

Module Details	
Module Title	Embedded Electronics
Module Code	ELE5016-B
Academic Year	2021/2
Credits	20
School	Department of Biomedical and Electronics Engineering
FHEQ Level	FHEQ Level 5

Contact Hours	
Type	Hours
Laboratories	40
Lectures	14
Directed Study	146

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

Module Aims
To equip students with the skills and understanding relevant to the use of modern electronic systems (Arduino) for different engineering and clinical applications.

Outline Syllabus
1) Introduction to Arduino hardware and software platform. 2) Analogue and Digital Systems - Introduction to and differences between analogue and digital systems, Basic signal processing, Analogue to Digital Converter (ADC)/Digital to Analogue Converter (DAC), Signal Sampling, Quantisation level, 3) Computer methods for signal capture and display: Arduino (or equivalent) and MATLAB interfacing. 4) Practical experience with analogue and digital circuit construction, sensor interfacing, conditioning and calibration methods and instrumentation for testing. 5) Arduino programming: Arduino Functions including Digital I/O, Analogue I/O, Time, Communication, Maths; Arduino Data types and constants; Arduino Structure (elements of Arduino code) 6) Practical experience with retrieving data from a sensing device such as pulse oximeter and analysing such data

Learning Outcomes	
Outcome Number	Description
01	Demonstrate broad knowledge of modern techniques and analytical methods for the acquisition, processing and characterisation of signals.
02	Demonstrate the ability to design, build, interface and test sensors for the acquisition, storage, display and analysis of data.
03	Demonstrate the ability to present the outcomes of design, experimentation and analysis through the use of a laboratory logbook.

Learning, Teaching and Assessment Strategy
Essential backbone of interactive lectures with tutorials to evaluate theory and practice. Largely lab-based work, both hands-on and computer-based design, simulation and analysis. A combination of learning and teaching methods involving a combination of synchronous lectures, demonstrations and laboratories. Where possible, recordings of lectures and demonstrations may be made available. Assessment is by Portfolio of lab report, Coursework - practical project with results and analysis; assignment on theoretical knowledge are used to assess students' understanding, knowledge, skills. Supplementary assessment if required will be to take an online exam covering all learning outcomes. This module satisfies the below Learning Outcomes as specified by the Accreditation of Higher Education Programmes: Third Edition (AHEP3) as published by The Engineering Council in-line with the UK Standard for Professional Engineering Competence (UK-SPEC). These outcomes specify six key areas of learning: Science and Mathematics (SM), Engineering Analysis (EA), Design (D), Economic, Legal, Social, Ethical and Environmental Context (EL), Engineering Practice (P) and Additional General Skills (G). SM1b, SM2b, EA1b, EA2, EA3b, EA4b, D2, D4, EL4, P2, P3, P4, G1, G2, SM1m, SM4m, SM5m, EA1m, EA5m, P9m. Further details of these learning outcomes can be found at https://www.engc.org.uk/.

Mode of Assessment			
Type	Method	Description	Weighting
Summative	Laboratory Report	Laboratory portfolio report containing lab work	40%
Summative	Coursework - Written	Design the circuit and implement software code and answer questions on theory and practice.	60%
Referral	Examination - Open Book	Open Book Examination	100%

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.

