

Division of Economic and Financial Studies
Department of Actuarial Studies



ACST399 Mathematical Theory of Risk
FIRST SEMESTER 2004

UNIT OUTLINE

Teaching Staff Involved in the Unit

The staff involved in the teaching of this unit are

Staff Member		Room	Telephone	Consultation Hours
Shauna Ferris	(Unit Coordinator)	C5C 494	9850 7294	Wednesday 2 pm to 3 pm Friday 12 pm to 1 pm
Leonie Tickle		C5C 488	9850 8567	Wednesday 2 pm to 3pm Friday 2 pm to 3 pm (Weeks 1 to 4 only)

Questions relating to the administration of the unit should be directed to the Unit Coordinator.

Questions relating to the unit content should be directed to your lecturer for that section of work (preferably during the tutorial or during consultation hours).

You can send emails to lecturers through the unit's website (a WEB-CT system).

Unit Details

Unit Name: Mathematical Theory of Risk

Credit Points: 4

Prerequisites: STAT272 (P)

Corequisites: none

If you do not satisfy the prerequisites and have not had the prerequisites waived then you should withdraw from this unit as soon as possible. If you do not, you will be automatically withdrawn from the unit, possibly after the HECS census date.

Please consult with the unit coordinator if you have queries about the prerequisite requirements for the unit.

Unit Description

This unit examines the use of statistical models in general insurance. Models to estimate the number of claims likely to be encountered and the likely range of claim sizes are studied. These models are then used as a basis for modelling the probability of ruin. The unit also examines methods for assessing the extent to which a particular company's historical claims experience can be regarded as a reliable guide to the future, looks at estimation of outstanding claim reserves, and examines the effect of reinsurance.

Assumed Knowledge and Skills

You should take the STAT272 (Pass) prerequisite seriously. You will need to be comfortable with the knowledge you have acquired (or should have acquired) in STAT272 - you will need this background information in order to understand the work cover in ACST399. In particular, you should be familiar with:

- The theory of statistical distributions, including the meaning of a random variable, discrete and continuous random variables, density functions, cumulative density functions
- Basic results relating to expectation, variance, covariance, and moment and cumulant generating functions
- Joint random variables and marginal density functions
- The use of Normal Distribution and Chi-Squared distribution tables
- Probability theory, including conditional probability
- Some mathematical techniques and results including integration by parts, inversion of a 2 by 2 matrix, and the binomial, logarithmic, exponential, and Taylor series approximations

Some of this work will be re-visited in the first two weeks of the unit; however you may find the pace rather hectic if you are not already familiar with the work.

Please start revising STAT272 now if you need to !

Unit Timetable

Week Number	Week Beginning	Topic Covered	Assignment /Test	Lecturer
1	1 March	Statistical Distributions and Results		LT
2	8 March	Statistical Distributions and Results		LT
3	15 March	Estimation		LT
4	22 March	Testing Fit; Reinsurance		LT
5	29 March	Individual Risk Models	Test 1	SF
6	5 April	Collective Risk Models		SF
STUDY BREAK	12 April			
	19 April			
7	26 April	Ruin Theory		SF
8	3 May	Reinsurance & Ruin; No Claim Discounts		SF
9	10 May	Credibility Theory		SF
10	17 May	Generalised Linear Models	Test 2	SF
11	24 May	Decision Theory		SF
12	31 May	Outstanding Claims Reserves		SF
13	7 June	Outstanding Claims Reserves		SF

Please note that changes to the timetable may occur and that any alterations will be advised in lectures/on the unit webpage.

Lectures

Lectures are held at the following times:

Day	Time	Location
Tuesday	2:00-4:00	W5A T1
Wednesday	11:00-1:00	E7B T5

Any alterations to the lecture times or locations will be advised in lectures/on the unit webpage.

Tutorials

There is a one-hour tutorial at 12:00 to 1:00 in w5C 220. This time is intended as an opportunity for you to ask questions about the material covered in each week's lectures.

Tutorials will commence in the first week of lectures.

Any alterations to the tutorial times or locations will be advised in lectures/on the unit webpage.

Textbooks

Unit notes, including lecture handouts and exercises, will be posted on the unit website.

The textbooks for the unit are:

- Hossack, I.B., Pollard J.H, and Zehnwirth, B. (1999), *Introductory statistics with applications in general insurance*, second edition (Cambridge University Press).
- Klugman, S.A., Panjer, H.H, and Willmot, G.E. (1998), *Loss models: From data to decisions*. (Wiley, New York)

The textbooks are available from the Macquarie University Co-op Bookshop. Copies are also available in the library.

Other references will be made available in ERIC during the semester.

The ACST399 website

To access this web site, go to <http://online.mq.edu.au/public/ACST399> (Note that the address is case-sensitive.) Click the login link and enter your username and password. If you have any trouble logging in (e.g. you have forgotten your password), please contact the Library Information Customer Service Desk.

The website for this unit will contain:

- A copy of this unit outline

- Lecture notes for each topic (released progressively over the semester)
- Tutorial problems and solutions
- Exams and tests, with worked solutions, from previous years

Announcements about the unit will be posted on the website. **You should check the website regularly** to make sure you are up-to-date with all important information about this unit.

You can use the Private Mail facility to contact the lecturers. The lecturers may use the Private Mail system to contact you - **please check your mail regularly**.

You may use the Discussions facility to discuss problems with your fellow students and with the lecturers.

If you did not understand the above, you can obtain training on how to use a web browser by contacting the Information Technology Training Unit on Level 1 of the Library. If you can't access the site due to having forgotten your password, contact the Information Technology Customer Support Desk also on Level 1 of the Library.

Before logging in to this site, you should follow the link labelled "Web Information" and read all the information there, including the Computer and Communications Security Policy and the Computer and Communications Usage Rules. This technical information mentions a number of "plugins" that may be required. Of those listed, in this unit you will only need Acrobat Reader.

If your home computer does not have internet access, you can access this web site from computers in the library.

This web site uses software called WebCT. If several of your units use this software, you might find it more convenient to go to <http://online.mq.edu.au/student/> and use the "login" link on that page. This leads you to a page which lists all Macquarie University WebCT sites to which you have access.

Remember to close your browser when you have finished using the site. If you don't, another person can use the still running browser to access the website with your account.

ACSTINFO Web site

To access the site, go to: <http://online.mq.edu.au/pub/ACSTINFO/> (Note that the address is case-sensitive.)

This site is used to distribute information to all students majoring in actuarial studies. The information supplied may include administrative information and job advertisements. You will retain access to this site during the vacation following the end of this semester.

It is to your advantage to ensure you read information on this web site regularly. You should not assume that information posted there will also be repeated in lectures.

When you login to this site, please read the section labelled "How to use this site." This contains useful information which will help you determine when there is new information on the site which you should read.

EFS Resource and Information Centre (ERIC)

The EFS Resource and Information Centre (ERIC) is located in room C5C 244 and offers photocopying facilities, reading areas and reference material. Solutions to assignments, weekly exercises, examinations, class tests are available from ERIC.

Grading

(Option 2) Macquarie University uses the grades HD, D, Cr, P, PC and F for grading the achievements of students in units of study. The grades of achievement are defined as follows:

High Distinction (HD) denotes performance which meets all unit objectives in such an exceptional way and with such marked excellence that it deserves the highest level of recognition.

Distinction (D) denotes performance which clearly deserves a very high level of recognition as an excellent achievement in the unit.

Credit (C) denotes performance which is substantially better than would normally be expected of competent students in the unit.

Pass (P) denotes performance which satisfies unit objectives.

Conceded Pass (PC) denotes performance which meets unit objectives only marginally.

Fail (F) denotes performance which does not meet unit objectives.

The numerical marks resulting from assessment of your work in this unit will be used as an initial indicator of the quality of your learning and understanding. The use of these numerical marks is, however, only a starting point in determining the appropriate grade. In particular, note that the mark ranges mentioned on p. 40 of the Handbook of Undergraduate Studies are not the raw marks. To obtain a grade you must satisfy the qualitative definition of that grade. Once your grade has been determined, you are allocated a standardised mark indicating your approximate position amongst students assigned that grade.

The unit ACST399 corresponds to the professional subject CT106. You require a grade of Credit or better in this unit in order to obtain an exemption from CT106.

Assessment

The following table gives an indication of the relative weighting of the assessment components:

Class Test 1	10%
Class Test 2	10%
Final Examination	80%

Class Tests

The class test(s) is/are scheduled for the following date(s):

Test One	covering weeks 1 to 4 inclusive	March 31 Wednesday	11:00
Test Two	covering weeks 1 to 8 inclusive	May 19 Wednesday	11:00

Please note that the class test dates, times and coverage may be subject to change, and that any alterations will be advised in lectures/on the unit webpage.

A Formula Sheet will be provided in the class tests.

Tests will be returned to students at lectures or tutorials.

Normal examination rules apply to the conduct of class tests. These rules are set out under the heading "Conduct of Examinations" in the Student Information – Assessment section of the current Macquarie University Handbook of Undergraduate Studies. Students are responsible for familiarising themselves with these rules prior to the class test.

Final Examination

The final examination will be a three-hour written paper with ten minutes reading time.

You will be provided with a copy of the book *Formulae and Tables for Actuarial Examinations* /and a formula sheet/ in the final examination. You should familiarise yourself with the tables book prior to the examination - copies are available in the library (HG 8067.F67). Note that there are two versions of the Formulae, green and blue. The green version has more formulae in the front section - but we will be using the blue version in exams. The layout of the tables is the same in both versions.

Legibility of Handwriting

You should ensure that your handwriting in the class assessment tasks and in the final examination is legible. Sections of work that are not legible will not be marked.

The Institute of Actuaries of Australia

Please refer to http://www.actuary.mq.edu.au/current_students/join_institute.shtml for information on the advantages of joining the Institute of Actuaries of Australia as a student.

Special Consideration

Applications for special consideration in respect of a class test or other class assessment task must be made on the "Advice of Absence or other Circumstances" form. These are available from and should be submitted to the Student Enquiry Service on Level 1 of the Lincoln Building.

Applications in respect of the final exam must be made on the "Request for Special Consideration" form. These forms are available from and should be submitted to the Academic Program Section on Level 4 of the Lincoln Building.

Applications based on medical grounds (whether for a class test or other class assessment task, or for the final examination) **must** be accompanied by the Professional Authority Form. Applications omitting this form (such as those which only supply a doctor's certificate) will be ignored.

The application forms are also online at <http://www.registrar.mq.edu.au/academic-index.html>. Note that FORMS MUST BE SUBMITTED BEFORE THE DEADLINE.

Mobile Phones

Academic Senate has resolved that no mobile phones should be used in classrooms or be brought into examination rooms. Mobile phones must be switched off during class tests.

Calculators/Computers

Calculators will be allowed in the class tests and the final examination but a clear indication of the steps involved in every calculation must be shown. Any machines that have a text-retrieval capacity, whether or not they have a full alphabet on the keyboard, are not allowed.

Calculators may be checked at the commencement of the class tests and final exam, and the make/model may be recorded.

Cheating and Plagiarism

To cheat in the context of university assignments, tests and examinations is to attempt to gain an unfair advantage by violating the principles of intellectual and scholarly integrity. Cheating also encompasses plagiarism, which is the appropriation or imitation of another person's ideas and manner of expressing them.

You are responsible for familiarising yourself with the document entitled "The dangers of cheating and plagiarism and how to avoid them" at <http://www.student.mq.edu.au/plagiarism/>.