MODULE SPECIFICATION

Part 1: Information			
Module Title	Digital Principles for Robotics		
Module Code	UFMFR8-15-1	Level	Level 4
For implementation from	2019-20		
UWE Credit Rating	15	ECTS Credit Rating	7.5
Faculty	Faculty of Environment & Technology	Field	Engineering, Design and Mathematics
Department	FET Dept of Engin Design & Mathematics		
Module type:	Standard		
Pre-requisites	None		
Excluded Combinations	None		
Co- requisites	None		
Module Entry requirements	None		

Part 2: Description

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

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)

Part 3: Assessment
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 logbook.

Formative assessment will be provided as oral feedback throughout the laboratory sessions particularly with respect to the lab exercises and the log-book entries.			
First Sit Components	**Final Assessment**	**Element weighting**	**Description**
Report - Component B		50 %	Logbook
Examination - Component A	✓	50 %	Exam (2 hours)
Resit Components	**Final Assessment**	**Element weighting**	**Description**
Written Assignment - Component B		50 %	Coursework
Examination - Component A	✓	50 %	Exam (2 hours)

Part 4: Teaching and Learning Methods

Learning Outcomes

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

Module Learning Outcomes	**Reference**
Knowledge and understanding of the basic mathematical principles as applied to the description and analysis of digital systems (US2)	MO1
An understanding of engineering principles as applied to digital systems and the ability to assess their performances	MO2
The ability to use integrated development environments to describe, simulate, implement and verify the correctness of digital designs	MO3
The ability to use specific Electronic Design Automation tools	MO4
An understanding of basic microcontroller structure and internal architecture	MO5
The ability to use digital electronics Computer Aided Design tools	MO6
Competence in using technical literature and the ability to obtain documentation from various sources	MO7

Contact Hours

Independent Study Hours:	
Independent study/self-guided study	114
Total Independent Study Hours:	114
Scheduled Learning and Teaching Hours:	
Face-to-face learning	36
Total Scheduled Learning and Teaching Hours:	36

	Hours to be allocated	150
	Allocated Hours	150
Reading List	*The reading list for this module can be accessed via the following link:* https://uwe.rl.talis.com/modules/ufmfr8-15-1.html	

Part 5: Contributes Towards
This module contributes towards the following programmes of study: Automation and Robotics Engineering {Foundation} [Feb][FT][GCET][4yrs] BEng (Hons) 2018-19 Robotics {Foundation} [Sep][FT][Frenchay][4yrs] BEng (Hons) 2018-19 Robotics {Foundation} [Sep][SW][Frenchay][5yrs] BEng (Hons) 2018-19 Automation and Robotics Engineering {Foundation} [Oct][FT][GCET][4yrs] BEng (Hons) 2018-19