MODULE SPECIFICATION

Part 1: Information			
Module Title	Operational Research		
Module Code	UFMF7A-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	Modelling and Optimisation 2020-21
Excluded Combinations	None
Co- requisites	None
Module Entry requirements	None

Part 2: Description

Overview: This module will develop the modelling theme introduced in Year 1. In particular it will examine Simulation modelling, one of the most widely used applications in Operational Research, and Linear Programming modelling. Simulation will be shown to be a modelling approach that can be used when a problem is too complex for standard operational research techniques to be used.

Educational Aims: In addition to developing model building skills, you will gain an understanding of when the use of simulation is appropriate and of the advantages and disadvantages of the approach. The idea that simulation is a controlled statistical sampling device will also be emphasised and the need for statistical skills will be stressed.

Outline Syllabus: The syllabus includes:

Introduction to Modelling, Deterministic versus Stochastic Models. Queuing Theory. The M/M/1, M/M/k, M/G/1 and M/D/1 models. The M/M/1 model with a finite population.

Introduction to Discrete-Event Simulation. The Use of Simulation? The strengths and weaknesses of DES. Applications of DES.

The Three Phase method. Exponential Distribution for inter-arrival and service times.

Can we use spreadsheets for DES? Specialist software for DES. The use of a specific DES software, such as Simul8.

Deterministic Simulation. Stochastic Simulation. Activity times – Comparing Deterministic and Stochastic Results.

Verification and Validation of DES models. Data Collection and Analysis. Fitting Distributions to Data. Testing for goodness–of fit. Estimating a distribution when no data exists.

Experimentation: Getting accurate results. Confidence Intervals for Measures of Performance. Comparisons between multiple alternatives of a model. Further Analysis.

Linear Programming: applications and simple models, spreadsheet solutions. More complex models.

Teaching and Learning Methods: The Teaching and Learning Strategy of the module will be a mix of taught theory (lecture) interspersed with tutorials and unscheduled independent learning that develops understanding of the theory and its computational implementation.

The unscheduled independent learning will be supported using a free take-home version of the DES software.

Contact Hours:
Contact: 36
Assimilation and skill development: 54
Coursework: 15
Exam preparation: 45
Total: 150

Part 3: Assessment

The module will be assessed by an examination to assess detailed knowledge of concepts and techniques and a written assignment on a simulation based project.

The assignment will be based on a challenging system either (a) proposed by the tutor or (b) encountered in the student's workplace, their previously professional or personal experience, so long as it appropriately assesses all of the module's learning outcomes. The assignment will require demonstration of independent learning of theory, system modelling, computational implementation, statistical analysis of results, and critical reflection of their work both in the classroom and during the assignment period outside the classroom.

First Sit Components	**Final Assessment**	**Element weighting**	**Description**
Examination (Online) - Component A		50 %	Exam
Written Assignment - Component A	✓	50 %	
Resit Components	**Final Assessment**	**Element weighting**	**Description**
Examination (Online) - Component A		50 %	Exam
Written Assignment - Component A	✓	50 %	Written 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
Have knowledge of and understand basic linear programming modelling and the approach of discrete-event simulation applied over a range of applications.	MO1
Construct a discrete-event simulation model of a system using an appropriate software such as Simul8.	MO2
Use a discrete-event simulation model to statistically explore the effect of model parameters and other inputs upon the performance of the system being simulated.	MO3
Show a critical understanding of the strengths and weaknesses of the discrete-event simulation approach and methods.	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/ufmf7a-15-2.html

Part 5: Contributes Towards

This module contributes towards the following programmes of study:

Mathematics and Statistics {Foundation} [Sep][SW][Frenchay][5yrs] BSc (Hons) 2018-19

Mathematics and Statistics {Foundation} [Sep][FT][Frenchay][4yrs] BSc (Hons) 2018-19

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