

**School of Engineering and Mathematical Sciences:** <http://www.latrobe.edu.au/sems/>

### Department of Mathematics and Statistics

<http://www.latrobe.edu.au/mathstats/>

**Unit Name:** Applied Statistics/Biostatistics/Medical Statistics/R Statistical Programming

**Unit Code:** STA2AS/STA2BS/STA2MS/STA2RSP

**Credit Points:** 15/20/20/5

**Semester:** 1

### Unit description

This is a composite unit consisting of students from STA2AS (Modern Applied Statistics, 15cp), STA2BS (Biostatistics, 20cp), STA2MS (Medical Statistics, 20cp) and STA2RSP (R Statistical Programming, 5cp) students. STA2RSP students only attend one Computer Lab Class and are not assessed on any lecture material or tutorial material covered by STA2AS/BS/MS. The core classes common to all STA2AS/BS/MS students are Lectures 1 & 2, one Computer Lab Class and one Tutorial (Lab Class). STA2BS students will have an extra lecture (Lecture 3) which extends on ideas introduced throughout the week to include examples and methods commonly used in biostatistics. Similarly, STA2MS will have an extra lecture (Lecture 3) tailored to the needs of medical statistics. A week by week schedule is included at the end of this handout.

The STA2AS/BS/MS units are part of La Trobe's Accredited Major in Statistics which is Accredited by the Statistical Society of Australia Inc. (<http://www.statsoc.org.au/>) As such, these units include many important concepts pertaining to applied statistical methods that are commonly encountered in research and industry.

### Learning Outcomes

**On successful completion of this unit, the student should be able to:**

1. Understand the importance of choosing the 'correct' method of analysis.
2. Appreciate the importance of thinking ahead when designing and planning statistical experiments.
3. Write and carry out intermediate tasks using the statistical software package R.
4. Assess the effectiveness of statistical methods using simulation.

### Generic skills

It is important that in your university studies you develop what is known as generic skills.

**Skills that are explicitly taught and assessed in this unit are:**

- *Numeracy* – Students are taught to deal with the appropriate treatment of numerical data and the assessment of informative measures.
- *Computer Literacy* – Students will be introduced to the statistical software package R (see <http://www.r-project.org/>).
- *Problem Solving Skills* – Students will encounter regular problem solving exercises by example in lectures and in tutorial, computer lab and homework exercises.
- *Critical and Reflective Thinking* – Students will be taught to 'think ahead' when it comes to designing experiments (critical thinking). Students will also regularly need to determine appropriate and purposeful arguments in the form of conclusions based on the testing of collective data or computer simulation (reflective thinking).

## Enrolment information

Students may only enrol in one of STA2AS, STA2BS, STA2MS or STA2RSP as they share common material.

### Assumed prior knowledge:

An introductory level understanding of probability, descriptive statistics and hypothesis testing.

**Pre-requisites:** one of STA1LS, STA1SS, STA1OCT, STA1PSY, STA2LS or STA2SS.

**Co-requisites:** None, but students who wish to pursue the Accredited Major in Statistics will also need to complete STA2MD in second semester (see me for more details).

## Learning resources

The unit text specifically designed for STA2AS/BS/MS students is available to purchase from the bookstore.

Prescribed / recommended	Title	Author	Publisher/online
Prescribed for STA2AS, STA2BS and STA2MS students	STA2AS STA2BS STA2MS Unit Text	L. A. Prendergast	Available at the La Trobe University bookstore
Recommended for STA2AS, STA2BS and STA2MS students	Fundamentals of Biostatistics, 6 <sup>th</sup> Edition	B. Rosner	Duxbury, Available at the La Trobe University bookstore
Recommended for all students	An Introduction to R	W. N. Venables, D.M. Smith and the R Development Core Team	Available for free online at <a href="http://www.r-project.org/">http://www.r-project.org/</a>

Students will be provided with printed copies of tutorial (lab), computer laboratory and assignment question sheets and solutions (solutions provided after completion or, in the case of assignments, upon return of marked assignments). Additionally, copies of these will be available on WebCT for students to download. Other items included on WebCT are unit information and additional files that are supportive to work carried throughout the semester.

## Organisation and Timetables

For a weekly schedule detailing unit topics please see the last page of this information document.

### Lectures (STA2AS/STA2BS/STA2MS students only)

STA2AS/STA2BS/STA2MS	Lecture 1	Monday 12pm	PS2 110*
STA2AS/STA2BS/STA2MS	Lecture 2	Monday 1pm	TC LT
STA2BS	Lecture 3	Friday 9am	PW 218
STA2MS	Lecture 3	Friday 10am	PS2 110

\* Note: Subject to late enrolments, this room may change.

### Laboratory classes (Tutorials)

STA2AS/STA2BS/STA2MS	Monday 2pm	PS2 313
STA2AS/STA2BS/STA2MS	Monday 3pm	PS2 313
STA2AS/STA2BS/STA2MS	Thursday 12pm	PS2 313

### Computer laboratory classes (Computer Labs)

STA2AS/STA2BS/STA2MS/STA2RSP	Tuesday 12pm	PS2 313
STA2AS/STA2BS/STA2MS/STA2RSP	Friday 12pm	TC416
STA2AS/STA2BS/STA2MS/STA2RSP	Friday 2pm	TC416
STA2AS/STA2BS/STA2MS/STA2RSP	Friday 3pm	TC416

### Assessment

#### STA2AS Assessment

Assessment Type	%	Due Date	Comments
Almost Weekly Assignments (9 in total)	20	19/3, 26/3, 2/4, 9/4, 30/4, 7/5, 14/5, 21/5, 4/6	Submit in the pigeon holes on level 2 of PS2. Choose the submission box with your laboratory time on it.
Minor Computer Lab Assignment	3	8/5	Submit in the pigeon holes on level 2 of PS2. Choose the submission box with your computer laboratory time on it.
Major Computer Lab Assignment	7	29/5	
One 45 minute Computer Lab test	15	Held in Week 13	
One 2.5-hour final examination	55	Held in Semester 1 Examination Period	

#### STA2BS Assessment

Assessment Type	%	Due Date	Comments
Almost Weekly Assignments (9 in total)	20	19/3, 26/3, 2/4, 9/4, 30/4, 7/5, 14/5, 21/5, 4/6	Submit in the pigeon holes on level 2 of PS2. Choose the submission box with your laboratory time on it.
Minor Computer Lab Assignment	3	8/5	Submit in the pigeon holes on level 2 of PS2. Choose the submission box with your computer laboratory time on it.
Major Computer Lab Assignment	7	29/5	
One 45 minute Computer Lab test	15	Held in Week 13	
One 3-hour final examination	55	Held in Semester 1 Examination Period	

### STA2MS Assessment

Assessment Type	%	Due Date	Comments
Almost Weekly Assignments (9 in total)	20	19/3, 26/3, 2/4, 9/4, 30/4, 7/5, 14/5, 21/5, 4/6	Submit in the pigeon holes on level 2 of PS2. Choose the submission box with your laboratory time on it.
Minor Computer Lab Assignment	3	8/5	Submit in the pigeon holes on level 2 of PS2. Choose the submission box with your computer laboratory time on it.
Major Computer Lab Assignment	7	29/5	
One 45 minute Computer Lab test	15	Held in Week 13	
One 3-hour final examination	55	Held in Semester 1 Examination Period	

### STA2RSP Assessment

Assessment Type	%	Due Date	Comments
Minor Computer Lab Assignment	15	8/5	Submit in the pigeon holes on level 2 of PS2. Choose the submission box with your computer laboratory time on it.
Major Computer Lab Assignment	35	29/5	
One 45 minute Computer Lab test	50	Held in Week 13	

#### Use of calculators:

Scientific calculators **may** be used in the exam. Graphics calculators including CAS calculators **may not** be used in the exam.

#### Requirements for passing:

There are no individual hurdle requirements for these units. You will pass the unit if you obtain a mark of 50 or better where your mark is calculated according to the weightings described above.

#### Learning Objectives/Generic Skills:

Assessment in this unit is largely based around problem solving with respect to numerically based problems. As such, you will be assessed on the associated generic skills in all types of assessment. You will also be assessed on your ability to propose well thought out solutions to these problems and with respect to how you critically appraise your results. Critical thinking is also then assessed through all types of assessment tasks. The bulk of assessment relating to computer literacy will be associated with the two computer laboratory assignments and the 45 minute computer laboratory test.

**Standard Department policies** apply regarding late assignment submissions and special consideration requests. Please refer to your Departmental Student Handbook or the Departmental homepage for further information.

### **Late submission of work:**

Late solutions will be accepted only in special circumstances and must be handed in personally to your tutor.

### **Statement of Originality:**

At the beginning of every piece of assessment work submitted, students must sign and date a 'Statement of Originality'. This statement should be exactly as follows:

``This is my own work. I have not copied any of it from anyone else."

### **Special Consideration Policy:**

Please refer to the La Trobe University special consideration policy. The appropriate form is available from Student Administration.

### **Special and Supplementary Examinations**

For first-semester units, these exams are scheduled in July and August and are organized by the Admissions, Examinations, Graduations and Scholarships Office. Examination dates are publicised well in advance. It is your responsibility to ensure you are available to sit a special or supplementary exam at the advertised date. Supplementary Assessment is controlled by University policy: follow the link from <http://www.latrobe.edu.au/policies/>

### **Feedback on Assessment**

Most assignment work will be submitted on Thursday or Friday afternoons (see the due dates at the top of assignment sheets). Students will receive their assessed assignments at the start of their tutorial class (lab class) the following week with the exception that the Minor and Major Computer Lab assignments will be handed back to students at the start of their Computer Lab class the following week. All questions regarding assignments, both before and after submission, should be directed to your tutor with the exception that questions regarding the Computer Lab assignments should be directed to your Computer Lab coordinator.

### **Academic and support staff**

**Lecturer:** Luke Prendergast

**Office:** Room 227, Physical Sciences 2

**Telephone ext:** 2610

**Email:** luke.prendergast@latrobe.edu.au

**Student consultation times:** TBA

For issues concerning this unit, you should first approach the lecturer. For more general matters associated with 2<sup>nd</sup> year, contact the Coordinator, Dr. Andriy Olenko. For (statistics) course advice you should contact Dr. Andriy Olenko, Physical Sciences 2 room 224, [a.olenko@latrobe.edu.au](mailto:a.olenko@latrobe.edu.au) or Dr. Ajay Chandra, Physical Sciences 2 room 226, [a.chandra@latrobe.edu](mailto:a.chandra@latrobe.edu)

## Academic Misconduct

### Academic Honesty

La Trobe University regards academic honesty as the foundation of teaching, learning, and research and scholarship. It requires its academic staff and students to observe the highest ethical standards in all aspects of academic work. The University demonstrates its commitment to these values by awarding due credit for honestly conducted scholarly work, and by penalising academic dishonesty and all forms of cheating.

At La Trobe University:

- it is the responsibility of the academic staff to conduct research and scholarship according to ethical standards of scholarship, and to teach their students ethical learning and research and scholarship practices;
- it is the responsibility of the students to acquire a clear understanding of how to avoid unethical practices, and to employ this knowledge in their work submitted for assessment.

Academic staff or students who engage in fraudulent or unethical research and scholarship practices will become subject to the disciplinary procedures of the University, as will students who cheat in tests, examinations, essays, or any other assessable work, or conspire with others to procure such a result.

The La Trobe University Academic Misconduct Policy is available online at: <http://latrobe.edu.au/policies/assets/downloads/academic-misconduct.pdf>. It is the responsibility of all students to become familiar with, and act in accordance with the University's policy.

### Plagiarism

Plagiarism will not be accepted. Whilst students are encouraged to collaborate with other students, we make a clear distinction between such collaboration and copying. Copying is cheating and will be reported through the Unit Co-ordinator to the Head of Department. Repeated copying will incur serious penalties. Standard University policies regarding plagiarism apply. You should refer to the University plagiarism site: <http://www.latrobe.edu.au/plagiarism/> where you will find details about how to avoid plagiarism, examples of plagiarism and some resources to assist you.

At the beginning of every piece of assessment work submitted, students must sign and date a 'Statement of Originality'. This statement should be exactly as follows:

``This is my own work. I have not copied any of it from anyone else."`

### Student Evaluation

Quality Assurance reports for the 2008 units will be provided on the unit homepages in WebCt.

Week	STA2AS/BS/MS Lectures 1 & 2	STA2BS Lecture 3	STA2MS Lecture 3	Tutorial (Lab)	Computer Lab	Homework (HW)
1	An introduction to probability including the Rule of Total Probability and Baye's Rule	An example of classification using the Rule of Total Probability and Baye's Rule	Receiver Operator Characteristics (ROC) Curves	No Class	No Class	
2	Descriptive Statistics and Random Variables	An example of descriptive statistics in research	An example of descriptive statistics in research	Tutorial 1	Session 1	HW 1 handed out
3	Some common discrete distributions	The spatial Poisson process including the index of dispersion	A brief introduction to queues modelled with the Poisson process	Tutorial 2	Session 2	HW 2 handed out HW 1 Due Thurs 4pm
4	Some common continuous distributions	Optional Help and Catch-up Class (Room TBA)	Optional Help and Catch-up Class (Room TBA)	Tutorial 3	Session 3	HW 3 handed out HW 2 Due Thurs 4pm
5	One sample hypothesis testing including power and sample size considerations	The log-normal distribution	The log-normal distribution	Tutorial 4	Session 4  Minor Assignment handed out	HW 4 handed out HW 3 Due Thurs 4pm
6	Two sample hypothesis testing including power and sample size considerations	<b>Good Friday</b> (Alt. class) Some examples of the two sample t-test.	<b>Good Friday</b> (Alt. class) Design of experiments	Tutorial 5	<b>Good Friday</b> (No class)	HW 4 Due Thurs 4pm
7	Non-parametric methods including the Wilcoxon Signed-Rank test and the Wilcoxon Rank-Sum test	<b>Anzac Day</b> (No class)	<b>Anzac Day</b> (Self reading) Case-study: Effects of lead exposure and psychological function in children	Tutorial 6	<b>Anzac Day</b> (No Class)	HW 5 handed out
8	Testing of categorical data Part I including contingency tables and Fisher's Exact test.	Thinking ahead. How many samples?	Anzac Day (Alt. class) Assessing risk including the odds-ratio and relative risk Part I	Tutorial 7	Session 5	HW 6 handed out HW 5 Due Thurs 4pm
9	Testing of categorical data Part II including Goodness of Fit tests and the Kappa statistic	Testing for Hardy-Weinberg equilibrium	Assessing risk including the odds-ratio and relative risk Part II	Tutorial 8	Session 6 Minor Assignment due Fri 4pm  Major Assignment handed out	HW 7 handed out HW 6 Due Thurs 4pm
10	Analysis of Variance (ANOVA) including two-way ANOVA	Case-study: Effects of lead exposure and psychological function in children.	Case-study: Effects of lead exposure and psychological function in children.	Tutorial 9	Session 7	HW 8 handed out HW 7 Due Thurs 4pm
11	Multiple linear regression	Dose-response models	Introduction to survival analysis	Tutorial 10	Session 8	HW 8 Due Fri 4pm HW 9 handed out
12	Revision	Optional Help and Catch-up Class (Room TBA)	Optional Help and Catch-up Class (Room TBA)	Optional revision	Session 9  Major Assignment due Friday 4pm	
13	Revision	Optional help class in room PS2 334	Optional help class in room PS2 334	No Class	45 Minute Test	HW 9 Due Thurs 4pm