1. **Title of the module**

MAST9640 (MA964) - Applied Algebraic Topology

1. **School or partner institution which will be responsible for management of the module**

School of Mathematics, Statistics and Actuarial Science

1. **The level of the module (Level 4, Level 5, Level 6 or Level 7)**

Level 7

1. **The number of credits and the ECTS value which the module represents**

15 credits (7.5 ECTS)

1. **Which term(s) the module is to be taught in (or other teaching pattern)**

Autumn or Spring

1. **Prerequisite and co-requisite modules**

Prerequisite: MAST5670 (Topology) or equivalent

1. **The programmes of study to which the module contributes**

MSc in Mathematics and its Applications, International MSc in Mathematics and Its Applications (including programmes with an Industrial Placement), MMath Mathematics

1. **The intended subject specific learning outcomes.  
   On successfully completing the module students will be able to:**

8.1 understand the basic concepts of topology with particular emphasis on CW complexes, manifolds and simplicial complexes;

8.2 apply topological methods to real-world problems;

8.3 use homological and computational methods to solve topological problems;

8.4 demonstrate geometric and algebraic intuition;

8.5 demonstrate the ability to formulate and prove abstract mathematical statements, and appreciate their connection with concrete calculation;

8.6 demonstrate enhanced computational skills.

1. **The intended generic learning outcomes.  
   On successfully completing the module students will be able to:**

9.1 communicate their own ideas clearly and coherently;

9.2 read and comprehend sophisticated mathematical ideas;

9.3 apply problem solving skills;

9.4 demonstrate an understanding of abstract concepts;

9.5 demonstrate their grasp of a wide variety of mathematical techniques and methods.

1. **A synopsis of the curriculum**

There is growing interest in applying the methods of algebraic topology to data analysis, sensor networks, robotics, etc. The module will develop the necessary elements of algebra and topology, and investigate how these techniques are used in various applications. The syllabus will include: an introduction to manifolds, CW complexes and simplicial complexes; an investigation of the elements of homotopy theory; an exploration of homological and computational methods; applications such as homological sensor networks and topological data analysis.

1. **Reading list (Indicative list, current at time of publication. Reading lists will be published annually)**

Introduction to Metric & Topological Spaces, W A Sutherland, 2nd edition, Oxford UP, 2009.

Basic Topology, M A Armstrong, Springer, 1983.

A Basic Course in Algebraic Topology, W S Massey, Springer, 1991.

Computational Homology, Kaczynski, Mischaikow & Mrozek, Springer, 2004.

Introduction to Topology: Pure and Applied, C Adams & R Franzosa, Pearson/Prentice Hall, 2008.

Algebaric Topology, A Hatcher, Cambridge UP, 2012.

1. **Learning and teaching methods**

Total contact hours: 32

Private study hours: 118

Total study hours: 150

1. **Assessment methods**
   1. Main assessment methods

Assessment Exercises requiring on average between 10 and 15 hours to complete 15%

Project Research and project work, requiring on average between 15%

10 and 15 hours to complete

Examination 3 hours 70%

The coursework mark alone will not be sufficient to demonstrate the student’s level of achievement on the module.

13.2Reassessment methods

Like-for-like

1. **Map of module learning outcomes (sections 8 & 9) to learning and teaching methods (section12) and methods of assessment (section 13)**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Module learning outcome** | *8.1* | *8.2* | *8.3* | *8.4* | *8.5* | *8.6* | *9.1* | *9.2* | *9.3* | *9.4* | *9.5* |
| **Learning/ teaching method** |  |  |  |  |  |  |  |  |  |  |  |
| Private Study | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| Lectures/Example classes | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| **Assessment method** |  |  |  |  |  |  |  |  |  |  |  |
| Assessment | **X** | **X** | **X** | **X** | **X** | **X** |  | **X** | **X** | **X** | **X** |
| Project |  | **X** |  |  |  |  | **X** | **X** |  | **X** |  |
| Examination | **X** | **X** | **X** | **X** | **X** | **X** |  | **X** | **X** | **X** | **X** |

1. **Inclusive module design**

The School recognises and has embedded the expectations of current equality legislation, by ensuring that the module is as accessible as possible by design. Additional alternative arrangements for students with Inclusive Learning Plans (ILPs)/declared disabilities will be made on an individual basis, in consultation with the relevant policies and support services.

The inclusive practices in the guidance (see Annex B Appendix A) have been considered in order to support all students in the following areas:

a) Accessible resources and curriculum

b) Learning, teaching and assessment methods

1. **Campus(es) or centre(s) where module will be delivered**

Canterbury

1. **Internationalisation**

Mathematics is an international language with techniques developed and refined by mathematicians across the globe. Mastery of the subject-specific learning outcomes, 8.1 to 8.6, will equip students to apply the theories and techniques of this module in a wide range of international contexts. The module team is drawn from the School of Mathematics, Statistics and Actuarial Science, which includes many members of staff with international experience of teaching and research collaboration.

In compiling the reading list, consideration has been given to the range of texts that are available internationally and a selection of texts has been identified to complement the delivery of the material.

Examples with an international dimension are included in the module where appropriate.

**DIVISIONAL OFFICE USE ONLY**

**Revision record – all revisions must be recorded in the grid and full details of the change retained in the appropriate committee records.**

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| --- | --- | --- | --- | --- |
| Date approved | Major/minor revision | Start date of the delivery of revised version | Section revised | Impacts PLOs (Q6&7 cover sheet) |
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