UNIVERSITY of BRADFORD

Module Descriptor

Module Details	
Module Title	Embedded Electronics
Module Code	ELE5016-B
Academic Year	2024/5
Credits	20
School	School of Computer Science, AI and Electronics
FHEQ Level	FHEQ Level 5

Contact Hours	
Type	Hours
Tutorials	18
Laboratories	22
Lectures	18
Directed Study	142

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Academic Year
BDB	University of Bradford / Academic Year

Module Aims

This Module aims to equip students with fundamental understanding of modern embedded electronic systems, their working principles, and their biomedical and clinical applications.

This Module further aims to introduce and discuss various types of sensors, as well as the acquisition and processing of different signals.

Finally, this Module aims to give students practical, hands-on experience of working with embedded electronics for prototyping purposes.

Outline Syllabus

This Outline Syllabus provides a brief summary of topics that will be covered during the Lecture and Laboratory sessions. This is a non-exhaustive list, with certain details, such as types of sensors used in Labs, subject to hardware availability.
1. Introduction to embedded systems and their applications in biomedical and clinical settings.
2. Anatomy of an embedded system and links to electronics, including memory and peripherals such as UART, I2C, SPI.
3. Programming and software engineering aspects of an embedded system, including regulations and frameworks for writing safe and secure code.
4. Analog and digital signals, including basic signal processing, analog to digital and digital to analog conversion (ADC/DAC).
5. Types of sensors, signal acquisition, and signal processing.
6. Collecting and processing signal data.

Learning Outcomes

Outcome Number	Description
01	Demonstrate broad knowledge of the constituent elements of embedded systems, their interactions and interdependencies.
02	Demonstrate the ability to design, build, interface, and test sensors for the acquisition, storage, display and analysis of signals.
03	Demonstrate the ability to design and code software to implement custom functionality, utilising development boards and components. Debug and troubleshoot said code.
04	Demonstrate the ability to interpret user and system requirements for an embedded system and derive technical requirements, providing rationale for design choices.
05	Demonstrate the ability to document and present the outcomes of design, experimentation, and analysis through the use of technical reports.

Learning, Teaching and Assessment Strategy

Teaching for this module consists of a combination of interactive lectures, tutorials and hands-on lab sessions. Lectures take place during both Semester 1 and Semester 2 in order to introduce and discuss relevant concepts close to their practice and exploration during lab sessions.

Tutorials will take place during Semester 1 and will focus on the programming aspects of this module. This way students will be better equipped to make the most out of the lab sessions in Semester 2. The tutorials will be carried out in a computer room/cluster.
The lab sessions themselves are designed around group work to facilitate teamworking skills and peer-to-peer learning. These sessions use electronics and hardware that are typical for an industry setting with the goal of producing device prototypes.

Where possible, recordings of lectures and lab demonstrations will be made available.

It is a requirement of the Institution of Engineering and Technology (IET) that students MUST achieve a mark of at least 30% in assessment components weighted above 30% IN ADDITION to achieving a mark of at least 40% in the module overall. This requirement applies ONLY to students on IET accredited programmes, which is the BDA occurrence/version of the module.

Assessment is by two Courseworks with equal weight, one in each Semester. These Courseworks are in essence practical mini-projects with an emphasis on the use of different sensors. These Courseworks allow students to demonstrate their skills in designing embedded systems, troubleshooting electronic circuits, and developing computer code, assessing Module Learning Outcomes 1, 2, 3. A theoretical element of the Courseworks, asking students to capture requirements and design a simple device in response, will assess Module Learning Outcomes 4, 5.

This module satisfies the below Learning Outcomes as specified by the Accreditation of Higher Education Programmes: Fourth Edition (AHEP4) as published by The Engineering Council in-line with the UK Standard for Professional Engineering Competence (UK-SPEC).

These outcomes specify five key areas of learning: Science and Mathematics (SM); Engineering Analysis (EA); Design and Innovation (DI); The Engineer and Society (ES); Engineering Practice (EP).

AHEP4 LOs covered: SM-B1, EA-B4, DI-B5, ES-B8, ES-B10, EP-B12, EP-B13, EP-B16,

Further details of these learning outcomes can be found at https://www.engc.org.uk/.

Mode of Assessment

Type	Method	Description	Weighting
Summative	Coursework - Written	A report on practical work during laboratory sessions, covering use of, and interfacing with, simple sensors.	50%
Summative	Coursework - Written	A report on practical work during tutorial sessions, covering use of advanced sensors and data processing.	50%

Reading List

To access the reading list for this module, please visit https://bradford.rl.talis.com/index.html

Please note:
This module descriptor has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but minor changes may occur given the interval between publishing and commencement of teaching. Upon commencement of the module, students will receive a handbook with further detail about the module and any changes will be discussed and/or communicated at this point.

https://bradford.ac.uk