



MODULE SPECIFICATION

Part 1: Information			
Module Title	Calculus and Numerical Methods		
Module Code	UFMFK3-30-1	Level	Level 4
For implementation from	2019-20		
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
<p>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.</p> <p>Outline Syllabus: Functions Properties of basic continuous functions. Concepts of limits and continuity</p> <p>Calculus Differentiation from first principles and the fundamental theorem of calculus. Differentiation and integration techniques. Taylor's theorem and Taylor series. Partial Differentiation</p> <p>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</p> <p>Computer Algebra</p>

STUDENT AND ACADEMIC SERVICES

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 three 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 group presentation will assess how well students can communicate mathematical ideas and concepts. This will be based on a mathematical problem set in the first semester and students will be required to use algebraic manipulation software to investigate and present their results. 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. The case study will involve group work. Students will receive an individual mark for this piece of work based on the overall mark given to the group work and the results of peer assessment from all members of the group. Feedback from the e-Assessments, group presentation and coursework is intended to assist students to prepare for the end-of-year examination.

STUDENT AND ACADEMIC SERVICES

First Sit Components	Final Assessment	Element weighting	Description
Presentation - Component B		5 %	Group presentation
Online Assignment - Component B		5 %	E- assessments
Examination - Component A	✓	75 %	Written examination
Case Study - Component B		15 %	Group case study
Resit Components	Final Assessment	Element weighting	Description
Examination - Component A	✓	75 %	Written examination
Case Study - Component B		25 %	Case study

Part 4: Teaching and Learning Methods																	
Learning Outcomes	<p>On successful completion of this module students will achieve the following learning outcomes:</p> <table border="1"> <thead> <tr> <th>Module Learning Outcomes</th> <th>Reference</th> </tr> </thead> <tbody> <tr> <td>Show an understanding of the mathematical concepts underlying calculus and differential equations</td> <td>MO1</td> </tr> <tr> <td>Show an understanding of the use of algebraic manipulation software to analyse and solve mathematical problems, including the writing of simple computer programs</td> <td>MO2</td> </tr> <tr> <td>Design and implement simple numerical algorithms</td> <td>MO3</td> </tr> <tr> <td>Communicate mathematical ideas and concepts</td> <td>MO4</td> </tr> </tbody> </table>	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						
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	<table border="1"> <thead> <tr> <th colspan="2">Independent Study Hours:</th> </tr> </thead> <tbody> <tr> <td>Independent study/self-guided study</td> <td>228</td> </tr> <tr> <td>Total Independent Study Hours:</td> <td>228</td> </tr> <tr> <th colspan="2">Scheduled Learning and Teaching Hours:</th> </tr> <tr> <td>Face-to-face learning</td> <td>72</td> </tr> <tr> <td>Total Scheduled Learning and Teaching Hours:</td> <td>72</td> </tr> <tr> <td>Hours to be allocated</td> <td>300</td> </tr> <tr> <td>Allocated Hours</td> <td>300</td> </tr> </tbody> </table>	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
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																

STUDENT AND ACADEMIC SERVICES

Reading List	<p><i>The reading list for this module can be accessed via the following link:</i></p> <p>https://uwe.rl.talis.com/modules/ufmfk3-30-1.html</p>
--------------	---

Part 5: Contributes Towards

This module contributes towards the following programmes of study:

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

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

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

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

Mathematics with Qualified Teacher Status (QTS) {Foundation} [Sep][FT][Frenchay][4yrs] BSc (Hons) 2018-19