MATH3900

Geometry and Topology

Session 1, Special circumstances 2021

Archive (Pre-2022) - Department of Mathematics and Statistics

Contents

Notice

As part of Phase 3 of our return to campus plan, most units will now run tutorials, seminars and other small group activities on campus, and most will keep an online version available to those students unable to return or those who choose to continue their studies online.

To check the availability of face-to-face activities for your unit, please go to timetable viewer. To check detailed information on unit assessments visit your unit's iLearn space or consult your unit convenor.

General Information

Unit convenor and teaching staff
Lecturer
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Please refer to iLearn

Lecturer
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Christine Hale
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Credit points
10

Prerequisites
130cp including MATH2010 or MATH235

Corequisites

Co-badged status

Unit description
This unit is designed to widen geometric intuition and horizons by studying topics such as projective geometry, topology of surfaces, graph theory, map colouring, ruler-and-compass constructions, knot theory and isoperimetric problems.

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:

ULO1: Formulate and model practical and abstract problems in mathematical terms

using methods from geometry and topology

ULO2: Apply concepts and techniques of geometry and topology to practical and abstract problems

ULO3: Use axioms and definitions correctly within a mathematical argument

ULO4: Apply the mathematical notions of invariant and isomorphism in order to discriminate and classify geometric objects

General Assessment Information

Assessment consists of Assignment 1 with weight 15% due on Wed 31 Mar (week 6), Assignment 2 with weight 15% due on Wed 19 May (week 11), Class test (online) with weight 15% on Mon 3 May (week 9), and Final Exam with weight 55%.

LATE SUBMISSION OF WORK: All assessment tasks must be submitted by the official due date and time. In the case of a late submission for a non-timed assessment (e.g. an assignment), if special consideration has NOT been granted, 20% of the earned mark will be deducted for each 24-hour period (or part thereof) that the submission is late for the first 2 days (including weekends and/or public holidays). For example, if an assignment is submitted 25 hours late, its mark will attract a penalty equal to 40% of the earned mark. After 2 days (including weekends and public holidays) a mark of 0% will be awarded. Timed assessment tasks (e.g. tests, examinations) do not fall under these rules.

Assessment Tasks

Name	Weighting	Hurdle	Due
Assignment 1	15%	No	Week 6
Class Test (Online)	15%	No	Week 9
Assignment 2	15%	No	Week 11
Final Exam	55%	No	Formal University Examination Period

Assignment 1

Assessment Type [1]: Problem set
Indicative Time on Task [2]: 5 hours
Due: **Week 6**
Weighting: **15%**

The assignments will include questions from both the topology and the geometry component of the unit.

On successful completion you will be able to:

- Formulate and model practical and abstract problems in mathematical terms using methods from geometry and topology
- Apply concepts and techniques of geometry and topology to practical and abstract problems
- Use axioms and definitions correctly within a mathematical argument
- Apply the mathematical notions of invariant and isomorphism in order to discriminate and classify geometric objects

Class Test (Online)

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 6 hours
Due: **Week 9**
Weighting: **15%**

This will be an online test and cover both the geometry and the topology components of the unit.

On successful completion you will be able to:

- Formulate and model practical and abstract problems in mathematical terms using methods from geometry and topology
- Apply concepts and techniques of geometry and topology to practical and abstract problems
- Use axioms and definitions correctly within a mathematical argument
- Apply the mathematical notions of invariant and isomorphism in order to discriminate and classify geometric objects

Assignment 2

Assessment Type [1]: Problem set
Indicative Time on Task [2]: 5 hours
Due: **Week 11**
Weighting: **15%**

The assignments will include questions from both the topology and the geometry component of the unit.

On successful completion you will be able to:
- Formulate and model practical and abstract problems in mathematical terms using methods from geometry and topology
- Apply concepts and techniques of geometry and topology to practical and abstract problems
- Use axioms and definitions correctly within a mathematical argument
- Apply the mathematical notions of invariant and isomorphism in order to discriminate and classify geometric objects

Final Exam

Assessment Type [1]: Examination
Indicative Time on Task [2]: 12 hours
Due: **Formal University Examination Period**
Weighting: **55%**

This will be an invigilated exam that covers all aspects of the unit

On successful completion you will be able to:
- Formulate and model practical and abstract problems in mathematical terms using methods from geometry and topology
- Apply concepts and techniques of geometry and topology to practical and abstract problems
- Use axioms and definitions correctly within a mathematical argument
- Apply the mathematical notions of invariant and isomorphism in order to discriminate and classify geometric objects

[1] If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the Writing Centre for academic skills support.

[2] Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

Delivery and Resources

Classes

Lectures: you should attend two one-hour lectures each week.

SGTA: you should attend one one-hour SGTA each week (starting in week 2).

Required and Recommended Texts and/or Materials

Additional notes will be attached to the course's iLearn page. Also recommended for the course is the following online texts:

The Four Pillars of Geometry by John Stillwell

Chris Cooper's Note on Geometry at https://coopersnotes.net/third_geometry.html

Chris Cooper's Note on Topology at https://coopersnotes.net/third_topology.html

Technology Used and Required

Students are expected to have access to an internet enabled computer with a web browser and Adobe Reader software. There are computers for student use in the Library and MUSE.

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

Week 1: Geometry: Euclidean geometry in the complex plane

Week 2: Topology: Topological spaces

Week 3: Geometry: Affine functions

Week 4: Topology: Surfaces and Surgery

Week 5: Geometry: Affine geometry

Week 6: Topology: Graphs on Surfaces, Graphs and Map Colouring

Week 7: Geometry: Projective geometry

Week 8: Topology: Knots and Links

Week 9: Geometry: Projective geometry; Test online

Week 10: Topology: The Alexander number of a Knot, The Alexander Group of a Knot

Week 11: Geometry: Constructions in geometry and number fields

Week 12: Topology: The Alexander Module, The Alexander Polynomial

Week 13: Revisions

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://policies.mq.edu.au). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy
- Academic Integrity Policy
- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Grade Appeal Policy
- Complaint Management Procedure for Students and Members of the Public
- Special Consideration Policy

Students seeking more policy resources can visit Student Policies (https://students.mq.edu.au/support/study/policies). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit Policy Central (https://policies.mq.edu.au) and use the search tool.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/admin/other-resources/student-conduct

Results

Results published on platform other than eStudent, (eg. iLearn, Coursera etc.) 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 or if you are a Global MBA student contact globalmba.support@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 help you improve your marks and take control of your study.

- Getting help with your assignment
- Workshops
- StudyWise

- Academic Integrity Module

The Library provides online and face to face support to help you find and use relevant information resources.

- Subject and Research Guides
- Ask a Librarian

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

If you are a Global MBA student contact globalmba.support@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.

Changes from Previous Offering

Last year, the topology part was delivered in the first 6 weeks, and geometry part in the second 6 weeks.

This year, topology and geometry parts will be delivered in alternate weeks, geometry in weeks 1,3,5,7, 9, 11

and topology in weeks 2,4,6,8,10 and 12.

In the last delivery, there was 4 hours of lecture each week. In this delivery, there are 2 hours of lecture and 1 hour of SGTA.

Changes since First Published

Date	Description
11/02/2021	Updated Assessment and Delivery and Resources sections.