MODULE SPECIFICATION

Part 1: Information			
Module Title	Coding Theory and Applications		
Module Code	UFMFQ7-15-2	Level	Level 5
For implementation from	2020-21		
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: In this module you will find out how concepts from abstract algebra can be applied to real-life problems such as how to send secret messages, how to reconstruct information which has been damaged and how to store and transmit data efficiently.

You will look at applications of group theory, finite fields and linear algebra to these problems.

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

Use of a computer algebra package to analyse and solve problems.

Outline Syllabus: Introduction:

What we mean by ‘coding theory’: coding for compression, errorcorrection, secrecy
Prefix-free codes
Optimal codes, entropy and uncertainty
Noisy channels and the problem of reliable communication
Review of concepts from algebra: groups, finite fields, linear algebra, number theory.

Data compression:
Block codes/ stream codes,
Algorithms, eg Huffman coding, LZW

Error-correcting codes:
Linear codes,
Hamming codes,
Cyclic codes
Applications to barcoding

Cryptography:
Symmetric cryptosystems: pencil and paper codes, one time pad, DES, AES
Public key cryptosystems: RSA, El Gamal, Diffie-Hellman, Elliptic Curve cryptography

Teaching and Learning Methods: Scheduled learning will include lectures/seminars, where students will discuss essential reading, and practical sessions which may include computer-based tutorials.

Independent learning will include hours engaged with essential reading, assignment preparation and completion.

Scheduled teaching hours: 36
Reading and assimilation time: 54
Coursework: 60
Total: 150 hours

Part 3: Assessment

Component A consists of an assignment consisting of problems of an extended nature which require analysis and exploration to solve. It will also include a short report, designed to introduce students to literature review, analysis of texts and referencing in preparation for undertaking a final year project.

First Sit Components	**Final Assessment**	**Element weighting**	**Description**
Written Assignment - Component A		100 %	Assignment
Resit Components	**Final Assessment**	**Element weighting**	**Description**
Written Assignment - Component A		100 %	Assignment

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**
Define mathematical concepts and state theorems precisely, and construct rigorous mathematical proofs	MO1
Use appropriate notation, logic, concepts and techniques to communicate mathematical arguments clearly and effectively	MO2
Select and apply appropriate techniques from abstract algebra to solve problems in coding theory	MO3
Undertake short literature reviews and use appropriate research and reporting techniques, such as referencing materials, library search	MO4

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/ufmfq7-15-2.html

Part 5: Contributes Towards
This module contributes towards the following programmes of study: Mathematics [Sep][FT][Frenchay][3yrs] BSc (Hons) 2019-20 Mathematics [Sep][SW][Frenchay][4yrs] BSc (Hons) 2019-20 Mathematics {Foundation} [Sep][SW][Frenchay][5yrs] BSc (Hons) 2018-19 Mathematics {Foundation} [Sep][FT][Frenchay][4yrs] BSc (Hons) 2018-19