MA260-12 Norms, Metrics and Topologies

22/23

Department
Warwick Mathematics Institute
Level
Undergraduate Level 2
Module leader
Richard Sharp
Credit value
12
Module duration
10 weeks
Assessment
Multiple
Study locations
University of Warwick main campus, Coventry Primary
Distance or Online Delivery

Description

Introductory description

The module treats various abstract settings in which to discuss convergence and continuity, and introduces concepts such as connectedness, compactness, and completeness, that will be taken further in future modules.

Norms provide a general measure of length, metrics a general measure of distance, and topologies an abstract setting in which to talk about "open sets". These notions are central in further work in both analysis and topology.

Module web page

Module aims

To introduce the notions of Normed Space, Metric Space and Topological Space, and the fundamental properties of Compactness, Connectedness and Completeness that they may possess.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Normed spaces - Metric spaces - Open and closed sets - Continuity - Topological spaces - The Hausdorff property and metrisability - Continuity between topological spaces - Compactness - Connectedness - Completeness in metric and normed spaces

Learning outcomes

By the end of the module, students should be able to:

- Demonstrate understanding of the basic concepts, theorems and calculations of Normed, Metric and Topological Spaces.
- Demonstrate understanding of the open-set definition of continuity and its relation to previous notions of continuity, and applications to open or closed sets.
- Demonstrate understanding of the basic concepts, theorems and calculations of the concepts of Compactness, Connectedness and Completeness (CCC).
- Demonstrate understanding of the connections that arise between CCC, their relations under continuous maps, and simple applications.

Indicative reading list

1. W A Sutherland, Introduction to Metric and Topological Spaces, OUP.
2. E T Copson, Metric Spaces, CUP.
3. G W Simmons, Introduction to Topology and Modern Analysis, McGraw Hill. (More advanced, although it starts at the beginning; helpful for several third year and MMath modules in analysis).

Subject specific skills

Familiarity with different ways of formulating convergence and continuity, and the relationship between them. Ability to use compactness and completeness arguments as part of larger proofs, frequently required in mathematical applications.

Transferable skills

Analytical and problem-solving skills as for any module in abstract mathematics. Facility for independent study and self motivation.

Study

Study time

Type	Required
Lectures	30 sessions of 1 hour (25%)
Seminars	5 sessions of 1 hour (4%)
Other activity	10 hours (8%)
Private study	75 hours (62%)
Total	120 hours

Private study description

self-working: reviewing lectured material and accompanying supplementary materials; working on both summative and formative coursework; revising for exams.

Other activity description

Collaborative project

Costs

No further costs have been identified for this module.

Assessment

You do not need to pass all assessment components to pass the module.

Students can register for this module without taking any assessment.

Assessment group B1

	Weighting	Study time
In-person Examination 3 hour examination - no books allowed	100%	

- Answerbook Pink (12 page)

Assessment group R

	Weighting	Study time
In-person Examination - Resit	100%	

- Answerbook Pink (12 page)

Feedback on assessment

Marked homework (formative) is returned and discussed in smaller classes and exam feedback.

Past exam papers for MA260

Availability

Courses

This module is Core for:

- Year 2 of UMAA-G105 Undergraduate Master of Mathematics (with Intercalated Year)
- UMAA-G100 Undergraduate Mathematics (BSc)
    - Year 2 of G100 Mathematics
    - Year 2 of G100 Mathematics
    - Year 2 of G100 Mathematics
- UMAA-G103 Undergraduate Mathematics (MMath)
    - Year 2 of G100 Mathematics
    - Year 2 of G103 Mathematics (MMath)
    - Year 2 of G103 Mathematics (MMath)
- Year 2 of UMAA-G106 Undergraduate Mathematics (MMath) with Study in Europe
- Year 2 of UMAA-G1NC Undergraduate Mathematics and Business Studies
- Year 2 of UMAA-G1N2 Undergraduate Mathematics and Business Studies (with Intercalated Year)
- Year 2 of UMAA-GL11 Undergraduate Mathematics and Economics
- Year 2 of UECA-GL12 Undergraduate Mathematics and Economics (with Intercalated Year)
- Year 2 of UMAA-G101 Undergraduate Mathematics with Intercalated Year

This module is Core option list A for:

- UMAA-GV17 Undergraduate Mathematics and Philosophy
    - Year 2 of GV17 Mathematics and Philosophy
    - Year 2 of GV17 Mathematics and Philosophy
    - Year 2 of GV17 Mathematics and Philosophy
- Year 2 of UMAA-GV19 Undergraduate Mathematics and Philosophy with Specialism in Logic and Foundations

This module is Option list A for:

- UPXA-GF13 Undergraduate Mathematics and Physics (BSc)
    - Year 2 of GF13 Mathematics and Physics
    - Year 2 of GF13 Mathematics and Physics
- UPXA-FG31 Undergraduate Mathematics and Physics (MMathPhys)
    - Year 2 of FG31 Mathematics and Physics (MMathPhys)
    - Year 2 of FG31 Mathematics and Physics (MMathPhys)