

ACE Network Subject Information Guide

C*-Algebras

Semester 1, 2022

Administration and contact details

Host department	School of Mathematics and Applied Statistics
Host institution	University of Wollongong
Name of lecturer	Aidan Sims
Phone number	02 4221 5003
Email address	asims@uow.edu.au
Homepage	http://aidansims.com
Name of honours coordinator	Marianito Rodrigo
Phone number	02 4221 4304
Email address	marianit@uow.edu.au
Name of masters coordinator	Pauline O'Shaughnessy
Phone number	02 4221 4241
Email address	poshaugh@uow.edu.au

Subject details

Handbook entry URL	https://courses.uow.edu.au/ and search MTST401
Subject homepage URL	Moodle - TBA
Honours student hand-out URL	Moodle - TBA
Start date:	March 3 2022
End date:	June 2 2022
Contact hours per week:	2
Census date:	31 March 2022
Lecture day(s) and time(s):	Thursday 1:30 - 3:30
Description of electronic access arrangements for	Moodle
students (for example, WebCT)	

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,

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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
Insert Program Learning Outcome here	Choose from list below
Insert Program Learning Outcome here	Choose from list below
Insert Program Learning Outcome here	Choose from list below
Insert Program Learning Outcome here	Choose from list below
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 A set of subject notes and exercises will be provided. No additional learning materials are

requires.

6. Assessment

Exam/assignment/classwork breakdown					
Exam	60 %	Assignment	40 %	Class work	0 %
Assignment due	dates	15 April 2022	03 June 2022		
Approximate exa	am date			11-23 June	

Institution honours program details

Weight of subject in total honours assessment at	1/8
host department	
Thesis/subject split at host department	Thesis worth 50%
Honours grade ranges at host department	
H1	85-100
H2a	75-84
H2b	65-74
Н3	50-64



Institution masters program details

Weight of subject in total masters assessment at	1/16
host department	
Thesis/subject split at host department	Thesis worth 1/8
Masters grade ranges at host department	
H1	85-100
H2a	75-84
H2b	65-74
НЗ	50-64