

Subject Information Guide

Math 4405 Measure Theory

Semester 2, 2016

Administration and contact details

Host Department	School of Mathematics and Physics
Host Institution	The University of Queensland
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Subject details

Handbook entry URL	https://www.uq.edu.au/study/course.html?course_code=MATH4405&offer=53544c554332494e&year=2014
Subject homepage URL	https://sites.google.com/site/mathnguyenthehuy/home/math-4405-measure-theory
Honours student hand-out URL	https://sites.google.com/site/mathnguyenthehuy/home/math-4405-measure-theory
Start date:	25 th July 2016
End date:	28 th October 2016
Contact hours per week:	3L1T
Lecture day and time:	Click here to enter text.
Description of electronic access arrangements for	

students (for example, WebCT)	
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Subject content

1. Subject content description

The course is an introduction to modern measure theory. A sound knowledge of measure theory and the Lebesgue integral is a starting point to undertake advanced studies in partial differential equations, nonlinear analysis, the calculus of variations and probability theory. The aim of this course is to learn basic elements of measure theory, including key methods and examples.

2. Week-by-week topic overview

Lebesgue integral & measure.
Monotone convergence.
Fatou's lemma & Lebesgue dominated convergence theorems.
Modes of convergence.
Bounded variation.
Absolute continuity.
Signed measures.
Generation of measures.
Radon-Nikodym & Riesz representation theorems.

3. Assumed prerequisite knowledge and capabilities

Students are assumed to be familiar with the material from MATH2400 Mathematical Analysis. Although it is not compulsory, some further familiarity with mathematics courses such as MATH3402 (Metric spaces and Topology) would be helpful.

4. Learning outcomes and objectives

Students should:
Develop an understanding of fundamental structures of Probability Theory and Analysis.
Acquire an excellent working knowledge of measure theory.
Acquire an excellent working knowledge of the Lebesgue integral.

Acquire a working knowledge of the relationship between the Lebesgue and the Riemann integrals.

After successfully completing this course you should be able to:

- 1 Appreciate the central role of sigma-algebras and measure in integration theory;
- 2 Work with measurable functions and understand their importance to the definition of the integral;
- 3 Work with special measures on Euclidean Space (Lebesgue measure; Hausdorff measure; the Vitali Covering Theorem; notions of dimension),
- 4 Decompose measures and appreciate the role this decomposition plays in the Radon-Nikodym representation theorem;
- 5 Gain a working knowledge of function spaces and modes of convergence;
- 6 Work with the integral on product spaces using the relationship with repeated integrals;
- 7 Apply results from measure theory to other areas of mathematics.

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
Knowledge	K1, K2
Skills	S1, S2, S3, S4, S5
Application of Knowledge and Skills	A1, A2, A3, A4
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

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

Insert texts, printed notes and/or software required

6. Assessment

Exam/assignment/classwork breakdown					
Exam	50 %	Assignment	50%	Class work	0%
Assignment due dates	Week beginning 15 th August 2016	Week beginning 5 th September 2016	Week beginning 3 rd October 2016	Week beginning 17 th October 2016	
Approximate exam date				5 November – 19 November	

Institution Honours program details

Weight of subject in total honours assessment at host department	50%
Thesis/subject split at host department	50/50
Honours grade ranges at host department:	
H1	85+ %
H2a	75-84 %
H2b	65-74 %
H3	50-64 %