



The University of Southern Queensland

Course Specification

Description: Data Analysis

| Subject | Cat-Nbr | Class | Term | Mode | Units | Campus |
|---------|---------|-------|---------|------|-------|--------|
| STA | 2300 | 14379 | 2, 2002 | ONC | 1.00 | TWMBBA |

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

STAFFING

Examiner: Christine McDonald

Moderator: Henry Eastment

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 (%) |
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| 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 observations, 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 distribution, 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).) .

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

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

Notz, W., Fligner, M. & Sorice, R. 2000, *The Basic Practice of Statistics: Study Guide*, 2nd edition, W.H. Freeman (or equivalent first edition, New York.

Study Book 2002, *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 | 26 Aug 2002 |
| ASS ON TPCS UPTO & INCL TP 4 | 100.00 | 10.00 | Y | 20 Sep 2002 |
| ASS ON TPCS UPTO & INCL TP 7 | 100.00 | 10.00 | Y | 28 Oct 2002 |
| PART A 3HR RESTRICTED EXAM | 35.00 | 35.00 | Y | END S2 (see note 4) |
| PART B 3HR RESTRICTED EXAM | 35.00 | 35.00 | Y | END S2 (see note 5) |

NOTES:

4. Examination dates will be available during the Semester. Please refer to Examination timetable when published.
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 participate actively 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 Minimum Requirements to Pass the Course: To be certain of obtaining a passing grade in this course, students must gain at least 50% of the total marks available and gain at least 50% of the marks available for the examination.
- 3 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.
- 4 Supplementary and Deferred Examinations: Students will be granted a deferred examination only if they perform satisfactorily in the assignments. Students who obtain an overall passing mark, but who do not perform satisfactorily in the examination, may, at the discretion of the examiner, be granted a supplementary

examination. Any supplementary or deferred examinations for this course will be held during the examination period for summer term, 2002.

- 5 Assignments: The due date for an assignment is the date by which the student must dispatch it to USQ. The onus is on the student to provide proof of the dispatch date, if required by the examiner. Students must retain a copy of any assignment submitted. This must be produced within 48 hours if required by the examiner. Assignments submitted after the Due Date may be penalised 10% for each working day late. 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.
 - 6 Examinations: Restricted Examination: a restricted examination is an examination where only those materials specified in the examination paper are permitted during the examination. 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 examination 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. With the approval of the examiner, candidates may take an appropriate non-electronic translation dictionary into the examination. This 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. A list of the materials candidates may access in the restricted examination will be on the frontispiece of the examination paper.
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