical/tutorial sessions within the module will enable students to undertake a range of supervised works to utilise microcontroller systems for the purposes of creating their own sensor driven control systems. Students will be expected to work individually under supervision of module team to develop their skills and understanding to demonstrate the theoretical underpinnings of the module.

Module Overview

This module provides the theoretical and practical skills required to design, develop and implement sensor systems in practical applications.

Additional Information

To provide the theoretical and practical skills required to design, develop and implement sensor systems in practical applications.

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Learning Outcome Mapping
Centralised Exam	Examination	60	2	MLO1, MLO2
Practice	PRACTICAL EXPERIMENT	40	0	MLO3, MLO1