Module Specification

Embedded Systems Design

Version: 2023-24, v2.0, 11 May 2023

Contents

Part 1: Information

Module title: Embedded Systems Design

Module code: UFMFXE-30-2

Level: Level 5

For implementation from: 2023-24

UWE credit rating: 30

ECTS credit rating: 15

Faculty: Faculty of Environment & Technology

Department: FET Dept of Engineering Design & Mathematics

Partner institutions: None

Field: Engineering, Design and Mathematics

Module type: Module

Pre-requisites: Programming for Engineers 2022-23

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

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

Features: Not applicable

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.

Part 3: Teaching and learning methods

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.

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

MO1 Control and manipulate microcontroller resources

MO2 Understand the characteristics of memory in low-powered and embedded technology

MO3 Develop software for embedded devices for a range of purposes

MO4 Explore booting and system initialisation in a range of devices

MO5 Interface external hardware to the microcontroller and understand the role and use of interrupt processing for time-critical applications

Hours to be allocated: 300

Contact hours:

Independent study/self-guided study = 204 hours

Face-to-face learning = 96 hours

Total = 300

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link https://uwe.rl.talis.com/modules/ufmfxe-30-2.html

Part 4: Assessment

Assessment strategy: 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.

Resit:
Resit assessment will be the same as the first sit.

Resit deliverable(s) will be scaled appropriately to group size and task complexity

Assessment tasks:

Examination (Online) (First Sit)
Description: Online Written examination
Weighting: 25 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO2, MO4, MO5

Portfolio (First Sit)
Description: Assessment of logbook
Weighting: 56 %
Final assessment: No
Group work: No
Learning outcomes tested: MO1, MO3, MO4, MO5

Practical Skills Assessment (First Sit)
Description: Demonstration of individual practical work
Weighting: 19 %
Final assessment: No
Group work: No
Learning outcomes tested: MO1, MO3, MO4, MO5

Examination (Online) (Resit)
Description: Online Written examination
Weighting: 25 %
Final assessment: Yes
Group work: No
Learning outcomes tested:

Portfolio (Resit)
Description: Assessment of logbook
Weighting: 56 %
Final assessment: No

Group work: No
Learning outcomes tested:

Practical Skills Assessment (Resit)
Description: Demonstration of individual practical work
Weighting: 19 %
Final assessment: No
Group work: No
Learning outcomes tested:

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Electronic and Computer Engineering [GlosColl] BEng (Hons) 2022-23

Electronic and Computer Engineering [Frenchay] BEng (Hons) 2022-23

Electronic and Computer Engineering {Apprenticeship-GLOSCOLL} [GlosColl] BEng (Hons) 2022-23