Module Specification

Embedded Systems Development

Version: 2023-24, v2.0, 03 Aug 2023

Contents

Part 1: Information

Module title: Embedded Systems Development

Module code: UFCF6Y-30-3

Level: Level 6

For implementation from: 2023-24

UWE credit rating: 30

ECTS credit rating: 15

College: Faculty of Environment & Technology

School: FET Dept of Computer Sci & Creative Tech

Partner institutions: None

Field: Computer Science and Creative Technologies

Module type: Module

Pre-requisites: C++ Development 2023-24

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: Not applicable

Features: Not applicable

Educational aims: This module will pursue a practical approach as far as consistent with the essentially abstract process of the design process.

Outline syllabus: The syllabus includes:

A group design & build project will require students to organize and manage themselves into effective teams.

This will involve: arranging and holding regular meetings, time planning, work allocation, document production, analytical review of the development process.

Concurrent Systems: Intellectual simplicity or system responsiveness; The interleaving problem; Centralized I/O management; Concurrent processes; varying priorities; Scheduling with pre-emption and time-slicing.

Commercial Executive Systems: Functionality; selection criteria; Scheduling strategies; Using a target executive, such as FreeRTOS; Processes; events; signals; pipes; Networking support facilities.

Choice of languages for Real-time Systems implementations: The requirements for real-time systems; Choosing a compiler.

Using a data-flow method for design, eg Ward-Mellor/Yourdon: Diagrams; pseudocode text; hierarchical design capture; Transformation to code modules; Run-time support facilities; Process communication/synchronization methods.

Review of Design Methodologies for Real-time Systems: Yourdon; Object Oriented Methods; DARTS.

Planning for multiple platform cross development; choosing and configuring cross-compiler tool kits.

Choosing and using microcontroller target board.

Part 3: Teaching and learning methods

Teaching and learning methods: An outline case-study specification will be provided, such as: POS retail network, a distributed Conference support system, or a

Secure Access Control System. Such schemes give broad scope for a range of interests to suit final year students returning with diverse experience and skills from their Placement Year.

Students will work in small groups to progressively carry out the series of steps for initial prototype development. They will be required to hold regular group meetings for specification analysis, work allocation, design reviews and general planning activity.

The students will be expected to progress the initial outline specification, through more detailed functional specifications and onto a prototype implementation with a final demonstration, seeking help from professional experts as appropriate, e.g. through online forums.

The group work will be regularly monitored by a tutor who will answer questions in the role of Client, but also assess the competence and contribution of individual members of each group.

Scheduled learning includes lectures, tutorials, practical work and supervised time in the lab.

Independent learning includes hours engaged with essential reading, development time and group working outside of scheduled classes, assignment preparation and completion etc. These sessions constitute an average time per level as indicated in the table above Scheduled sessions may vary slightly depending on the module choices you make.

Contact Hours:

Activity:
Contact time: 72 hours
Assimilation and development of knowledge: 148 hours
Exam preparation: 20 hours

Coursework preparation: 60 hours

Total study time: 300 hours

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

MO1 Choose and use appropriate software design methods for concurrent and control systems development

MO2 Design and develop a computer system for an embedded application

MO3 Recognise and deal with the inherent complexity of an embedded system

MO4 Evaluate the competing demands of the various technical, pragmatic, environmental and commercial pressures that impact software development decisions and appropriately reconcile these demands using recognised methods

MO5 Select an appropriate systematic approach to the development of a quality product

MO6 Work with colleagues and others, including sector experts and reflect on the successes failures therein

Hours to be allocated: 300

Contact hours:

Independent study/self-guided study = 228 hours

Face-to-face learning = 72 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/ufcf6y-30-3.html

Part 4: Assessment

Assessment strategy: At both first sit and resit, the assessment is via a portfolio of tasks which together assess the learning outcomes by taking an implementation approach. This approach allows the students, through the course of the module, to

build on their learning and demonstrate it through the development of a software artefact. The students are required to document both the technical development and its management. For example, students are expected to include a record of review meetings in their portfolio. Evidence of the execution of the software system is also required.   The students work in groups and each student is required to include a statement that records their individual contribution to that group is assessed through an individual statement. The statement must be verified by other group members' reports.

Consistent with the largely practical approach of this module, a relatively lowly weighted exam (25% of the module) assesses the more theoretical element.

At resit, the scale of the software system developed maybe be reduced to reflect a small group size.

Assessment tasks:

Portfolio (First Sit)
Description: Portfolio of practical tasks.
Weighting: 75 %
Final assessment: No
Group work: Yes
Learning outcomes tested: MO1, MO2, MO4, MO5, MO6

Examination (Online) (First Sit)
Description: Online exam (24 hours)
Weighting: 25 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO3, MO4, MO5

Portfolio (Resit)
Description: Portfolio of practical tasks.
Weighting: 75 %

Final assessment: No

Group work: Yes

Learning outcomes tested: MO1, MO2, MO4, MO5, MO6

Examination (Online) (Resit)

Description: Online exam (24 hours)

Weighting: 25 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1, MO3, MO4, MO5

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Electronic and Computer Engineering [SHAPE] BEng (Hons) 2023-24