MACQUARIE UNIVERSITY
FACULTY OF SCIENCE

STAT272: PROBABILITY
UNIT OUTLINE
SEMESTER 1, 2009

Unit convenor: A/Prof Gillian Heller

Prerequisites: STAT171(P); MATH133(P) or MATH136(P)

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

STAT272, Probability, is a 3 credit point unit run by the Statistics Department in the Faculty of Science.

This unit is a mathematically based introduction to probability theory. Emphasis is placed on the theoretical development of the subject matter. Students should be mathematically competent, especially in the areas of integration, differentiation, and the summation of infinite series. Students who are not confident about their ability in these areas should consider enrolling in the more general unit, STAT273 (Introduction to Probability). Topics covered in STAT272 include conditional probability, discrete and continuous random variables, transformations, convolutions, moments and moment generating functions, central limit theorem, sampling distributions, order statistics, bivariate and multivariate distributions.

TEACHING STAFF

Name	Weeks	Room	Phone	Email
A/ Prof Gillian Heller	1-7	E4A 533	9850 8541	gillian.heller@mq.edu.au
Prof Barry Quinn	7-13	E4A 535	9850 6475	barry.quinn@mq.edu.au

Other teaching staff and times for consultation hours will be finalised at the end of Week 1, and the information posted on Blackboard.

CLASSES

The timetable for classes can be found on the University web site at:
http://www.timetables.mq.edu.au/
Lectures: You are required to attend 3 x 1 hour lectures each week, beginning in Week 1.
Tutorials: You are required to attend 1 x 1 hour tutorial each week, beginning in Week 2.

REQUIRED AND RECOMMENDED TEXTS AND/OR MATERIALS

The prescribed textbook is "**Mathematical Statistics with Applications**" by W Mendenhall, D Wackerly and R Scheaffer (6^{th} or 7^{th} edition) - library call number is QA276.M426. Students are expected to have access to a copy of this book throughout the semester. The text is also a textbook for STAT271.

The following books may be useful references:

ROSS, S.	A First Course in Probability (QA273.R83)
SCHEAFFER, R. L.	Introduction to Probability and Its Applications (QA273.S357)
SMITH, P. J.	Into Statistics (QA276.S615)
FREUND, J. E.	Mathematical Statistics (QA276.F692)
HOEL, P.	Introduction to Mathematical Statistics (QA276.H57)
HOGG, R.V. & TANIS, E.A.	Probability and Statistical Inference (QA273.H694)
LARSON, H.	Introduction to Probability Theory and Statistical Inference (QA273.L352)
SPIEGEL, M.R., SRINIVASAN, J. & SCHILLER, J.J.	Schaum's outline of theory and problems of probability and statistics (QA273.25.S64)
WALPOLE, R.E. & MYERS, R.H.	Probability and Statistics for Engineers and Scientists (TA340.W35)
HOGG, R.V. & CRAIG, A.T.	Introduction to Mathematical Statistics (QA276.H59)

At least one copy of each of these is available in the Library, and extra copies may be available on the shelves for borrowing purposes.

It should be understood that there are variations in notation (and even in definition) from one reference book to another, and that *the lecture material alone defines recommended notation.*

Note that all lecture notes will be available in pdf form on Blackboard before the lecture. You are required to print out your own copy and bring this to lectures.

BLACKBOARD

All unit materials, including administrative updates, lecture notes, tutorials and assignments, will be posted on Blackboard. The web address is https://learn.mq.edu.au . If you have not used Blackboard before, help is available from the left panel of the login screen.

LEARNING OUTCOMES

The unit is an introduction to the mathematical foundations of the theory of probability, and thus provides the basic mathematical techniques needed for the theory of statistics. By the end of this unit, students will be able to compute the moments of various discrete and continuous distributions, obtain the moment generating functions and distributions of sums of independent random variables, obtain the distributions of transformed random variables, and of compound random variables.

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 problem-solving skills.

TEACHING AND LEARNING STRATEGY

Students will attend three one-hour lectures and one one-hour tutorial per week. The notes shown in lectures will be available on Blackboard before the lecture is given, but note that corrections may be made after the lecture. Tutorial exercises will be set weekly and will be available on Blackboard before the tutorial. Students are expected to have attempted **all** questions **before** the tutorial.

A plan of the topics to be covered is at the end of this document.

ASSESSMENT

Assignments: Assignments are a major part of the learning process. There will be four assignments, due in weeks 4, 7, 10 and 12. On-time submission is **compulsory**. Late submission of assignments will not be accepted without a good reason. Failure to submit assignments may result in automatic exclusion from the unit in accordance with Bachelor Degree Rule 11(1).

Assignment submission: Assignments are to be submitted to your tutor, in your tutorial in the week in which they are due. They are to be accompanied by the assignment cover sheet, which is available for download from Blackboard.

Final Examination: The duration of the final examination is three hours plus ten minutes' reading time. An electronic calculator and **two** A4 sheets of paper (written on one or both sides) may be taken in to the exam room. All material thereon must be in the student's own handwriting. The examination will test your knowledge and understanding of principles, and *not* your ability to substitute into rote-learnt formulae. It follows that you need to undertake sufficient practice by doing exercises, in order to grasp the principles of the subject and to become fluent at *problem solving*; it is *not* sufficient to believe that you will pass simply by quoting and mechanically applying formulae.

Final assessment is computed as:

Assignment 1	5%
Assignment 2	5%
Assignment 3	5%
Assignment 4	5%
Final examination	80%

For a passing grade, satisfactory performance is required in the assignment average and the final examination.

The University examination period is 10 - 26 June. You are expected to present yourself for examination at the time and place designated in the University examination timetable, which will be available at http://www.timetables.mq.edu.au/exam .

Only documented illness or unavoidable disruption may be used as reasons for not sitting an examination at the designated time. In these circumstances you may wish to consider applying for Special Consideration. Information about the special consideration policy and procedure is available at
http://www.mq.edu.au/policy/docs/special_consideration/policy.html
and
http://www.mq.edu.au/policy/docs/special_consideration/procedure.html .
The form is at
http://www.reg.mq.edu.au/Forms/APSCon.pdf .

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 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.

UNIVERSITY POLICY ON GRADING

Your final grade in STAT272 will be based on your work during semester and in the final examination as specified in the Assessment section above. The grades allocated are as set out in the Bachelor Degree Rules 10(2) as follows:

HD	*High Distinction* 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
D	*Distinction* denotes performance which clearly deserves a very high level of recognition as an excellent achievement in the unit
Cr	*Credit* denotes performance which is substantially better than would normally be expected of competent students in the unit
P	*Pass* denotes performance which satisfies unit objectives
PC	*Conceded Pass* denotes performance which meets unit objectives only marginally
F	*Fail* denotes performance which does not meet unit objectives

Please note that a student must meet the performance standard outlined above in both the coursework and the examination sections of this unit in order to be awarded a particular grade.

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.

STAT272 - PROBABILITY - FIRST SEMESTER 2009
SYLLABUS

TOPIC	MATERIAL COVERED
1	Sample space, events. Axioms of probability, conditional probability. Bayes Theorem. Random variables and probability distributions.
2	Discrete Distributions and their applications (Bernoulli, geometric, negative binomial, binomial, hypergeometric, multinomial). The Poisson process and the Poisson distribution.
3	Continuous random variables and distributions with applications (uniform, exponential, triangular, normal, gamma, beta etc.). Discrete and continuous cumulative distribution functions.
4	Expected values (discrete and continuous) and properties of the expectation operator. Measures of variation.
5	Moments: raw and central. Interpretation of moments (skewness, kurtosis etc.).
6	Sums of independent random variables. Discrete and continuous convolutions with applications.
7	Distribution of functions (monotonic and non-monotonic) of continuous random variables. Transformation of a continuous random variable to one with a uniform distribution, with applications to simulation.
8	Probability generating functions and moment generating functions (raw and central) with properties and applications. The moment generating function of a sum of independent random variables. The uniqueness theorem. Characteristic functions.
9	Tchebysheff's inequality. The central limit theorem and applications.
10	Multivariate (particularly bivariate) random variable theory (continuous and discrete). Marginal and conditional distributions and expectations. Covariance and correlation. Compound distributions.
11	Order statistics, specifically the distributions of the minimum, maximum and median.