MATH3909
Real and Functional Analysis
Session 2, In person-scheduled-weekday, North Ryde 2022
School of Mathematical and Physical Sciences

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General Information

Unit convenor and teaching staff
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Credit points
10

Prerequisites
((MATH2010 or MATH235) and (MATH2020 or MATH236)) or MATH3901 or MATH3902 or MATH3905 or MATH3906 or MATH331 or MATH332 or MATH335 or MATH336

Corequisites

Co-badged status

Unit description
This unit is concerned with a review of the limiting processes of real analysis and an introduction to functional analysis. Through the discussion of such abstract notions as metric spaces, normed vector spaces and inner product spaces, we can appreciate an elegant and powerful combination of ideas from analysis and linear algebra.

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: demonstrate a well-developed knowledge of the principles, concepts and techniques of a broad range of areas in analysis and applied mathematics, with significant depth in analysis and functional analysis.

ULO2: demonstrate an understanding of the breadth of mathematics, the multi-disciplinary role of mathematics and the way it contributes the development in other related fields of study.

ULO3: construct sustained logical, clearly presented and justified mathematical arguments incorporating deductive reasoning.
ULO4: formulate and model practical and abstract problems in mathematical terms using a variety of methods drawn from analysis and functional analysis.

ULO5: apply mathematical principles, concepts, techniques and technology efficiently to solve practical and abstract problems across a range of areas in analysis and functional analysis.

ULO6: interpret mathematical information communicated in wide range of forms.

General Assessment Information

Late Assessment Submission Penalty

From 1 July 2022, Students enrolled in Session based units with written assessments will have the following late penalty applied. Please see https://students.mq.edu.au/study/assessment-exams/assessments for more information.

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark) will be applied each day a written assessment is not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded even if the assessment is submitted. Submission time for all written assessments is set at 11:55 pm. A 1-hour grace period is provided to students who experience a technical concern.

For any late submission of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, students need to submit an application for Special Consideration.

Assessments where Late Submissions will be accepted

In this unit, late submissions will be accepted as follows:

Assignment 1, Assignment 2 – YES, Standard Late Penalty applies  Test 1, Test 2, Final Exam - NO, unless Special Consideration is granted

Assessment Tasks

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Hurdle</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test 2</td>
<td>10%</td>
<td>No</td>
<td>Week 10</td>
</tr>
<tr>
<td>Test 1</td>
<td>10%</td>
<td>No</td>
<td>Week 4</td>
</tr>
<tr>
<td>Assignment 1</td>
<td>15%</td>
<td>No</td>
<td>Week 06</td>
</tr>
<tr>
<td>Final Exam</td>
<td>50%</td>
<td>No</td>
<td>Examination Period</td>
</tr>
<tr>
<td>Assignment 2</td>
<td>15%</td>
<td>No</td>
<td>Week 12</td>
</tr>
</tbody>
</table>

Test 2
Assessment Type 1: Quiz/Test
Indicative Time on Task: 5 hours
Due: Week 10
Weighting: 10%

This will be a test held during the semester. It will test the ability of students to analyse and solve mathematical problems using concepts and techniques in real and functional analysis.

On successful completion you will be able to:
  • demonstrate a well-developed knowledge of the principles, concepts and techniques of a broad range of areas in analysis and applied mathematics, with significant depth in analysis and functional analysis.
  • demonstrate an understanding of the breadth of mathematics, the multi-disciplinary role of mathematics and the way it contributes the development in other related fields of study.
  • construct sustained logical, clearly presented and justified mathematical arguments incorporating deductive reasoning.
  • formulate and model practical and abstract problems in mathematical terms using a variety of methods drawn from analysis and functional analysis.
  • apply mathematical principles, concepts, techniques and technology efficiently to solve practical and abstract problems across a range of areas in analysis and functional analysis.
  • interpret mathematical information communicated in wide range of forms.

Test 1
Assessment Type: Quiz/Test
Indicative Time on Task: 5 hours
Due: Week 4
Weighting: 10%

This will be a test held during the semester. It will test the ability of students to analyse and solve mathematical problems using concepts and techniques in real and functional analysis.

On successful completion you will be able to:
  • demonstrate a well-developed knowledge of the principles, concepts and techniques of a broad range of areas in analysis and applied mathematics, with significant depth in
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Assignment 1
Assessment Type 1: Problem set
Indicative Time on Task 2: 10 hours
Due: Week 06
Weighting: 15%

The assignment will include a set of questions with short answers involving proofs and calculations.
analysis.
  • interpret mathematical information communicated in wide range of forms.

Final Exam
Assessment Type 1: Examination
Indicative Time on Task 2: 15 hours
Due: Examination Period
Weighting: 50%

The final exam will cover all topics of the unit

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  • construct sustained logical, clearly presented and justified mathematical arguments incorporating deductive reasoning.
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  • apply mathematical principles, concepts, techniques and technology efficiently to solve practical and abstract problems across a range of areas in analysis and functional analysis.
  • interpret mathematical information communicated in wide range of forms.

Assignment 2
Assessment Type 1: Problem set
Indicative Time on Task 2: 10 hours
Due: Week 12
Weighting: 15%

The assignment will include a set of questions with short answers involving proofs and calculations.

https://unitguides.mq.edu.au/unit_offers/149242/unit_guide/print
On successful completion you will be able to:

• demonstrate a well-developed knowledge of the principles, concepts and techniques of a broad range of areas in analysis and applied mathematics, with significant depth in analysis and functional analysis.

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• interpret mathematical information communicated in wide range of forms.

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

There is one 2-hour lecture and one 1-hour sgta per week.

Unit Schedule

<table>
<thead>
<tr>
<th>WEEK</th>
<th>TOPIC</th>
<th>ASSESSMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>The real number system</td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>Sequences</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>Topology of Real Numbers</td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>Continuity</td>
<td>Test 1: Real Analysis</td>
</tr>
</tbody>
</table>
## 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
- Assessment Procedure
- Complaints Resolution 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

Academic Integrity
At Macquarie, we believe academic integrity – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free online writing and maths support, academic skills development and wellbeing consultations.

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

The Writing Centre
The Writing Centre provides resources to develop your English language proficiency, academic writing, and communication skills.

- **Workshops**
- **Chat with a WriteWISE peer writing leader**
- **Access StudyWISE**
- **Upload an assignment to Studiosity**
- **Complete the 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
Macquarie University offers a range of Student Support Services including:

- **IT Support**
- **Accessibility and disability support** with study
- **Mental health support**
- **Safety support** to respond to bullying, harassment, sexual harassment and sexual assault
- **Social support including information about finances, tenancy and legal issues**
Student Enquiries
Got a question? Ask us via AskMQ, or contact Service Connect.

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.