Module code: MOD005450	Version: 1 Date Amended: 04/May/2016

1. Module Title

Embedded Software Engineering

2a. Module Leader

Glen Mason

2b. Department

Department of Computing and Technology

2c. Faculty

Faculty of Science and Technology

3a. Level

6

3b. Module Type

Standard (fine graded)

4a. Credits

15

4b. Study Hours

150

5. Restrictions

Type	Module Code	Module Name	Condition
Pre-requisite:	MOD005424	Programming Concepts	Compulsory
Pre-requisite:	MOD005437	Object-Oriented Programming Development	Compulsory
Co-requisites:	None		
Exclusions:	None		
Courses to which this module is restricted:	BSc(Hons) Computing and Information Systems		

LEARNING, TEACHING AND ASSESSMENT INFORMATION

6a. Module Description

Over the past 20 years the world of computing has moved on from large static desk top machines to small, mobile embedded devices. An embedded system is regarded as an application that contains at least one programmable computer (typically a MCU, ASIC, or DSP) where the user are in the main unaware that the system is computer based.

This module will examine the key elements of embedded software development where engineers are faced with limited resources, hardware constraints while meeting performance, reliability and safety specifications. The module will provide an overview of peripherals, development methods, architectures, reliability issues and safety standards.   Prior knowledge of a computing language e.g. C, C#, C++ is essential however work on FPGA's involving VHDL will be introduced at a beginner's level.

The module will be assessed by a portfolio of coursework including a research paper, embedded system projects and an in class phase test.

6b. Outline Content

Review of Embedded Systems Applications and Terminology

Types of Architecture Event Triggered, Time Triggered, Real Time Operating Systems

Develop systems involving digital I/O, ADC,DAC, Interrupts, SPI,I2C, CAN

Review of international safety standards IEC61508, 60730, 62304, ISO26262 and DO-178C

Introduction FPGA development using VHDL and their applications as diverse monitors.

6c. Key Texts/Literature

The reading list to support this module is available at: http://readinglists.anglia.ac.uk/modules/mod005450

6d. Specialist Learning Resources

32bit ARM LPC1768/1769 Processors and DE0-Nano FPGA development boards

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	Demonstrate knowledge of reliability and safety issues when developing embedded systems.
2	Knowledge and Understanding	Understand common peripherals, interfaces and communication protocols, applications, limitations and future developments
3	Intellectual, practical, affective and transferrable skills	Manage project and exhibit research skills
4	Intellectual, practical, affective and transferrable skills	Use embedded C and VHDL in system development

8a. Module Occurrence to which this MDF Refers

Year	Occurrence	Period	Location	Mode of Delivery
2017/8	F01UCP	Semester 2	University Centre, Peterborough	Face to Face

8b. Learning Activities for the above Module Occurrence

Learning Activities	Hours	Learning Outcomes	Details of Duration, frequency and other comments
Lectures	12	1,2	Lecture 1 hr x 12 weeks
Other teacher managed learning	24	2,4	Labs / practical's/ seminars 2 hr x 12 weeks
Student managed learning	114	1,2,3,4	reading, research, skills practice, assignment
TOTAL:	150		

9. Assessment for the above Module Occurrence

Assessment No.	Assessment Method	Learning Outcomes	Weighting (%)	Fine Grade or Pass/Fail	Qualifying Mark (%)
010	Practical	1,2	30 (%)	Fine Grade	30 (%)

Phase test - 1 hour (1,000 words equivalent)

Assessment No.	Assessment Method	Learning Outcomes	Weighting (%)	Fine Grade or Pass/Fail	Qualifying Mark (%)
011	Coursework	2,3,4	70 (%)	Fine Grade	30 (%)

1 x Laboratory Project (1,000 words equivalent) 1 x Research Paper (1,000 words)

In order to pass this module, students are required to achieve an overall mark of 40%.

In addition, students are required to:

(a) achieve the qualifying mark for each element of fine graded assessment of as specified above

(b) pass any pass/fail elements