Unit Outline

STAT2001 Mathematical Statistics

Semester 1, 2016

Unit study package code: STAT2001
Mode of study: Internal
Tuition pattern summary: Note: For any specific variations to this tuition pattern and for precise information refer to the Learning Activities section.
Lecture: 1 x 2 Hours Weekly
Tutorial: 1 x 1 Hours Weekly
Workshop: 1 x 1 Hours Weekly
This unit does not have a fieldwork component.

Credit Value: 25.0

Pre-requisite units:
- 7062 (v.0) Mathematics 101 or any previous version
- 10926 (v.0) Mathematics 103 or any previous version
- MATH1010 (v.0) Advanced Mathematics or any previous version
- MATH1004 (v.0) Mathematics 1 or any previous version

AND

- 310532 (v.0) Statistical Data Analysis 102 or any previous version
- STAT1001 (v.0) Statistical Probability or any previous version

AND

- 7063 (v.0) Mathematics 102 or any previous version
- 7492 (v.0) Mathematics 104 or any previous version
- MATH1011 (v.0) Mathematics 2 or any previous version

Co-requisite units: Nil

Anti-requisite units: Nil

Result type: Grade/Mark

Approved incidental fees: Information about approved incidental fees can be obtained from our website. Visit fees.curtin.edu.au/incidental_fees.cfm for details.

Unit coordinator:
Title: Dr
Name: Ritu Gupta
Phone: +618 9266 7289
Email: R.Gupta@curtin.edu.au
Location: Building: 314 - Room: 459
Teaching Staff: Name: Ritu Gupta  
Phone: +618 9266 7289  
Email: R.Gupta@curtin.edu.au  
Location: Building: 314 - Room: 459

Administrative contact: Name: Aimee Tournay  
Phone: +61 8 9266 9595  
Email: Aimee.Tournay@curtin.edu.au  
Location: Building: 311 - Room: 144

Learning Management System: Blackboard (lms.curtin.edu.au)
Syllabus

This unit will cover the probabilistic framework for modelling real world process. Students will acquire practical skills in developing mathematical models for processes, compute various probabilities of interest and estimate parameters of the underlying models. There will be particular emphasis on mathematical statistical techniques and how these are used to compute probabilities of interest for both discrete and continuous process. Topics covered include: review of probability axioms and probability rules; special univariate distributions; random variables and expectations; multivariate distributions; covariance and correlation; marginal and conditional distributions; conditional expectation; transformations; functions of random variables including random sums and order statistics; moment generating functions; probability generating functions and cumulant generating functions; convergence of random sequences; distributions derived from normal distribution; distribution of sample mean and the sample variance; methods of estimation and properties of estimators.

Introduction

This unit offers comprehensive review of probabilistic methods and tools related to Mathematical Statistics, including probability axioms, Statistical distributions and their moments, parameter estimation and sampling theory.

Unit Learning Outcomes

All graduates of Curtin University achieve a set of nine graduate attributes during their course of study. These tell an employer that, through your studies, you have acquired discipline knowledge and a range of other skills and attributes which employers say would be useful in a professional setting. Each unit in your course addresses the graduate attributes through a clearly identified set of learning outcomes. They form a vital part in the process referred to as assurance of learning. The learning outcomes tell you what you are expected to know, understand or be able to do in order to be successful in this unit. Each assessment for this unit is carefully designed to test your achievement of one or more of the unit learning outcomes. On successfully completing all of the assessments you will have achieved all of these learning outcomes.

Your course has been designed so that on graduating we can say you will have achieved all of Curtin’s Graduate Attributes through the assurance of learning process in each unit.

<table>
<thead>
<tr>
<th>On successful completion of this unit students can:</th>
<th>Graduate Attributes addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Gain in-depth knowledge of some basic and advanced concepts in probability theory and its application in real life situations in terms of modelling and probability calculations</td>
<td>✅</td>
</tr>
<tr>
<td>2 Distinguish between the different types of probability distribution models and their applicability in the real world</td>
<td>✅</td>
</tr>
<tr>
<td>3 Demonstrate knowledge of dealing with more than one random variable, their joint characteristics and their applications</td>
<td>✅</td>
</tr>
<tr>
<td>4 Explain convergence concepts for a sequence of independent random variables, and the utility of generating functions</td>
<td>✅</td>
</tr>
<tr>
<td>5 Estimate the parameters of real life models using statistical estimation methods and compare estimates</td>
<td>✅</td>
</tr>
</tbody>
</table>
Learning Activities

Attendance at all lectures and tutorials is strongly recommended.

The week’s topic should be read before attending each lecture. It is recommended that you take notes in the class.

The tutorial/Workshop exercises are designed to familiarise you with the essential concepts, calculations and interpretations relating to the various topics.

Learning Resources

Other resources

Texts: No prescribed text – lecture notes are available in Blackboard.

Recommended Texts:

Assessment

Assessment schedule

<table>
<thead>
<tr>
<th>Task</th>
<th>Value %</th>
<th>Date Due</th>
<th>Unit Learning Outcome(s) Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment</td>
<td>10 percent</td>
<td>Week: Weeks 7 &amp; 14 Day: Friday Time: 5 pm</td>
<td>5</td>
</tr>
<tr>
<td>Portfolio</td>
<td>20 percent</td>
<td>Week: Weeks 1-12 Day: Each Workshop Time: Each Workshop</td>
<td>1,2,3,4,5</td>
</tr>
<tr>
<td>Quiz</td>
<td>10 percent</td>
<td>Week: Teaching Weeks 1-12 Day: Check quiz page Time: Check quiz page</td>
<td>1,2,3,4,5</td>
</tr>
<tr>
<td>Final Examination</td>
<td>60 percent</td>
<td>Week: Examination Period Sem 1, 2016 Day: Check Examination Timetable Sem1, 2016 Time: Check Examination Timetable Sem1, 2016</td>
<td>1,2,3,4,5</td>
</tr>
</tbody>
</table>

Detailed information on assessment tasks

1. The assignments will be released in week 2 and is due Friday 5.00 pm week 7 (Part I) and week 11 (Part II) respectively. The assignment must be neatly written in ink, but computer printout will be accepted where this is appropriate. The assignment needs to be submitted using submission tab on Blackboard.

Detailed instruction will be presented on assignment. Assignments must have an official cover sheet attached to the assignment questions. Assignments without the completed cover sheet will not be accepted.

2. This is a collection of weekly tasks that would be completed in the workshop during weeks 1-12. At the end of each workshop there will be either a mini task or a validation test. In weeks 3, 7, and 11 there will be a validation test. Rest of the weeks there will be mini task. Students will also be required to complete a learning reflection journal.

Mini task: To be completed and submitted two days before the next workshop.

Validation Test: 10 mintues test based on the contents covered in previous weeks. More information will be available on BB.

Oveal Score - Mini task-Best 6@ 1%, Validation test- 3@ 4%, Student Reflection- 2

3. There are on-line quizzes (worth 10%) starting in the first week. The due date for each quiz is given on the quiz itself. You can access these quizzes through the Mathematical Statistics section of Blackboard: click on Online Quizzes. This is a link to the (AIM) web server that hosts the quizzes. Each quiz (except the first quiz) tests any work covered up to the week before its due date. Another link in the menu in Blackboard is Online Quiz Info (easy-to-navigate information describing how the AIM (Online) Quizzes work; please read this before you attempt any of the quizzes.

Note that if Blackboard is down the online quizzes may be accessed directly via http://aim02.curtin.edu.au.

Any queries regarding the quizzes may be emailed to maths-aim@lists.curtin.edu.au (there are links within AIM for this). Please make the subject of such queries something like: MS Quiz 4 Qn 3. Dr Greg Gamble (room 314.353) will promptly respond to your queries. Most responses will also be blogged at a page that is accessible from the AIM homepage. So, you should check the blog in case someone else has had a similar query to the one you were about to
There is one final examination. This will be held during the examination period at the end of the semester. The final examination will be **closed book**: notes and books will not be allowed. You will be allowed to use a calculator during the examination, provided that it does not have a facility for storing text data. You will be provided with a Formula and Tables book for Actuarial Examinations.

**Pass requirements**
Achieve a grade/mark greater than or equal to 5/50.

**Fair assessment through moderation**
Moderation describes a quality assurance process to ensure that assessments are appropriate to the learning outcomes, and that student work is evaluated consistently by assessors. Minimum standards for the moderation of assessment are described in the Assessment and Student Progression Manual, available from [policies.curtin.edu.au/policies/teachingandlearning.cfm](policies.curtin.edu.au/policies/teachingandlearning.cfm)

**Late assessment policy**
This ensures that the requirements for submission of assignments and other work to be assessed are fair, transparent, equitable, and that penalties are consistently applied.

1. All assessments students are required to submit will have a due date and time specified on this Unit Outline.
2. Students will be penalised by a deduction of ten percent per calendar day for a late assessment submission (eg a mark equivalent to 10% of the total allocated for the assessment will be deducted from the marked value for every day that the assessment is late). This means that an assessment worth 20 marks will have two marks deducted per calendar day late. Hence if it was handed in three calendar days late and given a mark of 16/20, the student would receive 10/20. An assessment **more than seven calendar days overdue will not be marked and will receive a mark of 0**.

**Assessment extension**
A student unable to complete an assessment task by/on the original published date/time (eg examinations, tests) or due date/time (eg assignments) must apply for an assessment extension using the Assessment Extension form (available from the Forms page at [students.curtin.edu.au/administration/](students.curtin.edu.au/administration/)) as prescribed by the Academic Registrar. It is the responsibility of the student to demonstrate and provide evidence for exceptional circumstances beyond the student's control that prevent them from completing/submitting the assessment task.

The student will be expected to lodge the form and supporting documentation with the unit coordinator before the assessment date/time or due date/time. An application may be accepted up to five working days after the date or due date of the assessment task where the student is able to provide an acceptable explanation as to why he or she was not able to submit the application prior to the assessment date. An application for an assessment extension will not be accepted after the date of the Board of Examiners' meeting.

**Deferred assessments**
If your results show that you have been granted a deferred assessment you should immediately check your OASIS email for details.

Deferred examinations/tests will be held from 18/07/2016 to 22/07/2016. Notification to students will be made after the Board of Examiners’ meeting via the Official Communications Channel (OCC) in OASIS.

**Supplementary assessments**
Supplementary assessments, if granted by the Board of Examiners, will have a due date or be held between 18/07/2016 and 22/07/2016. Notification to students will be made after the Board of Examiners’ meeting via the
It is the responsibility of students to be available to complete the requirements of a supplementary assessment. If your results show that you have been granted a supplementary assessment, you should immediately check your OASIS email for details.

Referencing style
The referencing style for this unit is Chicago. More information can be found on this style from the Library web site: http://libguides.library.curtin.edu.au/referencing.

Copyright
© Curtin University. The course material for this unit is provided to you for your own research and study only. It is subject to copyright. It is a copyright infringement to make this material available on third party websites.

Academic Integrity (including plagiarism and cheating)
Any conduct by a student that is dishonest or unfair in connection with any academic work is considered to be academic misconduct. Plagiarism and cheating are serious offences that will be investigated and may result in penalties such as reduced or zero grades, annulled units or even termination from the course.

Plagiarism occurs when work or property of another person is presented as one's own, without appropriate acknowledgement or referencing. Submitting work which has been produced by someone else (e.g. allowing or contracting another person to do the work for which you claim authorship) is also plagiarism. Submitted work is subjected to a plagiarism detection process, which may include the use of text matching systems or interviews with students to determine authorship.

Cheating includes (but is not limited to) asking or paying someone to complete an assessment task for you or any use of unauthorised materials or assistance during an examination or test.

From Semester 1, 2016, all incoming coursework students are required to complete Curtin’s Academic Integrity Program (AIP). If a student does not pass the program by the end of their first study period of enrolment at Curtin, their marks will be withheld until they pass. More information about the AIP can be found at: https://academicintegrity.curtin.edu.au/students/AIP.cfm

Refer to the Academic Integrity tab in Blackboard or academicintegrity.curtin.edu.au for more information, including student guidelines for avoiding plagiarism.

Information and Communications Technology (ICT) Expectations
Curtin students are expected to have reliable internet access in order to connect to OASIS email and learning systems such as Blackboard and Library Services.

You may also require a computer or mobile device for preparing and submitting your work.

For general ICT assistance, in the first instance please contact OASIS Student Support: oasisapps.curtin.edu.au/help/general/support.cfm

For specific assistance with any of the items listed below, please contact The Learning Centre: life.curtin.edu.au/learning-support/learning_centre.htm

- Using Blackboard, the I Drive and Back-Up files
- Introduction to PowerPoint, Word and Excel
Additional information

CALCULATOR AND COMPUTER

This unit will follow Actuaries Institute calculator policy. Institute’s rules relating to the use of calculators in the examinations, are as follows,

"Candidates may use electronic calculators in all the examinations subject to the following conditions:

• Candidates must provide their own calculators
• Under no circumstances should hand-held personal computers, of any description, be taken into the examination room
• Calculators must be silent, have visual display only and be battery or solar operated
• Any stored data and/or stored program facilities must be cleared before the calculator is taken into the examination room
• Candidates are advised that in all calculations intermediate results should normally be shown to gain full marks

The following calculators ONLY are permitted:
• Casio FX82, FX 83 or FX85 (with or without any suffix)
• Hewlett Packard HP 12C (with or without any suffix)
• Sharp EL531 (with or without any prefix or suffix)
• Texas Instruments BA II Plus (with or without any suffix)
• Texas Instruments TI-30 (with or without any suffix)"

If you have a calculator which is NOT on the above list you must talk to the Lecturer in Charge of this unit. Students who attempt to bring a calculator which has not been approved by the Lecturer in Charge into the examinations may find they are not allowed to use the calculator in the examinations.

Further information on the approved calculators can be found on the UK Institute of Actuaries website www.actuaries.org.uk

Enrolment

It is your responsibility to ensure that your enrolment is correct - you can check your enrolment through the eStudent option on OASIS, where you can also print an Enrolment Advice.

Student Rights and Responsibilities

It is the responsibility of every student to be aware of all relevant legislation, policies and procedures relating to their rights and responsibilities as a student. These include:

• the Student Charter
• the University’s Guiding Ethical Principles
• the University’s policy and statements on plagiarism and academic integrity
• copyright principles and responsibilities
• the University’s policies on appropriate use of software and computer facilities

Information on all these things is available through the University’s "Student Rights and Responsibilities" website at: students.curtin.edu.au/rights.
Student Equity

There are a number of factors that might disadvantage some students from participating in their studies or assessments to the best of their ability, under standard conditions. These factors may include a disability or medical condition (e.g. mental illness, chronic illness, physical or sensory disability, learning disability), significant family responsibilities, pregnancy, religious practices, living in a remote location or another reason. If you believe you may be unfairly disadvantaged on these or other grounds please contact Student Equity at eesi@curtin.edu.au or go to http://eesi.curtin.edu.au/student_equity/index.cfm for more information.

You can also contact Counselling and Disability services: http://www.disability.curtin.edu.au or the Multi-faith services: http://life.curtin.edu.au/health-and-wellbeing/about_multifaith_services.htm for further information.

It is important to note that the staff of the university may not be able to meet your needs if they are not informed of your individual circumstances so please get in touch with the appropriate service if you require assistance. For general wellbeing concerns or advice please contact Curtin's Student Wellbeing Advisory Service at: http://life.curtin.edu.au/health-and-wellbeing/student_wellbeing_service.htm

Recent unit changes

Students are encouraged to provide unit feedback through eVALUate, Curtin’s online student feedback system. For more information about eVALUate, please refer to evaluate.curtin.edu.au/info/.

To view previous student feedback about this unit, search for the Unit Summary Report at https://evaluate.curtin.edu.au/student/unit_search.cfm. See https://evaluate.curtin.edu.au/info/dates.cfm to find out when you can eVALUate this unit.

Recent changes to this unit include:

Peer review of work discontinued
Lecture notes reviewed
Program calendar
The schedule below is a guide only

<table>
<thead>
<tr>
<th>Teaching Week</th>
<th>Begin Date</th>
<th>Lecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>29 February</td>
<td>Review of probability axioms and probability rules, special univariate distributions</td>
</tr>
<tr>
<td>2.</td>
<td>7 March</td>
<td>Random variables and expectations</td>
</tr>
<tr>
<td>3.</td>
<td>14 March</td>
<td>Multivariate distribution, covariance and correlation, marginal and transformations, conditional distributions, conditional expectation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[Validation Test 1]</td>
</tr>
<tr>
<td>4.</td>
<td>21 March</td>
<td>Multivariate distribution, covariance and correlation, marginal and transformations, conditional distributions, conditional expectation</td>
</tr>
<tr>
<td>5.</td>
<td>28 March</td>
<td>Tuition Free Week</td>
</tr>
<tr>
<td>6.</td>
<td>4 April</td>
<td>Multivariate distribution, covariance and correlation, marginal and transformations, conditional distributions, conditional expectation</td>
</tr>
<tr>
<td>7.</td>
<td>11 April</td>
<td>Moment generating function, probability generating function and cumulant generating functions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[Assignment Part I &amp; Validation Test 2]</td>
</tr>
<tr>
<td>8.</td>
<td>18 April</td>
<td>Tuition Free Week</td>
</tr>
<tr>
<td>9.</td>
<td>25 April</td>
<td>Convergence of random sequences, distribution derived from normal distribution</td>
</tr>
<tr>
<td>10.</td>
<td>2 May</td>
<td>Distributions of sample mean and the sample variance,</td>
</tr>
<tr>
<td>11.</td>
<td>9 May</td>
<td>Methods of estimation and properties of estimators.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[Validation Test 3]</td>
</tr>
<tr>
<td>12.</td>
<td>16 May</td>
<td>Methods of estimation and properties of estimators.</td>
</tr>
<tr>
<td>13.</td>
<td>23 May</td>
<td>Methods of estimation and properties of estimators.</td>
</tr>
<tr>
<td>14.</td>
<td>30 May</td>
<td>Review</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[Assignment Part II]</td>
</tr>
</tbody>
</table>

Study Week
Examinations