ACE Network Subject Information Guide

Probability and Martingale Theory

Semester 1, 2024

Administration and contact details

Host department	School of Mathematics and Statistics
Host institution	The University of Sydney
Name of lecturer	Ben Goldys and Qiying Wang
Phone number	(02)93512976
Email address	beniamin.goldys@sydney.edu.au
Homepage	
Name of honours coordinator	Marek Rutkowski
Phone number	(02)93514860
Email address	marek.rutkowski@sydney.edu.au
Name of masters coordinator	NA
Phone number	NA
Email address	NA

Subject details

Handbook entry URL	TBD
Subject homepage URL	TBD
Honours student hand-out URL	TBD
Teaching period (start and end date):	**19/02/2024- 24/05/2024**
Exam period (start and end date):	**03/06/2024 – 15/06/2024**
Contact hours per week:	**4**
ACE enrolment closure date:	**TBA**
Lecture day(s) and time(s):	**TBA**
Description of electronic access arrangements for students (for example, LMS)	**Canvas page:** **https://canvas.sydney.edu.au/courses/56924** **Not available yet**

Subject content

1. **Subject content description**

Measure theory as a basis for mathematical theory of probability, convergence of random variables, Strong Law of Large Numbers, conditional expectation, characteristic function, Central Limit Theorem, discrete-time martingales, Martingale Convergence Theorem, Maximal inequalities, Optional Stopping Theorem, Strong Law of Large Numbers, applications to games and statistics

2. **Week-by-week topic overview**

   See https://www.sydney.edu.au/units/STAT4528/2020-S1C-ND-CC

3. **Assumed prerequisite knowledge and capabilities**

   Familiarity with mathematical proofs
   Probability theory: events and sample spaces, operations on events, definition of probability and computation of probabilities, discrete and continuous probability distributions, independence of random variables, expected value of a random variable
   Analysis: limits, Riemann integral, computation of simple integrals

4. **Learning outcomes and objectives**

   See https://www.sydney.edu.au/units/STAT4528

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
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

- Typed lecture notes on the Canvas page of the course
- Klenke Achim, Probability theory—a comprehensive course, 2020

6. Assessment

Exam/assignment/classwork breakdown					
Exam	60%	**Assignments 1 and 2**	2x10%	**Assignment 3**	20 %
Assignment due dates		**Weeks 4 and 7**		**Week 12**	
Approximate exam date					

Institution honours program details – To Be Determined

Weight of subject in total honours assessment at host department	Click here to enter text.
Thesis/subject split at host department	Click here to enter text.
Honours grade ranges at host department	
H1	Enter range %
H2a	Enter range %
H2b	Enter range %
H3	Enter range %

Institution masters program details – To Be Determined

Weight of subject in total masters assessment at host department	Click here to enter text.
Thesis/subject split at host department	Click here to enter text.
Masters grade ranges at host department	
H1	Enter range %
H2a	Enter range %
H2b	Enter range %
H3	Enter range %