



The University of Southern Queensland

## Course Specification

### Description: Data Analysis

Subject	Cat-Nbr	Class	Term	Mode	Units	Campus
STA	2300	20365	1, 2003	ONC	1.00	WIBAY

<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: Henry Eastment

### OTHER-REQUISITES

Recommended Pre-requisites: CSC1400 or CSC1402 or CIS1000 or ELE1301

### 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 unit 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 unit 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, sampling distributions, tests and C.I.  | 7.00 |
| 8. 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 |
| 9. 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 |

**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 Software Package' (Available: Cicada Bay Pty Ltd) .

(Or SPSS Student Version 10.0 for Windows, Prentice Hall (External Students only). The stats package PaceXL will come in a CD with the Textbook for S1 2003.)

Introductory Book 2003, *Course STA2300 Data Analysis*, USQ Distance Education Centre, Toowoomba.

Moore, D.S. 2000, *The Basic Practice of Statistics*, 2nd edition, W.H. Freeman, New York.  
(Or the First Edition print)

Study Book 2003, *Course STA2300 Data Analysis*, USQ Distance Education Centre, Toowoomba.

## 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	07 Apr 2003
ASS ON TPCS UPTO & INCL TP 4	100.00	10.00	Y	12 May 2003
ASS ON TPCS UPTO & INCL TP 7	100.00	10.00	Y	02 Jun 2003
PART A 3HR RESTRICTED EXAM	35.00	35.00	Y	END S1 (see note )
PART B 3HR RESTRICTED EXAM	35.00	35.00	Y	END S1 (see note )

### NOTES:

- . Examination dates will be available during the Semester. Please refer to Examination timetable when published. This is Part A of a 3 hour examination.
- . Examination dates will be available during the Semester. Please refer to Examination timetable when published. This is Part B of a 3 hour examination.

## 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 a passing grade, students must demonstrate, via the summative assessment items, that they have achieved the required minimum standards in relation to the objectives of the course by satisfactorily completing all summative assessment items (the examination and assignments).
- 5 Method used to combine assessment results to attain final grade:  
The final grades for students will be assigned on the basis of the weighted aggregate of the marks obtained for each of the summative assessment items in the course.
- 6 Examination information:  
In a Restricted Examination, candidates are allowed access to specific materials during the examination. The only materials that candidates may use in the restricted examination for this course are: writing materials (non-electronic and free from material which could give the student an unfair advantage in the examination); calculators which cannot hold textual information (students must indicate on their examination paper the make and model of any calculator(s) they use during the examination). Formula sheets as provided by the Examiner with the examination paper. Students whose first language is not English, may, with the Examiner's approval, take an appropriate non- electronic translation dictionary into the examination. Students who wish to use a translation dictionary **MUST** request and receive written approval from the Examiner at least one week before the examination date. Translation dictionaries will be subject to perusal and may be removed from the candidate's possession until appropriate disciplinary action is completed if found to contain material that could give the candidate an unfair advantage.
- 7 Examination period when Deferred/Supplementary examinations will be held:  
Any Deferred or Supplementary examinations for this course will be held during the examination period at the end of the semester of the next offering of 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/SECARIAT/calendar/Part5/> or in the printed version of the current USQ Handbook.

## **ASSESSMENT NOTES**

- 9 The due date for an assignment is the date by which a student must despatch the assignment to the USQ. The onus is on the student to provide proof of the despatch date, if requested by the Examiner. The examiner may grant an extension of the due date of an assignment in extenuating circumstances.