MODULE SPECIFICATION

Part 1: Information			
Module Title	Calculus and Numerical Techniques		
Module Code	UFMFJV-30-1	Level	Level 4
For implementation from	2020-21		
UWE Credit Rating	30	ECTS Credit Rating	15
Faculty	Faculty of Environment & Technology	Field	
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

Overview: The module contains the groundwork of methods needed by first year mathematics students and which are built on at later levels. Underlying concepts of calculus, which are fundamental to understanding, are explored. The module then builds on these concepts and investigates applications in differential equations and in numerical methods. As part of the module, the student will use mathematical software to construct and interpret solutions.

Educational Aims: The aim of this module is to develop knowledge and understanding in calculus and numerical methods and applications to support the study of related materials throughout the programme and to demonstrate the power of the mathematics in modelling and solving real world problems of interest.

Outline Syllabus: Calculus:
Differentiation (from first principles);
Differentiation techniques and applications;
Sequences and series;
Multivariable functions and partial derivatives;
Critical point analysis;
Integration techniques and applications;
Multiple integrals.

Differential Equations:
Basic concepts;
First order differential equations (including the use of an integrating factor and separation of variables);
Second order linear differential equations with constant coefficients.

Numerical Methods:
Finding zeros of real-valued functions;
Solving first order differential equations;
Approximating integrals;
Curve fitting;
Concepts of error and convergence.

Fourier Series:
Motivation from modelling;
Real and complex forms of Fourier series.

Teaching and Learning Methods: The module is delivered by means of lectures and tutorials. The lectures will be delivered in a collaborative teaching space (e.g. TEAL room) to allow underlying concepts and methods to be followed by exercises, small group discussions and research in a managed and coordinated manner. The tutorials will be delivered in a PC class to allow the flexibility for students to individually use mathematical software to support their learning as well as to work through theoretical exercises.

There will be a pre-lecture work package (containing for example background reading, screencasts to watch, e-assessment questions) which students are expected to complete in preparation for each class.

To prepare for assessment, students will be expected to undertake self-directed learning in addition to the directed learning which supports taught classes.

Part 3: Assessment

The assessment strategy is designed to assess achievement of the learning outcomes, to support the development of skills and to provide individual feedback such that students are aware of their progress and level of achievement during the year.

Component A consists of an e-examination mid-way through the module to assess competency with the mathematical methods taught in the first part of the course and to provide rapid feedback. The majority of questions on the e-examination will have been encountered by students in formative e-assessments.

The end of module examination assesses work covered in the second semester. As part of the examination students will answer questions on a problem provided to them during the second semester. The students will be expected to do some preliminary investigations on the problem prior to sitting the exam.

The resit assessment will take the form of a written examination. As part of the examination students will answer questions on a problem provided to them at least two weeks before the resit period. The students will be expected to do some preliminary investigations on the problem prior to sitting the resit exam.

First Sit Components	**Final Assessment**	**Element weighting**	**Description**
Examination (Online) - Component A	✓	75 %	Controlled conditions coursework to be held at the end of TB2. (2 hours)
Examination (Online) - Component A		25 %	E-examination to be held at the end of TB1. Based on questions on formative e-assessments.

Resit Components	Final Assessment	Element weighting	Description
Examination (Online) - Component A	✓	100 %	Written examination incorporating preseen scenario

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
Apply and evaluate appropriate techniques to solve problems in the domain of calculus, differential equations and numerical methods	MO01
Implement simple numerical algorithms and evaluate their results	MO02
Analyse and solve mathematical problems using mathematical software	MO03
Communicate explanations of mathematical ideas and concepts, discussion of examples, and evaluation of solutions	MO04

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://rl.talis.com/3/uwe/lists/C449D3EE-3E0B-B317-95B3-9C7282E18430.html?draft=1&lang=en-US&login=1

Part 5: Contributes Towards

This module contributes towards the following programmes of study: