



The University of Southern Queensland

## Course specification

### Description: Advanced Statistical Methods

Subject	Cat-nbr	Class	Term	Mode	Units	Campus
STA	8302	44312	2, 2005	ONC	1.00	Toowoomba

<b>Academic group:</b>	FOSCI
<b>Academic org:</b>	FOS003
<b>Student contribution band:</b>	2
<b>ASCED code:</b>	010103

### STAFFING

Examiner: Peter Dunn

Moderator: Paul Fahey

### RATIONALE

Statisticians need to be proficient in a wide range of statistical techniques. Many of these are either only touched on or omitted from undergraduate programs. An opportunity to broaden the students' knowledge-base with more advanced statistical techniques is provided in this course.

### SYNOPSIS

This course is normally offered only in even years. This course contains advanced statistical methods selected from topics including but not restricted to: statistical inference, generalised linear models, multivariate analysis, order statistics, computational methods, statistical quality control, and reliability analysis.

### OBJECTIVES

On completion of this course, students should be able to:

1. identify the technique or techniques needed to deal with a statistical problem;
2. demonstrate the skills needed to address the statistical problem so as to provide an appropriate statistical analysis;
3. understand some of the advanced statistical methods;
4. read, understand and present publications in statistics of a technical nature;
5. demonstrate understanding of Philosophy and method of Bayesian inference;
6. demonstrate, depending on options chosen, knowledge and understanding of multivariate analysis, order statistic and computational methods, quality control and reliability, or generalised linear models.

## TOPICS

Description	Weighting (%)
1. Students will study either Part A and one of Parts B, C and D OR Part E as follows: PART A - Inferential Statistics 1 Parametric Estimation: methods of estimation; properties of estimators - unbiasedness, consistency, efficiency, loss/risk functions; sufficiency, complete sufficiency, exponential family, uniformly minimum variance unbiased estimator; interval estimation; Bayesian estimation - point and interval. 2 Tests of Hypothesis: power function, most powerful test, generalised likelihood ratio test, uniformly most powerful test, minimax test, Bayes test (60%). PART B - Multivariate Analysis 1 Multivariate Distributions: multivariate normal, Hotelling's T-Square, Student-t, Wishart 2 Estimation and Tests: estimation of mean vector and covariance matrix, sampling distribution of sample mean vector and covariance matrix, tests about mean and covariance in one and two sample cases (40%). PART C - Order Statistics & Computational Methods 1 Order Statistics: distribution of order statistics (o.s.) and functions of o.s., asymptotic distributions, sample cumulative distribution function, tolerance limits 2 Computational Methods: bootstrapping, jackknifing, randomization technique (40%). PART D - Quality Control and Reliability 1 Quality Control: sequential analysis, acceptance sampling, process control, Taguchi method 2 survival analysis, censored & truncated data, extreme - value distribution (40%). PART E - Generalised linear models: review of regression and regression diagnostics; exponential dispersion models; link functions; variance functions; residuals; diagnostics; specific types of generalised linear models; quasi-likelihood; extended quasi-likelihood; dispersion models; the saddlepoint approximation; some advanced topics.	100.00

## TEXT and MATERIALS required to be PURCHASED or ACCESSED

ALL textbooks and materials are available for purchase from USQ BOOKSHOP (unless otherwise stated). Orders may be placed via secure internet, free fax 1800642453, phone 07 46312742 (within Australia), or mail. Overseas students should fax +61 7 46311743, or phone +61 7 46312742. For costs, further details, and internet ordering, use the 'Textbook Search' facility at <http://bookshop.usq.edu.au> click 'Semester', then enter your 'Course Code' (no spaces).

To be advised.

## REFERENCE MATERIALS

Reference materials are materials that, if accessed by students, may improve their knowledge and understanding of the material in the course and enrich their learning experience.

Anderson, TW 1984, *An Introduction to Multivariate Statistical Analysis*, 2nd edn, Wiley, New York.

Box, GEP & Tiao, GC 1992, *Bayesian Inference in Statistical Analysis*, Wiley, New York.

Cox, DR & Hinkley, DV 1974, *Theoretical Statistics*, Chapman and Hall, New York.

Dobson, Annette J 2001, *An Introduction to Generalized Linear Models*, 2nd edn, Chapman and Hall, New York.

Mood, AM, Graybill, FA & Boes, DC 1974, *Introduction to the Theory of Statistics*, 3rd edn, McGraw-Hill, New York.

## STUDENT WORKLOAD REQUIREMENTS

ACTIVITY	HOURS
Assessment	50.00
Consultation	7.00
Directed Study	110.00

## ASSESSMENT DETAILS

Description	Marks out of	Wtg(%)	Due date
ASSIGNMENT 1	20.00	10.00	19 Jul 2005 (see note 1)
ASSIGNMENT 2	20.00	10.00	19 Jul 2005
ASSIGNMENT 3	20.00	10.00	19 Jul 2005
ASSIGNMENT 4	20.00	10.00	19 Jul 2005
ASSIGNMENT 5	20.00	15.00	19 Jul 2005
ASSIGNMENT 6	20.00	15.00	19 Jul 2005
PROJECT	100.00	30.00	19 Jul 2005 (see note 2)

### NOTES

1. Assignment due dates will be advised by Examiner.
2. Project details to be advised by Examiner.

## IMPORTANT ASSESSMENT INFORMATION

- 1 Attendance requirements:  
It is the students' responsibility to attend and participate appropriately in all activities (such as lectures, tutorials, laboratories and practical work) scheduled for them, and to study all material provided to them or required to be accessed by them to maximise their chance of meeting the objectives of the course and to be informed of course-related activities and administration.
- 2 Requirements for students to complete each assessment item satisfactorily:  
To complete each of the assessment items satisfactorily, students must obtain at least 50% of the marks available for each assessment item.
- 3 Penalties for late submission of required work:  
If students submit assignments after the due date without prior approval then a penalty of 10% of the total marks gained by the student for the assignment will apply for each working day late.

- 4 Requirements for student to be awarded a passing grade in the course:  
To be assured of receiving a passing grade a student must submit all of the summative assessment items and achieve at least 50% of the available weighted marks for those items.
- 5 Method used to combine assessment results to attain final grade:  
The final grades for students will be assigned on the basis of the aggregate of the weighted marks obtained for each of the summative assessment items in the course.
- 6 Examination information:  
An examination may be negotiated with the examiner.
- 7 Examination period when Deferred/Supplementary examinations will be held:  
There will be no Deferred or Supplementary examinations in this course.
- 8 University Regulations:  
Students should read USQ Regulations 5.1 Definitions, 5.6. Assessment, and 5.10 Academic Misconduct for further information and to avoid actions which might contravene University Regulations. These regulations can be found at the URL <http://www.usq.edu.au/corporateservices/calendar/part5.htm> or in the current USQ Handbook.

#### **ASSESSMENT NOTES**

- 9 Students must retain a copy of each item submitted for assessment. If requested, students will be required to provide a copy of assignments submitted for assessment purposes. Such copies should be despatched to USQ within 24 hours of receipt of a request being made.