GENERAL DESCRIPTION

Introduction to Mathematical Statistics II is a one-semester course which provides you with the mathematical foundations of modern statistical inference and applications. It is an important course for students who are planning further study in statistics or applied probability, or for students who need to use statistics in their chosen discipline.

Statistics is an important discipline in its own right. It is what is known as an enabling discipline for many fields of scientific work, including bioinformatics and finance. Statistics relies on mathematical tools (most notably probability theory), computational skills and critical scientific thinking.

UNITS VALUE: 2

PREREQUISITES AND ASSUMED KNOWLEDGE

There is a prerequisite of either Mathematics I or Mathematics IM. Those students who have done Mathematics IM would normally be concurrently enrolled in, or have already done, Mathematics IIM.

Most students will also have done Statistical Practice I or Mathematics for Information Technology I or Laplace Transforms and Probability and Statistics (LTPS, NAPS). Students who have not done any of these courses will need to spend extra time on the first two chapters of the textbook over the first few weeks of this course.

RECOMMENDED CONCURRENT LEVEL II COURSES

If you are planning to Major in Statistics, you will need to do the Semester 2 course Statistical Theory and Modelling II (2 units) in addition to Introduction to Mathematical Statistics II. We also strongly recommend that you take Statistical Practice II (2 units) as well, if you can fit in the 6 Level II Statistics units.

You will find Multivariable Calculus II (2 units) extremely useful for mathematical statistics and the Statistics Major more generally.

STAFF

The Lecturer for this course is Associate Professor Patty Solomon, Room EM107 (Engineering Mathematics Building). Phone: 8303 3033, email: patty.solomon@adelaide.edu.au

The Tutor-in-Charge is Ms Ann Coultas, Room G23a Mathematics Building. Email: ann.coultas@adelaide.edu.au
Ms Amy Glen (who is a PhD student) will also be tutoring for this course.
LECTURES

The lectures will be held at 1.10pm on Thursdays and Fridays in Lecture Theatre G08 on the ground floor of the Mathematics Building.

Printed notes in the form of two lecture slides to a page will be handed out in the first lecture of Week 1.

TUTORIALS

Tutorials are held fortnightly on Tuesdays (1.10pm and 2.10pm) and Wednesdays (2.10pm) in the even-numbered weeks starting in Week 2. Students are expected to have attempted the tutorial questions prior to their tutorial. Note that the Fortnightly Handouts (which are described below) contain the tutorial questions, the assignment questions to be handed in for marking, and additional exercises you may work through in your own time. Solutions to all tutorial and additional exercises will be provided.

The tutorials will be held in EM213. Timetables to be filled in for tutorial allocation will be handed out in the first lecture on Thursday of Week 1. **All students should fill in their timetable and return the sheet to Ann Coultas, Room G23a by 10am the following day (Friday of Week 1).** You will then be allocated to a Tutorial Group.

Tutorial allocation lists, notices, exam results, etc, will be posted on the Statistics Notice-board outside Lecture Theatre G02 on the ground floor of the Mathematics Building.

TEXTBOOK

The textbook for this subject is

  by Wackerley, Mendenhall & Scheaffer. Duxbury/Thomson Learning.

This book will also be used in the other Level II Statistics courses this year and is a good investment if you are planning further studies in Statistics.

Copies are available from Unibooks ($94.95 before discount). However, students get the 8% ETSS rebate plus the Unibooks discount which is 12% for cash for the first four weeks of semester. You may be able to obtain a copy of the 5th or 6th Edition second-hand (the two editions are very similar). There are three copies of the textbook held on Reserve in the Barr Smith Library and one copy for normal loan. A solutions manual to the exercises in WMS is also held on Reserve.

You may find the following books useful further reading:

  by J.A. Rice. Wadsworth.

A more extensive and slightly higher-level book. This is one of my favourite undergraduate Statistics texts because of its emphasis on applications of realistic complexity. It is a hard book to learn from though because the mathematical details are fairly scant.


This book covers the material for the first two-thirds of the course. As the title implies, it is a book about basic probability for statistics.
FORTNIGHTLY HANDOUTS

At the beginning of each fortnight (in the odd weeks) you will receive a handout which contains an outline the topics to be covered during the following fortnight, together with the relevant sections of the lecture notes and the textbook. The handout will also contain the tutorial and assignment questions.

CONSULTING TIMES

These will be announced shortly.

ASSIGNMENTS

There will be three assignments, due by noon on Fridays in Weeks 5, 8 and 12. The pooled mark for the three assignments will count 20% towards the final assessment. As explained below (see Examination), if your final mark based on the examination alone is higher than your combined assignment plus examination mark, then the higher final mark will be awarded, and vice versa. 

Please note that unless negotiated prior to the due date, late assignments will attract a 20% penalty per day.

Your assignments should be placed in the boxes marked ‘Level II Statistics’ on the ground floor of the Mathematics Building in the stairwell opposite Room G03. The front of your assignment should include your Name, Tutorial Time and Course. We will make every effort to mark and return your assignments within a fortnight of the due date. Solutions to the assignments will be provided.

EXAMINATION

There will be a two-hour examination at the end of this course in the June examination period, comprising 80% of the final mark. However, if your final mark is higher using the examination result alone, then this will be 100% of your final mark. The exam will be based on the material covered in the lectures, assignments, tutorials and other exercises. Statistical formulae and tables required in the exam will be provided. Past exam papers and attachments are available from my home page http://www.maths.adelaide.edu.au/people/psolomon/teaching.html

The supplementary examination will be held in July 2003. Students should refer to the School Policy on supplementary examinations.

COURSE OUTLINE

1. Introduction: What Statistics is about and why it is important. Illustrative examples.
3. Discrete random variables: Expected values, and expectations of functions of random variables. The Bernoulli and geometric distributions. Random sampling with and without replacement leading to the binomial and hypergeometric distributions.
Normal approximation to binomial. The Poisson distribution. Moment generating functions. Markov’s Inequality and Tchebyshev’s Inequality.

4. **Continuous distributions**: The cumulative distribution function and probability density functions. Expectation. The continuous uniform, normal and Cauchy distributions. The exponential distribution, the hazard and survival functions, and half-life. Poisson processes. Gamma and chi-square distributions. Moment generating functions. Tchebyshev’s Inequality.


6. **Functions of random variables**: The three different methods for finding the distribution of a function of random variables: distribution functions (i.e., the cdf method); transformations; and moment generating functions.

7. **Appendix of additional topics in case they are useful for you (this material is not examinable)**: The bivariate normal distribution. Conditional expectation.

The lecture notes, Fortnightly Handouts and any additional handouts for this course will be available from MyUni at http://www.myuni.adelaide.edu.au or from my web page at http://www.maths.adelaide.edu.au/people/psolomon/teaching.html. Paper copies of all handouts will be provided free of charge.

**WHO SHOULD BE DOING THIS COURSE**

Introduction to Mathematical Statistics II is essential for any student who is planning one or more of the following:

- A career in statistics or applied probability, including bioinformatics, biostatistics or telecommunications.
- A career in a discipline which uses high-level applications of statistics, for example, finance, computer science or engineering.
- To do the Statistics Major.
- To enrol in one or both of the core third year Statistics courses Statistical Modelling III and Theory of Statistics III.
- To enrol in one or more of the elective Level III Statistics courses. In 2003, the mainstream Statistics electives are Time Series III, Biostatistics III, Statistics for Quality Improvement III and Sampling Theory and Practice III.
- To apply for an Australian Bureau of Statistics Undergraduate Scholarship in Statistics.

Intellectual Property and Copyright for this course belong to The University of Adelaide.

**Associate Professor Patty Solomon**
February 2003