UNSW Course Outline

MATH3801 Probability and Stochastic Processes - 2024

Published on the 14 Feb 2024

General Course Information

Course Code : MATH3801
Year : 2024
Term : Term 1
Teaching Period : T1
Is a multi-term course? : No
Faculty : Faculty of Science
Academic Unit : School of Mathematics & Statistics
Delivery Mode : Online
Delivery Format : Standard
Delivery Location : Kensington
Campus : Sydney
Study Level : Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

This is an advanced level course in probability theory and stochastic processes for mathematics/statistics and data science students. Topics covered during the seminars and tutorials include rigorous definition of probability and random variables; convergence of random

variables; Poisson and Wiener process, and Ito Calculus.

Course Aims

The course aims to impart analytical skills that will allow students to prove rigorously the basic properties of stochastic processes such as the Wiener process and Ito integral. Students will be expected to understand the properties and subtleties of numerous random objects, allowing them to simulate these on a computer and draw appropriate conclusions. The higher version of the course will require knowledge of some extra proofs and technical arguments.

Relationship to Other Courses

This is similar to MATH3901 and MATH5901, but it is less stringent with regards to proofs and rigour.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : State the defining properties of various stochastic process models and related random objects.
CLO2 : Identify appropriate stochastic process model(s) for a given research problem.
CLO3 : Provide logical and coherent proofs of fundamental results in the theory of stochastic processes.

Course Learning Outcomes	Assessment Item
CLO1 : State the defining properties of various stochastic process models and related random objects.	• Quiz 1 • Quiz 2 • Final Examination
CLO2 : Identify appropriate stochastic process model(s) for a given research problem.	• Quiz 1 • Quiz 2 • Final Examination
CLO3 : Provide logical and coherent proofs of fundamental results in the theory of stochastic processes.	• Quiz 1 • Quiz 2 • Final Examination

Learning and Teaching Technologies

Moodle - Learning Management System

Learning and Teaching in this course

all content will be posted on Moodle webpage

Additional Course Information

see Moodle webpage

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Quiz 1 Assessment Format: Individual	20%	Start Date: Approximately Week 3 Due Date: Approximately Week 4 Post Date: 01/02/2024 12:00 AM
Quiz 2 Assessment Format: Individual	20%	Start Date: approx. Week 9 Due Date: approx. Week 10 Post Date: 01/02/2024 12:00 AM
Final Examination Assessment Format: Individual	60%	Start Date: approx. Week 9 Due Date: approx. Week 10 Post Date: 01/02/2024 12:00 AM

Assessment Details

Quiz 1

Assessment Overview

Quiz 1 will assess background knowledge and material covered in Weeks 1 to 3.

The Assignment/Quiz will be released online in Week 4 and you will have 48 hours to submit your solution. General feedback will be provided during the live lectures within 10 working days of the task.

Course Learning Outcomes

- CLO1 : State the defining properties of various stochastic process models and related random objects.
- CLO2 : Identify appropriate stochastic process model(s) for a given research problem.
- CLO3 : Provide logical and coherent proofs of fundamental results in the theory of stochastic processes.

Detailed Assessment Description

Similar to MATH3901 and MATH5901, but with less emphasis on difficult proofs and rigour.

Assessment Length

N/A

Submission notes

N/A

Assessment information

Standard Late submission penalty applies.

Assignment submission Turnitin type

Not Applicable

Quiz 2

Assessment Overview

Quiz 2 will assess background knowledge and material covered in Weeks 1 to 9.
The Assignment/Quiz will be released online in Week 10 and you will have 48 hours to submit your solution. General feedback will be provided during the live lectures within 10 working days of the task.

Course Learning Outcomes

- CLO1 : State the defining properties of various stochastic process models and related random objects.
- CLO2 : Identify appropriate stochastic process model(s) for a given research problem.
- CLO3 : Provide logical and coherent proofs of fundamental results in the theory of stochastic processes.

Detailed Assessment Description

Simialr to MATH3901, but with less emphasis on proofs and rigour.

Assessment Length

N/A

Submission notes

N/A

Assessment information

Standard Late submission penalty applies.

Assignment submission Turnitin type

Not Applicable

Final Examination

Assessment Overview

The final exam is designed to summarise your learning and problem-solving skills on all topics delivered across the term, including material from lectures, tutorials, and course notes. The online exam is typically 2 hours and consists of 4 main questions - details will be confirmed during the course. The examination will occur during the official university examination period.

Course Learning Outcomes

- CLO1 : State the defining properties of various stochastic process models and related random objects.
- CLO2 : Identify appropriate stochastic process model(s) for a given research problem.
- CLO3 : Provide logical and coherent proofs of fundamental results in the theory of stochastic processes.

Detailed Assessment Description

Similar to MATH3901, but with less emphasis on proofs and theory.

Assessment Length

N/A

Submission notes

N/A

Assessment information

N/A

Assignment submission Turnitin type

Not Applicable

General Assessment Information

Lecture notes provide the main reference source for this course. New ideas and skills are first introduced and demonstrated in lectures, and then students develop these skills by applying them to specific tasks using assignment exercises.

Effective learning is best supported by a climate of inquiry, in which students are actively engaged in the learning process during lectures by asking and answering questions relevant to the material being presented. This course is structured with a strong emphasis on problem-solving tasks in assignment problems.

Grading Basis

Standard

Requirements to pass course

Students have to accumulate a score above 50%.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 0 : 5 February - 11 February	Other	N/A
Week 1 : 12 February - 18 February	Topic	Probability and Random Variables
Week 2 : 19 February - 25 February	Topic	(Conditional) Expectation and Integrals
Week 3 : 26 February - 3 March	Topic	Fatou's Lemma and Integral Transforms
Week 4 : 4 March - 10 March	Topic	Modes of Convergence or Random Variables
Week 5 : 11 March - 17 March	Topic	Central Limit Theorems & Martingales
Week 6 : 18 March - 24 March	Topic	Mid-semester break
Week 7 : 25 March - 31 March	Topic	Wiener Process and Brownian Motion
Week 8 : 1 April - 7 April	Topic	Stochastic Calculus and Ito Formula
Week 9 : 8 April - 14 April	Topic	Simple SDEs and Strong Solutions
Week 10 : 15 April - 21 April	Topic	Selected Advanced Topics and Revision

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

General Schedule Information

On regular weeks, there will be two 2-hour lectures, currently delivered online via Moodle. For each course, there will also be a 1-hour tutorial (a total of 5 contact hours per week). Moodle will be your primary resource for obtaining course materials such as lecture notes and assignments.

Course Resources

Prescribed Resources

The following resources are recommended:

https://primoa.library.unsw.edu.au/permalink/61UNSW_INST/1m02euc/alma9951496554501731

Recommended Resources

The following textbook is recommended:

https://primoa.library.unsw.edu.au/permalink/61UNSW_INST/1m02euc/alma9951496554501731

Additional Costs

N/A

Course Evaluation and Development

Teaching will be adjusted in view of feedback on the background knowledge of the students.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Lecturer	Zdravko Botev		1064 Mathematics Building	N/A	Tuesdays and Thursdays after tutorials	No	Yes

Other Useful Information

Academic Information

Upon your enrolment at UNSW, you share responsibility with us for maintaining a safe, harmonious and tolerant University environment.

You are required to:

- Comply with the University's conditions of enrolment.
- Act responsibly, ethically, safely and with integrity.
- Observe standards of equity and respect in dealing with every member of the UNSW community.
- Engage in lawful behaviour.
- Use and care for University resources in a responsible and appropriate manner.
- Maintain the University's reputation and good standing.

For more information, visit the UNSW Student Code of Conduct Website.

Academic Honesty and Plagarism

Referencing is a way of acknowledging the sources of information that you use to research your assignments. You need to provide a reference whenever you draw on someone else's words, ideas or research. Not referencing other people's work can constitute plagiarism.
Further information about referencing styles can be located at https://student.unsw.edu.au/referencing

Academic integrity is fundamental to success at university. Academic integrity can be defined as a commitment to six fundamental values in academic pursuits: honesty, trust, fairness, respect, responsibility and courage. At UNSW, this means that your work must be your own, and others' ideas should be appropriately acknowledged. If you don't follow these rules, plagiarism may be detected in your work.
Further information about academic integrity, plagiarism and the use of AI in assessments can be located at:

- The Current Students site,
- The ELISE training site, and
- The Use of AI for assessments site.

The Student Conduct and Integrity Unit provides further resources to assist you to understand your conduct obligations as a student: https://student.unsw.edu.au/conduct

Submission of Assessment Tasks

Penalty for Late Submissions
UNSW has a standard late submission penalty of:

- 5% per day,
- for all assessments where a penalty applies,
- capped at five days (120 hours) from the assessment deadline, after which a student cannot submit an assessment, and
- no permitted variation.

Any variations to the above will be explicitly stated in the Course Outline for a given course or assessment task.

Students are expected to manage their time to meet deadlines and to request extensions as early as possible before the deadline.

Special Consideration

If circumstances prevent you from attending/completing an assessment task, you must officially apply for special consideration, usually within 3 days of the sitting date/due date. You can apply by logging onto myUNSW and following the link in the My Student Profile Tab. Medical documentation or other documentation explaining your absence must be submitted with your application. Once your application has been assessed, you will be contacted via your student email address to be advised of the official outcome and any actions that need to be taken from there. For more information about special consideration, please visit: https://student.unsw.edu.au/special-consideration

Important note: UNSW has a "fit to sit/submit" rule, which means that if you sit an exam or submit a piece of assessment, you are declaring yourself fit to do so and cannot later apply for Special Consideration. This is to ensure that if you feel unwell or are faced with significant circumstances beyond your control that affect your ability to study, you do not sit an examination or submit an assessment that does not reflect your best performance. Instead, you should apply for Special Consideration as soon as you realise you are not well enough or are otherwise unable to sit or submit an assessment.

Faculty-specific Information

Additional support for students

- The Current Students Gateway
- Student Support
- Academic Skills and Support
- Student Wellbeing, Health and Safety
- Equitable Learning Services
- UNSW IT Service Centre
- Science EDI Student Initiatives, Offerings and Guidelines

School-specific Information

School of Mathematics and Statistics and UNSW Policies

The School of Mathematics and Statistics has adopted a number of policies relating to enrolment, attendance, assessment, plagiarism, cheating, special consideration etc. These are in addition to the Policies of The University of New South Wales. Individual courses may also adopt other policies in addition to or replacing some of the School ones. These will be clearly notified in the Course Initial Handout and on the Course Home Pages on the Maths Stats web site. Students

in courses run by the School of Mathematics and Statistics should be aware of the School and Course policies by reading the appropriate pages on the web site starting at: The School of Mathematics and Statistics assessment policies

The School of Mathematics and Statistics will assume that all its students have read and understood the School policies on the above pages and any individual course policies on the Course Initial Handout and Course Home Page. Lack of knowledge about a policy will not be an excuse for failing to follow the procedure in it.

Special Consideration - Short Extension Policy

The School of Mathematics and Statistics has carefully reviewed its range of assignments and projects to determine their suitability for automatic short extensions as set out by the UNSW Short Extension Policy. Upon comprehensive examination of our course offerings that incorporate these types of assessments, we have concluded that our current deadline structures already accommodate the possibility of unexpected circumstances that may lead students to require additional days for submission. Consequently, the School of Mathematics and Statistics has decided to universally opt out of the Short Extension provision for all its courses, having pre-emptively integrated flexibility into our assessment deadlines. The decision is subject to revision in response to the introduction of new course offerings. Students may still apply for Special Consideration via the usual procedures.

Computing Lab

The main computing laboratory is room G012 of the Anita B.Lawrence Centre (formerly Red Centre). You can get to this lab by entering the building through the main entrance to the School of Mathematics (on the Mezzanine Level) and then going down the stairs to the Ground Level. A second smaller lab is Room M020, located on the mezzanine level through the glass door (and along the corridor) opposite the School's entrance.

For more information, including opening hours, see the computing facilities webpage. Remember that there will always be unscheduled periods when the computers are not working because of equipment problems and that this is not a valid excuse for not completing assessments on time.

School Contact Information

School Contact Information

Please visit the School of Mathematics and Statistics website for a range of information.

For information on Courses, please go to “Student life & resources” and either Undergraduate and/or Postgraduate and respective "Undergraduate courses" and "Postgraduate courses" for information on all course offerings.

All school policies, forms and help for students can be located by going to the "Student Services" within “Student life & resources” page. We also post notices in "Student noticeboard" for your information. Please familiarise yourself with the information found in these locations. If you cannot find the answer to your queries on the web you are welcome to contact the Student Services Office directly.

Undergraduate

E: ug.mathsstats@unsw.edu.au

P: 9385 7011 or 9385 7053

Postgraduate

E: pg.mathsstats@unsw.edu.au

P: 9385 7053

Should we need to contact you, we will use your official UNSW email address of in the first instance. **It is your responsibility to regularly check your university email account. Please use your UNSW student email and state your student number in all emails to us.**