MODULE SPECIFICATION

Part 1: Information			
Module Title	Embedded Systems Design		
Module Code	UFMFXE-30-2	Level	Level 5
For implementation from	2019-20		
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:	Standard		
Pre-requisites	Programming in C 2019-20		
Excluded Combinations	None		
Co- requisites	None		
Module Entry requirements	None		

Part 2: Description

Overview: Pre-requisites: students must take UFCFF6-30-1 Programming in C or equivalent

Educational Aims: In addition to the Learning Outcomes, the educational experience may explore, develop, and practise but not formally discretely assess the following:
The use of an integrated software development environment.
De-bug techniques.

Outline Syllabus: Historical overview of embedded microprocessor systems and the drive for integration leading to the development of the microcontroller. Review of the basic architecture of a typical 8-bit microcontroller. Detailed examination of the internal resources within a microcontroller, to include: parallel ports, synchronous and asynchronous serial ports, analogue-to-digital conversion and comparator modules, pulse-width modulation signal generation, counter/timer facilities, internal and external memory considerations.

On-board serial data communication with peripheral ICs, and off-board communication with a host or other computing entity via, for example, USB or radio telemetry.

Comparison of 8-bit, 16-bit and 32-bit architectures and processing capabilities.

Software development for microcontroller applications. Top-down program design, and the use of

flowcharts, pseudo-code and other techniques to formulate an algorithmic solution to a programming design task before writing specific code.

Programming style, codes of practice. Code validation and verification techniques. Use of an integrated code development environment. De-bug facilities, strategies and techniques.

Event-driven software and real-time operating systems.

Teaching and Learning Methods: This module will involve 4 hours contact per week divided between lecture sessions and laboratory sessions.

Over the course of the academic year students should expect to spend approximately:

Contact time: 96 hours
Assimilation and development of knowledge: 132 hours
Exam preparation: 36 hours
Coursework preparation: 36 hours
Total study time: 300 hours

This module will extend and further develop the practical, theoretical and professional skills needed for designing and implementing complex embedded systems for a wide range of applications.

An initial set of structured laboratory exercises will extend the students understanding of the tools and techniques required, followed by an assessed problem based design exercise.

Accompanying lectures will present the formal aspects of the module. Students will be given small design problems to consider as part of their independent study in support of the lectures. These will then be discussed in laboratory sessions.

Students will be expected to maintain an individual log book of both laboratory work and independent exercises as part of their professional development. The log book will be inspected at regular intervals in order to provide formative feedback. The log book will also form part of the assessment.

Scheduled Learning in the form of lectures, tutorials, demonstrations and laboratory work will comprise 1/3 of the total study time.

Independent Learning will include directed reading, tutorial exercises, general reading of trade journals, academic papers and other texts.

Part 3: Assessment

The examination is summative and assesses the students' understanding of concepts and techniques, and their ability to apply them in relatively straightforward problems.

The coursework is both summative and formative. The logbook will be used to assess competency in the methods taught during semester 1. Feedback from the first coursework is intended to assist students to prepare for the examination.

First Sit Components	**Final Assessment**	**Element weighting**	**Description**
Practical Skills Assessment - Component B		19 %	Demonstration of individual practical work
Portfolio - Component B		56 %	Assessment of logbook
Examination - Component A	✓	25 %	Written examination (2 hours)

Resit Components	Final Assessment	Element weighting	Description
Practical Skills Assessment - Component B		75 %	Practical development and software and supporting documentation
Examination - Component A	✓	25 %	Written 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
Control and manipulate microcontroller resources	MO1
Understand the characteristics of memory in low-powered and embedded technology	MO2
Develop software for embedded devices for a range of purposes	MO3
Explore booting and system initialisation in a range of devices	MO4
Interface external hardware to the microcontroller and understand the role and use of interrupt processing for time-critical applications	MO5

Contact Hours

Independent Study Hours:	
Independent study/self-guided study	204
Total Independent Study Hours:	204
Scheduled Learning and Teaching Hours:	
Face-to-face learning	96
Total Scheduled Learning and Teaching Hours:	96
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/ufmfxe-30-2.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 {Top Up} [Aug][FT][SHAPE][1yr] BEng (Hons) 2018-19 Electronic and Computer Engineering {Top Up} [Aug][PT][SHAPE][2yrs] 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