MODULE SPECIFICATION

Part 1: Information			
Module Title	Microcontrollers Applications Group Lab		
Module Code	UFMFKA-30-2	Level	Level 5
For implementation from	2021-22		
UWE Credit Rating	30	ECTS Credit Rating	15
Faculty	Faculty of Environment & Technology	Field	Engineering, Design and Mathematics
Department	FET Dept of Engin Design & Mathematics		
Module type:	Project		
Pre-requisites	None		
Excluded Combinations	None		
Co- requisites	None		
Module Entry requirements	None		

Part 2: Description

Overview: This module introduces concepts and practices related to microcontroller based systems. Students will be gain skills and knowledge in comparing, selecting, implementing, integrating and testing hardware and software components required for a microcontroller based robotic system.

This module aims to give students an in-depth, hands-on and teamwork experience of designing and building a microcontroller-based embedded system. Microcontrollers are frequently used in the design and implementation of control interfaces for autonomous robots. An embedded system will often contain microcontrollers and can, for example, provide navigation capabilities without requiring human intervention. Such an embedded system will need to incorporate sensing, actuating, communicating, and controlling functionalities, all of which require hardware and software development.

Educational Aims: The aim of this module is to integrate topics and concepts from across engineering to facilitate the design of an autonomous mobile robot.
The module also builds upon earlier modules and requires the students to demonstrate their project management skills.

Outline Syllabus: The Syllabus is outlined as follows:

Embedded programming
Digital input/output
Interrupts and timers
Sensors and actuators

Controller design
Analogue to digital conversion
Serial communication
Path planning and maze solving algorithms
Use of robotic operating systems and simulation platforms

Teaching and Learning Methods: Scheduled Learning includes lectures, workshops and laboratory sessions. At the start of the course, students are divided into groups and are helped to develop an interesting and original mobile embedded system they could expect to complete within the time allotted for the course. In the first semester, there is an emphasis on students' individual work on completing laboratory exercises that are designed to help them gain knowledge of the principles and practical use of a microcontroller. This constitutes a major part of Assessment B4 (individual assessment). Laboratory sessions in the second semester allow more time for students to work in a group on designing and implementing a microcontroller-based system. Students keep individual logbooks as documentary support. Groups make presentations to the rest of the class during and at the end of the project, demonstrate their mobile embedded system, and write a group report at the end of the course.

Part 3: Assessment

Students' achievements in the module will be assessed by the following strategy:

First Assessment Opportunity (Sit)
Component A

Description of each element:

Presentation One (10%): this is a 15-min group presentation with questions and it will take place in the first semester. It is an assessment of learning, but at the same time, assessment for learning.

Written Group Report (50%): this is a 4000-word group report that presents the mobile robot designed and implemented by each student group. This assessment uses peer assessment to reflect individual contribution to the project.

Presentation Two and Demonstration (20%): this includes a 15 min group presentation with questions, and a group demonstration of the microcontroller-based system that is presented in the Group Report (both in the second semester).

Laboratory Logbook (20%): students are expected to document laboratory-based exercises, to record group meeting minutes, to write effective reflections, to review personal research and to produce design documentation.

Additionally, there will be opportunities for formative assessment (which does not contribute to the module mark). According to in-process evaluations of student comprehension, learning needs, and academic progress during lectures and labs, the tutors will regularly give students feedback on their laboratory exercises and progress with mobile robot design.

Second Assessment Opportunity (Resit) (further attendance at taught classes is not required)
Component A

Description of each element:

Written Individual Report: this includes a 1500-word individual report that proposes design of a specific microcontroller based system. Selected lab exercises will also need to be completed by the student and to be documented in the report (not included in word count).

Oral Examination: Questions designed to assess sufficient knowledge of the design cycle and technical aspects of the project.

First Sit Components	**Final Assessment**	**Element weighting**	**Description**
Report - Component A	✓	50 %	2. Written Group Report (50%): this is a 4000-word group report that presents the mobile robot designed and implemented by each student group. Although being a group report, this assessment uses peer assessment to reflect individual contribution to the project.
Presentation - Component A		10 %	This is a 15-min group presentation with questions and it will take place in the first semester. It is an assessment of learning, but at the same time, assessment for learning.
Presentation - Component A		20 %	Presentation Two and Demonstration (20%): this includes a 15 min group presentation with questions, and a group demonstration of the microcontroller-based system that is presented in the Group Report (both in the second semester).
Laboratory Report - Component A		20 %	4. Laboratory Logbook (20%): students are expected to document laboratory-based exercises, to record group meeting minutes, to write effective reflections, to review personal research and to produce design documentation.
Resit Components	**Final Assessment**	**Element weighting**	**Description**
Report - Component A		70 %	Individual written report (1500 words) plus log book
Presentation - Component A	✓	30 %	Oral examination based on report (15 mins)

Part 4: Teaching and Learning Methods

Learning Outcomes

On successful completion of this module students will achieve the following learning outcomes:

Module Learning Outcomes	**Reference**
Design embedded software using a microcontroller and implementing a robot navigation algorithm. [AHEP D3b]	MO1
Evaluate and test electronic components and circuits for electronics and robotics system design. [AHEP EA2b]	MO2
Describe and explain the process of designing and constructing a mobile robot. [AHEP EA1b]	MO3
Implement and integrate core functionalities (e.g. sensing, actuating, etc.) required for a microcontroller-based robotic system. [AHEP EA4b]	MO4
Demonstrate capabilities in project planning, monitoring and reporting project progress. [AHEP D5, EL3i, P11m]	MO5

Contact Hours

Independent Study Hours:

Independent study/self-guided study	228

	Total Independent Study Hours:	228
	Scheduled Learning and Teaching Hours:	
	Face-to-face learning	72
	Total Scheduled Learning and Teaching Hours:	72
	Hours to be allocated	300
	Allocated Hours	300
Reading List	*The reading list for this module can be accessed via the following link:* https://uwe.rl.talis.com/modules/ufmfka-30-2.html	

Part 5: Contributes Towards
This module contributes towards the following programmes of study: Robotics {Foundation} [Sep][FT][Frenchay][4yrs] BEng (Hons) 2019-20 Robotics {Foundation} [Sep][SW][Frenchay][5yrs] BEng (Hons) 2019-20