MATH706

Research Topics in Mathematics 3

S2 Day 2016

Dept of Mathematics

Contents

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General Information

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MRes convenor
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Credit points
4

Prerequisites
Admission to MRes

Corequisites

Co-badged status

Unit description
This unit is study of a current topic of Mathematical research. As a preparation for life as a researcher, part of the assessment in this unit will be based on oral presentations by the student. The unit will be based around a mixture of standard lectures and student seminars.

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:

Construct examples of categories and functors in a range of mathematical areas, and be able to apply constructions for building new categories from old.

Recognise examples of universal mapping properties occurring in algebra and topology.

Calculate with limits and colimits in familiar categories such as sets and vector spaces; reduce complex limits to iterated applications of more basic ones.

Apply the concept of natural transformation in practical mathematical situations, and calculate basic structures in functor categories.

Compute free objects with respect to forgetful functors; construct the free functors formed out of such free objects.

Assessment Tasks

Name	Weighting	Due
Four assignments	100%	See iLearn

Four assignments

Due: **See iLearn**
Weighting: **100%**

Written solutions, generally involving both proof and calculation.

On successful completion you will be able to:

- Construct examples of categories and functors in a range of mathematical areas, and be able to apply constructions for building new categories from old.
- Recognise examples of universal mapping properties occurring in algebra and topology.
- Calculate with limits and colimits in familiar categories such as sets and vector spaces; reduce complex limits to iterated applications of more basic ones.
- Apply the concept of natural transformation in practical mathematical situations, and calculate basic structures in functor categories.
- Compute free objects with respect to forgetful functors; construct the free functors formed out of such free objects.

Delivery and Resources

Category Theory

Category theory studies pure-mathematical entities from a structural perspective, finding unifying features appearing across seemingly unrelated areas of mathematics, and providing a powerful and flexible language for describing those features. It plays an increasingly important role in modern algebra, geometry, and topology. This course is an introduction to the basic language and notions of category theory: categories and functors, universal properties, limits and colimits, functor categories and adjunctions.

Classes

You should attend the two-hour lecture each week.

Required and recommended rexts and/or materials

There is no required text for this unit. If you wish to look at a textbook, I recommend:

Steve Awodey, "Category Theory", second edition, Oxford Logic Guides, OUP 2010.

Technology used and required

You are expected to have access to an internet enabled computer with a web browser and Adobe Reader software. 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.**

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

New Assessment Policy in effect from Session 2 2016 http://mq.edu.au/policy/docs/assessment/policy_2016.html. For more information visit http://students.mq.edu.au/events/2016/07/19/new_assessment_policy_in_place_from_session_2/

Assessment Policy prior to Session 2 2016 http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy prior to Session 2 2016 http://mq.edu.au/policy/docs/grading/policy.html

Grade Appeal Policy http://mq.edu.au/policy/docs/gradeappeal/policy.html

Complaint Management Procedure for Students and Members of the Public http://www.mq.edu.au/policy/docs/complaint_management/procedure.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.

- 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:

Assessment task

- Four assignments

Learning and teaching activity

- 2 hours per 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:

Assessment task

- Four assignments

Learning and teaching activity

- 2 hours per 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:

Assessment task

- Four assignments

Learning and teaching activity

- 2 hours per 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:

Assessment task

- Four assignments

Learning and teaching activity

- 2 hours per 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:

Assessment task

- Four assignments

Learning and teaching activity

- 2 hours per week