Module Specification

Digital Principles for Robotics

Version: 2023-24, v3.0, 13 Mar 2023

Contents

Part 1: Information

Module title: Digital Principles for Robotics

Module code: UFMFR8-15-1

Level: Level 4

For implementation from: 2023-24

UWE credit rating: 15

ECTS credit rating: 7.5

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: None

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: See Learning Outcomes.

In addition, the educational experience may explore, develop, and practise but not formally discretely assess the following:

Develop competence in problem identification, analysis, design and implementation (D4, D6)

Understanding of the need for a high level of professional and ethical conduct (S5).

Outline syllabus: Combinational Logic:

Number systems (decimal, binary, Hexadecimal, conversion)

Combinational logic design principles (Truth tables, Basic Logic gates (AND, OR, XOR, NAND, NOR, NOT), Boolean algebra, circuit analysis, circuit synthesis), Basic characteristics of digital ICs.

Minimisation using Karnaugh maps

Implementation using discrete gates, multiplexers, ROMs, PLAs and PLDs.

Sequential Logic:

Basic latches and flip-flops (RS, D, JK), clocking and evolution of flip-flops.

Counters and shift registers

Finite state machines

Design process of synchronous sequential circuits.

Implementation using field programmable devices (FPGAs).

Introduction to VHDL:

Design flow for hardware description languages (capture, implementation, functional simulation, timing simulation, hardware verification).

VHDL structure (interface, implementations and components)
Design approaches in VHDL.

Introduction to Micro-controllers:

Review the design flow of in micro-controllers based applications.

Review of basic functional parts of one small and one medium scale microcontroller, including internal architecture, programming model, op-codes, addressing modes, memory mapping and address decoding.

Use of digital electronics CAD tools, and simple system simulations

Design and implementation of single-chip microcontroller-based embedded system

Part 3: Teaching and learning methods

Teaching and learning methods: The module covers the basic principles of digital systems. The theoretical concepts are formally introduced in lectures. These are supported by directed reading and well detailed worked examples. The practical content exposes the students to the practical aspect of the module. The laboratory exercises complement the theoretical aspect of the module. Relevant ethical issues will be highlighted and students will be encouraged to consider these further through directed reading.

Activity (Hours)
Contact (36)
Assimilation and skill development (70)
Undertaking coursework (20)
Exam preparation (24)
Total (150)

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

MO1 Knowledge and understanding of the basic mathematical principles as applied to the description and analysis of digital systems (US2)

MO2 An understanding of engineering principles as applied to digital systems and the ability to assess their performances

MO3 The ability to use integrated development environments to describe, simulate, implement and verify the correctness of digital designs

MO4 The ability to use specific Electronic Design Automation tools

MO5 An understanding of basic microcontroller structure and internal architecture

MO6 The ability to use digital electronics Computer Aided Design tools

MO7 Competence in using technical literature and the ability to obtain documentation from various sources

Hours to be allocated: 150

Contact hours:

Independent study/self-guided study = 114 hours

Face-to-face learning = 36 hours

Total = 150

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/ufmfr8-15-1.html

Part 4: Assessment

Assessment strategy: A formal exam that contributes 50% towards the final mark of the module. The examination is summative and assesses the students' understanding of concepts and techniques, and their ability to apply them in relatively straightforward problems.

A coursework that contributes 50% towards the final mark of the module. The coursework consists of a portfolio of individual reflective tasks covering key concepts based on laboratory sessions

Formative assessment will be provided as oral feedback throughout the laboratory sessions particularly with respect to the lab exercises and the log-book entries.

The resit assessment format is the same as the sit assessment

Assessment tasks:

Examination (Online) (First Sit)
Description: Online Exam (24 hours)
Weighting: 50 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO5

Portfolio (First Sit)
Description: Students will be required to submit an individual reflective portfolio of key concepts based on laboratory sessions
Weighting: 50 %
Final assessment: No
Group work: No
Learning outcomes tested: MO2, MO3, MO4, MO5, MO6, MO7

Examination (Online) (Resit)
Description: Online Exam (24 hours)
Weighting: 50 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO3

Portfolio (Resit)
Description: Students will be required to submit an individual reflective portfolio of key concepts based on laboratory sessions
Weighting: 50 %
Final assessment: No
Group work: No
Learning outcomes tested: MO2, MO3, MO4, MO5, MO6, MO7

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Automation and Robotics Engineering {Foundation} [GCET] BEng (Hons) 2022-23