MODULE SPECIFICATION

Part 1: Information			
Module Title	Modelling and Optimisation		
Module Code	UFMFM3-30-1	Level	Level 4
For implementation from	2020-21		
UWE Credit Rating	30	ECTS Credit Rating	15
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 the student will meet a wide range of different types of mathematical models. This should enable the student to gain an appreciation of the mathematical modelling process, especially concerning the way in which it seeks to simplify so that reality can be analysed mathematically. In doing this the student should realise the power of such models to provide useful answers to real problems

Outline Syllabus: The Nature of Modelling: Underlying assumptions, modelling techniques, verification presentation of information; algebraic, numerical and graphical. Interpretation and communication of results.

Graph theory: definitions, isomorphic graphs, examples, sub-graphs, operation on graphs, paths, cycles, components, vertex degrees matrices associated with graphs, regular graphs, metric characteristics, Koenig's Theorem, line graphs, Trees, Simple Algorithms (minimal spanning tree; shortest paths).

Linear Programming: Formulation, Graphical Solutions Sensitivity analysis, Simplex method (based on explanation relating it to Gaussian elimination, and the dimension of the solution space). Excel Solver.

Decision Analysis techniques: Decision Making Criteria, maximin, maximax, minimax and expected value Decision Trees, networks, critical paths. Activity-on-node networks, types of activity dependency relationship, activity times and float, Gantt charts, PERT.

Calculus based techniques: Identification of stationary points for curves and surfaces, global and local maxima and minima, constraints.

The following areas are indicative of the examples that will be used to illustrate the above modelling approaches; project planning, stock control, asset allocation, financial modelling, queuing, forecasting, geometry, physical problems.

Teaching and Learning Methods: Scheduled teaching hours will typically take the form of:

Contact time: 72 hours

Assimilation and development of knowledge: 150 hours

Coursework preparation: 22 hours

Examination preparation: 56 hours

TOTAL: 300 HOURS

The module is delivered by means of lectures, tutorials and workshops. The role of these different delivery mechanisms within the learning strategy is:

Whole group lectures, used to deliver new material and to consolidate previous material

Tutorials, with activities designed to enhance the understanding of the material delivered in the lectures and to apply the skills and knowledge learned from the lectures. These will also be used to work on PC's where this is appropriate.

Workshops delivered to the whole group where a case study or exam style questions are covered

Self-directed learning, to prepare for contact sessions and assessments.

Part 3: Assessment

The assessment strategy is designed to build confidence with the concepts and material during the year as students work towards the end of year examination. The coursework will consist of a number of short activities either e-assessment or short investigations which can be marked and returned to students quickly to provide timely feedback. To this end

Component B focusses on work covered in semester 1 while Component A focusses on work in semester 2.

Each investigation requires students to demonstrate understanding of certain techniques, model a problem, find a solution, and write a short report which will require them to consider the strengths and weaknesses of the model that they have produced.

Component A also contains the library workbook exercise designed to promote skills to search for information and the appropriate use of references in the context of an applied mathematics problem.

First Sit Components	**Final Assessment**	**Element weighting**	**Description**
Online Assignment - Component A		10 %	Library workbook
Written Assignment - Component A		40 %	Investigation 2
Online Assignment - Component B		10 %	E-assessment
Written Assignment - Component B	✓	40 %	Investigation 2
Resit Components	**Final Assessment**	**Element weighting**	**Description**
Written Assignment - Component A	✓	50 %	Investigation 2
Written Assignment - Component B		50 %	Investigation 1

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**
Develop simple models in a wide variety of real (though simple) situations using a range of techniques from linear algebra, operational research, graph theory and calculus	MO1
Determine solutions using appropriate optimisation techniques to a variety of problems	MO2
Interpret the solutions provided by the models back into the real context of the problem	MO3
Understand the limitations of the models and the solutions provided, and demonstrate an awareness of the effect of the simplifying assumptions made to enable the models to function	MO4
Demonstrate an understanding of the modelling process, having seen a wide range of different methods and techniques	MO5
Demonstrate the ability to use library and internet resources for research activities	MO6

Contact Hours

Independent Study Hours:	
Independent study/self-guided study	228
Total Independent Study Hours:	228
Scheduled Learning and Teaching Hours:	
Face-to-face learning	72

	Total Scheduled Learning and Teaching Hours:	72
	Hours to be allocated	300
	Allocated Hours	300
Reading List	*The reading list for this module can be accessed via the following link:* https://uwe.rl.talis.com/modules/ufmfm3-30-1.html	

Part 5: Contributes Towards
This module contributes towards the following programmes of study: Mathematics with Qualified Teacher Status (QTS) [Sep][FT][Frenchay][3yrs] BSc (Hons) 2020-21 Mathematics with Qualified Teacher Status (QTS) {Foundation} [Sep][FT][Frenchay][4yrs] BSc (Hons) 2019-20 Mathematics {Foundation} [Sep][FT][Frenchay][4yrs] BSc (Hons) 2019-20 Mathematics {Foundation} [Sep][SW][Frenchay][5yrs] BSc (Hons) 2019-20