Module Specification

The Professional Mathematical Scientist I

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Part 1: Information

Module title: The Professional Mathematical Scientist I

Module code: UFMFLV-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:

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: In this module we aim to produce mathematical scientists for the 21st century, who not only have the technical knowledge required for participation in the key emerging industries, but who are also equipped with transferable skills such as critical and creative thinking, communication, innovation, problem solving, collaboration, and who are capable of assessing the human and global impact of science and technology.

By adapting our curriculum, pedagogy and assessment to incorporate these skills we aim to develop mathematical scientists that can adapt to the rapidly changing world, and contribute to a more productive, sustainable, and just future.

Features: Not applicable

Educational aims: The goal of this module is to enable students to experience how real-world problems can be modelled mathematically and hence solved. Participation in field trips will acquaint with real life challenges faced by professional mathematicians.

In doing this module, students will develop their professional skills using projects and problems of varying complexity, through active learning. In doing so, they will learn to appreciate project and modelling cycles.

Students will be expected to work as part of a team to carry out projects and communicate their findings.

Computer programming and version management will be an important strand of this module, which will provide a basic foundation that feeds into other modules at all level.

This module will complement the material taught on other modules, where challenges and active learning will help students develop their skills in mathematical modelling; computational thinking and statistical reasoning.

Outline syllabus: Computer Programming:

Arithmetic expressions, data visualisation, symbolic algebra, control statements (loops and condition statements), data types and structures (e.g. arrays, matrices, scalars, strings), procedures / functions, local and global variables, reading from and writing to text files, implementation and basic analysis of algorithms.

The Nature of Modelling and the Modelling Cycle:

Problem formulation, making underlying assumptions, modelling techniques, verification of results, validation of model, presentation of information; algebraic, numerical and graphical. Interpretation and communication of results. The modelling activities will focus on problems that require familiarity with discrete mathematics structures and concepts. The entry level technical knowledge required to solve the mathematical problems involved in the projects will be derived either from other level 4 modules on the programme or from pre-existing knowledge of mathematics students would have from their previous study.

Professional attributes:

Research skills, scientific writing, group working skills, communication skills, presentation skills, reflective practice, ethics.

Part 3: Teaching and learning methods

Teaching and learning methods: Learning material will be delivered using lectures and workshops taught in collaborative learning spaces (TEAL rooms) and pc-labs.

Using appropriate case studies, in TEAL rooms, students will work in groups on problems that give them the opportunity to engage with research, industry and both local and global community sectors. The problems will be designed to develop core skills; IT, research, scientific writing, communication, presentation, referencing, reflection. Immersive Project weeks are used to integrate material from across the level 4 programme.

Programming will be taught using structured weekly workshops.

Professional and academic skills will be taught in workshops where small group discussions and where further on-line research can take place.

Problem formulation and mathematical modelling will be taught via lectures and workshops.

Module Learning outcomes:

MO1 Implement the modelling cycle to solve problems based on real life scenarios using mathematical methods where a variety of solution methods are possible.

MO2 Plan and conduct a systematic mathematical enquiry.

MO3 Write programs in an appropriate computer language, and apply appropriate software, to solve structured mathematical problems.

MO4 Communicate the findings of a mathematical investigation to a specified audience.

MO5 Reflect on the cultural, ethical, or sustainability impact of mathematical applications.

Hours to be allocated: 300

Contact hours:

Independent study/self-guided study = 224 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/ufmflv-30-1.html

Part 4: Assessment

Assessment strategy: Component B (50%) Modelling and Professional Skills Portfolio

The Professional Skills Portfolio will be made up of three distinct parts

Library workbook (5%)
A reflective log which will identify, and provide evidence of how key skills have been

developed and include a reflection on the cultural, ethical or sustainability impact of mathematical applications as experienced through project work and field trips. (5%) Modelling exercises (40%) Group Projects with individual component and peer assessment. The group projects will be based on problems derived from real life scenarios, and the solutions will require application of methods developed across the level 4 programme.

Component A Programming Portfolio (50%) will involve two equally weighted programming tasks that allow students to demonstrate their knowledge of the syntax and structure of a programmiing environment and its application to mathematical problems.

The resit assessment will have the same essential structure as the first sit assessment with group work tasks replaced by individual tasks and a single programming assessment replacing the Programming Portfolio.

Assessment components:

Portfolio - Component A (First Sit)
Description: Consists of two equally weighted programming activities delivered in each semester designed to build confidence and competence in the application of mathematics within a programming environment.
Weighting: 50 %
Final assessment: No
Group work: No
Learning outcomes tested: MO2, MO3

Portfolio - Component B (First Sit)
Description: Portfolio containing
reflective log (5%)
library workbook (5%)
Group presentation (total 20 minutes: 8 minutes presentation, 12 minutes Q&A) (15%)
Group report (2500 words) (25%)

Weighting: 50 %
Final assessment: Yes
Group work: Yes
Learning outcomes tested: MO1, MO2, MO4, MO5

Online Assignment - Component A (Resit)
Description: Consists of a single programming activities delivered equivalent to the first sit assessment designed to assess competence in the application of mathematics within a programming environment.
Weighting: 50 %
Final assessment: No
Group work: No
Learning outcomes tested: MO2, MO3

Portfolio - Component B (Resit)
Description: Portfolio containing DEWIS assessments and reflective essay (1500 words)
Weighting: 50 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO4, MO5

Part 5: Contributes towards

This module contributes towards the following programmes of study:

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

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

Mathematics with Qualified Teacher Status {Foundation Year}
[Sep][FT][Frenchay][3yrs] BSc 2020-21