

ACE Network Subject Information Guide

C*-algebras

Semester 1, 2019

Administration and contact details

Host Department	School of Mathematics and Applied Statistics
Host Institution	University of Wollongong
Name of lecturer	Aidan Sims
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Subject details

Handbook entry URL	N/A
Subject homepage URL	N/A
Honours student hand-out URL	N/A
Start date:	6/03/2019
End date:	5/06/2014
Contact hours per week:	2
Lecture day and time:	Wednesday 1:30-3:30 (AEST)
Description of electronic access arrangements for students (for example, WebCT)	Resources will be hosted and available for download on the lecturers web-site. Details available at the commencement of the course.

Subject content

1. Subject content description

We will cover the basics of the theory of C*-algebras, including spectral theory, Gelfand duality and the commutative Gelfand-Naimark

theorem, the continuous functional calculus, the structure of ideals and positive elements, representation theory, the GNS construction and the noncommutative Gelfand-Naimark theorem, and pure states and irreducible representations.

2. Week-by-week topic overview

Wk 1: Bounded operators on Hilbert space, and examples

Wk 2: Banach algebras and the spectrum

Wk 3: Spectral radius and automatic continuity

Wk 4: Ideals and maximal ideals

Wk 5: Maximal-ideal space and Gelfand transform

Wk 6: Gelfand's theorem

Wk 7: The Gelfand-Naimark theorem and the functional calculus

Wk 8: Functional calculus, spectral permanence, automatic isometry

Wk9: Positive elements and quotients

Wk10: The GNS construction

Wk11: The noncommutative Gelfand-Naimark theorem

Wk12: Pure states and irreducible representations

3. Assumed prerequisite knowledge and capabilities

Basic point-set topology. Complex Hilbert space. Fundamentals of real analysis.

The fundamentals of complex analysis and of functional analysis are preferable but not essential.

4. Learning outcomes and objectives

Over the duration of this course you will learn the basic theory of C^* -algebras including most of the fundamental structure theorems that underpin the subject. You will also be proficient in working with the spectrum of an element of a Banach algebra and exploiting the spectral radius formula, and you will be proficient in exploiting the continuous functional calculus for normal elements of C^* -algebras.

AQF specific Program Learning Outcomes and Learning Outcome Descriptors (if available):

AQF Program Learning Outcomes addressed in this subject	Associated AQF Learning Outcome Descriptors for this subject
Insert Program Learning Outcome here	Choose from list below
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Learning Outcome Descriptors at AQF Level 8

Knowledge

K1: coherent and advanced knowledge of the underlying principles and concepts in one or more disciplines

K2: knowledge of research principles and methods

Skills

S1: cognitive skills to review, analyse, consolidate and synthesise knowledge to identify and provide solutions to complex problem with intellectual independence

S2: cognitive and technical skills to demonstrate a broad understanding of a body of knowledge and theoretical concepts with advanced understanding in some areas

S3: cognitive skills to exercise critical thinking and judgement in developing new understanding

S4: technical skills to design and use in a research project

S5: communication skills to present clear and coherent exposition of knowledge and ideas to a variety of audiences

Application of Knowledge and Skills

A1: with initiative and judgement in professional practice and/or scholarship

A2: to adapt knowledge and skills in diverse contexts

A3: with responsibility and accountability for own learning and practice and in collaboration with others within broad parameters

A4: to plan and execute project work and/or a piece of research and scholarship with some independence

5. Learning resources

Printed notes will be provided. No other resources are needed.

6. Assessment

Exam/assignment/classwork breakdown					
Exam	60%	Assignment (2)	40%	Class work	0%
Assignment due dates					
	7/04/2014	12/05/2014	Click here to enter a date.	Click here to enter a date.	

Approximate exam date	18/06/2014
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Institution Honours program details

Weight of subject in total honours assessment at host department	1/8
Thesis/subject split at host department	BMath(Hons): Thesis worth 25% BMathAdv(Hons): Thesis worth 37.5%
Honours grade ranges at host department:	
H1	85-100
H2a	75-84
H2b	65-74
H3	50-64