# Unit Outline

**MATH5011 Survival Analysis**  
Semester 1, 2016

<table>
<thead>
<tr>
<th><strong>Unit study package code:</strong></th>
<th>MATH5011</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mode of study:</strong></td>
<td>Internal</td>
</tr>
</tbody>
</table>
| **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:

- 309807 (v.0) Mathematical Statistics 503 or any previous version  
  **OR**  
- 309803 (v.0) Actuarial Statistics 501 or any previous version  
  **OR**  
- 302315 (v.0) Mathematical Statistics 202 or any previous version  
  **OR**  
- STAT5008 (v.0) Mathematical Statistics or any previous version  
  **OR**  
- STAT5007 (v.0) Actuarial Statistics or any previous version  
  **OR**  
- STAT2001 (v.0) Mathematical Statistics or any previous version  
  **AND**  
- 309812 (v.0) Theory of Interest 502 or any previous version  
  **OR**  
- MATH5000 (v.0) Theory of Interest 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](fees.curtin.edu.au/incidental_fees.cfm) for details.

### Unit coordinator:

<table>
<thead>
<tr>
<th><strong>Title:</strong></th>
<th>Mr</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name:</strong></td>
<td>Adrian Wong</td>
</tr>
<tr>
<td><strong>Phone:</strong></td>
<td>+61 9266 7668</td>
</tr>
<tr>
<td><strong>Email:</strong></td>
<td><a href="mailto:Adrian.Wong@curtin.edu.au">Adrian.Wong@curtin.edu.au</a></td>
</tr>
<tr>
<td><strong>Location:</strong></td>
<td>Building: 314 - Room: 458</td>
</tr>
</tbody>
</table>

### Teaching Staff:
Acknowledgement of Country

We respectfully acknowledge the Indigenous Elders, custodians, their descendants and kin of this land past and present.

Syllabus

This unit will cover survival models, lifetime distributions, statistical models of transfer between multiple states, binomial and Poisson models of mortality, maximum likelihood estimation of transition intensities, age specific transition intensities, statistical tests, standard life tables, and graduation of crude estimates.

Introduction

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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.

On successful completion of this unit students can:

<table>
<thead>
<tr>
<th>No.</th>
<th>Learning Outcomes</th>
<th>Graduate Attributes addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Review of binominal and poisson processes and their application to the modelling of mortality</td>
<td>✅ ![Icon] ![Icon] ![Icon]</td>
</tr>
<tr>
<td>2</td>
<td>Using the concept of survival models, apply estimation procedures to produce lifetime distributions</td>
<td>✅ ![Icon] ![Icon] ![Icon]</td>
</tr>
<tr>
<td>3</td>
<td>Apply maximum likelihood estimation, Poisson and Binomial models of mortality to produce mortality rates</td>
<td>✅ ![Icon] ![Icon] ![Icon]</td>
</tr>
<tr>
<td>4</td>
<td>Use of the census approximation and crude mortality estimates to test for consistency to produce graduated mortality tables</td>
<td>✅ ![Icon] ![Icon] ![Icon]</td>
</tr>
<tr>
<td>5</td>
<td>Design and construct survival models for analysis of practical problems</td>
<td>✅ ![Icon] ![Icon] ![Icon]</td>
</tr>
</tbody>
</table>

Curtin’s Graduate Attributes

- **Apply discipline knowledge**
- **Thinking skills** (use analytical skills to solve problems)
- **Information skills** (confidence to investigate new ideas)
- **Communication skills**
- **Technology skills**
- **Learning how to learn** (apply principles learnt to new situations) (confidence to tackle unfamiliar problems)
- **International perspective** (value the perspectives of others)
- **Cultural understanding** (value the perspectives of others)
- **Professional Skills** (work independently and as a team) (plan own work)

Find out more about Curtin’s Graduate attributes at the Office of Teaching & Learning website: [ctl.curtin.edu.au](http://ctl.curtin.edu.au)
Learning Activities
Lectures, tutorials and workshops.

Learning Resources
Other resources
Course Notes for Subject CT4 from the Institute of Actuaries, published by the ActEd Company.

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>Test</td>
<td>10 percent</td>
<td>Week: 5 Day: TBA Time: TBA</td>
<td>1,2,3</td>
</tr>
<tr>
<td>Assignment</td>
<td>20 percent</td>
<td>Week: 12 Day: TBA Time: TBA</td>
<td>3,4,5</td>
</tr>
<tr>
<td>Examination</td>
<td>70 percent</td>
<td>Week: Exam week Day: TBA Time: TBA</td>
<td>2,3,4</td>
</tr>
</tbody>
</table>

Detailed information on assessment tasks

1. Covers first 5 weeks of lectures.
2. Covers next 5 weeks of lectures.
3. Covers all topics.

Pass requirements
Students must achieve a Final Mark of 50 or greater to pass this unit.

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

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. Late submission of assessments is not accepted in this unit. Students will receive a zero mark for any assessment item submitted late.

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/) 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 are not available in this unit.

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: oasisaaos.curtin.edu.au/helo/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

You are not permitted to use any CAS (Computer Algebra System) calculators such as Classpads in the test and final examination. You are to provide detailed working of intermediate steps in all assessments. Only calculators approved specifically by the school/department may be used during your test and examination.

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 eesj@curtin.edu.au or go to http://eesj.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:

None.
### Program Calendar

#### Program Calendar – Semester 1 2016

<table>
<thead>
<tr>
<th>Week</th>
<th>Begin Date</th>
<th>Topics</th>
<th>Required Text</th>
<th>Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation</td>
<td>22 February</td>
<td>Orientation Week</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>29 February</td>
<td>Survival models and the Life Table</td>
<td></td>
<td>Ch 7</td>
</tr>
<tr>
<td>2.</td>
<td>7 March</td>
<td>Estimating the lifetime distribution. The Kaplan-Meier and Nelson-Aalen models</td>
<td></td>
<td>Ch 8</td>
</tr>
<tr>
<td>3.</td>
<td>14 March</td>
<td>Continued</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>21 March</td>
<td>The Cox Regression Model</td>
<td></td>
<td>Ch 9</td>
</tr>
<tr>
<td>5.</td>
<td>28 March</td>
<td>Tuition Free Week</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>4 April</td>
<td>Continued</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>11 April</td>
<td>Binomial and Poisson Models</td>
<td></td>
<td>Ch 10</td>
</tr>
<tr>
<td>8.</td>
<td>18 April</td>
<td>Tuition Free Week</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>25 April</td>
<td>Exposed to risk</td>
<td></td>
<td>Ch 11</td>
</tr>
<tr>
<td>10.</td>
<td>2 May</td>
<td>Continued</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>9 May</td>
<td>Graduation and Statistical Tests</td>
<td></td>
<td>Ch 12</td>
</tr>
<tr>
<td>12.</td>
<td>16 May</td>
<td>Continued</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>23 May</td>
<td>Methods of Graduation</td>
<td></td>
<td>Ch 13</td>
</tr>
<tr>
<td>14.</td>
<td>30 May</td>
<td>Continued</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>6 June</td>
<td></td>
<td>Study Week</td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>13 June</td>
<td></td>
<td>Examinations</td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>20 June</td>
<td></td>
<td>Examinations</td>
<td></td>
</tr>
</tbody>
</table>