MODULE SPECIFICATION

Part 1: Information			
Module Title	Building and Porting Embedded Operating Systems		
Module Code	UFCFJ4-15-3	Level	Level 6
For implementation from	2020-21		
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		
Module type:	Standard		
Pre-requisites	None		
Excluded Combinations	None		
Co- requisites	None		
Module Entry requirements	None		

Part 2: Description

Educational Aims: This module will allow the students to explore and understand the features and functions of embedded and real-time operating systems.

In addition to Learning Outcomes, the educational experience may explore, develop, and practise but not formally discretely assess the following:

Understand the need to work effectively with colleagues within a team

Outline Syllabus: The various component parts of operating systems will be described as well as the manifold design decisions and constraints that they may be affected by. The difficulties of porting systems will be explored looking at the various problems and constraints of differing architectures. The role of the developer's tool chain and its effective use will be explored, leading to a detailed examination of the role of the various tools and their output formats. The phases of system initialisation will be covered, looking at problems such as the initial boot stage, memory initialisation, the role of MMUs and other memory protection systems. Installation and debugging such system will also be covered, for example looking at the role of technologies, such as JTAG and flash memory.

Although the emphasis is on embedded systems, timing constraints will be examined and

students will explore how to achieve greater system performance through either modification of kernel code or through supplemental systems. Topics covered will include:

Embedded and real-time systems

The role and function of embedded OS

Variety of Embedded OSs

The embedded systems market

Cross development tool chains

Cross compilers and tools

Linker and linking

Object control and conversion tools

Cross debuggers

Porting and configuring embedded OS

Configuration options and systems

System boot code

Basic IO mechanisms

File system creation

Networking embedded OSs

Technologies in embedded OS

Boot loaders

Serial communications

MMU and memory protection

Flash memory

JTAG

Timing considerations

Changing schedulers and tick rates

Using patches

Auxiliary programs – RTAI, RTLinux

Teaching and Learning Methods: The course will be paced through lectures, with group practicals and individual assignments providing a broadening experience. The theoretical content, introduced in lectures, will be reviewed in seminars. Personal work time will be used for background reading, report writing and preparation for laboratories.

Part 3: Assessment

The students will be assessed through a mix of practical assignment tasks and an examination. The practical tasks are designed to be completed over the course of the module, rather than as a piece of increased effort near the end of the teaching. This approach is taken to ensure sustained student engagement and to allow the student to demonstrate their mastery of a number of practical skills.

The more theoretical aspects of the course are assessed in the exam.

First Sit Components	**Final Assessment**	**Element weighting**	**Description**
Practical Skills Assessment - Component B		50 %	Practical coursework
Examination (Online) - Component A	✓	50 %	Examination (2 hours)
Resit Components	**Final Assessment**	**Element weighting**	**Description**
Practical Skills Assessment - Component B		50 %	Practical coursework
Examination (Online) - Component A	✓	50 %	Examination (2 hours)

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**
Understand the features and functions of embedded and real-time operating systems	MO1
Specify and select an embedded real-time system appropriate to a particular application area	MO2
Develop a test application in order to debug a newly ported embedded operating system	MO3
Develop small systems appropriate for embedded system use	MO4
Assess the suitability of tools and technologies used in embedded operating systems and therefore choose and use them appropriately	MO5

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://uwe.rl.talis.com/modules/ufcfj4-15-3.html	

Part 5: Contributes Towards
This module contributes towards the following programmes of study: Electronic and Computer Engineering [Sep][FT][Frenchay][3yrs] BEng (Hons) 2018-19 Electronic and Computer Engineering [Sep][SW][Frenchay][4yrs] BEng (Hons) 2018-19 Electronic and Computer Engineering [Sep][PT][GlosColl][5yrs] BEng (Hons) 2018-19 Electronic and Computer Engineering {Apprenticeship} [Sep][PT][GlosColl][5yrs] BEng (Hons) 2018-19