

MACQUARIE UNIVERSITY
STAT273/D1 – Risk and Chance
Unit Information 2004

Aim:

This unit is designed for students majoring in Statistics and/or any discipline other than Actuarial Studies. The teaching will focus on the understanding of probability concepts and their applications. EXCEL and *Scientific Notebook* will be used to assist in calculation and simulation.

Basic skills of calculus, such as elementary differentiation and integration, are essential for this course. However, the emphasis will be on the understanding of the processes, rather than the actual calculations.

Topics:

Probability concepts; brief review of set notation
Experiments and outcomes; elementary events; sample spaces; probability of events
The Axioms of probability theory
Mutually exclusive events, complementary events, independent events
Conditional probability
Stagewise experiments, probability trees
Bayes' theorem
Random variables - discrete and continuous
Distributions of random variables, and cumulative distribution functions
Mean, variance and percentiles, random walks
Discrete distributions:
Bernoulli; Geometric; Binomial; Poisson; Negative Binomial; Hypergeometric
Continuous distributions:
Uniform; Exponential; Normal; Gamma; Beta
Tchebysheff's inequality and its application
Central limit theorem and applications
Sampling distributions, chi-square, t and F distributions.
Adequacy of a model; goodness of fit test, normal probability plots
Functions of random variables
Joint probability distributions - discrete and continuous
Marginal and conditional distributions; mean, variance, covariance
An introduction to Markov chains

**Students should acquire a copy of
STAT273 Course Notes – 2004 from the Co-op Bookshop**

Objectives:

Probability theory

By the end of this unit, students should;

- Have a solid understanding of introductory probability theory,
- Understand the difference between discrete and continuous random variables
- Understand the difference between theoretical and empirical probability,
- For various discrete and continuous random variables,
 - Be familiar with the distributions
 - Write the function and the cumulative distribution functions.
 - Graph the distribution and the cumulative distribution function
 - Calculate probabilities, expected values, variances and standard deviations
 - Generate Distributions
 - Generate random numbers from Distributions
 - Solve probability problems
- For bivariate probability distributions (discrete and continuous), find
 - Joint, marginal and conditional probabilities,
 - covariance
- Understand basic anatomy of homogeneous Markov Chains and
 - Find stationary distribution, if one exists,
 - Manipulate and interpret Markov Chains with absorbing states.

Generic Skills

By the end of this unit, students should;

- Have enhanced their problem solving ability,
- Have improved their report writing and written communication skills
- Have acquired useful Internet skills

Statistical computing

By the end of this unit, students should;

- Be able to generate probability distributions and cumulative distributions, and graph these distributions
- Be able to simulate random numbers from probability distributions and cumulative distributions,
- Be able to organise and summarize random data,
- Determine whether random data fits a particular model
- Be able to find probabilities, expected values etc, using an appropriate statistical package

Websites

1. Stat273 homepage: <http://www.stat.mq.edu.au/units/stat273/>
(for general information, homework, assignments and solutions)
2. Online:
http://online.mq.edu.au/SCRIPT/STAT273/scripts/serve_home/
(for Online Discussions and Review Quizzes and solutions)

References that may be useful:

Kinney, J.J. (1997) Probability - An Introduction with Statistical Applications, John Wiley and Sons QA273.K493/1997

Scheaffer R.L. (1994) Introduction to Probability and Its Applications, (2nd Edition) Duxbury Press, QA273.S357

Copies these books are held in the Reserve section of the library.

Students will also be directed to relevant websites each week.

Assessment:

Two Assignments 10% (5% each)
Two Mid-semester Tests 12% (6% each)
Online Quizzes 9%
Tutorial work 9%
Final Exam 60%

A satisfactory performance is required in all aspects of the unit. **To pass the unit you must pass the final examination.** You should also refer to the University's rules on grades, rule 10(2), <http://handbook.mq.edu.au/PDFs/ug-bachelor-degree-rules.pdf> .

Lectures:

Wednesday: 6-8pm E6A 102.

Tutorials:

Tutorial participation is a **compulsory** component of this course. Tutorials will be held on Wednesdays at 4, 5 in C5C 217, and 8pm in C5C 219. Tutorials start in the **second** week of the semester.

Students are required to attend one tutorial a week. Practical exercises and worksheets will be handed out at each tutorial and sometimes a word processed report will be required. All tutorial work will be assessed.

Additional Exercises:

A number of exercises appear at the end of each lecture in the Study Guide. It is expected that students will attempt all the questions. The exercises will not be discussed during the tutorial, although some may be discussed during the lectures. A solution will be made available on the website.

Students should also investigate the websites recommended in the lectures each week.

Online Quizzes:

These provide you with an opportunity to gauge your basic understanding of the concepts introduced in the course. They contribute 9% towards the total assessment.

Your login ID is "gffffnnn", where "g" is the first letter of your given name, "ffff" is the first four letters of your family name (or as many as possible if less than four) and "nnn" are three digits. Your initial password "abnnnnnn" where "ab" will be two random characters and "nnnnnn" your date of birth. You will have been mailed your username and the two random characters after enrolling.

Assignments:

There will be two assignments. They are to be posted to the appropriate assignment box in ERIC (C5C 242) by **6 pm** of the due date. Late submission of assignments will be penalized at the rate of 20% per day. Failure to submit assignments may result in automatic exclusion from the unit.

The due dates are

Assignment 1 Due: Wednesday, 28th April (week 7)

Assignment 2 Due: Wednesday, 2nd June (week 12)

The assignment will not be marked unless it is accompanied by an assignment cover sheet which clearly shows your name, your tutor's name and your tutorial time and makes a declaration that the work is your own work.

Assignment solutions will be made available on the website, or in ERIC.

Plagiarism:

Whilst you are encouraged to discuss the work with your peers, it will be expected that the final work handed in will be your own work. Any work that is copied from another student may result in disciplinary action for all students involved. You should refer to the University policy on Plagiarism.

Mid-semester Tests:

Two mid-semester tests of 50 minutes will be held in the first lecture hour. The tests will be on:

Week 6, 7th April

Week 10, 19th May

Any student who cannot attend the test due to unavoidable disruption must report the circumstances (supported by medical certificate or other proper evidence) in writing to the Registrar as soon as possible.

Final Examination

Will be of 3 hours duration with 10 minutes reading time.

For both of the Mid-semester tests and Final examinations you are allowed to bring in one A4 page of handwritten notes, written on both sides. All necessary statistical tables will be provided.

Students with Disabilities

Students with disabilities are encouraged to contact the Equity Support Unit to determine whether they are eligible for support service. The Equity Support Staff can be contacted on 9850 7497. The Advice of Disability form may be downloaded from <http://registrar.mq.edu.au/academic-index.htm>

Misadventure

Should you suffer illness or other misadventure which affects your performance during term or for the exam, then you should fill in an Advice of Absence or other Circumstances and /or Request for Special Consideration also available from <http://registrar.mq.edu.au/academic-index.htm>.

Students should read the University's policy on Special Consideration, http://handbook.mq.edu.au/p3/pt3d_100.htm, and the DEFS' information regarding supplementary exams, <http://www.efs.mq.edu.au/supexams.htm>

I hope you enjoy the course.

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