ACST151
Introduction to Actuarial Studies

Semester 1, 2009

Actuarial Studies Department
Students in this unit should read this unit outline carefully at the start of semester. It contains important information about the unit. If anything in it is unclear, please consult one of the teaching staff in the unit.

**ABOUT THIS UNIT**

This unit provides an introduction to the important underlying aspects of actuarial work. We look at the development of actuarial techniques in the context of life insurance, general insurance, superannuation, and investment. The aim is to develop problem-solving skills and give students some of the basic tools for risk management and financial modelling. The unit shows how studies in related disciplines (such as accounting, demography, economics, statistics, computing, and mathematics) are essential to the education of an actuary. The unit works through the control cycle approach to insurance: business objectives, product design, risk assessment, modelling of insurance and financial risks (including claim frequency and claim size of individual claims and on a portfolio basis), pricing, reserving, investment and asset liability matching, claims management, legal requirements, solvency, profitability, and responding to experience. Assessment is via assignments, class tests, and a final examination. This unit is relevant for students who want to become actuaries or risk managers. Students are assumed to have studied mathematics in high school up to at least HSC Extension 1 level (or equivalent from other states/countries). This subject is a prerequisite for more advanced units in the actuarial studies program.
**TEACHING STAFF**

- **Convenor**: Shauna Ferris.
  - Contact by email at sferris@efs.mq.eu.au
  - Building E4A Room 617

- **Lecturer**: Associate Professor John Shepherd
  - Contact by email at jshepher@efs.mq.edu.au
  - Building E4A Room 616

- **Tutors**
  - Gareth Sweeney (contact via BlackBoard Private Mail)
  - Werner Fortmann (contact via BlackBoard Private Mail)

- **Teaching Assistant**: Werner Fortmann (contact via BlackBoard Private Mail)

If you have any questions about the general administration of this unit, please send them to Werner Fortmann via BlackBoard Private Mail. (We will show you how to use this in lectures).

Shauna Ferris will be available for consultation on Wednesday afternoon between 3 pm and 5 pm. If you need to see her at some other time, please send an email to make an appointment.

**CLASSES**

There are two lectures each week.

<table>
<thead>
<tr>
<th></th>
<th>Day</th>
<th>Time</th>
<th>Location</th>
<th>Tutor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class_01</td>
<td>Fri</td>
<td>9</td>
<td>W6B 315</td>
<td>Werner Fortmann</td>
</tr>
<tr>
<td>Class_02</td>
<td>Fri</td>
<td>9</td>
<td>C5A 232</td>
<td>Garreth Sweeney</td>
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<td>Fri</td>
<td>10</td>
<td>W6B 315</td>
<td>Werner Fortmann</td>
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<td>Fri</td>
<td>10</td>
<td>C5A 232</td>
<td>John Shepherd/ S. Ferris</td>
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<td>12</td>
<td>C4A 312</td>
<td>Garreth Sweeney</td>
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<tr>
<td>Class_06</td>
<td>Fri</td>
<td>12</td>
<td>W5A 105</td>
<td>John Shepherd/ S. Ferris</td>
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</table>

To help you find your room, it is helpful to know that
- Buildings on the East side of Campus are labelled E
- Buildings on the West Side of Campus are labelled W
- Buildings near the Centre of the campus are labelled C

The timetable for classes can be found on the University web site at: [http://www.timetables.mq.edu.au/](http://www.timetables.mq.edu.au/)
There is no prescribed textbook for this unit.

Course notes and tutorial exercises and solutions will be posted on BlackBoard each week.

The web page for this unit can be found by going to learn.mq.edu.au and entering your user id and password. This will give you a list of all the units you are enrolled in this semester.

If you forget your password or have any technical problems accessing the website, then you can contact the help desk at 9850-4357. (9850-HELP) or by going to C5C244.

The course is divided into four modules
  - Module 1: Induction
  - Module 2: Life Insurance
  - Module 3: General Insurance
  - Module 4: Financial Products

Induction module (Weeks 1-3)

The aim of this introductory (induction) module is to help you to develop a working knowledge (*) of the following important components of the next 3-4 years of your life:

- Macquarie University
- Your actuarial studies program
- Actuarial work and its impact
- Environment of actuarial work
- Studying at Macquarie in the actuarial program

*Working knowledge:* Enough knowledge and understanding to get you started on your program of actuarial study (over the next 3-4 years your knowledge and understanding will continue to grow from this initial foundation)

Learning outcomes

By the end of this module (Weeks 1-3) you will have:

- Met and got to know a few of your actuarial class mates.
- Thought, talked and written about what actuaries are and what they do.
- Discovered some of the areas in which actuaries apply their skills.
• Researched some aspects of the current context of actuarial work.
• Accessed and used some sources of actuarial knowledge (eg actuarial literature).
• Thought about how and why you learn best.
• Thought about how best to approach your learning in the actuarial program.
• Used basic financial mathematics techniques to analyse retirement savings schemes.
• Used (and modified) some simple Excel worksheets.

Topics

• What are actuaries and what do they do?
• Why actuaries belong to a profession?
• A framework for actuarial work: the actuarial control cycle
• The global financial crisis (as background to actuarial work)
• Providing people with post-retirement incomes
• Spreadsheets using Excel
• Introductory financial mathematics

Life Insurance module (Weeks 4-7)

Historically speaking, the actuarial profession developed to meet the needs of the life insurance industry. The skills and techniques developed in the life insurance industry have turned out to be very useful in a wide variety of other areas of risk management and finance.

The early actuaries had to solve many problems, such as:
• How can we create products which will meet the needs of our customers?
• How do we estimate the risk that a healthy person will die in the next year?
• How should we set the price for a life insurance product in a competitive market, allowing for various costs and expenses?
• How can we classify risks and underwrite those risks?
• For longer term products, how should we invest the policyholder’s money between the date the premium is paid and the date the benefit is paid?
• How much capital is needed to provide a high level of security / reduce the probability of ruin to acceptable levels?
• How should we identify, monitor, and manage the financial and insurance risks? How can risks be transferred and hedged?
• How should the financial position of a company be shown in the accounts?
• How should we distribute the profits we make?
• What legislation is necessary to make the life insurance system work properly?

In order to answer these questions, actuaries have to apply knowledge from several disciplines, including statistics, modelling, economics, demography, marketing, financial mathematics, computing and law.

Throughout this unit, we will also be considering the ethical obligations of actuaries. Actuaries are a profession, trusted by the community, and hence must demonstrate the highest standards of integrity.
General Insurance module (Weeks 8-11)

General insurance covers a very diverse range of risks including: the risk that a house will burn down during a bushfire; the risk that an airplane will be high-jacked by terrorists; the risk that a doctor will make a mistake and injure someone during an operation; the risk that an employee will steal money from his employer. This makes general insurance even more difficult than life insurance.

It is harder to evaluate the risks because there is much greater diversity in the risk.

Also, in general insurance, the amount of a claim payment will vary depending on the amount of damage; we must use more complex statistical models which allow for variation in both the frequency and the size of the claims.

In general insurance, there may be delays and disputes about the payment of claims – which introduces additional problems in accounting and claims management.

Actuaries adapted the basic life insurance control cycle to general insurance. Basically, the actuary uses the control cycle to manage all aspects of the insurance business, including product design, risk classification, financial modelling, pricing, reinsurance and hedging investment, capital, reserving (Valuation of Liabilities) and accounting, monitoring experience, claims management, and legislative controls.

Financial Products module (Weeks 12-13)

Many products also involve financial risks: risks involving changes in interest rates, exchange rates, stock market returns, and economic conditions. Most students will be aware of the effects of poor risk management of financial products, e.g. in the subprime debt market and the credit default swap market. We will look (briefly) at some financial products, the risks involved, and the methods of managing such risks.

Generic Skills

In addition to the discipline-based learning objectives, all academic programs at Macquarie seek to develop students' generic skills in a range of areas. One of the aims of this unit is that students develop their skills in the following:

- Foundation skills of literacy, numeracy and information technology;
- Communication skills;
- Critical analysis skills;
- Problem-solving skills; and
- Creative thinking skills.
TEACHING AND LEARNING STRATEGY

- The course will be taught through lectures and tutorials.

- The lecturers will present the course material in lectures, but we expect students to be active participants – asking questions, responding to questions from the lecturer, and working through some of the problems using “thought experiments”.

- The tutorials will be small groups (about 30 students per group). You will be given tutorial questions each week, which you are expected to attempt before the tutorial. We encourage you to work in groups and help each other learn.

- All course material will be posted on BlackBoard, along with old tests and exams.

- Please use the discussion board to ask questions and discuss any issues raised in class.

- We will provide anonymous section of the discussion board, so that you can feel free to make helpful comments on the course. Please show courtesy to others and do NOT use the discussion board to make negative comments about your fellow students or staff. Be constructive.

<table>
<thead>
<tr>
<th>Week</th>
<th>Week Begins</th>
<th>Topics Covered</th>
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<tbody>
<tr>
<td>1</td>
<td>23 Feb</td>
<td>Induction Module</td>
</tr>
<tr>
<td>2</td>
<td>2 March</td>
<td>Induction Module</td>
</tr>
<tr>
<td>3</td>
<td>9 March</td>
<td>Induction Module</td>
</tr>
<tr>
<td>4</td>
<td>16 March</td>
<td>Life Insurance</td>
</tr>
<tr>
<td>5</td>
<td>23 March</td>
<td>Life Insurance</td>
</tr>
<tr>
<td>6</td>
<td>30 March</td>
<td>Life Insurance</td>
</tr>
<tr>
<td>7</td>
<td>6 April</td>
<td>Life Insurance</td>
</tr>
<tr>
<td>8</td>
<td>27 April</td>
<td>General Insurance</td>
</tr>
<tr>
<td>9</td>
<td>4 May</td>
<td>General Insurance</td>
</tr>
<tr>
<td>10</td>
<td>11 May</td>
<td>General Insurance</td>
</tr>
<tr>
<td>11</td>
<td>18 May</td>
<td>General Insurance</td>
</tr>
<tr>
<td>12</td>
<td>25 May</td>
<td>Financial Products</td>
</tr>
<tr>
<td>13</td>
<td>1 June</td>
<td>Financial Products</td>
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**RELATIONSHIP BETWEEN ASSESSMENT AND LEARNING OUTCOMES**

Assessment tasks will include:

<table>
<thead>
<tr>
<th>Task</th>
<th>Length</th>
<th>Due Date</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Short report 1</td>
<td></td>
<td>March 16</td>
<td>3%</td>
</tr>
<tr>
<td>Short report 2</td>
<td></td>
<td>April 6</td>
<td>3%</td>
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<tr>
<td>Essay</td>
<td>1000 words</td>
<td>April 27</td>
<td>7%</td>
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<tr>
<td>Project</td>
<td></td>
<td>May 18</td>
<td>7%</td>
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<tr>
<td>Class test 1</td>
<td>1 hour</td>
<td>March 31</td>
<td>10%</td>
</tr>
<tr>
<td>Class test 2</td>
<td>1 hour</td>
<td>May 12</td>
<td>10%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>3 hours</td>
<td></td>
<td>60%</td>
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</table>

The short reports and essay task will help you to develop skills in research and written communication. It will also help you to look at controversial issues, and weigh up different points of view.

The project will enable you to develop computer skills which are useful for modelling risk. You will be required to provide a written report explaining the implications of your analysis.

Assignments should be submitted at Business and Economics Student Services (affectionately known as BESS), on the ground floor of building E4A, before 4 pm on the due date. (One of your jobs in the first week of term is to locate BESS)

Further details of the assignments will be posted on BlackBoard later in the term. We will post an announcement on BlackBoard to notify you of this. YOU SHOULD CHECK BLACKBOARD FOR ANNOUNCEMENTS AT LEAST ONCE A WEEK.

Note that you should always acknowledge the source of any work you submit. Rules about academic referencing will be placed on BlackBoard. Please read these before you submit any work.

Extensions will be granted when you can provide evidence of illness or unavoidable disruption to your studies. If you think you deserve an extension, you should send an email to our Teaching Assistant (Werner Fortmann) via Private Mail explaining the circumstances and requesting an extension.

Late submissions will be accepted up to one week late, but with a penalty of 10% of the marks for the assignment, for each day late (or part thereof). Late submissions will not be accepted after the solutions are posted on the website!

Model solutions to class tests and modelling-type assignments (where appropriate) will be placed on Blackboard within one week after the due date.
Examination

A 3 hour final examination for this unit will be held during the University Examination Period.

The University Examination period in First Half Year 2009 is from June 10 to June 26.

You are expected to present yourself for examination at the time and place designated in the University Examination Timetable. The timetable will be available in draft form approximately eight weeks before the commencement of the examinations and in final form approximately four weeks before the commencement of the examinations.

http://www.timetables.mq.edu.au/exam

The only exception to not sitting an examination at the designated time is because of documented illness or unavoidable disruption. In these circumstances you may wish to consider applying for Special Consideration. Information about unavoidable disruption and the special consideration process is available at http://www.reg.mq.edu.au/Forms/APSCon.pdf

If a Supplementary Examination is granted as a result of the Special Consideration process the examination will be scheduled after the conclusion of the official examination period.

You are advised that it is Macquarie University policy not to set early examinations for individuals or groups of students. All students are expected to ensure that they are available until the end of the teaching semester that is the final day of the official examination period.

PLAGIARISM

The University defines plagiarism in its rules: "Plagiarism involves using the work of another person and presenting it as one's own." Plagiarism is a serious breach of the University's rules and carries significant penalties. You must read the University's practices and procedures on plagiarism. These can be found in the Handbook of Undergraduate Studies or on the web at: http://www.student.mq.edu.au/plagiarism/

The policies and procedures explain what plagiarism is, how to avoid it, the procedures that will be taken in cases of suspected plagiarism, and the penalties if you are found guilty. Penalties may include a deduction of marks, failure in the unit, and/or referral to the University Discipline Committee.

STUDENT SUPPORT SERVICES

Macquarie University provides a range of Academic Student Support Services. Details of these services can be accessed at http://www.student.mq.edu.au.