MODULE SPECIFICATION

Part 1: Information			
Module Title	Calculus and Numerical Methods		
Module Code	UFMFK3-30-1	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: 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 learn the use of software to construct and interpret solutions.

Outline Syllabus: Functions
Properties of basic continuous functions. Concepts of limits and continuity

Calculus
Differentiation from first principles and the fundamental theorem of calculus. Differentiation and integration techniques. Taylor's theorem and Taylor series. Partial Differentiation

Differential Equations
Solution of first and second order differential equations, initial conditions and boundary conditions, systems of first order differential equations, separation of variables, integrating factors, complementary function and particular integral. Modelling with Differential Equations

Computer Algebra
Arithmetic, expressions, statements, functions, plotting functions, manipulating plots, data types,

matrices, vectors, solving equations and calculus.

Computer Programming
Design of algorithms, control statements (loops and condition statements), arrays, procedures, local and global variables, reading from and writing to text files.

Numerical Methods
Newton-Raphson iteration, Lagrange interpolation, Trapezium rule, Euler's method

Teaching and Learning Methods: Typically the scheduled teaching hours take the form of:

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

Small-group tutorials, in a room with access to computers. The session will include activities designed to reinforce analytical skills and to develop familiarity with the use of computer algebra software/programming as appropriate for that week.

Contact time: 72 hours

Assimilation and development of knowledge: 150 hours

Coursework preparation: 22 hours

Examination preparation: 44 hours

Presentation preparation: 12 hours

TOTAL: 300 HOURS

The module is delivered by means of lectures and tutorials. 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 for this module comprises a written examination (Component A) and two coursework elements (Component B). The examination is summative and assesses the students understanding of concepts and techniques, and their ability to apply them in relatively straightforward problems.

The coursework is both summative and formative. The e-assessments assess competency with the mathematical methods taught in the course. These run every few weeks and are designed to keep students engaged with the material throughout the module.

The individual presentation will assess how well students can communicate mathematical ideas and concepts based on a mathematical problem set in the first semester.

The case study assesses the student's ability to apply the techniques taught to an applied problem. This will be extended and demanding and will not have been explicitly covered in the course of taught classes.

First Sit Components	**Final Assessment**	**Element weighting**	**Description**
Examination (Online) - Component A	✓	25 %	Online Written examination
Online Assignment - Component B		25 %	E- assessments
Case Study - Component B		50 %	Individual case study

Resit Components	Final Assessment	Element weighting	Description
Examination (Online) - Component A	✓	25 %	Online Written examination
Case Study - Component B		75 %	Case study

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
Show an understanding of the mathematical concepts underlying calculus and differential equations	MO1
Show an understanding of the use of algebraic manipulation software to analyse and solve mathematical problems, including the writing of simple computer programs	MO2
Design and implement simple numerical algorithms	MO3
Communicate mathematical ideas and concepts	MO4

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/ufmfk3-30-1.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