STAT2005  
Introduction to Stochastic Processes

An introduction to stochastic processes, which are random processes occurring in time or space. They are used to model dynamic relationships involving random events in a wide variety of disciplines including the natural and social sciences, and in financial, managerial and actuarial settings. The course consists of a short review of basic probability concepts and a discussion of conditional probability and conditional expectation, followed by an introduction to the basic concepts and an investigation of the long-run behaviour of Markov chains in discrete time, countable state space. The course also covers some important continuous-time stochastic processes including Poisson processes and other Markov pure jump processes, as well as Brownian motion and other related Gaussian processes as time permits.

<table>
<thead>
<tr>
<th>Mode of Delivery</th>
<th>On campus</th>
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</thead>
<tbody>
<tr>
<td>Prerequisites</td>
<td>STAT2001 Introductory Mathematical Statistics</td>
</tr>
<tr>
<td>Incompatible Courses</td>
<td>STAT7004</td>
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<tr>
<td>Co-taught Courses</td>
<td>STAT7004</td>
</tr>
<tr>
<td>Course Convener:</td>
<td>Dr. Yuguang Fan</td>
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<td><a href="mailto:yuguang.fan@anu.edu.au">yuguang.fan@anu.edu.au</a></td>
</tr>
<tr>
<td>Office hours for student consultation:</td>
<td>By appointment</td>
</tr>
<tr>
<td>Research Interests</td>
<td>General theory of stochastic processes</td>
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<tr>
<td>Relevant administrator</td>
<td>Ms Patricia Penm</td>
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<tr>
<td>Email:</td>
<td><a href="mailto:patricia.penm@anu.edu.au">patricia.penm@anu.edu.au</a></td>
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SEMESTER 2  
2017
COURSE OVERVIEW

Learning Outcomes
On satisfying the requirements for this course, students will have the knowledge and skills to:

1. Demonstrate the concepts and investigation of the long-run behavior, respectively, of simple stochastic processes in discrete time; namely, Markov chains.

2. Demonstrate in detail the various topics of continuous-time stochastic processes, with topics drawn from:
   a. Poisson Processes
   b. other Markov pure jump processes
   c. Brownian motion
   d. Other related Gaussian processes

Assessment Summary

<table>
<thead>
<tr>
<th>Assessment Task</th>
<th>Value</th>
<th>Due Date</th>
<th>Date for Return of Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment 1</td>
<td>10%</td>
<td>Week 5</td>
<td>Week 6</td>
</tr>
<tr>
<td>Mid Semester Exam</td>
<td>20%</td>
<td>Week 6 or 7</td>
<td>Week 8</td>
</tr>
<tr>
<td>Assignment 2</td>
<td>10%</td>
<td>Week 11</td>
<td>Week 12</td>
</tr>
<tr>
<td>Final Exam</td>
<td>60%</td>
<td>Exam Period</td>
<td>TBA by RSFAS</td>
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</tbody>
</table>

Research-Led Teaching
ANU has a rich history of research in the area of applied probability and stochastic processes. The lecturer is an active researcher in the area of stochastic processes (in particular, Lévy processes, combinatorial stochastic processes and their applications), with a keen interest to attract talented students for research projects.

Feedback

Staff Feedback
Students will be given feedback in the following forms in this course:

- two assignments give feedback to students as well as teaching staff
- mid semester exam covers feedback over the first half
- close contact to tutors in tutorials and consultation
- lecturer provides feedback in consultations and online forum

Student Feedback
ANU is committed to the demonstration of educational excellence and regularly seeks feedback from students. One of the key formal ways students have to provide feedback is through Student Experience of Learning Support (SELS) surveys. The feedback given in these surveys is anonymous and provides the Colleges, University Education Committee and Academic Board
with opportunities to recognise excellent teaching, and opportunities for improvement.

For more information on student surveys at ANU and reports on the feedback provided on ANU courses, go to

http://unistats.anu.edu.au/surveys/self/students/ and
http://unistats.anu.edu.au/surveys/self/results/learning/

Policies

ANU has educational policies, procedures and guidelines, which are designed to ensure that staff and students are aware of the University's academic standards, and implement them. You can find the University's education policies and an explanatory glossary at: http://policies.anu.edu.au/

Students are expected to have read the Academic Misconduct Rule before the commencement of their course.

Other key policies include:

- Student Assessment (Coursework)
- Student Surveys and Evaluations

Required Resources

Commonwealth supported students and domestic full-fee paying students generally must be able to complete the requirements of their program of study without the imposition of fees that are additional to the student contribution amount or tuition fees.

Provided that its payment is in accordance with the Act, a fee is of a kind that is into any one or more of the following categories:

(a) It is a charge for a good or service that is not essential to the course of study.

(b) It is a charge for an alternative form, or alternative forms, of access to a good or service that is an essential component of the course of study but is otherwise made readily available at no additional fee by the higher education provider.

(c) It is a charge for an essential good or service that the student has the choice of acquiring from a supplier other than the higher education provider and is for:

(i) equipment or items which become the physical property of the student and are not consumed during the course of study; or

(ii) food, transport and accommodation costs associated with the provision of field trips that form part of the course of study.

(d) It is a fine or a penalty provided it is imposed principally as a disincentive and not in order to raise revenue or cover administrative costs.
Additional course costs
Not applicable.

Examination material or equipment
To be announced on WATTLE

Recommended Resources
Purchase of textbooks is OPTIONAL. For samples of suitable textbooks see

- Stochastic Processes and Models (2005) by David Stirzaker

ROUGH COURSE SCHEDULE

<table>
<thead>
<tr>
<th>Week/Session</th>
<th>Summary of Activities</th>
<th>Assessment</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Revision &amp; Conditioning I</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Revision &amp; Conditioning II</td>
<td>Release Assignment 1</td>
</tr>
<tr>
<td>3</td>
<td>Markov Chains I</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Markov Chains II</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Markov Chains III</td>
<td>Assignment 1 due (10%)</td>
</tr>
<tr>
<td>6</td>
<td>Markov Chains IV</td>
<td>Return Assignment 1</td>
</tr>
<tr>
<td></td>
<td><strong>Mid Semester Break</strong></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Pure Jump Processes I</td>
<td>Mid Sem Exam (20%, or week 6)</td>
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<tr>
<td>8</td>
<td>Pure Jump Processes II</td>
<td>Release Assignment 2</td>
</tr>
<tr>
<td>9</td>
<td>Pure Jump Processes III</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Brownian Motion and Gaussian Processes I</td>
<td>Assignment 2 is due (10%)</td>
</tr>
<tr>
<td>11</td>
<td>Brownian Motion and Gaussian processes II</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Catch up/Revision</td>
<td>Return Assignment 2</td>
</tr>
<tr>
<td></td>
<td>Examination Period</td>
<td>Final Exam (60%)</td>
</tr>
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ASSESSMENT REQUIREMENTS

The ANU is using Turnitin to enhance student citation and referencing techniques, and to assess assignment submissions as a component of the University’s approach to managing Academic Integrity. For additional information regarding Turnitin please visit the ANU Online website.
As a further academic integrity control, students may be selected for a 15 minute individual oral examination of their written assessment submissions.

Any student identified, either during the current semester or in retrospect, as having used ghost writing services will be investigated under the University’s Academic Misconduct Rule.

**Assessment Tasks**

**Assessment Task 1: Assignment 1**

**Details of task:** Answer specified questions based on materials from Weeks 1 to 4. You may type your answer in a type-setting software or you may hand-write parts of your answers. Please ensure that your handwriting is legible. Although verbal discussions with others (fellow students, tutors, lecturer) are encouraged, the contents of your assignment must be produced by you as an individual and must comply with academic integrity policies given at [here](#).

**Assessment Task 2: Mid-Semester Exam**

**Details of task:** Midterm Exam is a closed book exam. A detailed formula sheet will be provided. Further details will be provided closer to the test date. RSFAS mid semester exams will be held in Week 6 or Week 7. The exact date will be announced later by Exam Section to avoid as many clashes as possible.

**Assessment Task 3: Assignment 2**

**Details of task:** Answer specified questions based on materials from Weeks 1 to 10. For details, see Assessment Task 1.

**Assessment Task 4: Final Exam**

**Details of task:** Closed book exam. A formula sheet is provided. Further details will be provided closer to the exam date.

Results of two assignments, Midterm Test and Final Exam are determining the final raw mark according to the proposed scheme.

There is no Special Examination for the mid-semester exam. Instead for students who would normally meet the requirements for a special exam (eg medical certificate), the weighting will be moved to the final exam. Students who do not sit the mid-semester exam and do not meet the necessary requirements for a special exam will receive a zero.

Final Exam is compulsory. Students who meet the requirements for a special exam (eg medical certificate) will be provided with one. Students who do not sit the final exam and do not meet the necessary requirements for a special exam will fail.

**Examination(s)**

See Assessment Tasks. Further details will be provided closer to the exam data.
Assignment submission

Hard Copy Submission: For some forms of assessment (hand written assignments, art works, laboratory notes, etc.) hard copy submission is appropriate when approved by the Associate Dean (Education). Students should submit such assignments to the assignment box under the correct course/tutorial label near the RSFAS admin office on Level 4, CBE building. Assignments must include the cover sheet. Please keep a copy of tasks completed for your records.

Extensions and penalties

Extensions and late submission of assessment pieces are covered by the Student Assessment (Coursework) Policy and Procedure.

The Course Convener may grant extensions for assessment pieces that are not examinations or take-home examinations. If you need an extension, you must request it in writing on or before the due date. If you have documented and appropriate medical evidence that demonstrates you were not able to request an extension on or before the due date, you may be able to request it after the due date.

No submission of assessment tasks without an extension after the due date will be permitted. If an assessment task is not submitted by the due date, a mark of 0 will be awarded.

Returning assignments

Assignments will be graded and returned in tutorials. Uncollected quizzes and assignments could be picked up from the drawers on Level 4, CBE building.

Resubmission of assignments

Resubmission of the assignment is not allowed under any circumstance.

Referencing requirements

Although formal scholarly referencing may not be necessary for the assignments, you must adhere to academic integrity policies (see details of Assessment Task 1).

Scaling

Your final mark for the course will be based on the raw marks allocated for each of your assessment items. However, your final mark may not be the same number as produced by that formula, as marks may be scaled. Any scaling applied will preserve the rank order of raw marks (i.e. if your raw mark exceeds that of another student, then your scaled mark will exceed the scaled mark of that student), and may be either up or down.
Privacy Notice

The ANU has made a number of third party, online, databases available for students to use. Use of each online database is conditional on student end users first agreeing to the database licensors terms of service and/or privacy policy. Students should read these carefully.

In some cases student end users will be required to register an account with the database licensor and submit personal information, including their: first name; last name; ANU email address; and other information.

In cases where student end users are asked to submit content to a database, such as an assignment or short answers, the database licensor may only use the students content in accordance with the terms of service including any (copyright) licence the student grants to the database licensor.

Any personal information or content a student submits may be stored by the licensor, potentially offshore, and will be used to process the database service in accordance with the licensors terms of service and/or privacy policy.

If any student chooses not to agree to the database licensors terms of service or privacy policy, the student will not be able to access and use the database. In these circumstances students should contact their lecturer to enquire about alternative arrangements that are available.

Tutorial Seminar Registration

Tutorial signup for this course will be done via the Wattle website. Detailed information about signup times will be provided on Wattle or during your first lecture. When tutorials are available for enrolment, follow these steps:

1. Log on to Wattle, and go to the course site
2. Click on the link ‘Tutorial enrolment’
3. On the right of the screen, click on the tab ‘Become Member of . . . ’ for the tutorial class you wish to enter
4. Confirm your choice

If you need to change your enrolment, you will be able to do so by clicking on the tab ‘Leave group. . . ’ and then re-enrol in another group. You will not be able to enrol in groups that have reached their maximum number. Please note that enrolment in ISIS must be finalised for you to have access to Wattle.

SUPPORT FOR STUDENTS

The University offers a number of support services for students. Information on these is available online from http://students.anu.edu.au/studentlife/