

Module code: MOD011136	Version: 1 Date Amended: 10/Jul/2025
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1. Module Title
Microcontroller Systems Design Project

2a. Module Leader
Muhammad Usman Bhutta

2b. School
School of Engineering and the Built Environment

2c. Faculty
Faculty of Science and Engineering

3a. Level
6

3b. Module Type
Standard (fine graded)

4a. Credits
30

4b. Study Hours
300

5. Restrictions			
Type	Module Code	Module Name	Condition
Pre-requisite:	MOD009725	Robotic Control Design Project	Compulsory
Co-requisites:	None		
Exclusions:	None		
Courses to which this module is restricted:	None		

LEARNING, TEACHING AND ASSESSMENT INFORMATION

6a. Module Description

In this multidisciplinary module, you will use a combination of skills relevant to robotics, electronic and electrical systems, mechatronics, and renewable energy systems. You'll be working on a real-world industrial project that lets you apply what you've learned so far, while also boosting your employability skills. The module includes advanced topics in programming, machine learning and AI, hardware and software development, connectivity, and data communications.

You'll be introduced to the techniques and best practices required to successfully create and manage an engineering project designed to identify a solution to an engineering need. Among the topics covered in this module are roles, responsibilities, and behaviours of a professional engineer, planning a project, project management stages, devising solutions, theories and calculations, management using a Gantt chart, evaluation techniques, communication skills, and the creation and presentation of a project report.

6b. Outline Content

Project management
Quality management and risk analysis
Autonomous systems
Advanced C/C++ programming
Hardware and software interface
Microcontrollers technology
Hardware Description Languages (Verilog and VHDL)
Artificial Intelligence and Robotic
Embedded Systems Integration
Internet of things (IOT)
Design, testing and debugging

6c. Key Texts/Literature

The reading list to support this module is available at: <https://readinglists.aru.ac.uk/>

6d. Specialist Learning Resources

Laboratories, computers, hardware, ESP32 IOT Boards, MULTISIM software, test equipment, presentation media, etc., as appropriate.

7. Learning Outcomes (threshold standards)		
No.	Type	On successful completion of this module the student will be expected to be able to:
1	Knowledge and Understanding	Designing and develop appropriate computational and analytical techniques to model complex problems in microcontroller design, recognizing the limitations of the techniques.
2	Knowledge and Understanding	Discuss the role of quality management systems and continuous improvement in the context of complex problems.
3	Intellectual, practical, affective and transferrable skills	Adopt a holistic and proportionate approach to the mitigation of security risks in an electronic and electrical project.
4	Intellectual, practical, affective and transferrable skills	Function effectively as an individual, and as a member or leader of a team; Communicate effectively on engineering matters with technical and nontechnical audience

8a. Module Occurrence to which this MDF Refers				
Year	Occurrence	Period	Location	Mode of Delivery
2025/6	ZZF	Template For Face To Face Learning Delivery		Face to Face

8b. Learning Activities for the above Module Occurrence			
Learning Activities	Hours	Learning Outcomes	Details of Duration, frequency and other comments
Lectures	24	1-4	Wks 1- 7, 3 hours per week Wks 8-10, 1 hour per week
Other teacher managed learning	48	1-4	Wks 1-7, 3 hours per week Wks 8-10, 5 hour per week Wks 11-12, 6 hour per week
Student managed learning	228	1-4	Self-directed learning
TOTAL:	300		

9. Assessment for the above Module Occurrence					
Assessment No.	Assessment Method	Learning Outcomes	Weighting (%)	Fine Grade or Pass/Fail	Qualifying Mark (%)
010	Coursework	1-4	50 (%)	Fine Grade	30 (%)
Individual report (Equivalent to max 2000 words) maps to Engineering Council Learning Outcome C3,C4,C9, C10 Component 2, 1500 words Physical product and individual Report maps to Engineering Council Learning Outcomes C6, C12, C13					
Assessment No.	Assessment Method	Learning Outcomes	Weighting (%)	Fine Grade or Pass/Fail	Qualifying Mark (%)
011	Coursework	1,2	30 (%)	Fine Grade	30 (%)
In-class test, 1.5 hrs, equivalent to 1500 words, maps to Engineering Council LO C1, C2, C3					
Assessment No.	Assessment Method	Learning Outcomes	Weighting (%)	Fine Grade or Pass/Fail	Qualifying Mark (%)
012	Practical	3,4	20 (%)	Fine Grade	30 (%)
Group Viva including oral presentation, equivalent of 1500 words, maps to Engineering Council LO C16,C17					

In order to pass this module, students are required to achieve an overall mark of 40% (for modules at levels 3, 4, 5 and 6) or 50% (for modules at level 7*).

In addition, students are required to:

- (a) achieve the qualifying mark for each element of fine graded assessment as specified above
- (b) pass any pass/fail elements

[* the pass mark of 50% applies for all module occurrences from the academic year 2024/25 – see Section 3a of this MDF to check the level of the module and Section 8a of this MDF to check the academic year]