# MATH703

Topology

S1 Day 2016

Dept of Mathematics

## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Information</td>
<td>2</td>
</tr>
<tr>
<td>Learning Outcomes</td>
<td>2</td>
</tr>
<tr>
<td>Assessment Tasks</td>
<td>3</td>
</tr>
<tr>
<td>Delivery and Resources</td>
<td>4</td>
</tr>
<tr>
<td>Unit Schedule</td>
<td>4</td>
</tr>
<tr>
<td>Learning and Teaching Activities</td>
<td>5</td>
</tr>
<tr>
<td>Policies and Procedures</td>
<td>5</td>
</tr>
<tr>
<td>Graduate Capabilities</td>
<td>6</td>
</tr>
</tbody>
</table>

## Disclaimer

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General Information

Unit convenor and teaching staff
convenor
Adam Sikora
adam.sikora@mq.edu.au
Contact via email
AH 2.633

Credit points
4

Prerequisites
Admission to MRes

Corequisites

Co-badged status

Unit description
This unit provides an advanced introduction to the key areas of research interest in modern topology. Topology is the study of continuity. The definition of a topological space was conceived in order to say what it means for a function between such spaces to be continuous. There are several ways of defining topological structure and the proofs that these are equivalent abstract many concrete results about specific kinds of spaces. Different ways of expressing continuity are obtained. Sequences are not adequate for general topological spaces, they need to be replaced by nets or filters, and we discuss convergence of those. Particular properties of topological spaces are analysed in detail: these include separation properties, compactness, connectedness, countability conditions, local properties, metrizability, and so on. Applications to basic calculus are emphasised. We then introduce algebraic topology by discussing the Poincaré or fundamental group of a space.

Important Academic Dates
Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes
On successful completion of this unit, you will be able to:

Understanding logical arguments and recognising any gaps or faults in such arguments.
Solving problems, including: formulating a precise mathematical question from a "real world" problem; identifying and applying appropriate mathematical techniques.
Expressing yourself clearly and logically in writing.

More broadly, you are expected to improve your generic skills in the following areas: literacy and numeracy, self-awareness and interpersonal skills, communications, critical analysis, problem solving and creative thinking.

## Assessment Tasks

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Five Assignments</td>
<td>50%</td>
<td>fortnightly</td>
</tr>
<tr>
<td>Final Exam</td>
<td>40%</td>
<td>Examination period</td>
</tr>
<tr>
<td>Presentation</td>
<td>10%</td>
<td>during semester</td>
</tr>
</tbody>
</table>

### Five Assignments

**Due:** *fortnightly*

**Weighting:** *50%

Written solutions, generally involving both proof and calculation.

On successful completion you will be able to:

- Understanding logical arguments and recognising any gaps or faults in such arguments.
- Solving problems, including: formulating a precise mathematical question from a "real world" problem; identifying and applying appropriate mathematical techniques.
- Expressing yourself clearly and logically in writing.
- More broadly, you are expected to improve your generic skills in the following areas: literacy and numeracy, self-awareness and interpersonal skills, communications, critical analysis, problem solving and creative thinking.

### Final Exam

**Due:** *Examination period*

**Weighting:** *40%

Take-home exam based on the semester's work, to be conducted in department.

On successful completion you will be able to:

- Understanding logical arguments and recognising any gaps or faults in such arguments.
- Solving problems, including: formulating a precise mathematical question from a "real world" problem; identifying and applying appropriate mathematical techniques.
- Expressing yourself clearly and logically in writing.

https://unitguides.mq.edu.au/unit_offerings/55815/unit_guide/print
• More broadly, you are expected to improve your generic skills in the following areas:
literacy and numeracy, self-awareness and interpersonal skills, communications, critical
analysis, problem solving and creative thinking.

Presentation
Due: during semester
Weighting: 10%

Presentation of some parts of course material in a seminar form

On successful completion you will be able to:
• Understanding logical arguments and recognising any gaps or faults in such arguments.
• Solving problems, including: formulating a precise mathematical question from a "real
world" problem; identifying and applying appropriate mathematical techniques.
• More broadly, you are expected to improve your generic skills in the following areas:
literacy and numeracy, self-awareness and interpersonal skills, communications, critical
analysis, problem solving and creative thinking.

Delivery and Resources

Classes
You should attend the two-hour lecture each week.

Required and recommended texts and/or materials
(available on-line from Macquarie library)

Technology used and required
You are expected to have access to an internet enabled computer with a web browser and pdf
viewer. Assignments and the take home exam are to be submitted by email in pdf. There will be
a shared DropBox folder from which the course materials -- assignments, exam and
supplementary notes -- will be accessible. Several areas of the university provide wireless
access for portable computers. There are computers for student use in the Library and in the Numeracy Centre (C5A 255). Difficulties with your home computer or internet connection do not constitute a reasonable excuse for lateness of, or failure to submit, assessment tasks.

Unit Schedule
Weekly lecture: Wednesday 10am-12pm.
Learning and Teaching Activities

Lecture
2 hours per week

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central. Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html


Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.

In addition, a number of other policies can be found in the Learning and Teaching Category of Policy Central.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/support/student_conduct/

Results

Results shown in iLearn, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit ask.mq.edu.au.

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.
Student Services and Support

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

Student Enquiries
For all student enquiries, visit Student Connect at ask.mq.edu.au

IT Help
For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University’s IT, you must adhere to the Acceptable Use of IT Resources Policy. The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

PG - Capable of Professional and Personal Judgment and Initiative

Our postgraduates will demonstrate a high standard of discernment and common sense in their professional and personal judgment. They will have the ability to make informed choices and decisions that reflect both the nature of their professional work and their personal perspectives.

This graduate capability is supported by:

Learning outcome

• Understanding logical arguments and recognising any gaps or faults in such arguments.

Assessment tasks

• Five Assignments
• Final Exam
• Presentation

PG - Discipline Knowledge and Skills

Our postgraduates will be able to demonstrate a significantly enhanced depth and breadth of knowledge, scholarly understanding, and specific subject content knowledge in their chosen fields.

This graduate capability is supported by:
Learning outcomes

• Understanding logical arguments and recognising any gaps or faults in such arguments.
• Solving problems, including: formulating a precise mathematical question from a "real world" problem; identifying and applying appropriate mathematical techniques.
• Expressing yourself clearly and logically in writing.
• More broadly, you are expected to improve your generic skills in the following areas: literacy and numeracy, self-awareness and interpersonal skills, communications, critical analysis, problem solving and creative thinking.

Assessment tasks

• Five Assignments
• Final Exam
• Presentation

PG - Critical, Analytical and Integrative Thinking

Our postgraduates will be capable of utilising and reflecting on prior knowledge and experience, of applying higher level critical thinking skills, and of integrating and synthesising learning and knowledge from a range of sources and environments. A characteristic of this form of thinking is the generation of new, professionally oriented knowledge through personal or group-based critique of practice and theory.

This graduate capability is supported by:

Learning outcomes

• Understanding logical arguments and recognising any gaps or faults in such arguments.
• Solving problems, including: formulating a precise mathematical question from a "real world" problem; identifying and applying appropriate mathematical techniques.
• More broadly, you are expected to improve your generic skills in the following areas: literacy and numeracy, self-awareness and interpersonal skills, communications, critical analysis, problem solving and creative thinking.

Assessment tasks

• Five Assignments
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PG - Research and Problem Solving Capability

Our postgraduates will be capable of systematic enquiry; able to use research skills to create new knowledge that can be applied to real world issues, or contribute to a field of study or
practice to enhance society. They will be capable of creative questioning, problem finding and problem solving.

This graduate capability is supported by:

**Learning outcomes**

- Understanding logical arguments and recognising any gaps or faults in such arguments.
- Solving problems, including: formulating a precise mathematical question from a "real world" problem; identifying and applying appropriate mathematical techniques.
- Expressing yourself clearly and logically in writing.
- More broadly, you are expected to improve your generic skills in the following areas: literacy and numeracy, self-awareness and interpersonal skills, communications, critical analysis, problem solving and creative thinking.

**Assessment tasks**

- Five Assignments
- Final Exam
- Presentation

**PG - Effective Communication**

Our postgraduates will be able to communicate effectively and convey their views to different social, cultural, and professional audiences. They will be able to use a variety of technologically supported media to communicate with empathy using a range of written, spoken or visual formats.

This graduate capability is supported by:

**Learning outcomes**

- Solving problems, including: formulating a precise mathematical question from a "real world" problem; identifying and applying appropriate mathematical techniques.
- Expressing yourself clearly and logically in writing.

**Assessment tasks**

- Five Assignments
- Final Exam
- Presentation

**PG - Engaged and Responsible, Active and Ethical Citizens**

Our postgraduates will be ethically aware and capable of confident transformative action in relation to their professional responsibilities and the wider community. They will have a sense of connectedness with others and country and have a sense of mutual obligation. They will be able to appreciate the impact of their professional roles for social justice and inclusion related to
This graduate capability is supported by:

**Learning outcomes**

- Understanding logical arguments and recognising any gaps or faults in such arguments.
- Solving problems, including: formulating a precise mathematical question from a "real world" problem; identifying and applying appropriate mathematical techniques.
- Expressing yourself clearly and logically in writing.
- More broadly, you are expected to improve your generic skills in the following areas: literacy and numeracy, self-awareness and interpersonal skills, communications, critical analysis, problem solving and creative thinking.

**Assessment tasks**

- Five Assignments
- Final Exam