



UNSW SCIENCE
School of Maths and Statistics

Course outline

**MATH3821 Statistical Modelling and
Computing**

Term 2, 2021

Staff

Position	Name	Email	Room
Lecturer-in-charge	Associate Professor Yanan Fan	y.fan@unsw.edu.au	RC-2055

Please refer to your Timetable on MyUNSW for your Lecture Tut, Lab enrolment days and times. All lectures are online, participation and attendance expected. Recordings will be made available.

Each week there will be two hours of tutorial/lab time, attendance will be recorded. There are both online and face to face options. Students are expected to bring their own laptops with R installed to face to face classes. Recordings will be made available of the online sessions. Students are expected to have a basic knowledge of the R program.

MATH3821: <http://timetable.unsw.edu.au/2021/MATH3821.html>

Administrative Contacts

Please visit the School of Mathematics and Statistics website for a range of information on School Policies, Forms and Help for Students.

For information on Courses, please go to “Current Students” and either Undergraduate and/or Postgraduate”, Course Homepage” for information on all course offerings,

The “Student Notice Board” can be located by going to the “Current Students” page; Notices are posted regularly for your information here. Please familiarise yourself with the information found in these locations. The School web page is: <https://www.maths.unsw.edu.au>

If you cannot find the answer to your queries on the web you are welcome to contact the Student Services Office directly by phone.

By email Undergraduate ug.mathsstats@unsw.edu.au

By phone: 9385 7053

Should we need to contact you, we will use your official UNSW email address of in the first instance. **It is your responsibility to regularly check your university email account. Please state your student number in all emails.**

Course Aims

The aim of MATH3821 is that at the end of session students should understand the concepts and techniques involved in the syllabus and be able to apply those concepts and techniques to the solution of appropriate problems. The R package will allow them to solve problems computationally.

Course Description

Introduction to flexible and modern approaches to statistical modelling and statistical computing. Theory, applications and computation for linear models, generalised linear models, the Bayesian linear model, nonparametric regression using kernel smoothers and smoothing splines, nonparametric density estimation and bandwidth selection. Applications of simulation in statistical inference including Monte Carlo simulation, bootstrap methods, and Markov chain Monte Carlo. Statistical packages include R.

Assessment and Deadlines

Assessment	Week	Weighting %	Due date if applicable
Tutorial		5%	
Assignment 1		10%	
Assignment 2		10%	
Midsession test	Week 7 (Thursday 11-12pm)	20%	
Final exam		55%	
	Total	100%	

Note:

Tutors are expected to enter assessment task marks onto the computer within a fortnight of the due date of the assessment. It is your responsibility to check that these marks are correct. If there is an error, speak to your tutor as soon as possible.

Late Submission of Assessment Tasks

No late submissions will be accepted. (Where "late" in this context means after any extensions granted for Special Consideration or Equitable Learning Provisions.)

Course Schedule

The course will include material taken from some of the following topics. This is should only serve as a guide as it is not an extensive list of the material to be covered and the timings are approximate. The course content is ultimately defined by the material covered in lectures.

Weeks	Topic	Reading (if applicable)
1	Revision of Linear Models and R	Lecture notes
2	Binomial regression	Lecture notes
3	Generalised linear models	Lecture notes
4	Nonparametric regression	Lecture notes
5	Nonparametric regression	Lecture notes
7	Density estimation	Lecture notes
8	Bayesian linear models	Lecture notes
9	Monte Carlo Methods	Lecture notes
10	Monte Carlo Methods	Lecture notes

Textbooks

Notes are available electronically via Moodle. Supplementary reading for the course can be found in the following.

- W.N. Venables and B.D. Ripley (1999), *Modern Applied Statistics with S-PLUS (Third Edition)*, Wiley.
- T.J. Hastie and R.J. Tibshirani (1990), *Generalized Additive Models*, Chapman and Hall.
- T.J. Hastie and R.J. Tibshirani and J. Friedman (2001), *The Elements of Statistical Learning: Data mining, inference and prediction*, Springer.
- D. Ruppert, M.P. Wand and R.J. Carroll (2003), *Semiparametric Regression*, Cambridge University Press.
- Chris J. Lloyd (1999), *Statistical Analysis of Categorical Data*, Wiley.
- P.J. Green and B.W. Silverman (1994), *Nonparametric Regression and Generalized Linear Model*, Chapman and Hall.
- Annette J. Dobson (1990), *An Introduction to Generalized Linear Models*, Chapman and Hall.
- Andrew Gelman, J.B. Carlin, H.S. Stern and D.B. Rubin (2004), *Bayesian Data Analysis*, Chapman and Hall.

Course Learning Outcomes (CLO)

- State definitions as specified in the syllabus;

- Demonstrate working knowledge of appropriate theorems;
- Apply the concepts and techniques of the syllabus to solve appropriate problems;
- Use specific and general results given specified assumptions;
- Use terminology and reporting styles appropriately and successfully to communicate information and understanding.

Teaching strategy

MATH3821 is taught through carefully planned lectures that logically develop the concepts and techniques specified in the course. Examples are emphasised as they provide the underlying motivation for the course, and because students best understand the general theory when it is developed from simple, and then more complex examples.

Small group tutorials allow students to apply the material introduced in the lectures. These tutorials provide the opportunity for individual assistance. Students are expected to print out and bring their tutorial exercises and are expected to work conscientiously at the exercises in the tutorials. Students are encouraged to give constructive feedback during the teaching session. They are encouraged to work collaboratively with other students to develop their understanding and their problem solving skills.

Students are strongly advised to take note of the detailed syllabus and notes provided in lectures and tutorials. Active participation in the tutorials are strongly encouraged. The level of depth of understanding required in this course is best understood by considering the examples given in lectures, exercises in tutorials, assignments and midsession tests (if applicable).

Moodle

Log in to Moodle to find announcements, general information, notes, lecture slide, classroom tutorial and assessments etc.

<https://moodle.telt.unsw.edu.au>

School and UNSW Policies

The School of Mathematics and Statistics has adopted a number of policies relating to enrolment, attendance, assessment, plagiarism, cheating, special consideration etc. These are in addition to the Policies of The University of New South Wales. Individual courses may also adopt other policies in addition to or replacing some of the School ones. These will be clearly notified in the Course Initial Handout and on the Course Home Pages on the Maths Stats web site.

Students in courses run by the School of Mathematics and Statistics should be aware of the School and Course policies by reading the appropriate pages on the Maths Stats web site starting at:

<https://www.maths.unsw.edu.au/currentstudents/assessment-policies>

The School of Mathematics and Statistics will assume that all its students have read and understood the School policies on the above pages and any individual course policies on the Course Initial Handout and Course Home Page. Lack of knowledge about a policy will not be an excuse for failing to follow the procedure in it.

Academic Integrity and Plagiarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW staff and students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.*

The **UNSW Student Code** provides a framework for the standard of conduct expected of UNSW students with respect to their academic integrity and behaviour. It outlines the primary obligations of students and directs staff and students to the Code and related procedures.

In addition, it is important that students understand that it is not permissible to buy essay/writing services from third parties as the use of such services constitutes plagiarism because it involves using the words or ideas of others and passing them off as your own. Nor is it permissible to sell copies of lecture or tutorial notes as students do not own the rights to this intellectual property.

If a student breaches the Student Code with respect to academic integrity, the University may take disciplinary action under the **Student Misconduct Procedure**.

The UNSW Student Code and the Student Misconduct Procedure can be found at:

<https://student.unsw.edu.au/plagiarism>

An online Module "[Working with Academic Integrity](https://student.unsw.edu.au/aim)" (<https://student.unsw.edu.au/aim>) is a six-lesson interactive self-paced Moodle module exploring and explaining all of these terms and placing them into your learning context. It will be the best one-hour investment you've ever made.

Plagiarism

Plagiarism is presenting another person's work or ideas as your own. Plagiarism is a serious breach of ethics at UNSW and is not taken lightly. So how do you avoid it? A one-minute video for an overview of how you can avoid plagiarism can be found <https://student.unsw.edu.au/plagiarism>.

Additional Support

ELISE (Enabling Library and Information Skills for Everyone)

ELISE is designed to introduce new students to studying at UNSW.

Completing the ELISE tutorial and quiz will enable you to:

- analyse topics, plan responses and organise research for academic writing and other assessment tasks
- effectively and efficiently find appropriate information sources and evaluate relevance to your needs
- use and manage information effectively to accomplish a specific purpose
- better manage your time
- understand your rights and responsibilities as a student at UNSW
- be aware of plagiarism, copyright, UNSW Student Code of Conduct and Acceptable Use of UNSW ICT Resources Policy
- be aware of the standards of behaviour expected of everyone in the UNSW community
- locate services and information about UNSW and UNSW Library

Some of these areas will be familiar to you, others will be new. Gaining a solid understanding of all the related aspects of ELISE will help you make the most of your studies at UNSW.

The *ELISE* training webpages:

<https://subjectguides.library.unsw.edu.au/elise/aboutelise>

Equitable Learning Services (ELS)

If you suffer from a chronic or ongoing illness that has, or is likely to, put you at a serious disadvantage, then you should contact the Equitable Learning Services (previously known as SEADU) who provide confidential support and advice.

They assist students:

- living with disabilities
- with long- or short-term health concerns and/or mental health issues
- who are primary carers
- from low SES backgrounds
- of diverse genders, sexes and sexualities
- from refugee and refugee-like backgrounds
- from rural and remote backgrounds
- who are the first in their family to undertake a bachelor-level degree.

Their web site is: <https://student.unsw.edu.au/els/services>

Equitable Learning Services (ELS) may determine that your condition requires special arrangements for assessment tasks. Once the School has been notified of these, we will make every effort to meet the arrangements specified by ELS.

Additionally, if you have suffered significant misadventure that affects your ability to complete the course, please contact your Lecturer-in-charge in the first instance.

Academic Skills Support and the Learning Centre

The Learning Centre offers academic support programs to all students at UNSW Australia. We assist students to develop approaches to learning that will enable them to succeed in their academic study. For further information on these programs please go to:

<http://www.lc.unsw.edu.au/services-programs>

Applications for Special Consideration for Missed Assessment

Please adhere to the Special Consideration Policy and Procedures provided on the web page below when applying for special consideration.

<https://student.unsw.edu.au/special-consideration>

Please note that the application is not considered by the Course Authority, it is considered by a centralised team of staff at the Nucleus Student Hub.

The School will contact you (via student email account) after special consideration has been granted to reschedule your missed assessment, for a *lab test or paper-based test* only.

For applications for special consideration for *assignment extensions*, please note that the new submission date and/or outcome will be communicated through the special consideration web site only, no communication will be received from the School.

For Dates on Final Term Exams and Supplementary Exams please check the “Key Dates for Exams” ahead of time to avoid booking holidays or work obligations.

<https://student.unsw.edu.au/exam-dates>

If you believe your application for Special Consideration has not been processed, you should email specialconsideration@unsw.edu.au immediately for advice.

Course Evaluation and Development (MyExperience)

Student feedback is very important to continual course improvement. This is demonstrated within the School of Mathematics and Statistics by the implementation of the UNSW online student

survey *myExperience*, which allows students to evaluate their learning experiences in an anonymous way. *myExperience* survey reports are produced for each survey. They are released to staff after all student assessment results are finalised and released to students. Course convenor will use the feedback to make ongoing improvements to the course.