

BIOL235 - BIOSTATISTICS Semester 2 2006

UNIT INFORMATION

Aims of the course :

This is a second course in statistical methods designed for biology students. The pre-requisite is either STAT170(P) or STAT171(P). The aims of BIOL235 are to extend the statistical methods presented in the 100-level courses and to do so in a biological context.

As well as outlining new methods, emphasis is placed on the logic of the statistical procedures and when they are appropriate. The prime focus will be on carrying out the appropriate statistical tests using the statistical package Minitab and in the full interpretation of the resulting output.

Lecturer: Stephen Brown
E4A-543
9850-8552
scbrown@efs.mq.edu.au

Tutor: Anne Karpin
Room E4A-554
9850-9617
akarpin@efs.mq.edu.au

Textbook :

There is no set textbook. Lecture notes will be supplied in advance at the lectures.

Suggested references :

- Manly, B.F.J. (1992) **The Design and Analysis of Research Studies**, Cambridge University Press. R853.S7 .M36/1992
- Mead, R. & Curnow, R.N. (1983) **Statistical Methods in Agriculture and Experimental Biology**, Chapman & Hall. S540.S7 .M4/1983
- Gardiner W.P. (1997) **Statistics for the Biosciences**, Prentice Hall QH323.5 .G37/1997
- Ramsey, F.L. & Schafer, D.W. (1997) **The Statistical Sleuth**, Duxbury Press QA276 .R33/1997
- Quinn, G.P. & Keough M.J. (2002) **Experimental design and Data Analysis for Biologists** Cambridge University Press QH323.5 .Q85 2002
- Moore, D.S. & McCabe, G.P. (1993) **Introduction to the Practice of Statistics**, Fifth Edition Freeman QA276.12 .M65 2006
- Pagano, M. & Gauvreau, K. (1993) **Principles of Biostatistics**, Duxbury Press: QH323.5 .P34/1993
- Watt, T.A. (1997) **Introductory Statistics for Biology Students** (Second edition) Chapman & Hall. QH323.5 .W385/1997
- Ryan, B.F. Joiner, B.L & Ryan, (2001) **The MINITAB Student Handbook**, PWS-Kent. QA276.4 .R9 2001

Other useful books:

- McPherson, G. (1990) **Statistics in Scientific Investigation: Its Basis, Application and Interpretation**, Springer-Verlag.
- Williams, F. (1979) **Reasoning with Statistics**, Holt, Rinehardt & Winston.

Lectures :

You are required to attend three lectures per week, held at the following times :
Tuesday 9-10 (E7B-100) Wednesday 9-10 (E7B-T2) Friday 9-10 (E7B-100)

The lectures will be available as iLectures

Tutorials :

You are required to attend one tutorial per week. They will begin in the **second** week of semester. The tutorials will all be held in the C5C computer laboratories in E4B

Wed 12-1 Thursday 10 -11 Fri 12-1

The tutorials will be largely devoted to the use of the statistical package Minitab.

The work will not be required to be handed in but attendance will be recorded. **Solutions will not be made available.**

Assignments :

You will be required to submit three assignments during the semester. They will be worth 3, 3, 4 marks towards your final grade.

The assignments will be due **by 10 am** on the due date and should be left in the BIOL235 Assignment Box in ERIC (E4B-106). Marks will be deducted for work handed in late.

The due dates are:

Assignment 1	Friday, 8th September (Week 6)
Assignment 2	Friday, 13th October (Week 9)
Assignment 3	Friday, 3rd November (Week12)

Project :

Due Friday 10th November (Week 13) at 5pm in ERIC

The project requires you to collect data and analyse it yourself, using the methods of this course. The project is to be word-processed and should be in report form. Your data may have been collected in another biology unit or may be from an experiment that you have designed and set up yourself. **In either case, it is necessary that you have been involved in some way in the collection of the data.** More details will be given later.

For assignments and the project :

Whilst you are encouraged to discuss the work extensively with your peers, it will be expected that the final work handed in will be your **own** work. Any work that is copied from another student may result in disciplinary action for **all** students involved. You should read the section headed "Plagiarism".

The assignments and project will not be marked unless it is accompanied, in each case, by a cover sheet which clearly shows your name, your tutor's name and your tutorial time and makes a declaration that the work is your own work.

Assessment :

The total mark will be made up as follows:

Assignments	10
Mid-semester test	8
Project	16
Final examination	66

In order to pass the course students must exhibit a satisfactory performance in all sections of the course.

The assignments and the project are compulsory.

To pass the course, you must pass the final exam.

For both the mid-semester exam and the final examination, you may bring into the examination one (1) sheet of A4 paper written on both sides. No formulae will be provided, however all necessary statistical tables will be provided.

The Mid-semester exam will be held during one of the lectures in Week 7 (The week beginning September 11).

Web Page :

<http://www.stat.mq.edu.au/units/biol235>

Course Schedule :

One and two sample tests and confidence intervals - one and two tailed

Error rates

Normal plots, residuals and fitted values

Analysis of Variance - one factor

Multiple Comparisons l.s.d., Tukey's h.s.d., Bonferroni, Dunnett procedures

Two Factor Analysis of Variance

Interaction and Additivity

Two way Analysis of Variance without interaction

Transformations

Experimental design

Different Levels of Replication

Simple Linear Regression and Correlation

Multiple regression

Stepwise Regression

Logistic Regression

Calculation of Power and Power Curves

DEPARTMENT OF BIOLOGICAL SCIENCES
DIVISION OF ENVIRONMENTAL AND LIFE SCIENCES
MACQUARIE UNIVERSITY

PLEASE NOTE THAT AN ADEQUATE PERFORMANCE IN ALL COMPONENTS OF A UNIT IS REQUIRED IN ORDER TO PASS.

EXAMINATIONS

Students are directed to consult the "University Handbook" at the beginning of the year to determine the commencement and finishing dates of both University examination periods in order to ensure their availability to attend compulsory examinations. Failure to attend an examination can only be explained within the definition of 'unavoidable disruption' which can be found in the "University Handbook".

Useful information is available at: <http://www.student.mq.edu.au/>

SPECIAL CONSIDERATION REQUESTS

During Semester:

All requests for special consideration should be submitted through the Student Enquiry Service, Registrar and Vice-Principal's Office. You must also provide your Lecturer with a copy of the documentation lodged at the Student Enquiry Service when submitting assignments. We strongly recommend that you see your Lecturer or Tutor on all such occasions to discuss the matter with her/him.

During Examination Period:

During the examination period, original requests for special consideration plus one copy must be submitted to the Registrar and Vice-Principal, through the Academic Program Section, Level 4, Lincoln Building. The copy will be forwarded to your Division of Registration which will in turn forward it to the Department. Full details, and forms, are available at <http://www.reg.mq.edu.au/Forms/APSCons.pdf>. As well as submitting the appropriate documentation through the Registrar and Vice-Principal's Office, if you miss an examination, YOU MUST CONTACT YOUR LECTURER WITHIN 72 HOURS OF THE DATE OF THE EXAMINATION so that alternative examination arrangements may be made without delay. Failure to do so will result in the award of an "F" grade.

Please note that the submission of requests for special consideration is monitored by the Department. Repeated requests will result in referral of the student to the Dean of Students for discussion and advice.

Important information, including Undergraduate Student Forms and deadlines for submission, is available at: <http://www.student.mq.edu.au/>

PLAGIARISM

The definition of plagiarism is reproduced here. ALL (ie internal and external) students are requested to read the definition. If you are still unsure about this issue, please see your Lecturer for further advice. When submitting an assignment, you will be signing a statement confirming that you have read the information on plagiarism. In the event that a Lecturer identifies a case of plagiarism, the University's procedures for suspected cases of plagiarism will be followed by the Department. These procedures are available for perusal at: <http://www.student.mq.edu.au/plagiarism/>

IF YOU HAVE ANY QUERIES RELATING TO THESE ISSUES, PLEASE CONTACT YOUR LECTURER OR THE HEAD OF DEPARTMENT OF BIOLOGICAL SCIENCES.

PLAGIARISM

Academic Senate in June 2001 approved policies and procedures to ensure that the University takes a consistent and equitable approach to plagiarism. The Senate adopted the following definition of plagiarism.

Plagiarism involves using the work of another person and presenting it as one's own. Any of the following acts constitutes plagiarism unless the source of each quotation or piece of borrowed material is clearly acknowledged:
copying out part(s) of any document or audio-visual material (including computer-based material);
using or extracting another person's concepts, experimental results, or conclusions;
summarising another person's work;
in an assignment where there was collaborative preparatory work, submitting substantially the same final version of any material as another student.

Encouraging or assisting another person to commit plagiarism is a form of improper collusion and may attract the same penalties which apply to plagiarism.

Senate also approved a statement entitled *The Dangers of Plagiarism and How to Avoid it* which is as follows:
The integrity of learning and scholarship depends on a code of conduct governing good practice and acceptable academic behaviour. One of the most important elements of good practice involves acknowledging carefully the people whose ideas we have used, borrowed, or developed. All students and scholars are bound by these rules because all scholarly work depends in one way or another on the work of others.

Therefore, there is nothing wrong in a student using the work of others as a basis for their own work, nor is it evidence of inadequacy on the student's part, provided they do not attempt to pass off someone else's work as their own.

To maintain good academic practice, so that a student may be given credit for their own efforts, and so that their own contribution can be properly appreciated and evaluated, they should acknowledge their sources and they should **ALWAYS:**

state clearly in the appropriate form where they found the material on which they have based their work, using the system of reference specified by the Division in which their assignment was set;
acknowledge the people whose concepts, experiments, or results they have extracted, developed, or summarised, even if they put these ideas into their own words;
avoid excessive copying of passages by another author, even where the source is acknowledged. Find another form of words to show that the student has thought about the material and understood it, but stating clearly where they found the ideas.

If a student uses the work of another person without clearly stating or acknowledging their source, the result is falsely claiming that material as their own work and committing an act of **PLAGIARISM**. This is a very serious violation of good practice and an offence for which a student will be penalised.

A STUDENT WILL BE GUILTY OF PLAGIARISM if they do any of the following in an assignment, or in any piece of work which is to be assessed, without clearly acknowledging their source(s) for each quotation or piece of borrowed material:

copy out part(s) of any document or audio-visual material, including computer-based material;
use or extract someone else's concepts or experimental results or conclusions, even if they put them in their words;
copy out or take ideas from the work of another student, even if they put the borrowed material in their own words;
submit substantially the same final version of any material as a fellow student. On occasions, a student may be encouraged to prepare their work with someone else, but the final form of the assignment must be their own independent endeavour.

Opportunities and temptations for plagiarism have increased with the spread of internet access. Plagiarism is a serious threat to the teaching and accreditation process, and seriously undermines the collegial and ethical principles which underpin the work of a University.

A full outline of the revised University Policy on Plagiarism can be found on the official Student @ Macquarie website at <http://www.student.mq.edu.au/plagiarism/>. The website includes a general discussion of plagiarism, definitions, examples drawn from concrete cases, procedures that will be followed by the University in cases of plagiarism, and recommended penalties. Students are expected to familiarise themselves with the website.
(*Macquarie University Handbook of Undergraduate Studies 2005, pp 44-45*)

Assignments are to be your own work. Using someone else's words (either another student's or from a book or journal article or a web site) without clear acknowledgement is **plagiarism** and can incur serious penalties. If it is ever necessary to use someone else's words for a phrase or sentence, they should be placed in quotation marks and acknowledged at the end of the sentence. If you use or modify a diagram or figure from another author, that must be acknowledged underneath (e.g. Figure 3 from Brown *et al*, 1995; figure modified from Green, 1997). Lecturers want to read your own words and ideas.

In the event that a Lecturer identifies a case of plagiarism, the University's procedures for suspected cases of plagiarism will be followed. These procedures are available for perusal at:

<http://www.student.mq.edu.au/plagiarism/>