Module Specification

Sets, Functions and Linear Algebra

Version: 2021-22, v1.0, 24 Jul 2019

Contents

Part 1: Information

Module title: Sets, Functions and Linear Algebra

Module code: UFMFL3-30-1

Level: Level 4

For implementation from: 2021-22

UWE credit rating: 30

ECTS credit rating: 15

Faculty: Faculty of Environment & Technology

Department: FET Dept of Engineering Design & Mathematics

Partner institutions: None

Delivery locations: Frenchay Campus

Field: Engineering, Design and Mathematics

Module type: Standard

Pre-requisites: None

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: Not applicable

Features: Not applicable

Educational aims: Two of the most important skills that distinguish a mathematical scientist from other kinds of scientist (and which make them so attractive to employers) are (i) the ability to construct very precise logical arguments and (ii) to

abstract from the specific case to the general. This abstraction to generality enables the mathematical scientist to apply ingenious, elegant and powerful techniques to a huge range of applied problems in science, engineering, social science and culture. This module is designed to develop these skills and to demonstrate the connections between abstract mathematical concepts and applications.

Outline syllabus: Mathematical Foundations (Sets and Functions):

Propositional logic: propositions, connectives, truth tables, implications

Proof: methods of proof, direct, contradiction, contrapositive, induction

Set theory: operations on sets, power sets, subsets, Cartesian products, quantifiers

Functions: injections, surjections, bijections, inverses

Number systems: integers, rationals, reals, complex numbers, concept of a field

Complex numbers: construction, algebra, geometry, nth roots, polynomial equations

Linear Algebra:

Vector algebra: dot and cross products, the angle between two vectors, equations and intersections of lines and planes

Matrices: algebra, geometrical transformations, determinants,
inverses, diagonal, orthogonal and symmetric matrices

Systems of linear equations: Gaussian elimination

Eigenvalues and eigenvectors

Vector spaces: subspaces, independent vectors, basis vectors, dimensions

Linear transformations: range and kernel

Inner-product spaces

Part 3: Teaching and learning methods

Teaching and learning methods: Scheduled teaching hours takes the form of:

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

Small-group tutorials, with activities designed to reinforce analytical and manipulation skills

A fortnightly workshop session used for contextualization in an applied setting or for more challenging examples

Contact time: 72 hours

Assimilation and development of knowledge: 150 hours

Coursework preparation: 22 hours

Examination preparation: 56 hours

TOTAL: 300 HOURS

During the module, connections will be drawn between the underlying abstract concepts and the methods and techniques used in problem solving and applications. Application areas may vary from year to year to reflect current staff expertise or recent scientific developments, but typical examples might include: modelling of complex networks (such as social networks or traffic networks); computer graphics;

decision modelling and optimisation.

The module is delivered by means of lectures and tutorials or workshops. To prepare for assessment, students are expected to undertake self-directed learning in addition to the directed learning which supports taught classes.

Module Learning outcomes:

MO1 Give clear definitions of mathematical concepts, state theorems precisely, and construct rigorous mathematical proofs

MO2 Use appropriate notation, logic, concepts and techniques to clearly and effectively communicate mathematical arguments

MO3 Select and apply appropriate techniques to solve systems of linear equations and to solve problems in Euclidean geometry

MO4 Select and apply appropriate techniques to analyse and solve problems from a range of application areas

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 via the following link https://uwe.rl.talis.com/modules/ufmfl3-30-1.html

Part 4: Assessment

Assessment strategy: Component A consists of examination(s) which assess the student's understanding of concepts and techniques, and their ability to apply them in relatively straightforward problems.

Component B consists of a series of computer-based online tests (e-assessments) using UWE's DEWIS system, designed to test understanding of material covered in the period immediately preceding each test.

Assessment components:

Online Assignment - Component B (First Sit)
Description: E-assessments
Weighting: 25 %
Final assessment: No
Group work: No
Learning outcomes tested: MO3, MO4

Examination - Component A (First Sit)
Description: January written exam
Weighting: 19 %
Final assessment: No
Group work: No
Learning outcomes tested: MO1, MO2, MO3, MO4

Examination - Component A (First Sit)
Description: Summer written exam
Weighting: 56 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO3, MO4

Online Assignment - Component B (Resit)
Description: E-assessments
Weighting: 25 %
Final assessment: No
Group work: No
Learning outcomes tested:

Examination - Component A (Resit)

Description: Written examination

Weighting: 75 %

Final assessment: Yes

Group work: No

Learning outcomes tested:

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Mathematics and Statistics {Foundation} [Sep][FT][Frenchay][4yrs] BSc (Hons) 2020-21

Mathematics and Statistics {Foundation} [Sep][SW][Frenchay][5yrs] BSc (Hons) 2020-21