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[refer to the ANU Campus Map  
\(map GH32, reference G3\)](#)

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## Course Outline

### STAT3038/6045 – Actuarial Techniques

### Semester 2, 2011

*STUDENTS: Course details change from semester to semester. Please check that you are reading the Course Outline for the correct semester.*

#### Course Description

This course covers the development of cash flow projection models for the purpose of reserving, pricing and profit-testing life insurance contracts. Profit vectors, profit signatures, and measures of profitability in the context of life insurance will be introduced. Basic models will be extended to deal with competing risks, multiple decrement tables, and the relationship between independent and dependent rates. Techniques to value defined benefit superannuation liabilities will be covered in theory and practice.

#### Contacts

Role	Office address	Email	Telephone	Consultation Times
<b>Lecturer and course convenor</b>  <i>Tim Higgins</i>	CBE Bld 26C, Room 4.30	<a href="mailto:tim.higgins@anu.edu.au">tim.higgins@anu.edu.au</a>	6125 4507	Wednesday 3-5pm. Please email to arrange a different day and time if you can't make it then.
<b>Tutor</b>  Gaurav Khemka	CBE Bld 26C, Room 3.07	<a href="mailto:gaurav.khemka@anu.edu.au">gaurav.khemka@anu.edu.au</a>	6125 7287	To be determined at the start of semester 2.
<b>School Student Administrators</b>  <i>Tracy Skinner</i>	CBE Bld 26C, Room 4.50	<a href="mailto:tracy.skinner@anu.edu.au">tracy.skinner@anu.edu.au</a>	6125 0487	

## Communication

### Email

If necessary, the lecturers and tutors for this course will contact students on their official ANU student email address. Information about your enrolment and fees from the Registrar and Student Services' office will also be sent to this email address.

### Announcements

Students are expected to check the Wattle site for announcements about this course, e.g. changes to timetables or notifications of cancellations. Notifications of emergency cancellations of lectures or tutorials will be posted on the door of the relevant room.

### Course URLs

More information about this course may be found on:

- [Study @ ANU](#),
- the [College of Business and Economics website](#), and
- [Wattle](#), the University's online learning environment. Log on to Wattle using your student number and your ISIS password.

## Course Information

### Learning Outcomes

Upon successful completion of the requirements for this course, students will be able to:

1. Describe simple types of life insurance contracts and the technique of discounted cash flows for use in reserving and pricing simple life insurance contracts, such as whole life, term life, endowment insurances, and unit-linked contracts. (Section 1, 2)
2. Describe and calculate various measures of profitability, including profit vectors, profit signatures, and the profit margin. (Section 2.3, 2.4)
3. Set up profit tests for simple life insurance contracts and use profit tests to determine life insurance premiums and/or provisions. Show how this can be achieved with or without spreadsheets. (Section 2.3, 2.4)
4. Describe and apply methods for modelling cash flows contingent on competing risks, including multiple state Markov models. (Section 3)
5. Describe and create multiple decrement tables, and derive relationships between dependent and independent probabilities as used in single and multiple decrement tables. (Section 3)
6. Describe the components of defined benefit superannuation and derive the mathematical formulae required to value the contributions and benefits of a defined benefit superannuation fund. (Section 4.1 – 4.3)
7. Show how superannuation benefits and the employer contribution rate for defined benefit superannuation funds can be calculated using spreadsheets, or via commutation functions. (Section 4.2, 4.3)

### Workload

It is anticipated that students will spend on average 10 hours per week on the course. This includes attending lectures and tutorials, studying the course material, preparing solutions to tutorial questions and assignments and preparing for exams. Students who are finding concepts difficult may need to devote considerably more time to the course. Students will be expected to spend a greater proportion of their time on this course in the lead-up to the assignments and final examination in revising the material and past exam questions or other forms of exam preparation.

## Course Delivery

*3 one hour lectures + 1 one hour tutorial*

While 3 hours per week have been set aside for lectures, for some weeks only 2 hours may be required to cover the material. The lecturer will inform the class in lectures and through Wattle whether two or three hours of classes are being taught from week to week. Lectures will be digitally audio recorded when possible and the recordings will be placed on Wattle.

There will be weekly tutorials held in PC computer labs. Many concepts in the course will be taught by use of computers. Some, but not all, of the tutorials will involve questions that require spreadsheets. The days and times of the tutorials will be finalised during the first week of lectures.

Tutorials will commence in the 2<sup>nd</sup> week of the semester. Note there will be no formal tutorial questions for Weeks 5 and 11. During these weeks you will have an opportunity to ask questions of your tutor about the spreadsheet techniques used in class and required for assessment.


Tutorial questions will be placed on Wattle at least a couple of weeks prior to the tutorial, and solutions will be placed on Wattle at the end of each week following tutorials.

## Attendance Requirements

Although attendance at lectures and tutorials is not compulsory, students are recommended to attend all classes so as to maximise their learning experience and improve their chances of achieving a good grade in the course.

## Tutorial Registration

Enrolment in tutorials will be completed online using the Electronic Teaching Assistant (ETA). To enrol, follow these instructions:

1. Go to <http://eta.fec.anu.edu.au>.
2. You will see the Student Login page. To log into the system, enter your University ID (your student number) and password (your ISIS password) in the appropriate fields and hit the **Login** button.
3. Read any news items or announcements.
4. Select "Sign Up!" from the left-hand navigation bar.
5. Select your courses from the list. To select multiple courses, hold down the control key. On PCs, this is the **Ctrl** key; on Macs, it is the  key. Hold this key down while selecting courses with the mouse. Once courses are selected, hit the **SUBMIT** button.
6. A confirmation of class enrolments will be displayed. In addition, an email confirmation of class enrolments will be sent to your student account.
7. For security purposes, please ensure that you click the **LOGOUT** link on the confirmation page, or close the browser window when you have finished your selections.
8. If you experience any difficulties, please contact the School Office (see page 1 for contact details).

## Study Schedule

The following schedule is preliminary only – the material may be completed at a faster or slower pace depending on the needs of the class. Tutorial questions will typically cover the previous week's lecture material.

<b>Week beginning (number)</b>	<b>Section Number</b>	<b>Topic</b>	<b>Supplementary reading brick</b>
July 25 (week 1)	1  2.1	<ul style="list-style-type: none"> <li>• Introduction to cash flow modelling.</li> <li>• Excel basics.</li> <li>• Life insurance and life products in Australia.</li> </ul>	N/A
Aug 1 (week 2)	2.2	<ul style="list-style-type: none"> <li>• Basic models using discounted cash flow techniques – pricing, reserving and estimating profit.</li> <li>• Introduction to multiple decrements.</li> <li>• Using spreadsheets for life insurance calculations.</li> </ul>	Ch.9 and Ch.15
Aug 8 (week 3 & 4)	2.3	<ul style="list-style-type: none"> <li>• Pricing contracts using profit tests.</li> <li>• Effect of different bases on profit.</li> <li>• Measures of profit.</li> <li>• Reserve assumptions.</li> </ul>	Ch.9
Aug 15 and 22 (weeks 4 & 5)	2.4	<ul style="list-style-type: none"> <li>• Unit-linked insurance contracts and associated cash flow projections.</li> <li>• Reserving for unit-linked policies – zeroising negative cash flows.</li> </ul>	Ch. 14
Aug 29 and Sept 5 (weeks 6 & 7)	3	<ul style="list-style-type: none"> <li>• Introduction to competing risks.</li> <li>• Relating probabilities and transition intensities.</li> <li>• Multiple decrement tables.</li> <li>• Deriving independent rates from dependent rates (and vice versa).</li> <li>• Valuing benefits and profit testing with competing risks.</li> </ul>	Ch.15 and Ch.17
Sept 26 (week 8)	4.1	<ul style="list-style-type: none"> <li>• Introduction to superannuation in Australia.</li> <li>• The role of the actuary.</li> <li>• Defined benefit fund benefits and contributions.</li> </ul>	Ch.19
Oct 3 and 10 (weeks 9 & 10)	4.2	<ul style="list-style-type: none"> <li>• Valuing superannuation benefits and contributions.</li> <li>• Basic spreadsheet models for superannuation.</li> </ul>	Ch.19
Oct 17 and 24 (weeks 11 & 12)	4.3	<ul style="list-style-type: none"> <li>• Valuing superannuation benefits and contributions using commutation functions.</li> <li>• Pension benefits.</li> <li>• Defined benefit valuation examples and modifying benefit design</li> </ul>	Ch.19
Oct 31 (week 13)	N/A	<ul style="list-style-type: none"> <li>• Revision</li> </ul>	N/A

# Assessment

## Proposed Assessment Schedule

Details about assessment may change during the first two weeks of semester. Please ensure that you check with your lecturer or tutor about any changes. Changes to the assessment schedule will be posted to the Wattle site. Further details regarding the assessment of the course will be announced in lectures and on Wattle.

Assessment item	Description and detail of assignment	Due Date	Weighting (%)
Assignment 1	Take home spreadsheet question(s)	5pm, Friday, 2 September (Week 6)	15%
Assignment 2	Take home spreadsheet question(s)	5pm, Friday, 28 October (Week 12)	15%
Final Exam	Written exam of 3 hours duration	Final exam period	70%

Assignments are compulsory and non-redeemable.

The following formula will be used to determine your final **raw** score:

$$15\% \times \text{Assignment 1 mark} + 15\% \times \text{Assignment 2 mark} + 70\% \times \text{Final exam result}$$

### Final exam

The exam will take place during the regular exam period and will be 3 hours in length, plus 15 minutes of reading time. Permitted material will include a dictionary, *Formulae and Tables for Actuarial Examinations*, a non-programmable calculator and one A4 page of notes (may be hand-written and/or typed on both sides). Further information will be provided to students via Wattle and in lectures.

### Scaling

Your final mark for the course will be based on the **raw** marks allocated for each assignment or examination. 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.

### Learning Outcomes-Assessment

This table illustrates how each assessment item provides evidence about your achievements against each learning outcome.

Course Learning Outcomes	Assignment 1	Assignment 2	Final Exam
The seven specific learning outcomes listed above are given here alongside the assessment items. This indicates whether the learning outcome is covered in each assessment piece.			
1	yes	no	yes
2	yes	no	yes
3	yes	no	yes

<b>Course Learning Outcomes</b>	<b>Assignment 1</b>	<b>Assignment 2</b>	<b>Final Exam</b>
The seven specific learning outcomes listed above are given here alongside the assessment items. This indicates whether the learning outcome is covered in each assessment piece.			
4	no	no	yes
5	no	yes	yes
6	no	yes	yes
7	no	yes	yes

### **Assignment Details**

#### *Assignment 1*

Due Date	5pm, Friday, 2 September (week 6)
Value or Weighting (%)	15%
Suggested Length	As directed in the assignment question to be placed on Wattle.
Instructions	As directed in the assignment question to be placed on Wattle.
Purpose	To create a spreadsheet using the practical application of the material in Sections 2.2 and 2.3 in a new situation.
Marking Criteria	A good answer will expand upon the spreadsheet work provided in Sections 2.2 and 2.3 and apply it to the new situation in the assignment.
Submission	Uploaded to Wattle

#### *Assignment 2*

Due Date	5pm, Friday, 28 October (week 12)
Value or Weighting (%)	15%
Suggested Length	As directed in the assignment question to be placed on Wattle.
Instructions	As directed in the assignment question to be placed on Wattle.
Purpose	To create a spreadsheet using the practical application of the material in Section 4.2 in a new situation.
Marking Criteria	A good answer will expand upon the spreadsheet work provided in Sections 4.2 and apply it to the new situation in the assignment.
Submission	Uploaded to Wattle

### **Penalties**

Penalties will be imposed on late submission of assignments. 10% of the maximum grade possible will be deducted for each day that an assignment is late. If an assignment is submitted on the due date, but after the 5pm deadline, it will be treated as if it is one day late. After 10 days, a grade of zero will be assigned.

## **Texts and Other Reading**

### **Prescribed Texts**

Weekly lecture notes will be available on Wattle. Hard copies of the lecture notes will not be provided in class. It is up to the student to print out the lecture notes from Wattle.

You will need to obtain a copy of the book *Formulae and Tables for Actuarial Examinations*. This can be ordered directly through ACTED Australia (website: [www.acted.com.au](http://www.acted.com.au)). You will make reference to this book in completing the lecture and tutorial exercises. In addition you will be **required** to use this book as a reference in the final examination.

### **Technology, Software, Equipment**

Students will be required to supply a calculator. The use of Excel is required for the completion of tutorial and assignment questions in this course. Excel may be used on campus or on the students personal computers or laptops. Students may find it beneficial to bring a laptop to lectures to follow along with Excel examples, although this is not a requirement.

### **Recommended/supplementary reading**

A selection of chapters from the text 'Life Assurance Mathematics' by W.F.Scott are available on Wattle. These will not be referred to directly during lectures but may provide additional understanding and examples. They are not a required reading. An additional list of readings for Subject CT5 (see below) can be found at [http://www.actuaries.org.uk/students/syllabus/further\\_reading/ct\\_subjects](http://www.actuaries.org.uk/students/syllabus/further_reading/ct_subjects). You may like to source and read these for other perspectives on the material in this course – again they are not required reading.

### **Pre-requisites**

STAT2001 – Introductory Mathematical Statistics

STAT2032 – Financial Mathematics

In addition, some material from STAT3037/6043 – Life Contingencies will be relevant in this course. For those students who have not completed STAT3037/6043, relevant lecture material from that course and a revision tutorial will be provided.

### **Other information**

Completion of this course along with Life Contingencies (STAT3037/STAT6043) entitles students for consideration for exemption from Subject CT5 (Contingencies) of the Institute of Actuaries of Australia. To qualify for an exemption from CT5 students must receive an average mark of at least 60 in this course and Life Contingencies. In addition a minimum mark of 50 Pass in both subjects is required to be considered for an exemption.

## **General Information for Actuarial Students**

The Institute of Actuaries of Australia (IAAust) allows students to become IAAust University Subscribers free of charge. Full time undergraduates studying at an Institute accredited university who are members of a university student actuarial society are eligible. To sign up, go to <http://www.actuaries.asn.au/Membership/MembershipoftheInstitute/Subscriber.aspx>.

The University Subscriber offer is not a membership of the IAAust but a subscription to receive information on career opportunities, invitations to selected IAAust events and online publications. You might also consider joining the IAAust – there are advantages in doing so while a full-time student. For membership information, go to <http://www.actuaries.asn.au/Membership/MembershipoftheInstitute.aspx>.

## General Information for all Students

### CBE Student Office

<http://www.cbe.anu.edu.au/>

The CBE Student Office provides assistance with program and course selection, enrolment, change of program, variation to enrolment, status and other general matters. It is located on Level 2 of CBE Building 26c, contact details:

- T: (61) 02 6125 3807
- E: info.cbe@anu.edu.au

### Main Administrative Dates 2011

[http://www.anu.edu.au/sas/SEAP\\_guide/](http://www.anu.edu.au/sas/SEAP_guide/)

The main administrative dates regarding teaching sessions, course census dates, examination period, graduation and enrolment variations (i.e. add and drop courses) are available from the ANU SEAP Guide 2011.

### Associate Dean (Education)

Dr Royston Gustavson is the Associate Dean (Education) in the ANU College of Business & Economics.

### ANU Student Support

Academic Skills and Learning Centre

<http://www.anu.edu.au/academicskills/>

The Academic Skills and Learning Centre, in the Pauline Griffin Building, offers services to students regarding a range of academic issues including essay writing, note-taking, referencing, reading, examination preparation, and plagiarism.

### ANU College

<http://www.anucollege.com.au/>

ANU College offers the following introductory and extended programs:

- maths bridging courses; and
- English language support for students from non-English-speaking backgrounds.

### Information Literacy Program

<http://ilp.anu.edu.au/index.html>

Workshops are available to undergraduate and graduate students to develop skills in handling information and communication technologies.

## Policies, Procedures and Rules

### ANU SEAP Guide 2010

[http://www.anu.edu.au/sas/SEAP\\_guide/](http://www.anu.edu.au/sas/SEAP_guide/)

The Student Enrolment and Administrative Procedures Guide (SEAP) supplements the ANU Undergraduate Handbook information available on Study@ANU (<http://info.anu.edu.au/studyat/>), the ANU Rules (<http://www.anu.edu.au/cabs/rules/>), and the Graduate Research website (<http://www.anu.edu.au/graduate/>).

## Information for Enrolled Students

[http://cbe.anu.edu.au/Current\\_Students/general\\_info/](http://cbe.anu.edu.au/Current_Students/general_info/)

Students are expected to be familiar with the ANU College of Business & Economics and university-wide policies and procedures on the following:

- Code of Practice for Student Academic Honesty
- Assessment Arrangements for Students from Language Backgrounds Other Than English
- Academic Progress Rules and Procedures
- Special examinations/consideration
- Supplementary examinations
- Review of assessment procedures

## Special Examinations

[http://cbe.anu.edu.au/Current\\_Students/general\\_info/specexam.asp](http://cbe.anu.edu.au/Current_Students/general_info/specexam.asp)

You must contact the College Office for guidance on the procedure for special examinations for final examination. Do not approach your lecturer for this information.

Students who are unable to attend an examination for reasons outlined in the policies above, may **apply** to sit a special examination by lodging an application with the College Student Administration Office no later than 72 hours after the scheduled examination. It is important to emphasise that **travel arrangements and minor illnesses are not normally acceptable grounds for special examinations** (Section 2, College 'Special Examination Policy').

**Section 7.7 of the 'Student Enrolment and Procedures Guide 2009' states:**

***Students must make themselves available for the duration of the examination period in order to attend any special examination that may be required.***

If you know in advance of circumstances whereby you will be unable to sit the examination, you should lodge an application for a special examination as soon as possible.

The dates on which Special Examinations will be held will be published on the School website when the final timetable is published.

Applications for special examinations must be correctly completed with all original supporting documentation attached. Where an application is made on the grounds of sickness, Section B of the application **must be completed by a medical practitioner** and a detailed medical certificate stating the effect on your capacity to sit the examination is required.

**The medical certificate must carry the stamp from the medical practice, and will not always be sufficient evidence.**

Special examinations are **not** automatically granted. If approved, successful candidates are required to contact the relevant School Office to obtain details of the special exam. If you do not sit the examination, or your application for a special examination is declined, then you will fail the course as incomplete.

It is not grounds for a further special examination if students are not contactable and miss the scheduled examination date.

## Special Consideration

If illness or other disruptive events have affected your preparation for, or performance during, an examination, you can bring this to the attention of the examiners by making a request for special consideration using the Application for Special Consideration form.

Requests for special consideration must be lodged with the relevant **School Office** before the scheduled date of the examination. However, if it relates to a problem that arose during the examination, it should be submitted immediately after the examination (see the invigilator).

Requests for special consideration must be accompanied by documentation of the illness and/or a letter setting out the reasons for the difficulties in studying for or sitting an examination. The examiners will take this into account in awarding the final grade.

### Special Arrangements

If you have a disability or disorder (permanent or temporary) which makes undertaking a formal sit-down examination difficult, then ***you are responsible for requesting special arrangements to be made for your examination.*** In the past these arrangements have included the use of special equipment, additional time, writing breaks, a scribe (someone to write for you), etc.

Please contact the Examinations and Graduations Office early in the semester and **at least 10 days prior to the examination period.**

Failure to make appropriate arrangements for an examination may result in a subsequent application for a special examination/special consideration being declined.

### Disabilities

If you have any queries about special arrangements with respect to disabilities, please refer to the Disabilities Officer. The ANU Disability Services Centre's website is at <http://www.anu.edu.au/disabilities/>.

### Supplementary Examinations

<http://www.anu.edu.au/cabs/rules/ExamsRules.pdf>

In accordance with the University Examinations Rules 2009 (No. 3), you may be provided with a supplementary examination.

If you have qualified for a supplementary examination, your grade will be recorded as a PX on your Notification of Results. ***You must notify the School Office, in writing (email is satisfactory), within 7 days of the official publication date of examination results to indicate your acceptance or otherwise to sit the supplementary examination.***

If you pass the supplementary examination you will receive the grade of PS (pass at supplementary examination) and a mark of 50. If you are unsuccessful, or you decide not to sit the supplementary examination, your grade will be recorded as N (fail) and your original mark will stand.

Supplementary examinations will be held early in the next semester on dates to be advised. For information regarding the timing and venues for supplementary examinations please refer to the school websites in week 2 of the current semester:

ABIS: <http://www.cbe.anu.edu.au/schools/abis/>

ECONOMICS: <http://www.cbe.anu.edu.au/schools/eco/>

FAS: <http://www.cbe.anu.edu.au/schools/fas/>

MMIB: <http://www.cbe.anu.edu.au/schools/mmib/>

Travel plans should be made accordingly as travel plans are not an acceptable reason to miss a supplementary examination.

### Results and Examinations

In accordance with the University Assessment Grades/Codes, CBE applies the following scale when awarding grades:

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#### Final Pass Grades

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HD – High Distinction	80–100
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D – Distinction	70–79
CR – Credit	60–69
P – Pass	50–59
PS – Pass at supplementary examination	50
<b>Final Fail Grades</b>	
N – Fail	00–49
NCN – Not Completed/Fail	
WN – Withdrawn with failure	
<b>Interim Codes</b> (used when a result for a course has not yet been finalised)	
DA – Deferred assessment	
PX – Offered supplementary assessment	
RP – Result pending	
WA – Withheld for administrative reasons	

### Results Notification

To access results students should check their ISIS accounts on the advertised date for release of examination results. After publication, students enquiring about results must provide an ANU student card as proof of identification to the Examinations, Graduations, Prizes and Timetabling Office (Building 12). For privacy reasons students should not make enquiries regarding the results of other students.

### Examination Timetable – Final Examination Period

<http://timetable.anu.edu.au/>

Details of the final examination timetable are available on the ANU Timetabling website. The onus is upon students to acquire their own scheduling details.

### Examination Timetable – Mid-Semester Examinations

When a mid-semester exam is scheduled, timetable information will be posted by the relevant School.

### Misconduct

<http://www.anu.edu.au/cabs/rules/DisciplineRules.pdf>

In relation to an examination, misconduct on the part of a student includes:

- cheating;
- plagiarism (including the reproducing in, or submitting for assessment for, any examination, by way of copying, paraphrasing or summarising, without acknowledgement and with the intention to deceive, any work of another person as the student's own work, with or without the knowledge or consent of that other person);

- submitting for an examination any work previously submitted for examination (except with the approval of the prescribed authority);
- failing to comply with the University's instructions to students at, or in relation to, an examination;
- acting, or assisting another person to act dishonestly, in or in connection with an examination; and/or
- taking a prohibited document into an examination venue.

The administrative procedures regarding misconduct are incorporated in the ANU Discipline Rules.

### **Plagiarism**

<http://academichonesty.anu.edu.au/>

The College regards plagiarism as any appropriation of the ideas or expressions of another without relevant and appropriate acknowledgment. This includes un-attributed appropriation of text or content and may extend to improper referencing. Plagiarism will not be tolerated in any course and all discovered instances would be pursued to the full extent allowable under the rules.

Where students have doubts as to how to deal with or acknowledge source materials in course assignments they should consult the lecturer or tutor.

The penalties and administrative procedures regarding plagiarism are incorporated in the ANU Policy on Academic Honesty.

On-line material discussing plagiarism and referencing styles is available from the Academic Skills and Learning Centre Web page (<http://www.anu.edu.au/academicskills/>).