



Module Specification

Calculus and Numerical Techniques

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Contents

Module Specification	1
Part 1: Information	2
Part 2: Description	2
Part 3: Teaching and learning methods	3
Part 4: Assessment.....	5
Part 5: Contributes towards	6

Part 1: Information

Module title: Calculus and Numerical Techniques

Module code: UFMFJV-30-1

Level: Level 4

For implementation from: 2023-24

UWE credit rating: 30

ECTS credit rating: 15

Faculty: Faculty of Environment & Technology

Department: FET Dept of Computer Sci & Creative Tech

Partner institutions: None

Field: Computer Science and Creative Technologies

Module type: Module

Pre-requisites: None

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body 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.

Features: Not applicable

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.

Part 3: Teaching and learning methods

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.

Module Learning outcomes: On successful completion of this module students will achieve the following learning outcomes.

MO1 Apply and evaluate appropriate techniques to solve problems in the domain of calculus, differential equations and numerical methods

MO2 Implement simple numerical algorithms and evaluate their results

MO3 Analyse and solve mathematical problems using mathematical software

MO4 Communicate explanations of mathematical ideas and concepts, discussion of examples, and evaluation of solutions

Hours to be allocated: 300

Contact hours:

Independent study/self-guided study = 228 hours

Face-to-face learning = 72 hours

Total = 300

Reading list: The reading list for this module can be accessed at [readinglists.uwe.ac.uk](https://uwe.rl.talis.com/modules/ufmfk3-30-1.html) via the following link <https://uwe.rl.talis.com/modules/ufmfk3-30-1.html>

Part 4: Assessment

Assessment strategy: 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.

An e-examination mid-way through the module assesses competency with the mathematical methods taught in the first part of the course and provides students with 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 whole module. 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.

Assessment tasks:

Online Assignment (First Sit)

Description: E-examination

Based on questions on formative e-assessments.

To be undertaken in a 24 hour window.

Weighting: 25 %

Final assessment: No

Group work: No

Learning outcomes tested: MO1

Examination (Online) (First Sit)

Description: Online exam (2 hours) available in a 24 hour window incorporating controlled conditions coursework activity.

Weighting: 75 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1, MO2, MO3, MO4

Online Assignment (Resit)

Description: E-examination

Based on questions on formative e-assessments.

To be undertaken in a 24 hour window.

Weighting: 25 %

Final assessment: No

Group work: No

Learning outcomes tested: MO1

Examination (Online) (Resit)

Description: Online exam (2 hours) available in a 24 hour window incorporating controlled conditions coursework activity.

Weighting: 75 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1, MO2, MO3, MO4

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Mathematics [Frenchay] BSc (Hons) 2023-24

Mathematics with Qualified Teacher Status {Foundation} [Sep][FT][Frenchay][3yrs] -
Not Running BSc (Hons) 2022-23

Mathematics {Foundation} [Frenchay] BSc (Hons) 2022-23