

UNIVERSITY OF WOLLONGONG  
**School of Mathematics and Applied Statistics**

[www.math.uow.edu.au](http://www.math.uow.edu.au)

*Information Sheet for*

**STAT902 Advanced Data Analysis**

Autumn Session, 2007

Wollongong Campus

This information sheet must be read in conjunction with the general information on educational issues and student matters provided in the document Policies and Services of the University, Faculty and School published by the School of Mathematics and Applied Statistics. A copy may be obtained from the subject coordinator or at

<http://www.math.uow.edu.au/current/generic.html>.

**Subject Coordinator and Lecturer:**

Professor Matt Wand

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Phone: (02) 4221 3556

Consultation: 2-3pm Thursday

**Assumed Knowledge**

Statistical distribution theory; Maximum likelihood estimation; Fundamentals of statistical inference; Linear regression; Basic matrix algebra.

**Subject Prerequisites**

STAT231, STAT232, MATH201, MATH203

**Overview of Subject Content**

Advanced data analysis via contemporary statistical models and software. Models include generalised linear models, linear mixed models and generalised additive models. The R and BUGS computing environments will be used for analysis of a wide array of data sets. Principles and theory of underlying the methodology will be covered.

**Tentative Lecture Schedule**

- Week 1. Introduction; Review of matrix results.
- Week 2. Review of distribution theory and likelihood theory.  
Introduction to vector calculus.
- Week 3. The R computing environment;  
Generalised linear models - examples and computing.
- Week 4. Generalised linear models - theory.
- Week 5. Best prediction - theory and applications.
- Week 6. Longitudinal data; random effects models;  
variance components - examples and computing.

- Week 7. Linear mixed models - theory.
- Week 8. Bayesian linear mixed models;  
Introduction to the BUGS computing environment.
- Week 9. Generalised linear mixed models (GLMM)  
– examples and computing in R and BUGS.
- Week 10. Generalised linear mixed models - theory.
- Week 11. Introduction to mixed model-based splines.
- Week 12. Generalised additive models (GAM) - examples and computing.
- Week 13. Generalised additive mixed models. Introduction to spatial statistics.

## References

There is no assigned text for this subject. Reference books are:

McCulloch, C.E. & Searle, S.R. (2001). *Generalized, Linear, and Mixed Models*, New York: Wiley.

Ruppert, D., Wand, M.P. & Carroll, R.J. (2003). *Semiparametric Regression*, New York: Cambridge University Press.

You are not required to purchase reference books. Copies of these books are available in the Library. These readings are recommended only and are not intended to be an exhaustive list. You are encouraged to use the Library catalogue and databases to locate additional readings with similar titles and contents.

## Web Postings

STAT902 has a web site: <http://www.math.uow.edu.au/handouts/stat902.shtml>

Handouts will be posted at this site during the session. Most files will be in pdf format for downloading. You should visit this site on a regular basis.

## Subject Learning Outcomes

After successful completion of this subject, students should be able to:

- (1) Have a thorough understanding of the roles of estimation and prediction in advanced data analysis.
- (2) Formulate regression models for analysis of a complicated data set. Complications may include data with repeated measures or a categorical response variable. Models include generalised linear models and mixed models.
- (3) Fit such models and perform subsequent analyses and diagnostics using the computer packages R and BUGS.
- (4) Derive expressions used for fitting and inference in generalised linear and mixed models.
- (5) Write independent code in the R language.

## Lectures

Lectures for MATH902 are

Tuesday, 10:30–12:30 in Room 15.113

You are required to attend all lectures in STAT902. Attendance will be monitored by a roll-call at the beginning of each lecture. Experience has shown that poor attendance at lectures leads to poor performance in this subject.

## Assessment

Your final mark in STAT902 will be determined as follows:

Assignments	30%
Final Exam	70%

Scaling of marks is not a standard procedure in this subject.

Note that you are not required to pass each individual component to receive a Pass grade in STAT902. However, you would seriously jeopardise your chances of passing this subject if you do not aim to be successful in every component of the assessment.

## Calculators

Please note that single-line-display calculators are permitted in examinations for this subject. They must not have alphanumeric keyboards (or capabilities) and they must not be programmable in any way. If you are not sure whether your calculator is acceptable, have it checked well before any exam.

## Final Examination

The final examination in STAT902 will be as follows:

Duration:	3 hours and 15 minutes
Value:	30% of final mark.

The examination will be held during the examination period in June 2007, at a time to be advised by the University. As a student enrolled in the University of Wollongong, you are required to be available for the entire examination period in June 2007.

## Assignments

Each week you will be given an assignment. It must be handed in at class in the following week. Assignments will be marked during the ensuing week and returned with solutions one week after submission in class. The eleven assignments will contribute a total of 30% towards your final mark in STAT902.

- Each assignment will be graded and returned to you in the following week.
- You must show working for each question on the assignment.
- Untidy or illegible work will not be assessed.
- Assignments will not be accepted outside classes or after the due date – unless you are successful in applying for special consideration (see later).
- Assignments must be submitted with the assignment cover sheet provided and you should make sure your receipt is initialed.
- Faxed or emailed assignments will not be accepted. You must submit your assignment in person.
- Extensions for assignments will not be granted.
- Late assignments will be penalised at a rate of 10% per day, not including weekends and public holidays.

Every assignment submitted will contribute towards your final assessment. However, the primary purpose of each assignment is to give you feedback on your progress and understanding of the work.

If you wish to seek special consideration for a late assignment (because you missed a lecture), you must apply for special consideration via SOLS, submit your documentation to the University Administration and then you should obtain a Special Consideration Form from the School Admin Assistant (Room 15.110). Submit the assignment with the completed form to the Admin Assistant as early as possible. In any case, assignments submitted more than 7 days after the original due date will not be accepted and other arrangements may be necessary. In this instance, contact the subject coordinator immediately.

### **Notification of Alterations**

If any alterations occur in the lecture times, assignment content or assignment due dates then you will be notified by e-mail. The lecturer will obtain your e-mail address for such notification in the first lecture.

### **Cheating and Plagiarism**

The University does not tolerate cheating nor plagiarism and regards them very seriously. For more information, see the document Policies and Services of the University, Faculty and School and the section in the University Undergraduate Handbook entitled Acknowledgement Practice/Plagiarism, or visit

<http://www.uow.edu.au/handbook/courserules/plagiarism.html>

### **Consultation**

If you are having any difficulties with STAT902, you are encouraged to seek advice from the lecturer. If you cannot come at the listed consultation time, contact the subject coordinator to arrange an appointment at a mutually convenient time.

<p>If you are having any difficulty with STAT902, you should seek advice before it is too late.</p>
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