



**UNSW**  
SYDNEY

**Faculty of Science  
School of Mathematics & Statistics**

**MATH2859  
PROBABILITY, STATISTICS  
AND  
INFORMATION**

**Semester 2, 2017**

## MATH2859 - Probability, Statistics and Information (3 UOC)

Prerequisite: MATH1231 or MATH1241 (or, in program 3648 or 3651 or 3652 or 3653 or 3749 or 3982, MATH1131 or MATH1141);

Exclusion: : MATH2099, BEES2041, BIOS2041, MATH2089, MATH2801, MATH2841, MATH2901.

### Course staff

Lecturer: A/Prof Jake Olivier (RC-2051), phone 9385 6656, email [j.olivier@unsw.edu.au](mailto:j.olivier@unsw.edu.au)

You will also be assigned a tutor for tutorials/laboratories, who should be **your first point of contact** for any questions about the course.

### Lectures

From Week 1 through to Week 12:

Monday 10-12 Physics Theatre
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### Tutorials and Laboratory classes

These are held at a variety of times and locations as indicated on your timetable through myUNSW. Students are expected to attend tutorials/laboratory classes, and rolls will be kept.

They start in **Week 1** with an introduction to Matlab. The computer labs run weeks 2, 4, 6 and 8, and the classroom tutorials in weeks 3, 5, 7, 9, 11, 12, and 13.

The computer labs are all held in the School of Mathematics and Statistics' computer laboratories (ground floor, RC-G012) in the Red Centre. Because of the block lab test in Week 10, your regular Statistics computer laboratory will **not be held that week**.

**Before the start of the session**, you should make sure you can logon to the computers in the laboratories using your **zID** and **zPass**. You can activate or unlock your zPass using the UNSW Identity Manager. If you are having difficulties please go to the Computing Centre helpdesk on the mezzanine level of the Red Centre. **You must have set your password and be able to login to the Mathematics & Statistics computer laboratories BEFORE the first lab in Week 1.**

You are advised to start, as soon as possible, the preliminary online Matlab Quizzes which are available through Maple TA from the UNSW Moodle course website. This is designed to get you started using Matlab, and they form part of your assessment (see below).

### Course Web Site

The MATH2859 course web site will be made available through the Moodle web portal:

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

You should check the course web site regularly for new and updated information.

### **Announcements**

Announcements may be made in lectures or through the course web site.

### **Course description**

This course gives an introduction to statistical methods essential in a wide range of engineering disciplines. This includes:

Exploratory data analysis; Probability and distribution theory including the Binomial, Poisson, Exponential and Normal distributions; Large sample theory including the Central Limit Theorem; Elements of statistical inference including estimation, confidence intervals and hypothesis testing; One sample and two-sample  $t$ -tests; Linear regression and analysis of variance.

Applications drawn from a variety of engineering disciplines will be illustrated.

Many statistical problems require the use of a computer software package. In this course, students are required to become familiar with **Matlab**. Matlab will be used extensively in this course.

### **Expected Learning Outcomes**

MATH2859 will enable you to understand the various ways in which random variation arises in engineering contexts and to develop facility at:

- applying various graphical and data analysis methods for summarising and understanding data;
- applying various statistical models and methods for drawing conclusions and making decisions under uncertainty in engineering contexts; and,
- using Matlab for graphical and statistical analysis.

We believe that effective learning is best supported by a climate of inquiry, in which students are actively engaged in the learning process. Hence, this course is structured with a strong emphasis on problem-solving tasks in lectures, in tutorials and laboratories, and in assessment tasks. Students are expected to devote the majority of their class and study time to the solving of such tasks.

New ideas and skills are first introduced and demonstrated in lectures, and then students develop these skills by applying them to specific tasks in tutorials and assessments. Computing skills are developed and practised in regular computer laboratory sessions.

This course has a major focus on research, inquiry and analytical thinking as well as information literacy. We will also explore capacity and motivation for intellectual development through the solution of both simple and complex mathematical models of problems arising in engineering, and the interpretation and communication of the results.

### Course Evaluation and Development

Feedback on the course is gathered, using among other means, UNSW's Course and Teaching Evaluation and Improvement (CATEI) Process. Student feedback is taken seriously, and continual improvements are made to the course based in part on such feedback. Past comments have highlighted the critical importance of gaining competence in Matlab as early as possible.

### Assessments

Besides the final exam, there are **two tests** during the session – a mid-session test during the tutorial in Week 7, and a lab test in Week 10. There will also be introductory Matlab quizzes which are due to be completed by the end of Week 2 and then three online statistics quizzes due in at the end of Weeks 5, 9 and 12.

Assessment	Details	Weighting	Date
Introductory Matlab quizzes	Available via Maple TA from Moodle web page. Start as early as possible from Week 1. Must be completed by the end of Week 2	4%	Before 4pm Friday 4 August
Statistics on-line quizzes	3 quizzes over the semester, available via Maple TA from Moodle web page, each worth 2%	6%	Before 1) 4pm Friday 25 August, 2) 4pm Friday 22 September and 3) 4pm Friday 20 October
Mid-session test	Test administered during Week 7 tutorials. You must sit the test in the tutorial in which you are enrolled	15%	Week 7 tutorial
Matlab computer Test	Lab test held in blocks in computer laboratory, arrange a time to do it at your convenience (after mid-session break)	15%	Week 10
Final Examination	1.5 hours	60%	Exam period (November)
Total		100%	

Note that **students must sit the test in Week 7 in the tutorial in which they are enrolled** unless they have prior written approval from the lecturer. Students who are unable to attend the test must give a medical certificate to the lecturer. **There will be no**

### **opportunity to resit a test.**

The Matlab part of MATH2859 is assessed in the following ways:

- Introductory Matlab quizzes, to get you started with the basics of Matlab.
- Laboratory test in Week 10.

The introductory Matlab quizzes will be administered through UNSW Moodle and Maple TA. They are due by the end of Week 2. You are allowed as many attempts as you want. Your best mark will count.

You will be required to arrange a time to do your lab test through the School of Mathematics and Statistics' 'Student Web Portal', to which there will be a link on Moodle. Further details of the Matlab test will be made available on Moodle and in lectures closer to the time. Students are advised to arrange the time for the Matlab test as soon as possible as there are limited places available at each time.

Students who are unable to attend the test at the time at which they have booked due to illness must give a medical certificate to the lecturer. **There will be no opportunity to resit a test.**

The **statistics online quizzes** over the semester will be administered through UNSW Moodle and Maple TA. Here are some guidelines you should follow when taking each quiz:

- You are allowed a maximum of **3 attempts**. Your best mark will count.
- Once you begin an attempt at a quiz, you have a fixed time to finish that attempt.
- You should only start an attempt at a quiz if you plan to finish it in that sitting. Be careful starting a quiz in The Red Centre computer labs. You will be kicked out if a tutorial has already booked the lab regardless if you have finished the quiz or not.
- Once you answer a question, select *Save your answer*. You will still be allowed to modify your response. Selecting *Finish* submits your responses to Maple TA which cannot be changed.
- Do not close Maple TA or your web browser during a quiz. You will not be able to continue that attempt the next time you login.
- It is expected that you work on each quiz alone.

### **Rationale for assessment**

The class tests will give students an opportunity to get feedback on their progress and mastery of the material during the session. Details of the material to be assessed in the tests

will be clarified in the couple of weeks before each of the tests. The preliminary quizzes due at the end of Week 2 are designed to make sure students start using Matlab at the start of the course. The quizzes due at the end of Weeks 5, 9 and 12 are designed to give continuing feedback about understanding of new concepts developed in the course. The final exam will assess student mastery of the material covered in the lectures, tutorials and laboratory classes.

### **Recommended Text**

J. Devore and N. Farnum, Applied Statistics for Engineers and Scientists, 2nd Edition, Duxbury Press, Thomson Publishers. Available at UNSW bookshop and UNSW library. A student solutions manual also exists.

### **Additional readings**

Basically any text with “Statistics” and “Engineers” in its title could make it. A quite comprehensive reference is

D. Montgomery and G. Runger, Applied Statistics and Probability for Engineers, 5th Edition, 2011, Wiley (previous editions work as well).

### **Lecture slides**

Lecture slides in pdf format will be made available via the UNSW Moodle web site. **They are not a substitute for attendance at lectures.** In addition, laboratory and tutorial material will also be made available on this website.

### **Matlab software**

Matlab R2012a is available on the computers in the School of Mathematics and Statistics computer laboratories on the mezzanine level and ground floor of the Red Centre. A Matlab Student Version is also available through the UNSW bookshop for \$119. It will be useful not only in this course but also in other courses. At <http://www.bookshop.unsw.edu.au/computing> do a quick search for “Matlab student”.

Matlab references:

- School of Mathematics and Statistics, Introduction to Matlab, 2012, available through the course web site
- School of Mathematics and Statistics, Statistics using Matlabe (SUM), available through the course web site
- Gilat, A., Matlab: an introduction with applications, Wiley, New York, 2005
- Pratap, R., Getting started with Matlab 7, Oxford University Press, 2005
- Higham, D.J. and Higham, N.J., Matlab guide, SIAM Philadelphia, 2004

## Consultation

Your lecturer will have regular consultation times which will be advertised in lectures and on Moodle. There will also be additional regular consultation times advertised with other members of the statistics department. At these times you are welcome to just turn up! For other consultation times, please email your lecturer for an appointment.

## Peer Support in Statistics

There will be a peer support session through the Student Support scheme in the School of Mathematics and Statistics, where you can get help with statistics. Details will be announced in lectures and on Moodle.

## Syllabus and approximate schedule

Below is the intended course schedule. However, lectures may fall slightly behind or get slightly ahead of this timetable. Any variation from this will be indicated by the lecturer.

Week	Date	Topic	Text Reference
1	29/07/2015	Presentation and Introduction	1.1
2	05/08/2015	Descriptive Statistics	1.2, 1.3, 2.1, 2.2, 2.3
3	12/08/2015	Elements of Probability	5.1, 5.2, 5.3
4	19/08/2015	Random variables	5.4
5	26/08/2015	Special discrete and continuous probability distributions	1.5, 1.6
6	02/09/2015	The Normal distribution. Sampling distributions.	1.4, 5.5, 5.6
7	09/09/2015	Inferences concerning a mean (confidence intervals)	7.1, 7.2, 7.4
8	16/09/2015	Inferences concerning a mean (hypothesis tests)	8.1, 8.2
9	23/09/2015	Inferences concerning proportions, variances and differences in means.	7.3, 7.5, 8.3
Midsession break			
10	07/10/2015	Regression analysis (I)	11.1, 11.2, 11.3
11	14/10/2015	Regression analysis (II)	11.4, 11.5, 11.6
12	21/10/2015	Analysis of Variance	Chapter 9