MODULE SPECIFICATION

Part 1: Information			
Module Title	Embedded Systems Programming		
Module Code	UFCFBS-15-2	Level	Level 5
For implementation from	2021-22		
UWE Credit Rating	15	ECTS Credit Rating	7.5
Faculty	Faculty of Environment & Technology	Field	Computer Science and Creative Technologies
Department	FET Dept of Computer Sci & Creative Tech		
Contributes towards	Computer Science BSc (Hons) 2020-21		
Module type:	Standard		
Pre-requisites	None		
Excluded Combinations	None		
Co- requisites	None		
Module Entry requirements	None		

Part 2: Description
This module explores the background and some of the fundamental characteristics of embedded systems. Based on this knowledge will develop solutions to problems involving such systems. **Educational Aims:** This module aims to equip the students with an appreciation of the particular characteristics of embedded systems and to enable them to build and manipulate such systems. **Outline Syllabus:** In this module you will cover the following areas: The history of embedded systems and mobile computing. Architecture of low powered mobile systems, exemplified by the ARM Cortex-M series processors. The nature of security in embedded and network systems Cross development and cross compilation Booting embedded systems JTAG - controlling dead or locked systems, recovering data - system initialization, security implications Memory technologies at the device level - Flash, SD

Data communications – serial data comms, SPI I2C

Networking technologies - wired and wireless

Configuring, building and booting embedded OS

File systems for embedded systems on a range of devices

Open source development methodologies. Working in OS communities, responsibilities, professionalism and legal implications.

Power saving features of mobile and embedded systems: Booting, suspending, sleeping and hibernating

Teaching and Learning Methods: The module will be delivered through a combination of lectures, demonstrations, practicals and tutorials. Some of the tutorials will be student-led.

The lectures will be supported by weekly practical sessions in which the students have the opportunity to apply some of the concepts discussed during the lecture. The practicals will allow the students to explore and debug mobile devices and/or device simulations using a range of tools.

In addition, laboratory exercises will allow the student to gain familiarisation with the tools and techniques required for the implementation and verification of safe embedded systems. Students will be expected to demonstrate self-direction and originality in their learning which will be facilitated through student directed tutorials.

Part 3: Assessment

Students will develop their embedded programming skills through a series of graded problems. The problems are presented as a series of worksheets of increasing difficulty. The problem solution will be assessed through a demonstration and discussion Students will receive feedback at the demonstration and are expected to use this feedback to improve their performance on subsequent exercises. Once a problem has been demonstrated, the exercise will be signed off and the sign off sheet will be handed in as evidence that the work has been completed.

The underpinning theoretical understanding of tools and technologies will be assessed through the examination. In the exam, students will also need to demonstrate that they recognise how to use these tools and technologies effectively

The same assessment strategy is used in the referral with the exception that, for the referral coursework students will be required to provide evidence of their achievements on the practical worksheets rather than an in person demonstration.

First Sit Components	**Final Assessment**	**Element weighting**	**Description**
Practical Skills Assessment - Component B		40 %	A series of graded practical tasks.
Examination - Component A	✓	60 %	Exam (2 hours)
Resit Components	**Final Assessment**	**Element weighting**	**Description**
Practical Skills Assessment - Component B		40 %	Series of graded practical tasks, evidenced by code and screen shots.
Examination - Component A	✓	60 %	Exam (2 hours)

Part 4: Teaching and Learning Methods

Learning Outcomes

On successful completion of this module students will be able to:

	Module Learning Outcomes
MO1	Discuss the characteristics of secure, low-powered mobile and embedded technology
MO2	Analyse and manipulate higher-level software architectures, file systems and memory
MO3	Develop software for mobile and embedded devices for a range of purposes
MO4	Explore and evaluate booting, system initialisation and data communication methods in a range of devices

Contact Hours

Contact Hours	
Independent Study Hours:	
Independent study/self-guided study	114
Total Independent Study Hours:	114
Scheduled Learning and Teaching Hours:	
Face-to-face learning	36
Total Scheduled Learning and Teaching Hours:	36
Hours to be allocated	150
Allocated Hours	150

Reading List

The reading list for this module can be accessed via the following link:

https://rl.talis.com/3/uwe/lists/027B7927-D8A4-9012-87CA-7AD8F23E356A.html?lang=en-GB&login=1