MATH701

Analysis

S1 Day 2018

Dept of Mathematics

Contents

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General Information

Unit convenor and teaching staff
Professor
Xuan Duong
xuan.duong@mq.edu.au
Contact via E-mail - Office
12 Wally's Walk, Room 729
Monday 12 to 1 pm

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 analysis. We will study Lebesgue integration, positive Borel measures, and the all important function spaces Lp. Then we will study the elementary Hilbert space theory and Banach space techniques. This will provide familiarity with some of the major theorems which make up the analysis toolbox: Monotone and Dominated Convergence theorems; Fatou's lemma; Egorov's theorem; Lusin's theorem; Radon-Nikodym theorem; Fubini-Tonelli theorems about product measures and integration on product spaces; Uniform Boundedness; Fundamental Theorem of Calculus for Lebesgue Integrals; Minkowski's Inequality; Holder's Inequality; Jensen's Inequality; and Bessel's Inequality.

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:

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

2. Solving problems, including: formulating a precise mathematical question from a "real

world" problem; identifying and applying appropriate mathematical techniques.

3. Expressing yourself clearly and logically in writing.

4. 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.

General Assessment Information

Each assignment has 5 or 6 questions mostly taken from the textbook Real and Complex Analysis of Walter Rudin.

Assessment Tasks

Name	Weighting	Hurdle	Due
Assignment 1	20%	No	Week 5
Assignment 2	20%	No	Week 7
Assignment 3	20%	No	Week 9
Assignment 4	20%	No	Week 11
Assignment 5	20%	No	Week 13

Assignment 1

Due: **Week 5**
Weighting: **20%**

This Assessment Task relates to the following 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: literacyand numeracy, self-awareness and interpersonal skills, communications, critical analysis, problem solving and creative thinking.

On successful completion you will be able to:

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

- 2. Solving problems, including: formulating a precise mathematical question from a "real

world" problem; identifying and applying appropriate mathematical techniques.

- 3. Expressing yourself clearly and logically in writing.
- 4. 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.

Assignment 2

Due: **Week 7**
Weighting: **20%**

This Assessment Task relates to the following 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: literacyand numeracy, self-awareness and interpersonal skills, communications, critical analysis, problem solving and creative thinking.

On successful completion you will be able to:

- 1. Understanding logical arguments and recognising any gaps or faults in such arguments.
- 2. Solving problems, including: formulating a precise mathematical question from a "real world" problem; identifying and applying appropriate mathematical techniques.
- 3. Expressing yourself clearly and logically in writing.
- 4. 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.

Assignment 3

Due: **Week 9**
Weighting: **20%**

This Assessment Task relates to the following 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: literacyand numeracy, self-awareness and interpersonal skills, communications, critical analysis, problem solving and creative thinking.

On successful completion you will be able to:

- 1. Understanding logical arguments and recognising any gaps or faults in such arguments.
- 2. Solving problems, including: formulating a precise mathematical question from a "real world" problem; identifying and applying appropriate mathematical techniques.
- 3. Expressing yourself clearly and logically in writing.
- 4. 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.

Assignment 4

Due: **Week 11**
Weighting: **20%**

This Assessment Task relates to the following 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: literacyand numeracy, self-awareness and interpersonal skills, communications, critical analysis, problem solving and creative thinking.

On successful completion you will be able to:

- 1. Understanding logical arguments and recognising any gaps or faults in such arguments.
- 2. Solving problems, including: formulating a precise mathematical question from a "real world" problem; identifying and applying appropriate mathematical techniques.
- 3. Expressing yourself clearly and logically in writing.
- 4. 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.

Assignment 5

Due: **Week 13**
Weighting: **20%**

This Assessment Task relates to the following 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: literacyand numeracy, self-awareness and interpersonal skills, communications, critical analysis, problem solving and creative thinking.

On successful completion you will be able to:

- 1. Understanding logical arguments and recognising any gaps or faults in such arguments.
- 2. Solving problems, including: formulating a precise mathematical question from a "real world" problem; identifying and applying appropriate mathematical techniques.
- 3. Expressing yourself clearly and logically in writing.
- 4. 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

Main textbook is W. Rudin's "Real and complex analysis"

Unit Schedule

The first five chapters of W. Rudin's book "Real and complex analysis":

Chapter 1: Abstract Integration

Chapter 2: Positive Borel measures

Chapter 3: Lp spaces

Chapter 4: Elementary Hilbert space theory

Chapter 5: Examples of Banach space techniques

Each of Chapters 1, 2, 4 and 5 takes an average of 5 hours lecturing, and Chapter 3 takes 4 hours.

The last week is for any unforseen delay.

Learning and Teaching Activities

Lectures

Lectures There are 2 hours of lectures each week.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). 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 *(**Note:** The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.)*

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

If you would like to see all the policies relevant to Learning and Teaching visit Policy Central (https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/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/study/getting-started/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.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

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 outcomes

- 1. Understanding logical arguments and recognising any gaps or faults in such arguments.
- 2. Solving problems, including: formulating a precise mathematical question from a "real world" problem; identifying and applying appropriate mathematical techniques.
- 3. Expressing yourself clearly and logically in writing.
- 4. 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

- Assignment 1
- Assignment 2
- Assignment 3
- Assignment 4
- Assignment 5

Learning and teaching activities

- Lectures There are 2 hours of lectures each week.

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

- 1. Understanding logical arguments and recognising any gaps or faults in such arguments.
- 2. Solving problems, including: formulating a precise mathematical question from a "real world" problem; identifying and applying appropriate mathematical techniques.
- 3. Expressing yourself clearly and logically in writing.
- 4. 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.

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- Assignment 4
- Assignment 5

Learning and teaching activities

- Lectures There are 2 hours of lectures each week.

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

- 1. Understanding logical arguments and recognising any gaps or faults in such arguments.
- 2. Solving problems, including: formulating a precise mathematical question from a "real world" problem; identifying and applying appropriate mathematical techniques.
- 3. Expressing yourself clearly and logically in writing.
- 4. 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.

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- Assignment 3
- Assignment 4
- Assignment 5

Learning and teaching activities

- Lectures There are 2 hours of lectures each week.

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

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

- 4. 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.

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- Assignment 3
- Assignment 4
- Assignment 5

Learning and teaching activities

- Lectures There are 2 hours of lectures each week.

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

- 1. Understanding logical arguments and recognising any gaps or faults in such arguments.
- 2. Solving problems, including: formulating a precise mathematical question from a "real world" problem; identifying and applying appropriate mathematical techniques.
- 3. Expressing yourself clearly and logically in writing.
- 4. 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.

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- Assignment 3
- Assignment 4
- Assignment 5

Learning and teaching activities

- Lectures There are 2 hours of lectures each week.

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 national and global issues

This graduate capability is supported by:

Learning outcomes

- 1. Understanding logical arguments and recognising any gaps or faults in such arguments.
- 2. Solving problems, including: formulating a precise mathematical question from a "real world" problem; identifying and applying appropriate mathematical techniques.
- 3. Expressing yourself clearly and logically in writing.
- 4. 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.

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- Assignment 2
- Assignment 3
- Assignment 4
- Assignment 5

Learning and teaching activities

- Lectures There are 2 hours of lectures each week.