Module Specification

Microcontrollers Applications Group Lab

Version: 2023-24, v3.0, 07 Jun 2023

Contents

Part 1: Information

Module title: Microcontrollers Applications Group Lab

Module code: UFMFKA-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: This module introduces concepts and practices related to microcontroller based systems. Students will be gain skills and knowledge in comparing, selecting, implementing, integrating and testing hardware and software components required for a microcontroller based robotic system.

This module aims to give students an in-depth, hands-on and teamwork experience of designing and building a microcontroller-based embedded system.

Microcontrollers are frequently used in the design and implementation of control interfaces for autonomous robots. An embedded system will often contain microcontrollers and can, for example, provide navigation capabilities without requiring human intervention. Such an embedded system will need to incorporate sensing, actuating, communicating, and controlling functionalities, all of which require hardware and software development.

Features: Not applicable

Educational aims: The aim of this module is to integrate topics and concepts from across engineering to facilitate the design of an autonomous mobile robot.
The module also builds upon earlier modules and requires the students to demonstrate their project management skills.

Outline syllabus: The Syllabus is outlined as follows:

Embedded programming
Digital input/output
Interrupts and timers
Sensors and actuators
Controller design
Analogue to digital conversion
Serial communication
Path planning and maze solving algorithms
Use of robotic operating systems and simulation platforms

Part 3: Teaching and learning methods

Teaching and learning methods: Scheduled Learning includes lectures, workshops and laboratory sessions. At the start of the course, students are divided into groups and are helped to develop an interesting and original mobile embedded system they could expect to complete within the time allotted for the course. In the first semester, there is an emphasis on students' individual work on completing laboratory exercises that are designed to help them gain knowledge of the principles and practical use of a microcontroller. This constitutes a major part of Assessment

B4 (individual assessment). Laboratory sessions in the second semester allow more time for students to work in a group on designing and implementing a microcontroller-based system. Students keep individual logbooks as documentary support. Groups make presentations to the rest of the class during and at the end of the project, demonstrate their mobile embedded system, and write a group report at the end of the course.

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

MO1 Design embedded software using a microcontroller and implementing a robot navigation algorithm. [AHEP D3b]

MO2 Evaluate and test electronic components and circuits for electronics and robotics system design. [AHEP EA2b]

MO3 Describe and explain the process of designing and constructing a mobile robot. [AHEP EA1b]

MO4 Implement and integrate core functionalities (e.g. sensing, actuating, etc.) required for a microcontroller-based robotic system. [AHEP EA4b]

MO5 Demonstrate capabilities in project planning, monitoring and reporting project progress. [AHEP D5, EL3i, P11m]

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/ufmfka-30-2.html

Part 4: Assessment

Assessment strategy: Students' achievements in the module will be assessed by the following strategy:

First Assessment Opportunity (Sit)

Description of each assessment task:

Presentation (30%): This assessment includes two presentations - one in the first teaching block and the other in the second teaching block. Each presentation takes a maximum of 15 minutes, including questions. The first presentation is an assessment of learning, but at the same time, assessment for learning. The second presentation, in a similar style to the first presentation, also includes a demonstration of the microcontroller-based system designed by students during this project module. Relating this assessment to hands-on experience would be stimulating and is designed to motivate learners.

Written Group Report (50%): This is a 4000-word written group report based on the group project, namely design and implementation of a microcontroller-based system. This groupwork assessment uses peer assessment to reflect individual contribution to the project.

Laboratory Logbook (20%): Each student needs to use a logbook to record key procedures and findings of laboratory activities (primarily a few sets of laboratory exercises), personal research conducted, group meeting minutes, and other details reflecting project planning and management. In addition to the final logbook submission, students need to submit their interim logbooks regularly in both teaching blocks. Additionally, there will be opportunities for formative assessment (which does not contribute to the module mark). According to in-process evaluations of student comprehension, learning needs, and academic progress during lectures and labs, the tutors will regularly give students feedback on their laboratory exercises and progress with mobile robot design.

Second Assessment Opportunity (Resit) (further attendance at taught classes is not required)

Description of each assessment task:

Presentation (30%): This takes the form of a presentation followed by an oral examination. The student will describe the designs, experiments, and results based on the microcontroller system. Subsequently, the examiners will ask them a set of questions to probe their knowledge and understanding of the work presented (20 mins). Instead of having two presentations for the referral, introduction of this oral examination gives the assessors an opportunity to extensively test student understanding and to help combat plagiarism.

Written Group Report (50%): Based on a groupwork context of designing and implementing a microcontroller-based system, similar to the first sit Report, students need to submit a written report (4,000 words). The word count limit is reduced to 2000 for a group of one student.

Laboratory Logbook (20%): Each student needs to use a logbook to record key procedures of and findings from completing a few sets of laboratory exercises, as well as personal research conducted.

Assessment tasks:

Presentation (First Sit)
Description: This assessment includes two presentations - one in the first teaching block (10%) and the other in the second teaching block (20%).

Each presentation takes a maximum of 15 minutes, including questions. The first presentation is an assessment of learning, but at the same time, assessment for learning. The second presentation, in a similar style to the first presentation, also includes a demonstration of the microcontroller-based system designed by students during this project module.
Weighting: 30 %
Final assessment: No
Group work: Yes

Learning outcomes tested: MO2, MO5

Report (First Sit)
Description: 4000-word written group report based on the group project, namely design and implementation of a microcontroller-based system.

This groupwork assessment uses peer assessment to reflect individual contribution to the project.
Weighting: 50 %
Final assessment: Yes
Group work: Yes
Learning outcomes tested: MO1, MO2, MO3, MO4, MO5

Laboratory Report (First Sit)
Description: Each student needs to use a logbook to record key procedures and findings of laboratory activities (primarily a few sets of laboratory exercises), personal research conducted, group meeting minutes, and other details reflecting project planning and management. In addition to the final logbook submission, students need to submit their interim logbooks regularly in both teaching blocks.
Weighting: 20 %
Final assessment: No
Group work: No
Learning outcomes tested: MO1, MO4, MO5

Presentation (Resit)
Description: This takes the form of a presentation followed by an oral examination. The student will describe the designs, experiments, and results based on the microcontroller system. Subsequently, the examiners will ask them a set of questions to probe their knowledge and understanding of the work presented (20 mins).
Weighting: 30 %
Final assessment: Yes
Group work: Yes
Learning outcomes tested: MO2, MO5

Report (Resit)
Description: Based on a groupwork context of designing and implementing a microcontroller-based system, similar to the first sit Report, students need to submit a written report (4,000 words).
The word count limit is reduced to 2000 for a group of one student.
Weighting: 50 %
Final assessment: No
Group work: Yes
Learning outcomes tested: MO1, MO2, MO3, MO4, MO5

Laboratory Report (Resit)
Description: Each student needs to use a logbook to record key procedures of and findings from completing a few sets of laboratory exercises, as well as personal research conducted.
Weighting: 20 %
Final assessment: No
Group work: No
Learning outcomes tested: MO1, MO4, MO5

Part 5: Contributes towards

This module contributes towards the following programmes of study:

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

Robotics [Frenchay] BEng (Hons) 2022-23

Automation and Robotics Engineering {Foundation} [Oct][FT][GCET][4yrs] BEng (Hons) 2021-22

Automation and Robotics Engineering {Foundation} [Feb][FT][GCET][4yrs] BEng (Hons) 2021-22

Electronic Engineering {Foundation} [Sep][SW][Frenchay][5yrs] BEng (Hons) 2021-22

Electronic Engineering {Foundation} [Sep][FT][Frenchay][4yrs] BEng (Hons) 2021-22

Robotics {Foundation}[Sep][SW][Frenchay][5yrs] BEng (Hons) 2021-22

Robotics {Foundation}[Sep][FT][Frenchay][4yrs] BEng (Hons) 2021-22

Electronics and Telecommunication Engineering {Foundation} [Feb][FT][GCET][4yrs] BEng (Hons) 2021-22

Electronics and Telecommunication Engineering {Foundation} [Oct][FT][GCET][4yrs] BEng (Hons) 2021-22

Instrumentation and Control Engineering {Foundation} [Feb][FT][GCET][4yrs] BEng (Hons) 2021-22

Instrumentation and Control Engineering {Foundation} [Oct][FT][GCET][4yrs] BEng (Hons) 2021-22

Electronic Engineering [Sep][PT][Frenchay][6yrs] BEng (Hons) 2020-21

Instrumentation and Control Engineering {Foundation} [Oct][PT][GCET][8yrs] BEng (Hons) 2019-20

Instrumentation and Control Engineering {Foundation} [Feb][PT][GCET][8yrs] BEng (Hons) 2019-20