# MODULE SPECIFICATION

| Part 1: Information | | | |
|---|---|---|---|
| Module Title | Mathematical Structures | | |
| Module Code | UFMFHV-30-1 | Level | Level 4 |
| For implementation from | 2020-21 | | |
| UWE Credit Rating | 30 | ECTS Credit Rating | 15 |
| Faculty | Faculty of Environment & Technology | Field | |
| 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

**Overview**: Two of the most important skills that distinguish a professional mathematical scientist from other kinds of scientist, and which make them so attractive to employers, are the ability
(i) to construct and to communicate precise logical arguments;
(ii) to abstract from the specific case to the general.
These skills enable the mathematical scientist to apply ingenious, elegant and powerful techniques to a wide range of problems in science and technology, social science, business and finance and culture.

The module is designed to develop these skills and to demonstrate the connections between abstract mathematical concepts and their applications, both within and outwith Mathematics. As with all other parts of the programme, the development of mathematical communication skills will be a guiding principle throughout the module.

The interplay between concepts, computation and applications will be highlighted, as will the important interactions between algebraic and geometric aspects of some of the topics. In addition, to emphasise the underlying unity of Mathematics and its applications, links with other parts of the programme will be made wherever appropriate (for example, in probability theory, graph theory, numerical analysis and abstract algebra).

**Educational Aims:** To discover, investigate and develop an understand of a variety of abstract structures which underpin much of Mathematics and its many applications.

**Outline Syllabus:** Sets, Numbers and Functions: naïve set theory; functions; relations; number systems; finite sets and counting principles; countable and uncountable sets.

Linear Algebra: vector spaces; linear transformations; matrices and determinants; systems of linear equations; spectral theory.

**Teaching and Learning Methods:** During the module, connections will be drawn between the underlying abstract concepts and the methods and techniques used in solving problems and in applications.

Scheduled teaching hours takes the form of:
whole group lectures and/or lectorials, used to deliver new material and/or to consolidate previous material;
smaller group tutorials with activities designed to encourage inquiry, critical thinking and mathematical precision;

Where appropriate, computer software will be utilised to visualise, analyse and/or solve relevant problems.

In order to consolidate learning, students will be expected to engage with lecture notes, worksheets and directed reading on a regular, ongoing basis. They will also be encouraged to deepen and broaden their knowledge via undirected reading from the Reading List and elsewhere.

**Part 3: Assessment**

Component A consists of two elements:
(E1) a 2-hour examination in January (25%) ;
(E2) a 2-hour summer examination (75%).

E1 assesses the module outcomes as they relate to material covered in semester one. Prior to the examination, students will be provided with a partial `shadow version' of the actual examination paper to allow students to prepare for assessment. The assessment will act as a mid-year progress indicator and as a source of feedback.

E2 will assess summatively the module outcomes as they relate to material covered in semester two. The examination will comprise unseen questions which assess the student's understanding of key concepts, theorems, techniques and their ability to apply them in order to solve relatively straightforward problems.

There is no Component B assessment.

The re-sit will comprise a single examination paper assessing the module outcomes relating to material from both semesters. All questions will be unseen.

| First Sit Components | **Final Assessment** | **Element weighting** | **Description** |
|---|---|---|---|
| Examination (Online) - Component A | | 25 % | January online written exam |
| Examination (Online) - Component A | ✓ | 75 % | Summer written exam |

| Resit Components | **Final Assessment** | **Element weighting** | **Description** |
|---|---|---|---|
| Examination (Online) - Component A | | 100 % | Online Written examination |

**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** |
|---|---|
| Select and apply appropriate techniques to analyse and solve problems from a range of areas, both within and outwith mathematics. | MO1 |
| Define mathematical concepts clearly, state theorems precisely, and construct rigorous proofs. | MO2 |
| Formulate and solve problems via abstraction. | MO3 |
| Communicate mathematical arguments clearly and effectively, by selecting an using appropriate notation, logic, concepts and techniques. | 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://rl.talis.com/3/uwe/lists/599CA13E-0E0D-1D20-1306-35B516161F3B.html?lang=en-US&login=1

**Part 5: Contributes Towards**

This module contributes towards the following programmes of study: