



The University of Southern Queensland

## Course Specification

### Description: Data Analysis

Subject	Cat-Nbr	Class	Term	Mode	Units	Campus
STA	2300	10363	1, 2002	ONC	1.00	TWMBBA

<b>Academic Group:</b>	FOSCI
<b>Academic Org:</b>	FOS003
<b>HECS Band:</b>	2
<b>ASCED Code:</b>	010103

### STAFFING

Examiner: Shahjahan Khan

Moderator: Paul Fahey

### RATIONALE

Practitioners in many disciplines are often required to deal with observations of variable phenomena and imprecise or approximate measurements. Statistics provides tools which help to identify the underlying nature of such phenomena, to evaluate the precision of the measurements, to discover the strength of the relationships between variables and to make predictions about the likelihood of particular events occurring in the future. This course provides many of the statistical concepts, methods and skills necessary for students in business, engineering and the physical and social sciences to collect, appraise, present, analyse and interpret data. Because these concepts are interdisciplinary in nature, students will encounter problems from many sources including their own area of interest. The statistical skills developed in this course will form the basis for more advanced statistical methods and concepts in specialist fields.

### SYNOPSIS

Students will be introduced to the concepts involved in descriptive and inferential statistics. Topics include methods of producing, exploring, condensing and displaying data, both of single and multiple variables, elementary probability, the normal distribution, single and two-sample inference of means and proportions, comparison of frequencies, correlation and regression. Emphasis will be placed on how statistics is used in practice and on the presentation and interpretation of statistical analyses. A computing package and calculator will be used to facilitate numerical calculation and graphing.

## OBJECTIVES

On completion of this course students should be able to:

- recognise the relevance and importance of statistical methods in their respective discipline;
- choose and apply appropriate graphical and numerical tools for organising, describing and exploring data;
- understand the basic principles of sample selection and experimental design;
- select and apply appropriate statistical tools to perform a range of inferential analyses;
- critically appraise the relevance, validity and accuracy of arguments based on data;
- make appropriate use of a statistical computer package.

## TOPICS

Description	Weighting (%)
1. Examining Distributions. Displaying distributions with graphs - categorical and quantitative variables, histograms, relative frequencies, stemplots, bar charts, shape, skewness, outliers. Describing distributions with numbers - mean, median, quartiles, boxplots, interquartile range, standard deviation, variance. The normal distribution - density curves, 68-95-99.7 rule, standardised scores, standard normal, using normal tables, assessing normality.	20.00
2. Examining Relationships. Scatterplots - interpretation, association, linearity, outliers. Correlation - interpretation. Least squares regression - intercept and slope, interpretation, residuals, influential observations, extrapolation, lurking variables, causation. Categorical data - contingency tables, interpretation, marginal distributions, conditional distributions, independence, Simpson's paradox.	14.00
3. Producing Data. Designing samples - simple random samples, stratified sampling, multistage sampling, surveys, problems and cautions. Populations, inference, probability. Designing experiments - comparative experiments, completely randomised experiments, main principles of design, statistical significance, cautions.	8.00
4. Sampling Distributions and Probability. Sampling distributions - sampling variability, parameters and statistics, simulation, bias, precision. Probability, randomness, basic facts, equally likely outcomes, random variables, discrete distributions, mean and standard deviation, continuous distributions, normal distributions. Sample proportions - sampling distribution, normal approximation. The binomial distribution - sample counts, binomial probabilities, mean and standard deviation. Sample means - sampling distribution, central limit theorem, law of large numbers.	14.00
5. Introduction to Inference. Estimation - statistical confidence, confidence intervals, margin of error, C.I. for a population mean, sample size, cautions. Hypothesis testing - null and alternative hypotheses, reasoning, procedure,	15.00

one and two-sided alternatives, p-values and statistical significance, tests for a population mean, tests with fixed significance level, tests from confidence intervals. Using significance tests - choosing a significance level, statistical and practical significance, cautions. Inference as decision - type I and II errors.

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| 6. Inference for means - the t distribution, tests and C.I.s, matched pairs procedure, assumptions, robustness. Comparing two means - comparative studies, conservative unequal variances t procedures, assumptions, robustness.                      | 8.00 |
| 7. Inference for proportions - assumptions, the z procedure for a single proportion, sample size, comparing two proportions, tests and C.I.s.   | 7.00 |
| 8. Inference for Regression. Introduction - the regression model. Inference about the model - C.I. for the slope, testing for a linear relationship, inference for prediction. Residuals, checking assumptions.                                       | 7.00 |
| 9. Inference for Two-way Tables. - Multiple comparison problem, two-way tables, expected counts, the chi-square test and distribution, test of equality of proportions, test of independence, robustness, comparison with z-test, follow-up analysis. | 7.00 |

### **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.

*PaceXL or Pace2000 Software Package*, Cicada Bay Pty Ltd. (External Students only).

Introductory Book, 2002 *Course STA2300 Data Analysis*, USQ Distance Education Centre, Toowoomba.

Moore, D. 2000 *The Basic Practice of Statistics*, 2nd edn, Freeman (or the first edition printed in 1995).

Notz, W., Fligner, M. & Sorice, R., 2000 *Study Guide for Moore's The Basic Practice of Statistics*, 2nd edn, Freeman, (or equivalent first edition). (External.

Study Book, 2002 *Course STA2300 Data Analysis*, 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.

Pace 2000 Software Package, Version 2.0 (or later), Cicada Bay Pty Ltd. (Not held in USQ library).

## STUDENT WORKLOAD REQUIREMENTS

ACTIVITY	HOURS
Assessment	20
Examinations	3
Lectures	26
Private Study	95
Tutorial	26

## ASSESSMENT DETAILS

Description	Marks Out of	Wtg(%)	Required	Due Date
ASSIGNMENT ON TOPICS 1 & 2	100.00	10.00	Y	04 Mar 2002 (see note 1)
ASS ON TPCS UP TO & INCL TP 4	100.00	10.00	Y	04 Mar 2002 (see note 2)
ASS ON TPCS UP TO & INCL TP 7	100.00	10.00	Y	04 Mar 2002 (see note 3)
3 HOUR EXAM (RESTRICTED) PART	35.00	35.00	Y	END S1 (see note 4)
PART B OF ABOVE 3HR EXAM	35.00	35.00	Y	END S1 (see note 5)

### NOTES:

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

- 1 It is the student's responsibility to attend classes and activities to ensure that they have the best chance to meet the objectives of the course and be well informed of course-related activities and administration.
- 2 To be certain of obtaining a passing grade in this course, students must gain at least 50% of the marks available for each assessment item.

- 3 The due date for assessments is the date by which the student must dispatch an assignment to USQ. The onus is on the student to provide proof of the dispatch date, if required by the examiner.
- 4 Students must retain a copy of any assignment submitted. This must be produced within 48 hours if required by the examiner.
- 5 Assignments submitted after the Due Date will be penalised 10% for each working day late unless the student can convince the Examiner that such a penalty is not warranted.
- 6 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 Restricted Examination: a restricted examination is an examination where only those materials specified in the examination paper are permitted during the examination.
- 8 The only materials that students may bring into the examination room and use in the restricted examination are: (a) writing materials (non-electronic and free from materials which could give the student an unfair advantage in the examination); (b) calculators which cannot hold textual information (students must indicate on their exam paper the make and model of any calculator(s) they use during the examination). These details may be checked by the invigilator of the examination.
- 9 Any supplementary or deferred exams for this course will be held during the semester 2, 2002 exam period. In exceptional circumstances, some deferred exams may be held during the semester 3, 2002 exam period.
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