THE UNIVERSITY OF SYDNEY
Semester 2, 2017

Information Sheet for **MATH1905 Statistics (Advanced)**

Websites: It is important that you check both the Junior Mathematics website and the MATH1905 website regularly.

Junior Mathematics webpage: `http://www.maths.usyd.edu.au/u/UG/JM/`
MATH1905 webpage: `http://www.maths.usyd.edu.au/u/UG/JM/MATH1905`

Both sites may be accessed through the Learning Management System (Blackboard):

`https://elearning.sydney.edu.au`.

Important announcements relating to Junior Mathematics are posted on the Junior Mathematics page. On the MATH1905 page you will find online resources and other useful links. Announcements regarding assessment tasks will be made on this page at various times throughout the semester.

Lectures:

Times	**Location**	**Lecturer**	**Office**
11am Mon 11am Tue	Wallace LT200 Quadrangle, General Lecture Theatre K2.05	Dr Michael Stewart	Carslaw 818

Lectures run for 13 weeks. The first lecture will be on Monday 31 July. The last lecture will be on Tuesday 31 October.

Consultation times: Consultation times will be posted on the MATH1905 webpage.

Tutorials: Tutorials (one per week) start in Week 2. You should attend the tutorial given on your personal timetable. Attendance at tutorials will be recorded. Your attendance will not be recorded unless you attend the tutorial in which you are enrolled.

Tutorial and exercise sheets: The question sheets for a given week will be available on the MATH1905 webpage. Solutions to tutorial exercises for week n will usually be posted on the web by the afternoon of the Friday of week n.

Reference books: M. C. Phipps and M. P. Quine. *A Primer of Statistics.* Prentice Hall, 2001.
L. Gonick and W. Smith. *The Cartoon Guide to Statistics.* Harper Collins, 1993.

Assessment: Your final raw mark for this unit of study will be calculated as follows:

70%: Exam at end of Semester 2.
10%: Quiz 1 mark (using the better mark principle).
10%: Quiz 2 mark (using the better mark principle).
5%: Assignment 1 mark.
5%: Assignment 2 mark.

The *better mark principle* means that for each quiz, the quiz counts if and only if it is better than or equal to your exam mark. If your quiz mark is less than your exam mark, the exam mark will be used for that portion of your assessment instead. For example, if your quiz 1 mark is better than your exam mark while your quiz 2 mark is worse than your exam mark, then the exam will count for 80%, quiz 1 will count for 10%, and the assignments will count for 10% of your overall mark. The assignment marks count for 10% regardless of whether they are better than your exam mark or not.

Final grades are returned within one of the following bands:

> **High Distinction (HD), 85–100:** representing complete or close to complete mastery of the material; **Distinction (D), 75–84:** representing excellence, but substantially less than complete mastery; **Credit (CR), 65–74:** representing a creditable performance that goes beyond routine knowledge and understanding, but less than excellence; **Pass (P), 50–64:** representing at least routine knowledge and understanding over a spectrum of topics and important ideas and concepts in the course.

A student with a passing or higher grade should be well prepared to undertake further studies in mathematics which are dependent on this unit of study.

Examination: There is one examination of 1.5 hours' duration during the examination period at the end of Semester 2. Further information about the exam will be made available at a later date on the website.

Quizzes: Quizzes will be held during tutorials. You must sit for the quiz during the tutorial in which you are enrolled, unless you have a Permission Slip from the Student Services Office, issued only for verifiable reasons. Otherwise, your quiz mark may not be recorded. Quizzes will only be returned in the tutorial you sat the quiz and must be collected by week 13.

Assignments: There are two assignments, which must be submitted electronically, **as PDF files only**, in Turnitin (an internet-based plagiarism-prevention service), via the Learning Management System (Blackboard) website by the deadline. Note that your assignment will not be marked if it is illegible or if it is submitted sideways or upside down. It is your responsibility to check that your assignment has been submitted correctly (check that you can view each page).

Assessment and feedback schedule:

Task	Available	Deadline/date	Latest extension*	Feedback
Assignment 1	Fri 11 Aug	5pm Mon 21 Aug	5pm Mon 28 Aug	9am Wed 30 Aug
Quiz 1		12–14 Sep (Week 7)		19–21 Sep (Week 8)
Assignment 2	Fri 15 Sep	5pm Tue 3 Oct	5pm Tue 10 Oct	9am Wed 11 Oct
Quiz 2		24–26 Oct (Week 12)		31 Oct–2 Nov (Week 13)

* Extensions for assignments are only possible for students registered with Disability Services or for approved Special Consideration or Special Arrangements applications.

Any questions? Before you contact us with any enquiry, please check the FAQ page:

`http://www.maths.usyd.edu.au/u/UG/JM/FAQ.html`.

Where to go for help: For administrative matters, go to the *Student Services Office, Carslaw 520*. For help with mathematics, see your lecturer, your tutor, or use the Ed discussion forum (`https://edstem.com.au`). Lecturers guarantee to be available during their indicated office hours, but may be available at other times as well. You may also email questions about the subject to `MATH1905@sydney.edu.au`. Ensure that any emails that you send to this address contain your name and SID, because anonymous emails will be ignored.

Special consideration and special arrangements: While studying at the University of Sydney, you may need to apply for special consideration or special arrangements as follows:

> Special consideration may be granted to students where well-attested illness, injury, or misadventure occurs to them (or someone they have carer's responsibility for) during the semester or the exam period. Special arrangements may be granted for essential community commitments. Further information on eligibility, document requirements, and how to apply is available at `http://sydney.edu.au/students/special-consideration-and-arrangements.html`. Applications must be made using the University's formal online application process.

Final examinations will be held in the formal examination period. Students affected by illness, injury or misadventure may lodge a request for Special Consideration to sit a replacement examination in the formal Replacement Examination period.

If you are registered with Disability Services and would like to have adjustments applied to the replacement examination, you are required to amend your Academic Plan with Disability Services specifically for this replacement examination. This needs to be done as soon as you are notified of award of the replacement opportunity. If you have not done so, you will be allowed to sit the replacement, but under unadjusted conditions.

You should *not* submit an application of either type

- if you are absent from a tutorial and there is no assessment associated with the missed tutorial, or
- if you miss a quiz, since the better mark principle applies.

The assessment category for the assignments is "Submitted Work".

If you are granted a "mark adjustment" for a quiz or an assignment, any marks obtained will not count and the weighting will be added to the examination weighting.

Objectives: This unit aims to:

- introduce techniques for summarising experimental univariate and bivariate data, such as that obtained in various branches of science, medicine, commerce etc, by means of elementary statistics and diagrams;
- introduce the statistical computing language R;
- use probability theory to provide a mathematical framework for real-life data modelling;
- introduce statistical inference and show how statistical tests can quantify evidence against a given scientific hypothesis.

Outcomes: Students who successfully complete this unit should be able to:

- explain univariate and bivariate data by means of the five number summary, mean, variance and standard deviation, correlation coefficient, boxplot, histogram and scatterplot;
- find the least squares regression line that best explains bivariate data when a linear relationship exists;
- use the statistical computing language R to analyse univariate and bivariate data;
- use the three axioms of probability to calculate the probabilities of simple events;
- understand the concept of a random variable and the meaning of the expected value and variance;
- apply the binomial, Poisson and geometric distributions as models for discrete data;
- use the concept of probability-generating functions to determine the mean and variance of discrete random variables;
- use the normal and exponential distributions as models for continuous data;
- understand the central limit theorem;
- understand the concept of hypotheses tests and p-values for quantifying evidence against simple null hypotheses; in particular using the binomial test for testing proportions, one- or two-sided Z-, t- or sign-test for making inferences about the population mean in one and two sample problems, and for assessing the significance of a linear regression model;
- understand the concept of a confidence interval;
- use the chi-squared test for a range of goodness-of-fit problems.

Proposed week-by-week outline:

1. **DATA ANALYSIS**

   - Week 1: Stem and Leaf Plots, Relative Frequencies and Probability. Histograms. 5-Figure Summaries, Boxplots. Introduction to R.
   - Week 2: Sample mean, sample variance. Bivariate data. Correlation. Least-squares regression. Numerical summaries and scatterplots using R.

2. **PROBABILITY**

   - Week 3: Axioms of probability. Venn diagrams. De Morgan's laws. Inclusion–exclusion principle. Counting principles. Permutations and combinations. Sampling without replacement. Bayes' rule. Independence.
   - Week 4: Integer-valued random variables. Expectation and variance. Binomial, Multinomial, Poisson, and Geometric distributions. Probability-generating functions.
   - Week 5: Continuous random variables. Expectation and variance. Standardised random variables, Normal random variables. Chebyshev's inequality.
   - Week 6: Independent random variables, sums of independent Normal random variables. Sampling distributions, Central limit theorem, normal approximation to binomial. Introduction to the t and χ^2 distributions.

3. **INFERENCE**

   - Week 7: Introduction to inference: estimation, hypothesis testing and confidence intervals. Inference concerning population means when population variances are known.
   - Week 8: Inference concerning normal population means when population variances are unknown: one sample, two paired samples, two independent samples.
   - Week 9: Inference in linear regression models with normal errors. Inference concerning multinomial probabilities. χ^2 goodness-of-fit tests.
   - Week 10: Labour Day public holiday (Monday 3 October). Tests of homogeneity and independence.
   - Week 11: Inference concerning binomial success probabilities. Sign Test.
   - Week 12: Binomial confidence intervals.
   - Week 13: Review. Past exam papers.