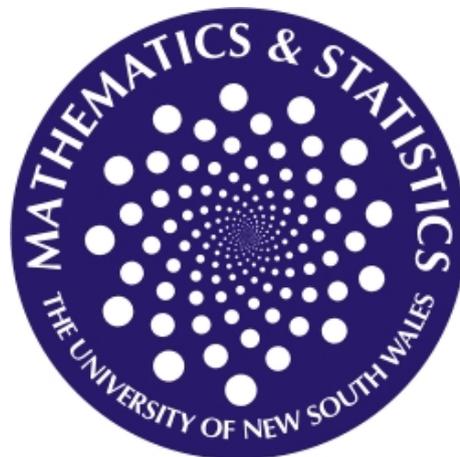**FACULTY OF SCIENCE**

SCHOOL OF MATHEMATICS AND STATISTICS

MATH3841

STATISTICAL ANALYSIS OF DEPENDENT DATA

Session 2, 2018

MATH3841 – Course Outline

Information about the course

Course Authority and Lecturer: Dr. Boris Beranger RC-4103,
                                   `b.beranger@unsw.edu.au`

Consultation: Tuesday 2pm.

Credit: This course counts for 6 Units of Credit (6UOC).

Prerequisites: Math3811 or Math3911 is assumed knowledge for this course.

Lectures: Monday 3pm & 4pm (Mathews 308), Wednesday 2pm (Mathews 309)

Tutorials: Wednesday 3pm (Mathews 309). Tutorials commence in Week 2 and conclude in Week 13.

Course Material: Further information, lecture notes, assignments and other learning material will be provided via Moodle.

Course aims

This course aims to extend the student's understanding of statistical modelling, predominantly based on independently distributed data, to these important practical examples where dependence is required in the models. The first half of the subject covers the multivariate normal distribution and the marginal and conditional distributions derived from it as well as various important properties concerning optimal prediction. The multivariate normal distribution is central to the practising statistician's understanding of dependence between measurements within subjects, across time or space. The second half of the course builds on the basic properties of the multivariate normal distribution by applying the results to a series of examples drawn from time series and spatial processes.

Relation to other Mathematics/Statistics courses

This course provides a theoretical foundation in multivariate statistics, and area which many other courses will build on. It is an elective in the Statistics major.

Student Learning Outcomes

In attending this course students will

1. extend their statistical knowledge gained in previous courses to the more realistic multivariate, dependent setting, and understand how the presented results are developed and implemented in practice;

2. appreciate how the ideas of modelling dependence are generic, and how they may be implemented in particular instances (multivariate, temporal and spatial);

3. gain practical experience in analysing temporally and spatially dependent data.

Relation to graduate attributes

The above outcomes are related to the development of the Science Faculty Graduate Attributes, in particular: 1.**Research, inquiry and analytical thinking abilities**, 2. **Capability and motivation for intellectual development** and 3. **Communication**.

Teaching strategies underpinning the course

The lectures are focused and compact presentations. The different methods are illustrated by relevant examples. Open class discussion is encouraged during the lectures.

Students will give short presentations on specific problems prepared for the weekly tutorial.

Rationale for learning and teaching strategies

We believe that effective learning is best supported by a climate of enquiry, in which students are actively engaged in the learning process. To ensure effective learning, students should participate in class as outlined below.

We believe that effective learning is achieved when students attend all classes, have prepared effectively for classes by reading through previous lecture notes, in the case of lectures, and, in the case of tutorials, by having made a serious attempt at doing for themselves the tutorial problems prior to the tutorials.

Furthermore, lectures should be viewed by the student as an opportunity to learn, rather than just copy down lecture notes.

Effective learning is achieved when students have a genuine interest in the subject and make a serious effort to master the basic material.

The art of logically setting out mathematics is best learned by watching an expert and paying particular attention to detail. This skill is best learned by regularly attending classes.

Assessment

Assessment	Weight	Date
Final Exam	60%	
Midsession Test	15%	Week 7 (Tutorial time)
Assignment 1	10%	Due in tutorial week 5. Available in Week 3.
Assignment 2	10%	Due in tutorial week 12. Available in Week 9.
Tutorial Presentations	5 %	Throughout semester (see individual allocations on Moodle).

Knowledge and abilities assessed: All assessment tasks will assess the learning outcomes outlined above.

Assessment criteria: The main criteria for marking all assessment tasks will be clear and logical presentation of correct solutions.

Assignments

Rationale: Assignments will give an opportunity for students to try their hand at more difficult problems requiring more than one line of argument and also introduce them to aspects of the subject which are not explicitly covered in lectures.

Assignments must be YOUR OWN WORK – if not marks will not be awarded for any components which are clearly not your own or which appear on someone else's submission.

You should consult the University web page on plagiarism.

<div align="center">www.lc.unsw.edu.au/plagiarism</div>

Late assignments will not be accepted.

Mid-Session Test

Rationale: This 50 minutetest will give students feedback on their progress and mastery of the material. The test will cover the lecture material on multivariate analysis covered in weeks 1 through 6. If you are absent from the test, you must provide a medical certificate.

There will be no repeat test.

Examination

Duration: Two (2) hours.

Rationale: The final examination will assess student mastery of the material covered in the lectures.

Weighting: 60% of your final mark.

You will be able to view your final exam timetable once Exams Central has finalised the timetable. Please visit the web page: https://student.unsw.edu.au/exam-timetable for details.

If you are unwell / miss your final examination, please refer to the Special Consideration Policy by visiting the website: https://student.unsw.edu.au/special-consideration.

Students with a **final mark in the range of 45-49** will be permitted to take the Additional Assessment Exam as a Concessional Additional Assessment (AA). There will be no notification to the individual student of the right to take the Concessional AA, but the details of the courses AA exam schedule will be provided on the School's website Notice Board, after the Provisional Results are published (normally 1 week after the exam period ends). The Additional Assessment exam for MATH3841 will be held within the period from 8 to 15 December 2018 (date TBA).

Tutorial Presentations

Rationale: Students will be required to present outline solutions to specific tutorial questions during tutorials. This will develop mental, logical coherence and communication skills. A question allocation for each student will be posted on Moodle.

As there are many opportunities to present tutorial solutions throughout the course, failure to present sufficient numbers of solutions in tutorials (according to the timetable) will result in marks being lost.

Additional resources and support

Lecture notes

Lecture notes will be provided on Moodle. Detailed derivations of key results and solutions to examples will be presented in lectures - it is important that you take additional notes on derivations and examples to augment the published notes.

Text and Reference Books

The content of this course is drawn from a number of text books in order that you might use these for more detailed reading than is provided in the Lecture Notes. These sources are as follows:

1. Johnson, R. A. and D. W. Wichern (1998). Applied Multivariate Statistical Analysis.

2. Brockwell, P. J. and R. A. Davis (2002). Introduction to Time Series and Forecasting.

3. Schabenberger, O. and C. A. Gotway (2005). Statistical Methods for Spatial Data Analysis.

Moodle

Course materials will be available on Moodle. You should check regularly for new materials.

Course schedule

- **Weeks 1-5:** Introduces the ideas of modelling dependence between multivariate samples. Results are developed that permit hypothesis tests and confidence intervals in the multivariate setting in analogy to the already familiar univariate context.

- **Weeks 6-10:** Introduction to dependence in a temporal setting. We look at removing seasonal and trend components to obtain stationary series, various types of stationary models up to ARMA models, parameter estimation and model selection, and methods and algorithms for forecasting.

- **Weeks 11-12:** Extension of dependence ideas to the spatial domain.

Course Evaluation and Development

The School of Mathematics and Statistics evaluates each course each time it is run. We carefully consider the student responses and their implications for course development. It is common practice to discuss informally with students how the course and their mastery of it are progressing.

Administrative matters

School Rules and Regulations

Fuller details of the general rules regarding attendence, release of marks, special consideration etc are available via the School of Mathematics and Statistics Web page at `http://www.maths.unsw.edu.au/currentstudents/assessment-policies`. See also the School rules for 'Additional Assessment'.

Plagiarism and academic honesty

Plagiarism is the presentation of the thoughts or work of another as one's own. Issues you must be aware of regarding plagiarism and the university's policies on academic honesty and plagiarism can be found at `https://student.unsw.edu.au/plagiarism`.