Course Profile

Welcome to the course profile for STAT1201 in Semester 2, 2005.

Objectives

The aim of STAT1201 is to provide an understanding of the nature of biological data and the subsequent need for statistical analysis, and to develop your statistical expertise and critical judgement. You will learn about the different types of data and how each can be visualised and summarised, and how you can make conclusions and predictions from the statistical analysis. You will also see that these statistical tools are based on simple mathematical ideas and associated assumptions.

Contents Overview

The course contents will include

- The nature of data and the need for statistical analysis
- Designing surveys and experiments
- Graphical and numerical summaries of data
- Relationships between variables
- Probability models, random variables, conditional probabilities
- Binomial distribution, Poisson distribution, Normal distribution
- Expected values and combinations of random variables
- Sampling distributions, bias and precision
- Confidence intervals for means and proportions
- Odds, odds ratios and logistic regression
- Tests of significance and decision making
- Transformations of data
- Analysis of variance, regression, and correlation
- Goodness-of-fit tests
- Non-parametric procedures

Background

Students should have a sound understanding of mathematics equivalent to Queensland Mathematics B or MATH1040.

Resource Page

Staff

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Textbooks

The prescribed book is *A Portable Introduction to Data Analysis* (3rd Edition). You should try to bring this book to lectures, tutorials and practicals. You will also be expected to read the sections relevant to the lecture content (see next page).

Two traditional textbooks are available in the libraries for reference and additional exercises:

Lectures

There are 3 lectures in each week before the mid-semester break. For the last four weeks of the semester, two of the lectures will be replaced by a 2-hour Collaborative Learning Task (see page 9), with the Friday lectures continuing as normal.

There are two lecture streams (L1 and L2). These will be taught by the same lecturer so you can swap between them if needed. Note that L1 is usually crowded at the start of semester.

There will be no second lecture (Wednesday, August 17th and Thursday, August 18th) in Week 4.

Visit mySI-net to check the current room allocations.

The table below gives the intended topics for each lecture during semester, along with the relevant sections from the textbook. The exact lecture topics may differ slightly from these. An updated list will be maintained on the Resource Page.

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
<th>Readings</th>
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<tbody>
<tr>
<td>1</td>
<td>Jul 25 Introduction, statistics in biology</td>
<td>1–2</td>
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<tr>
<td></td>
<td>Ethical experimentation</td>
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<tr>
<td>2</td>
<td>Aug 1 Quantitative plots, quantiles</td>
<td>3–6</td>
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<td></td>
<td>Averages, density curves</td>
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<tr>
<td>3</td>
<td>Aug 8 Relationships, correlation, least squares</td>
<td>7–9</td>
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<td>Proportions, two-way tables</td>
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<tr>
<td>4</td>
<td>Aug 15 Probability, sensitive questions</td>
<td>10–14</td>
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<td>Discrete random variables, Binomial distribution</td>
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<td>Expected values, standard deviations</td>
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<tr>
<td>5</td>
<td>Aug 22 Combining random variables</td>
<td>15–18</td>
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<tr>
<td></td>
<td>Normal distributions</td>
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<tr>
<td>6</td>
<td>Aug 29 Sampling distribution of the mean, Central Limit Theorem</td>
<td>19–22</td>
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<tr>
<td></td>
<td>Confidence intervals, hypothesis tests</td>
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<td>7</td>
<td>Sep 5 Student’s t distribution, CIs and tests for a mean</td>
<td>23–24</td>
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<td>Assumptions, transformations</td>
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<tr>
<td>8</td>
<td>Sep 12 Difference between means</td>
<td>25–28</td>
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<tr>
<td></td>
<td>Proportions, odds ratios</td>
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<tr>
<td>9</td>
<td>Sep 19 Regression</td>
<td>29–33</td>
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<tr>
<td></td>
<td>ANOVA</td>
<td></td>
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<tr>
<td>10</td>
<td>Oct 3 Multiple comparisons</td>
<td>34–35</td>
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<tr>
<td></td>
<td>Two-way ANOVA</td>
<td></td>
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<tr>
<td>11</td>
<td>Oct 10 One-way and two-way tables</td>
<td>37–38</td>
</tr>
<tr>
<td></td>
<td>Logistic regression</td>
<td>39</td>
</tr>
<tr>
<td>12</td>
<td>Oct 17 Nonparametric methods</td>
<td>40</td>
</tr>
</tbody>
</table>

3
Small-Group Learning

PASS Tutorials

The weekly tutorials will be run as peer-assisted study sessions (PASS). You will have an opportunity to practice the ideas covered in the lectures, working through activities and exercises with other students and the PASS leaders. Try to look at relevant data sets in the book before the session to identify any specific problems. PASS leaders are not available for help outside the sessions so use the sessions wisely.

PASS tutorials start in Week 3. Sign-on for a PASS tutorial on mySI-net before the end of Week 1. PASS tutorials are held in Week 4.

Note that all PASS tutorials will be held in 67-140.

Practicals

This semester we are running a larger number of practicals than in previous years, with 11 one-hour sessions starting in Week 2.

In the practicals you will use statistical software (OStats) to explore and analyse data, as well as to learn or reinforce some of the course content. You will be expected to use the skills you develop in the practicals in your project work and in the practical exam. The statistical software is also available for use in your other courses.

Each practical involves a small task which you submit on the web. Each practical you complete correctly counts 1% to your overall grade, to a maximum of 10%. The deadline for completing each practical task is 5pm on the Friday of the week in which the practical is held.

Practicals start in Week 2 and will be held in iLC4 (69-209). Practicals are not held in Week 4.

Sign-on for a practical session on mySI-net before the end of Week 1.

OStats

The OStats statistical software is available for download from the Resource Page and can be used for free by current students and staff at the University of Queensland. Versions are currently available for Mac OS 8-9, Mac OS X, and Windows 98/NT/2000/XP. Please contact Michael Bulmer if you would be interested in a Linux version.

OStats is intended to be a tool and there is no way of entering data directly into it. Instead you should first enter data into something like a spreadsheet, or even a text editor or word processor. You can then copy and paste your data into OStats for exploration and analysis. There will also be data sets provided from the Resource Page which can be copied from the web browser into OStats. You can also save your files in OStats to open again later.
Assessment Details

Your final grade is calculated by adding up your marks for each of the assessment items, using the weights indicated in this section. Refer to the Assessment Criteria on page 11 for how the marks are translated to grades.

Note that the criteria on page 11 are also used as a general guide for marking each of the assessment items, particularly the projects, in addition to the specific marking guides included for each item.

Survey (1%)

At the start of semester we ask you to complete a basic survey to provide data for use in the lectures, tutorials, and practicals. This survey is completed online, via the Resource Page, and you can do it as part of the practical in Week 2. It should be completed by the end of Week 2 at the latest, and completing it counts 1% towards your final grade.

Haiku Project (1%)

The Haiku Project gives you an opportunity to express your view of statistics at the start of the course. It simply involves composing a haiku to express your view. This is to be submitted via the Resource Page by 5pm on Friday, August 5th. All submissions that show some effort will receive 1% towards the assessment of the course. Visit the Resource Page for more details about haiku.

A short-list will be chosen by a panel and then all students in the course can vote for the best work. There will be a prize for the winning entry of a $50 book voucher to the UQ Bookshop, with two runner-up prizes of $30 and $20.

Practicals (10%)

As noted on page 4, the weekly practical tasks count 1% each to a maximum of 10% of your final grade.
Experiment Project (20%)

The aim of this project is to design and carry out a study involving a comparative experiment and then to analyze the results and present them as a scientific paper. Examples of good and bad projects are available on the Resource Page, and Section 45 of the textbook gives examples of experiments completed in previous semesters, but you can choose any experimental topic of interest to you.

If your study will involve humans then you will need to complete an Ethics Clearance Form on the web page and have it approved before carrying out the experiment. A discussion of ethics issues will be given in Lecture 3. Animal experiments are not allowed. Ethics Clearance Forms must be completed on the web by 5pm on Friday, August 12th.

You are expected to carry out the study early in semester, finalizing a one-page summary of your findings by Friday, August 26th. You can then make use of PASS to discuss your results and their analysis as the course progresses. Your paper reporting on the study is due on Friday, October 21st.

Contact the Project Coordinator (see page 2) if you have any queries regarding this project.

Submission

This project is to be completed individually. The summary report and scientific paper are to be prepared via the web, though any word processor can be used for making drafts. Details will be available on the Resource Page.

The completed summary report and paper should then be finalized before 5pm on the due dates listed above. More precisely, you can edit your report on the web page up until 5pm on the due date, when the current version will be taken as your submission.

Assessment

The summary is worth 5% and will be marked using the following criteria:

- Data submitted in appropriate format
- Brief description of the study
- Brief discussion of significant limitations
- Brief summary of results
- One plot which best illustrates the results

The final paper is worth 15% and will be marked using the following criteria:

- Clear description of the topic and aims
- Discussion of the design of the experiment
- Discussion of the measurement process
- Appropriate graphical summaries
- Appropriate numerical summaries
- Description of the data distributions
• Appropriate confidence interval or significance test
• Check of assumptions underlying inference
• Conclusion relating the results to the aims
• Overall concise and logical presentation

Prize

Full marks can be obtained for any comparative experiment. However, to encourage more creative experiments, a prize will be awarded for the most scientifically interesting experiment, not involving human subjects, undertaken for this assessment. The prize will be decided by a panel of UQ scientists and the winner announced at the lectures on Friday, October 28th.

The winner will receive a $200 book voucher to the UQ Bookshop.
Scientific Paper Review (10%)

The aim of this project is to find a scientific paper through the library that uses statistical inference, illustrating a confidence interval or a test of significance. You will then critically review the article’s use of these statistical methods in relation to the aims of their study. Most articles will actually involve many uses of statistics. You only need to identify one confidence interval or significance test and discuss it.

While this sheet is handed out at the start of semester, the required material for this project will not be covered in the course until early May.

Examples will be given in the lectures to show you how to access journal databases and electronic journals. There are also other courses running in the libraries throughout the year, as listed on www.library.uq.edu.au/training/session2.html

Most papers in medical journals or other biological journals will use statistics. Avoid actual statistics journals as these mostly won’t have applications! The paper you obtain must have page numbers.

Note that each paper can only be reviewed by one student. Once you have found the paper you want to review, follow the ‘Paper Review’ link on the Resource Page and check that it is not already listed by another student. If it is okay then register it for yourself.

Submission

The project report is to be prepared and submitted via the web, though any word processor can be used for making drafts. Details will be available on the Resource Page. The report must be finalized by 5pm on Friday, October 14th.

As part of the submission, you must print or photocopy the first page of the paper and submit it in the STAT1201 assignment box outside Room 67-646 before the due date. Write your name and student number at the top of the page.

Assessment

Your report of no more than 500 words on the paper should include

- a summary of the paper’s topic and objective (2 marks)
- a description of the experimental or survey protocol used, with comments on design aspects, if any, that may limit the study (2 marks)
- a summary of a statistical conclusion (2 marks)
- an explanation in layman’s terms of what the statistical conclusion suggests (2 marks)
- a bibliographic reference for the article (1 mark)
- a copy of the first page of the paper, submitted separately (1 mark)
Collaborative Learning Tasks (8%)

In the last four weeks of semester the first two lectures each week will be replaced by a 2-hour Collaborative Learning Task. Each task will require attendance at one of the 2-hour contact times listed on mySI-net. You should try to sign-on for a session at the start of semester. However, there will be an opportunity to change your time at the end of September, and additional places may be made available to meet demand.

Further details regarding the Collaborative Learning Tasks will be available on the Resource Page in September.

Final Exam (40%)

A two-hour practical exam will be held in the November examination period, covering methods learnt in the practicals as well as the rest of the course material. The practical exam will be multiple-choice and is worth 40% of your final grade. Sample exams will be made available on the Resource Page early in semester.

During the practical exam you can refer to a single A4 sheet of notes (two-sided). You will also need a calculator.
Assessment Guidelines

Assessment Timetable

Below is a summary of the assessment during the semester.

<table>
<thead>
<tr>
<th>Week</th>
<th>Assessment Item</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Survey due</td>
<td>1%</td>
</tr>
<tr>
<td>Aug 5</td>
<td>Haiku Project due</td>
<td>1%</td>
</tr>
<tr>
<td>5</td>
<td>Summary Report due</td>
<td>5%</td>
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<tr>
<td>Aug 26</td>
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<tr>
<td>10–13</td>
<td>Collaborative Learning Tasks</td>
<td>8%</td>
</tr>
<tr>
<td>Oct 3-28</td>
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</tr>
<tr>
<td>11</td>
<td>Paper Review due</td>
<td>10%</td>
</tr>
<tr>
<td>Oct 14</td>
<td></td>
<td></td>
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<tr>
<td>12</td>
<td>Project Report due</td>
<td>15%</td>
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<tr>
<td>Oct 21</td>
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<td></td>
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<tr>
<td>13</td>
<td>Laboratory Book due</td>
<td>10%</td>
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<tr>
<td>Oct 28</td>
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<tr>
<td>Exams</td>
<td>Practical Exam</td>
<td>40%</td>
</tr>
<tr>
<td>Ongoing</td>
<td>Practicals</td>
<td>10%</td>
</tr>
</tbody>
</table>

Late Assessment

Late haiku projects, summary reports, paper review reports, project reports, and laboratory books will not be accepted unless arrangements have been made with the course coordinator. This will typically require evidence of an illness or bereavement.

Assessment Policy

Students should be familiar with the rules which relate to assessment in their degrees as well as general university policy such as found in the General Award Rules. These are all set out on the Program and Course Information page on the UQ website www.uq.edu.au/student/courses
Assessment Criteria

To earn a Grade of 7, you must achieve a final mark between 85-100% by demonstrating an excellent understanding of the course material. You will be able to analyse a broad range of data settings, providing insight and thoroughness in the form of necessary assumptions and other factors that might affect the analysis. You will demonstrate excellent proficiency in communicating statistical ideas in writing and a high level of accuracy in graphical and numerical work.

To earn a Grade of 6, you must achieve a final mark between 75-84% by demonstrating a comprehensive understanding of the course material. You will be able to analyse most data settings, identifying important assumptions and other factors that might affect the analysis. You will demonstrate proficiency in communicating statistical ideas in writing and a high level of accuracy in graphical and numerical work.

To earn a Grade of 5, you must achieve a final mark between 65-74% by demonstrating an adequate understanding of the course material. You will be able to analyse many data settings, identifying the key assumptions that might affect the analysis. You will demonstrate the ability to write statistical reports and show accuracy in graphical and numerical work.

To earn a Grade of 4, you must achieve a final mark between 50-64% by demonstrating an understanding of the basic concepts of the course. You will be able to analyse the important data settings, identifying some key assumptions that might affect the analysis. You will demonstrate the ability to write statistical reports and show accuracy in graphical and numerical work.

To earn a Grade of 3, you must achieve a final mark between 45-49% by demonstrating some knowledge of the basic concepts of the course. You will be able to analyse the important data settings. You will demonstrate the ability to write statistical reports and show accuracy in graphical and numerical work.

To earn a Grade of 2, you must achieve a final mark between 20-44% by demonstrating some knowledge of the basic concepts of the course. You will be able to partially analyse a few important data settings. Written reports may be poor and accuracy in graphical and numerical work may be low.

To earn a Grade of 1, you must achieve a final mark between 0-19%. You will be able partially analyse very few data settings. Written reports will be poor and accuracy in graphical and numerical work will be low.
Graduate Attributes

The University has a statement of Graduate Attributes which describes core attributes to be developed in an undergraduate program. The following graduate attributes, taken from the University statement, will be emphasized in this course. Brief comments on how these will be developed are given. The full University statement is at www.uq.edu.au/hupp/index.html?policy=3.20.5

In-Depth Knowledge of the Field of Study

Through theory and applications in lectures and through hands-on work in projects and practicals you will develop

- A comprehensive and well-founded knowledge of the field of study.
- An understanding of how other disciplines relate to the field of study.

Effective Communication

Communication skills will be developed through informal interactions in tutorials and the collaborative project work. Written communication will be emphasised in reviewing scientific papers and writing project reports, which will also require the use of information resources. Through these activities you should develop

- The ability to collect, analyse, and organise information and ideas, and to convey those ideas clearly and fluently, in both written and spoken forms.
- The ability to interact effectively with others in order to work towards a common outcome.
- The ability to select and use the appropriate level, style and means of communication.
- The ability to engage effectively and appropriately with information and communication technologies.

Independence and Creativity

Project work is designed to encourage independence and creativity and develop

- The ability to identify problems, create solutions, innovate and improve current practices.

Critical Judgement

Analytical and critical thinking will be illustrated in lectures and in textbook readings. Activities in tutorials and project work will build on this to develop

- The ability to define and analyse problems
- The ability to apply critical reasoning to issues through independent thought and informed judgement
- The ability to evaluate opinions, make decisions and to reflect critically on the justifications for decisions.

Ethical And Social Understanding

An important part of statistics is the design of experiments within a social and ethical context. This will be emphasized in lecture examples and project work to help develop

- An appreciation of the philosophical and social contexts of a discipline.
Other Policies and Procedures

Academic Integrity and Plagiarism

Below is the University’s definition of plagiarism:

Plagiarism is the action or practice of taking and using as one’s own the thoughts or writings of another (without acknowledgement). The following practices constitute acts of plagiarism and are a major infringement of the University’s academic values:

- where paragraphs, sentences, a single sentence or significant part of a sentence which are copied directly, are not enclosed in quotation marks and appropriately footnoted;
- where direct quotations are not used, but are paraphrased or summarised, and the source of the material is not acknowledged either by footnoting or other simple reference within the text of the paper;
- where an idea which appears elsewhere in print, film or electronic medium is used or developed without reference being made to the author or the source of that idea.

When a student knowingly plagiarises someone’s work, there is intent to gain an advantage and this may constitute misconduct.

Students are encouraged to study together and to discuss ideas, but this should not result in students handing in the same or similar project work. Do not allow another student to copy your work. While students may discuss approaches to tackling an assignment problem, care must be taken to submit individual and different reports. Submitting the same or largely similar reports for a project may constitute misconduct.

For more information on the University policy on academic integrity and plagiarism, please refer to www.uq.edu.au/hupp/index.html?policy=3.40.12

Supplementary Examinations

A supplementary examination may be awarded in one course to students who obtain a grade of 2 or 3 in the final semester of their program and require this course to finish their degree. You should check the rules for your degree program for information on the possible award of supplementary examinations. Applications for supplementary examinations must be made to the Director of Studies in the Faculty.

Special Examinations

If a student is unable to sit a scheduled examination for medical or other adverse reasons, she/he can and should apply for a special examination. Applications made on medical grounds should be accompanied by a medical certificate; those on other grounds must be supported by a personal declaration stating the facts on which the application relies.

Applications for special examinations for central and end-of-semester exams must be made through the Student Centre. Applications for special examinations in school exams are made to the course coordinator.

More information on the University’s assessment policy may be found at www.uq.edu.au/hupp/index.html?policy=3.30.5
Feedback on Assessment

You may request feedback on assessment in this course progressively throughout the semester from the course coordinator. Feedback on assessment may include discussion, written comments on work, model answers, lists of common mistakes and the like.

Students may peruse examinations scripts and obtain feedback on performance in a final examination provided that the request is made within twelve months of the release of final course results. After a period of twelve months following the release of results, examination scripts may be destroyed.

Information on the University’s policy on access to feedback on assessment may be found at www.uq.edu.au/hupp/index.html?policy=3.30.6

Students with Disabilities

Any student with a disability who may require alternative academic arrangements in the course is encouraged to seek advice at the commencement of the semester from a Disability Adviser at Student Support Services.

A large-print edition of the textbook may be purchased from the Bookshop’s Print On Demand service.

Assistance for Students

Students with English language difficulties should contact the course coordinator or tutors for the course.

Students with English language difficulties who require development of their English skills should contact the Institute for Continuing and TESOL Education on extension 56565.

The Learning Assistance Unit located in the Relaxation Block in Student Support Services. You may consult learning advisers in the unit to provide assistance with study skills, writing assignments and the like. Individual sessions are available. Student Support Services also offers workshops to assist students. For more information, phone 51704 or on the web at www.sss.uq.edu.au.

Student Liaison Officer

The School of Physical Sciences has a Student Liaison Officer as an independent source of advice to assist students with resolving academic difficulties. The Student Liaison officer during 2005 will be Dr Peter Adams (pa@maths.uq.edu.au), Room 67-547, Extension 53276.

Library Contact

The liaison librarian for the physical sciences disciplines is located in the Physical Sciences and Engineering Library in the Hawken Building and may be consulted for assistance in the course. The liaison librarian for 2005 is Leith Woodall (l.woodall@library.uq.edu.au), Extension 52367.