



The University of Southern Queensland

Course Specification

Description: Experimental Design

Subject	Cat-Nbr	Class	Term	Mode	Units	Campus
STA	3300	10387	1, 2002	ONC	1.00	TWMBBA

Academic Group:	FOSCI
Academic Org:	FOS003
HECS Band:	2
ASCED Code:	010103

STAFFING

Examiner: Ashley Plank
Moderator: Shahjahan Khan

PRE-REQUISITES

Pre-requisite: STA 2300

RATIONALE

The proper design, implementation and analysis of results of experiments are of vital importance in many disciplines. The validity and reliability of research findings can be severely compromised if a poor design or experimental procedure is followed. This course introduces principles of good design in experiments and discusses appropriate methods of analysis of planned experiments. This course has relevance to all students planning or planning to be involved in experimental projects, especially students in the general science disciplines. Previous statistical knowledge to the level of STA2300 Data Analysis only is assumed.

SYNOPSIS

This course covers principles of design such as randomisation, replication, factorial arrangement and blocking. Practical experience is gained in designing, carrying out, analysing and writing up the results of an experimental study. Methods of analysis are discussed and practiced, mainly on computer. The emphasis is on general principles of design and analysis rather than in describing the details of particular design layouts. Consideration is given to assumption checking, robustness, prior and posterior analysis, contrasts, confounding, lack of balance, error control and reduction, and interpretation of results.

OBJECTIVES

On completion of this course students will be able to:

- recognise the need for and implement procedures for randomisation;
- recognise the importance of factorial arrangements and replication;
- recognise the advantages and disadvantages of blocking;
- analyse a data set in an appropriate fashion using a computer package;
- interpret the results of an analysis in everyday terms;
- deal with the analysis of incomplete data for some designs.

TOPICS

Description	Weighting (%)
1. Data Screening - introduction to a computer package - exploratory and preliminary analysis - descriptive and graphical tools - transformations	10.00
2. Inference - hypothesis testing and p values - estimation and confidence intervals - comparative experiments, independent and dependent samples - linear regression, dummy variables	5.00
3. Introduction to experimentation - observational v experimental studies - causality and correlation - validity - some design principles	10.00
4. Completely randomised designs with one factor - experimental procedure - principle of randomisation - modelling the data - analysis of variance and interpretation - descriptive techniques - residual analysis - nonparametric techniques	15.00
5. Analytic comparisons - contrasts, simple and complex, - planned and unplanned comparisons - multiple comparisons and error rates - Newman-Keuls range tests	15.00
6. Balanced factorial experiments - principles of factorial arrangement - descriptive techniques - main and interaction effects - multiway analysis of variance - estimation of effects - model fitting	15.00
7. Blocking - principle of error reduction - single and multifactor arrangements - random and fixed effects - calculation of expected mean squares - components of variance	15.00
8. Regression Analysis - missing values and unbalanced designs - analysis and interpretation - analysis of covariance - trend analysis	15.00

TEXT and MATERIALS required to be PURCHASED or ACCESSED:

Books can be ordered by fax or telephone. For costs and further details use the 'Book Search' facility at <http://bookshop.usq.edu.au> by entering the author or title of the text.

Eton Statistical and Mathematical Tables, 1980, 4th edn, Heinemann. (or equivalent),

SPSS Windows Software, Basic and Advanced Modules, Version 10.0, Prentice Hall (available through USQ Bookshop.)

Coakes, S.J. & Steed L.G. 2001 *SPSS: Analysis without Anguish*, Wiley.

Introductory Book, 2002 *Course STA3300 Experimental Design*, USQ Distance Education Centre, Toowoomba.

Selected Readings, 2002 *Course STA3300 Experimental Design*, USQ Distance Education Centre, Toowoomba.

Study Book, 2002 *Course STA3300 Experimental Design*, USQ Distance Education Centre, Toowoomba.

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.

Box, G.E.P., Hunter, W.G. & Hunter, J.S. 1978 *Statistics for Experimenters: An Introduction to Design, Data Analysis, and Model Building*, Wiley.

Hicks, C.R. 1993 *Fundamental Concepts in the Design of Experiments*, 4th edn, Saunders College Pub.

Mason, R.L., Gunst, R.F. & Hess, J.L. 1989 *Statistical Design and Analysis of Experiments with Applications to Engineering and Science*, Wiley.

Maxwell, S.E. & Delaney, H.D. 1990 *Designing Experiments and Analysing Data: A Model Comparison Perspective*, Wadsworth.

STUDENT WORKLOAD REQUIREMENTS

ACTIVITY	HOURS
Assessment	20
Examinations	3
Lectures	28
Private Study	90
Tutorial	28

ASSESSMENT DETAILS

Description	Marks Out of	Wtg(%)	Required	Due Date
ASSIGNMENT 1	100.00	10.00	Y	04 Mar 2002 (see note 1)
ASSIGNMENT 2	100.00	10.00	Y	04 Mar 2002 (see note 2)
PROJECT PROPOSAL	999.00	0.00	Y	04 Mar 2002 (see note 3)
PROJECT	100.00	20.00	Y	04 Mar 2002 (see note 4)
EXAM 3 HOUR RESTRICTED	100.00	60.00	Y	END S1 (see note 5)

NOTES:

1. Further details about the due dates are detailed in the assessment section of the Course Specifications.
2. Further details about the due dates are detailed in the assessment section of the Course Specifications.
3. Further details about the due dates are detailed in the assessment section of the Course Specifications.
4. Further details about the due dates are detailed in the assessment section of the Course Specifications.
5. Examination dates will be available during the Semester. Please refer to Examination timetable when published.

OTHER REQUIREMENTS

- 1 Attendance Requirements: It is the student's responsibility to actively participate in all classes scheduled for them, and to study all material provided to them or required to be accessed by them to maximize their chance of meeting the objectives of the course and to be informed of course-related activities and administration.
- 2 Requirements to Satisfactorily Complete Each Assessment Item: To satisfactorily complete each of the assignments, student must obtain at least half of the marks available for each assignment. Assessment item 3 is a prerequisite to Assessment item 5.
- 3 Minimum Requirements to Pass the Course: To be certain of gaining a passing grade in this course, students must gain at least 50% of the marks available for each assessment item.
- 4 Grading: Final grades for students will be determined by the addition of the marks obtained in each assessment item, weighted as in the Assessment Details and by considering the students' level of achievement of the objectives of the course.
- 5 Supplementary and Deferred Examinations: Students who obtain an overall passing mark, but who do not perform satisfactorily in an examination, may, at the discretion of the examiner, be granted a supplementary examination. Students will be granted a deferred examination only if they perform satisfactorily in all other assessment

items. Any supplementary or deferred examinations for this course will be held at the end of semester 1, 2003.

- 6 Assignments: The due date for assessments is the date by which a student must despatch an assignment to the USQ. The onus is on the student to provide proof of the despatch date, if requested by the examiner. Students **MUST** retain a copy of all assignments which must be produced if and when required by the examiner. In accordance with the University's Policy on Assignments (Regulation 5.6.1), the examiner of a course may grant an extension of the due date of an assignment in extenuating circumstances. This policy may be found in the USQ Handbook, the Distance Education Student Guide and the Faculty of Sciences' Orientation Handbook for new on-campus students. All students are advised to study and follow the guidelines associated with this policy.
 - 7 Examinations: Restricted Examination - a restricted examination is an examination where only those materials specified in the examination paper are permitted during the examination. For this course writing materials and non-programmable calculators only are allowed.
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