BCA PROGRAM OUTLINE - 2014

What is the BCA?

The Biostatistics Collaboration of Australia (BCA) is a consortium of biostatistical experts from around Australia with representatives from universities, government and the pharmaceutical industry.

At present there is an urgent shortage of highly skilled biostatisticians. The BCA has developed a program of post-graduate courses that aims to fill a serious gap between current programs in public health and epidemiology (which train users of biostatistical methods, not professional biostatisticians), and general statistics courses (which do not cater to the increasingly diverse and specialised needs of health research).

By combining the best talents from around the country, this collaboration has developed a focussed curriculum with a mission to provide Australia with well-trained professional biostatisticians. The courses provide a sound mathematically-based grounding in statistical methods with a strong emphasis on applications in all areas of health and medical research.

A three tier award structure is available to postgraduate students:

(Post)Graduate Certificate
(Post)Graduate Diploma
Masters Degree

The BCA consortium currently comprises the following (consortium) universities:

- The University of Adelaide
- Macquarie University
- Monash University
- The University of Melbourne
- The University of Newcastle
- The University of Queensland
- The University of Sydney

All units of study are delivered by distance learning.

(Units of study are called variously at different universities, units, subjects, or courses)

The coordinating office is supported by the NHMRC Clinical Trials Centre.
Course Objectives

Masters Degree
On completion of this course, students will:

1. have developed a sound understanding of epidemiological study design and the theory and application of the major areas of biostatistics relevant to professional practice
2. have acquired skills in complex statistical analyses to handle a variety of practical problems using modern statistical techniques and software
3. have acquired skills in data collection and data management, including quality control procedures and the ethical handling of data
4. have developed skills to identify the relevant statistical issues in practical problems in medical/health settings and to propose and implement an appropriate statistical design and/or analysis methodology
5. have developed skills and had experience in communication of biostatistical issues with clinical/health personnel and the presentation of statistical results in a format suitable for publication in health-related journals or professional reports
6. have acquired the technical skills to be able to read methodological papers in the biostatistical literature and apply the methods described therein to practical problems
7. have developed the practical and technical skills to commence professional careers as independent biostatisticians and/or to progress to further postgraduate research studies
8. be able to demonstrate an understanding of professional codes of conduct and ethical standards such as those of the Statistical Society of Australia
9. have developed problem solving abilities in biostatistics, characterised by flexibility of approach

(Post)Graduate Diploma
On completion of this course, students will:

1. be able to demonstrate a broad understanding of the mathematical back-ground, theory and application of the principles of epidemiology and biostatistical methods in health and medical research
2. have acquired skills in complex statistical analyses to handle a variety of practical problems using modern statistical techniques and software
3. have acquired skills in data collection and data management, including database design, quality control procedures and the ethical handling of data
4. have developed skills to identify the relevant statistical issues in practical problems in medical/health settings and to propose and implement an appropriate statistical design and/or analysis methodology
5. have developed skills and demonstrated ability to present statistical results in a format suitable for publication in health-related journals or professional reports
6. have acquired the technical skills to be able to read methodological papers in the biostatistical literature and apply the methods described therein to practical problems
7. have developed the practical and technical skills to progress to further postgraduate studies in biostatistics
8. be aware of professional codes of conduct and ethical standards such as those of the Statistical Society of Australia

(Post)Graduate Certificate
On completion of this course, students will:

1. be able to demonstrate a broad understanding of the value and basic principles of biostatistical methods in health and medical research
2. be able to demonstrate an understanding of the principles of epidemiology and its biostatistical underpinnings
3. have acquired skills in data management and basic statistical analyses
4. have developed the practical and technical skills to progress to further postgraduate studies in biostatistics
Entry requirements and enrolment advice

What is biostatistics?
Biostatistics is the discipline that underpins the use of statistical methods in health and medical research. Its foundation is the mathematics of variability and it encompasses the science of designing quantitative research studies and other data collections, managing and analysing data, and interpreting the results.

Who is the program for?
The program has been designed to provide advanced biostatistical training for a diverse range of students. The main thing is that you should have an aptitude for advanced mathematics, and a desire to learn biostatistics.

The program includes units designed to provide the background in mathematical and statistical theory to those without a first degree in mathematics or statistics. The compulsory unit in epidemiology introduces those unfamiliar with research in population health to critical appraisal of the health and medical literature.

Graduates with a health sciences background, eg Masters degree in Public Health or Clinical Epidemiology, will gain increased and more sophisticated statistical skills, while those from a mathematical background will further their health and medical statistics application techniques. On completion of the Masters Degree or Graduate Diploma, graduates will have attained the required skills for employment as a biostatistician, while those completing the Graduate Certificate will have an understanding of the principles of epidemiology and some aspects of biostatistics.

Entry requirements - who is eligible to apply?
Applicants should have:

• a Bachelor degree in Statistics, Mathematics, Science, Psychology, Medicine, Pharmacy, Nursing, Health Sciences or other appropriate discipline from an approved university (or equivalent qualification)

• a proven aptitude for advanced mathematical work, indicated for example by a high level of achievement in high school mathematics

• already passed an introductory course in statistics, covering at least the estimation of means and proportions with confidence intervals, and the comparison of means and proportions between two groups using hypothesis tests (i.e. t-tests and chi-squared tests for 2x2 tables).

Each consortium university may have additional entry requirements. You should check the details with the university of your choice.

How and where will I study?
The way the program is structured by the Consortium of universities is a little different to programs offered within the one university. The BCA model involves partner universities fully recognising units taught by other consortium universities.

Teaching is done by distance delivery, with course materials sent to students in printed form, and an online learning management system used to generate class interaction and to manage assessment.

You should apply to enrol at your choice of the consortium universities. Although the program is delivered by distance, it is advisable to consider the availability of local support and supervision, particularly for the Work Project Portfolio at the Masters level.

The university in which you enrol will become your home university. All BCA units are accredited at all consortium universities and each unit is delivered by one and only one of these universities in any semester. Students enrolled in the same unit at different universities receive identical unit of study materials and instruction. A central BCA coordinating office function is to act as a liaison and communication centre for students, coordinators and administrators at all BCA participating universities.

The companion document to this guide, the Consortium Outline, contains an explanation of how the BCA system works, along with current contact details for BCA program coordinators and student administrators at these universities. These contact details can contact can also be found at www.bca.edu.au/awardinguni.htm

Using this Outline and seeking further assistance
This Outline lists unit outlines for all units of study, core and elective, within the program. The curriculum table on page 5 lists required units for each course, semester availability and pre and co-requisites. The Study Schedules on pages 6 and 7 provide examples of how you might structure your program of study.

Should you decide to enrol, the BCA program coordinator at your home university would be your academic advisor. Postgraduate administrative staff can help you with enrolment advice. Having considered your options with the aid of this document, we recommend that you discuss study options with the BCA program coordinator at your chosen university.
Fees
The program attracts standard postgraduate coursework fees. Prices may differ a little between universities and fee scales may change each year at each consortium university. You will need to ask about the fees when making enquiries at the university's.

A postgraduate loans scheme, FEE-HELP, is available to domestic postgraduate students, by the Australian Government Department of Education, Employment and Workplace Relations (DEEWR)
See: www.goingtouni.gov.au

If you are not a citizen or permanent resident of Australia or New Zealand, you will be charged international fee rates and must study from overseas (because the Australian Government does not permit international students WHO HAVE ENTERED AUSTRALIA on a STUDENT VISA to enrol in part-time distance study courses such as the BCA program).

What are the study requirements?
Access to a computer and the internet are essential study requirements.
An online learning management system, eLearning, is a central component of the distance delivery. It is used for a variety of functions, the most important of which is as a communication tool, for student/student and student/coordinator discussion. Email is also used, particularly as the first point of contact from BCA administrators and unit coordinators. Hard copy materials are sent by post and can also be accessed via eLearning.
Advice about textbook and software requirements can be found on pages 8 and 9.
If you are not familiar with required software packages we strongly advise you to familiarise yourself with them before you start your studies. If you need further help with access to these resources, contact the BCA Coordinating Office, see page 1 for contact details.

Course load
(Post)Graduate Certificate; (Post)Graduate Diploma; and Master of Biostatistics, where the qualifications are subsets of each other with an increasing degree of mathematical maturity and rigor required as the level of qualification increases.

Masters
For the Masters degree 10 or 11 coursework units of study are required plus a 1 or 2 unit Workplace Project Portfolio. Students may be waived the requirement to complete either Epidemiology (students coming from a background in health research), or one or more of the units Mathematical Background for Biostatistics, Probability and Distribution Theory, and Principles of Statistical Inference (students coming from a background in mathematics and/or statistics). This will leave room to complete elective units in addition to the compulsory Workplace Project Portfolio.

(Post)Graduate Diploma
For the (Post)Graduate Diploma, the Work Placement Project Portfolio is not a requirement and Survival Analysis is an elective. Some students may substitute electives for units of study such as Epidemiology, Mathematical Background for Biostatistics, Probability and Distribution Theory or Principles of Statistical Inference, if they have equivalent prior study.

(Post)Graduate Certificate
For the (Post)Graduate Certificate only, Epidemiology is compulsory, allowing maximum flexibility (within the constraints of other unit-specific prerequisites, as indicated).

NOTE: In BCA coursework information, course load is tallied by unit of study. The way that credit points are tallied per unit differs between universities. In order for students to understand the performance indicators noted in university handbooks and student records at the university in which they are enrolled, students should familiarise themselves with the relevant classification methods at their home university. This information is available on university websites and in postgraduate handbooks.

Studying from overseas
Australian Government laws do not permit international students WHO HAVE ENTERED AUSTRALIA on a STUDENT VISA to enrol in part-time distance study courses.
However, this restriction does NOT apply if you are studying from overseas.
A major issue associated with studying the Masters degree from overseas is the unit called Workplace Project Portfolio (WPP), the aim of which is for students to gain practical experience, usually in workplace settings, in the application of knowledge and skills learnt during the coursework of the Masters program. The student will provide evidence of having met this goal by presenting a portfolio or thesis made up of a preface and project reports.
Arrangements would need to be put in place to ensure suitable supervision and appropriate project/s. (This issue doesn't arise at the Graduate Diploma level as WPP is not a requirement.)
It is essential to discuss this with the BCA program coordinator at the university at which you wish to enrol.
See BCA Awarding Universities
## BCA curriculum 2014

### Required units of study for each course (unless an exemption or credit has been granted)

<table>
<thead>
<tr>
<th>Semester</th>
<th>BCA Code</th>
<th>Unit of study</th>
<th>Co/Prerequisites</th>
<th>(Post) Grad Cert</th>
<th>(Post) Grad Dip</th>
<th>Masters</th>
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<tbody>
<tr>
<td>1 &amp; 2</td>
<td>EPI</td>
<td>Epidemiology</td>
<td>-</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>1 &amp; 2</td>
<td>MBB</td>
<td>Mathematical Background for Biostatistics</td>
<td>-</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>1 &amp; 2</td>
<td>PDT</td>
<td>Probability and Distribution Theory</td>
<td>MBB</td>
<td>✓</td>
<td>✓</td>
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</tr>
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<td>1</td>
<td>HIS</td>
<td>Health Indicators &amp; Health Surveys</td>
<td>*MBB</td>
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<td></td>
</tr>
<tr>
<td>1 &amp; 2</td>
<td>DMC</td>
<td>Data Management &amp; Statistical Computing</td>
<td>-</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>1 &amp; 2</td>
<td>PSI</td>
<td>Principles of Statistical Inference</td>
<td>MBB, PDT</td>
<td>✓</td>
<td>✓</td>
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</tr>
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<td>1</td>
<td>CLB</td>
<td>Clinical Biostatistics</td>
<td>EPI, MBB, PDT, *PSI</td>
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<td></td>
<td></td>
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<tr>
<td>2</td>
<td>DES</td>
<td>Design of Randomised Controlled Trials</td>
<td>EPI, MBB</td>
<td>✓</td>
<td>✓</td>
<td></td>
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<tr>
<td>2</td>
<td>LMR</td>
<td>Linear Models</td>
<td>EPI, MBB, PDT, PSI</td>
<td>✓</td>
<td>✓</td>
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</tr>
<tr>
<td>2</td>
<td>CDA</td>
<td>Categorical Data &amp; Generalised Linear Models</td>
<td>EPI, MBB, PDT, PSI, *LMR</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>1</td>
<td>SVA</td>
<td>Survival Analysis</td>
<td>EPI, MBB, PDT, PSI, LMR</td>
<td>✓</td>
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<td></td>
</tr>
<tr>
<td>1&amp;or 2</td>
<td>WPP</td>
<td>Workplace Project Portfolio</td>
<td>minimum of 4 units, including LMR &amp; DMC</td>
<td>✓</td>
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</tr>
<tr>
<td>1</td>
<td>LCD</td>
<td>Longitudinal &amp; Correlated Data</td>
<td>EPI, MBB, PDT, PSI, LMR</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>BAY</td>
<td>Bayesian Statistical Methods</td>
<td>EPI, MBB, PDT, PSI, LMR</td>
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<td></td>
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<tr>
<td>TBA</td>
<td>BIF</td>
<td>Bioinformatics</td>
<td>MBB, PDT, DMC, PSI, LMR</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>ACT</td>
<td>Advanced Clinical Trials</td>
<td>EPI, MBB, PDT, PSI, DES, LMR</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- ✓ unit is compulsory
- * co-requisite, may be taken concurrently
- LMR: program Coordinator approval is required for taking LMR & EPI simultaneously.
- WPP: adequate supervisory arrangements must be in place before students commence WPP. Students wishing to complete the Masters Degree should discuss options for this unit with the BCA program coordinator at their home university. The requirements of individual universities may differ. Depending on the university, 1, 2 and 4 unit options may be available for WPP.
- BAY is delivered in alternate years. It IS offered in 2014.
- BIF: delivery in 2014 to be advised. BCA will notify students by email.
- ACT is delivered in alternate years. It is NOT offered in 2014.
Study schedules

Because many units of study have pre- or co-requisites, we show below our recommendations for the way you might structure your program of study, depending on what you have studied to date, and hence what exemptions you have. The examples are not exhaustive and variations are possible. You may wish to discuss your own program with the Biostatistics Program Coordinator at the university at which you have applied to enrol or, if already enrolled, your home university.

Note that BAY, BIF and ACT are offered in alternate years. See the curriculum table on page 5 for the current delivery schedule.

**TABLE A:** for students starting in Semester 1 and studying two units per semester

<table>
<thead>
<tr>
<th>Exemptions</th>
<th>EPI only</th>
<th>MBB only</th>
<th>EPI+MBB</th>
<th>MBB+PDT+PSI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sem 1</td>
<td>MBB + EPI</td>
<td>MBB + DMC</td>
<td>EPI + DMC</td>
<td>PDT + DMC</td>
</tr>
<tr>
<td>Sem 2</td>
<td>PDT + DES</td>
<td>PDT + DES</td>
<td>PDT + DES</td>
<td>PSI + DES</td>
</tr>
<tr>
<td><strong>Year 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sem 1</td>
<td>PSI + DMC</td>
<td>PSI + HIS/CLB</td>
<td>PSI + HIS/CLB</td>
<td>HIS + CLB</td>
</tr>
<tr>
<td>Sem 2</td>
<td>LMR + CDA</td>
<td>LMR + CDA</td>
<td>LMR + CDA</td>
<td>LMR + CDA</td>
</tr>
<tr>
<td><strong>Year 3</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sem 1</td>
<td>SVA + WPP/HIS/CLB/LCD</td>
<td>SVA + WPP/HIS/CLB/LCD</td>
<td>SVA + WPP/HIS/CLB/LCD</td>
<td>SVA + WPP/LCD</td>
</tr>
<tr>
<td>Sem 2</td>
<td>WPP/ACT/BAY/BIF</td>
<td>WPP/ACT/BAY/BIF</td>
<td>WPP/ACT/BAY/BIF</td>
<td>WPP/ACT/BAY/BIF</td>
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**TABLE B:** for students starting in Semester 1 and studying one unit per semester

<table>
<thead>
<tr>
<th>Exemptions</th>
<th>EPI only</th>
<th>MBB only</th>
<th>EPI+MBB</th>
<th>MBB+PDT+PSI</th>
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</thead>
<tbody>
<tr>
<td><strong>Year 1</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Sem 1</td>
<td>MBB</td>
<td>MBB</td>
<td>DMC</td>
<td>PDT</td>
</tr>
<tr>
<td>Sem 2</td>
<td>PDT</td>
<td>PDT</td>
<td>PDT</td>
<td>PSI</td>
</tr>
<tr>
<td><strong>Year 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sem 1</td>
<td>DMC</td>
<td>DMC</td>
<td>EPI</td>
<td>DMC</td>
</tr>
<tr>
<td>Sem 2</td>
<td>PSI</td>
<td>DES</td>
<td>DES</td>
<td>LMR</td>
</tr>
<tr>
<td><strong>Year 3</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sem 1</td>
<td>EPI</td>
<td>PSI</td>
<td>PSI</td>
<td>SVA</td>
</tr>
<tr>
<td>Sem 2</td>
<td>LMR</td>
<td>LMR</td>
<td>LMR</td>
<td>CDA/DES</td>
</tr>
<tr>
<td><strong>Year 4</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sem 1</td>
<td>SVA</td>
<td>HIS/CLB/SVA</td>
<td>SVA</td>
<td>HIS/CLB/LCD</td>
</tr>
<tr>
<td>Sem 2</td>
<td>DES/CDA</td>
<td>CDA</td>
<td>CDA</td>
<td>DES/CDA</td>
</tr>
<tr>
<td><strong>Year 5</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sem 1</td>
<td>HIS/CLB/WPP</td>
<td>HIS/CLB/SVA/LCD</td>
<td>HIS/CLB/LCD</td>
<td>HIS/CLB/LCD</td>
</tr>
<tr>
<td>Sem 2</td>
<td>CDA/DES</td>
<td>ACT/BAY/BIF</td>
<td>ACT/BAY/BIF</td>
<td>ACT/BAY/BIF</td>
</tr>
<tr>
<td><strong>Year 6</strong></td>
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</tr>
<tr>
<td>Sem 1</td>
<td>WPP/HIS/CLB/LCD</td>
<td>WPP/HIS/CLB/LCD</td>
<td>WPP/HIS/CLB/LCD</td>
<td>WPP/HIS/CLB/LCD</td>
</tr>
<tr>
<td>Sem 2</td>
<td>WPP/ACT/BAY/BIF</td>
<td>WPP/ACT/BAY/BIF</td>
<td>WPP/ACT/BAY/BIF</td>
<td>WPP/ACT/BAY/BIF</td>
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</table>
TABLE C: for students starting in Semester 2 and studying **two units per semester**

<table>
<thead>
<tr>
<th>Exemptions</th>
<th>No exemptions*</th>
<th>EPI only§</th>
<th>MBB only¤</th>
<th>EPI+MBB</th>
<th>MBB+PDT+PSI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sem 2</td>
<td>MBB + DMC</td>
<td>MBB + DMC</td>
<td>PDT + DMC</td>
<td>PDT + DES</td>
<td>EPI + LMR*</td>
</tr>
<tr>
<td><strong>Year 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sem 1</td>
<td>PDT + EPI</td>
<td>PDT + HIS</td>
<td>PSI + EPI</td>
<td>PSI + DMC</td>
<td>DMC + SVA</td>
</tr>
<tr>
<td>Sem 2</td>
<td>PSI + DES</td>
<td>PSI + DES</td>
<td>LMR + DES</td>
<td>LMR + CDA</td>
<td>CDA + DES</td>
</tr>
<tr>
<td><strong>Year 3</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sem 1</td>
<td>HIS + CLB</td>
<td>CLB§</td>
<td>SVA + HIS/CLB</td>
<td>SVA + HIS/CLB</td>
<td>HIS/CLB/ LCD</td>
</tr>
<tr>
<td>Sem 2</td>
<td>LMR + CDA</td>
<td>LMR + CDA</td>
<td>CDA + WPP/ACT/BAY/BIF</td>
<td>WPP/ACT/BAY/BIF</td>
<td>WPP/ACT/BAY/BIF</td>
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<tr>
<td><strong>Year 4</strong></td>
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</tr>
<tr>
<td>Sem 1</td>
<td>SVA + WPP#</td>
<td>SVA + WPP/LCD</td>
<td>WPP/HIS/CLB/LCD</td>
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<tr>
<td>Sem 2</td>
<td>WPP/ACT/BAY/BIF</td>
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</tr>
</tbody>
</table>

* Program Coordinator approval is required for taking LMR & EPI simultaneously.

# Students with no exemptions, who wish to complete in 3 years, are only able to do a single unit of WPP

§ Students with EPI-only exemption are unable to complete in 3 years if starting in Semester 2

¤ Students with MBB-only exemption are unable to take ACT or BAY or BIF if wishing to complete in 3 years, starting in Sem 2

TABLE D: for students starting in Semester 2 and studying **one unit per semester**

<table>
<thead>
<tr>
<th>Exemptions</th>
<th>No exemptions</th>
<th>EPI only</th>
<th>MBB only</th>
<th>EPI+MBB</th>
<th>MBB+PDT+PSI</th>
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<td><strong>Year 1</strong></td>
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<td></td>
</tr>
<tr>
<td>Sem 2</td>
<td>MBB</td>
<td>MBB</td>
<td>PDT</td>
<td>PDT</td>
<td>DMC</td>
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<tr>
<td><strong>Year 2</strong></td>
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</tr>
<tr>
<td>Sem 1</td>
<td>PDT</td>
<td>DMC</td>
<td>EPI</td>
<td>PSI</td>
<td>EPI</td>
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<tr>
<td>Sem 2</td>
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<td>PDT</td>
<td>DMC</td>
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Unit of study outlines
Units of study available for the program in biostatistics

Unit outline notes:

- Where "co-requisite" is noted in unit outlines, the unit/s may be taken concurrently

- Units of study (units) may be referred to at different universities as units, subjects, courses or papers. At the University of Queensland (UQ) a course (equivalent to a BCA unit of study) is comprised of 2 UQ units.

- Epidemiology (EPI)
  All units of study in the BCA curriculum were developed specifically for the program, with the exception of EPI which was a pre-existing unit at most universities. This means that students may have a choice of options for studying EPI in one or both semesters, depending on their home university. Home university postgraduate advisors may direct students to the EPI offered at that university, or students may be able to choose between units delivered face-to-face locally or, alternatively, by distance elsewhere. This is the only instance in the BCA curriculum where a choice for study options may exist. All other BCA units are delivered by distance by one university only in any semester.

  Program coordinators at each consortium university can advise about Epidemiology choices.

  If a local study option is not offered at a home university, students will be doing (Introduction to) Epidemiology delivered by distance by the University of Queensland.

- Data Management and Statistical Computing (DMC)
  Students who do not have experience in the use of SAS or Stata will need to include DMC in their curriculum choices. SAS and Stata software are compulsory for this unit. See Statistical Software below.

- Study Resources
  Requirements for compulsory textbooks and software are included in the unit outlines listed below. Complete listings for compulsory and recommended readings and guidelines for software use are provided in unit Study Guides provided to students who have enrolled in the relevant unit/s.

  Additional resources can be found on the BCA Student Resources page.

  Details for compulsory textbooks and statistical software packages, including purchasing advice, can be found in the BCA Textbook and Software Guide

  - Textbooks
    Compulsory references generally contain sections that are relevant to assessment tasks. Recommended references – books, book chapters, papers and journals – provide further background reading.

    NB: ISBN numbers are listed in the BCA Textbook and Software Guide. The length of ISBN codes increased from 10 to 13 digits in Jan 2007. All ISBN-10s were officially changed to ISBN-13s (by adding the Bookland EAN prefix ‘978’ and recalculating the final check digit).

    All ISBNs listed BCA guides are 13 digit codes.

  - Statistical Software
    Most units of study require the use of SAS or Stata statistical software packages. Students will need to choose one or the other. Both are required for Data Management and Statistical Computing (DMC) and Longitudinal and Correlated Data (LCD). Stata is used in many of the units. If you don't have the required software on your home computer, you will need to be able to access it somewhere regularly throughout the semester.

    Note that, if installing the statistical software package, SAS, it will run on 32 and 64 bit systems and it will run on XP, Vista and Windows 7. It will NOT however run on the ‘Home’ version of most operating systems, and is not compatible with the Mac OS. See the BCA Textbook and Software Guide for full details about buying software.
SUPPORT FOR SOFTWARE: Unit coordinators may specify that students can use either Stata or SAS or both for some of or the entire unit. (MBB students can choose between Excel and Stata. Some elective units also specify Excel or WinBUGS or freeware.) The requirement for either or both packages will be made clear in the unit descriptions listed below and further details may be provided in unit Study Guides. If both packages are required, information will be given on the extent to which help will be provided for each in the modules or sections in which they may be used. Generally, one package will be recommended and supported while students may use another one if they choose, but are responsible for finding their own support for any difficulties they may encounter.

- **Learning Management Systems (LMS) - eLearning**
  Most BCA units use the online facility eLearning via the BCA online learning site, using Blackboard which is administered by the University of Sydney, *with the exception of Epidemiology* (EPI), which is delivered via the online facilities at the delivering university. EPI by distance is delivered by the University of Queensland. EPI units delivered face-to-face and/or by distance at some consortium universities may include the use of online facilities available at the relevant university.
Epidemiology (EPI)

Coordinator: Coordinator will depend on university.

This unit is offered on-campus (face-to-face) and/or by distance at some universities. Home university postgraduate advisors may offer students the option to enrol in the epidemiology unit offered at that university, face-to-face or by distance. See the note on page 8 for further details.

If students are not doing EPI at their home university, they will be doing (Introduction to) Epidemiology delivered by distance means at the University of Queensland (UQ).

UQ specifications:

Assessment: Three written assignments (20%, 40%, 40%)
Resources for distance students: Online course materials, tutorial support, assignment completion, and interaction facilities, requiring a UQ username and password.

General outline for EPI:

Prerequisites: None
Time commitment: 8-12 hours total study time per week
Semester availability: Semester 1 and semester 2
Aim: On completion of this unit students should be familiar with the major concepts and tools of epidemiology, the study of health in populations, and should be able to judge the quality of evidence in health-related research literature.

Content: Topics include: historical developments in epidemiology; sources of data on mortality and morbidity; disease rates and standardisation; prevalence and incidence; life expectancy; linking exposure and disease (eg. relative risk, attributable risk); main types of study designs – case series, ecological studies, cross-sectional surveys, case-control studies, cohort or follow-up studies, randomised controlled trials; sources of error (chance, bias, confounding); association and causality; evaluating published papers; epidemics and epidemic investigation; surveillance; prevention; screening.

Assessment: As prescribed by university
Prescribed texts: As prescribed by university
Special computer requirements: Nil
Resources for distance students: Resources dependent on delivering university facilities.
Mathematical Background for Biostatistics (MBB)

Coordinators: Semester 1: A/Prof Gary Glonek, School of Mathematical Sciences, University of Adelaide
Semester 2: Dr Maurizio Manuguerra, Department of Statistics, Macquarie University

Prerequisites: None

Semester availability: Semester 1 and semester 2

Time commitment: 8 -15 hours total study time per week, depending on the amount of revision required

Aim: On completion of this unit students will be able to follow the mathematical demonstrations and proofs used in biostatistics at Masters degree level, and to understand the mathematics behind statistical methods introduced at that level. The intention is to allow students to concentrate on statistical concepts in subsequent units, and not be distracted by the mathematics employed.

Content: Basic algebra and analysis; exponential functions; calculus; series, limits, approximations and expansions; linear algebra, matrices and determinants; and numerical methods

Assessment: Assignments 100%: functions and limits (20%) calculus (40%) linear algebra (40%)

Prescribed texts:
   Note: There are a number of Anton versions; be sure you have the correct one. For details see the BCA Textbook and Software Guide

Useful but not essential text:

Special computer requirements: Wolfram Alpha (online free resource), Microsoft Excel or Stata statistical software

Resources for distance students: Printed course notes, video lectures and assignment material by mail, email, and online interaction facilities.
Probability and Distribution Theory (PDT)

Coordinators:
A/Prof Rory Wolfe  
Dept of Epidemiology & Preventive Medicine, Monash University

Prof Andrew Forbes  
Dept of Epidemiology & Preventive Medicine, Monash University

Either Prof Forbes or Prof Wolfe will be the principal coordinator in a given semester.

Prerequisites:  
Mathematical Background for Biostatistics

Semester availability:  
Semester 1 and semester 2

Time commitment:  
8-12 hours total study time per week

Aim:  
This unit will focus on applying the calculus-based techniques learned in Mathematical Background for Biostatistics (MBB) to the study of probability and statistical distributions. These two units, together with the subsequent Principles of Statistical Inference (PSI) unit, will provide the core prerequisite mathematical statistics background required for the study of later units in the Graduate Diploma or Masters degree.

Content:  
This unit begins with the study of probability, random variables, discrete and continuous distributions, and the use of calculus to obtain expressions for parameters of these distributions such as the mean and variance. Joint distributions for multiple random variables are introduced together with the important concepts of independence, correlation and covariance, marginal and conditional distributions. Techniques for determining distributions of transformations of random variables are discussed. The concept of the sampling distribution and standard error of an estimator of a parameter is presented, together with key properties of estimators. Large sample results concerning the properties of estimators are presented with emphasis on the central role of the normal distribution in these results. General approaches to obtaining estimators of parameters are introduced. Numerical simulation and graphing with Stata is used throughout to demonstrate concepts.

Assessment:  
Two written assignments, each worth 35% and submission of selected practical written exercises from 4 modules 30%.

Prescribed texts:  

For details, including ISBN, see the BCA Textbook and Software Guide

Special computer requirements:  
Stata statistical software

Resources for distance students:  
Printed course notes and assignment material by mail, email, and online interaction facilities
Data Management and Statistical Computing (DMC)

Coordinators: Semester 1: A/Prof Patrick McElduff, Centre for Clinical Epidemiology and Biostatistics, University of Newcastle
Semester 2: Dr Helena Romaniuk, School of Population Health, University of Melbourne

Prerequisites: None

Semester availability: Semester 1 and semester 2

Time commitment: 8-12 hours total study time per week

Aim: The aim of this unit is to provide students with the knowledge and skills required to undertake moderate to high level data manipulation and management in preparation for statistical analysis of data typically arising in health and medical research. Specific objectives are for students to:

- Gain experience in data manipulation and management using two major statistical software packages (Stata and SAS)
- Learn how to display and summarise data using statistical software
- Become familiar with the checking and cleaning of data
- Learn how to link files through use of unique and non-unique identifiers
- Acquire fundamental programming skills for efficient use of software packages
- Learn key principles regarding confidentiality and privacy in data storage, management and analysis

Content: The topics covered are:

- Module 1 – Stata and SAS: The basics (importing and exporting data, recoding data, formatting data, labelling variable names and data values; using dates, data display and summary presentation, and creating programs)
- Module 2 – Stata and SAS: graphs, data management and statistical quality assurance methods (including advanced graphics to produce publication-quality graphs)
- Module 3 – Data management using Stata and SAS (using functions to generate new variables, appending, merging, transposing longitudinal data; programming skills for efficient and reproducible use of these packages, including loops and arguments)

Assessment: Three written assignments worth 30%, 35% and 35%

Recommended texts: If you have not used SAS or Stata previously, it is recommended that you have access to the text for the relevant software.


For details, including ISBN, see the BCA Textbook and Software Guide

If buying the Stata book, order it online at: www.survey-design.com.au or www.stata.com/bookstore/bios.html

Special computer requirements: SAS and Stata software. For advice about buying these packages (at education license prices), see the BCA Textbook and Software Guide. If you have further questions you can consult the BCA program coordinator at your home university or the BCA coordinating office.

Resources for distance students: Printed course notes (and/or CD) and assignment material by mail and online interaction facilities
Principles of Statistical Inference (PSI)

Coordinator: Semester 1: Ms Liz Barnes and Ms Lucy Davies, NHMRC Clinical Trials Centre, University of Sydney
Semester 2: Dr Patrick Kelly, School of Public Health, University of Sydney

Prerequisites: Mathematical Background for Biostatistics, Probability and Distribution Theory

Semester availability: Semester 1 and semester 2

Time commitment: 8-12 hours total study time per week

Aim: To provide a strong mathematical and conceptual foundation in the methods of statistical inference, with an emphasis on practical aspects of the interpretation and communication of statistically based conclusions in health research.

Content: Review of the key concepts of estimation, and construction of Normal-theory confidence intervals; frequentist theory of estimation including hypothesis tests; methods of inference based on likelihood theory, including use of Fisher and observed information and likelihood ratio; Wald and score tests; an introduction to the Bayesian approach to inference.

Assessment: Assignments 70% (2 written assignments worth 35% each) and submission of selected practical exercises 30%

Prescribed texts: Recommended – not compulsory:


Special computer requirements: SAS or Stata statistical software

Resources for distance students: Printed course notes and assignment material by mail, email, and online interaction facilities
Design of Randomised Controlled Trials (DES)

Coordinator: Dr Amy Salter, Ms Aarti Gulyani, Discipline of Public Health, University of Adelaide

Prerequisites: Epidemiology, Mathematical Background for Biostatistics

Semester availability: Semester 2

Time commitment: 8-12 hours total study time per week

Aim: To enable students to understand and apply the principles of design and analysis of experiments, with a particular focus on randomised controlled trials (RCTs), to a level where they are able to contribute effectively as a statistician to the planning, conduct and reporting of a standard RCT.

Content: Topics include: principles and methods of randomisation in controlled trials; treatment allocation, blocking, stratification and allocation concealment; parallel, factorial and crossover designs, including n-of-1 studies; practical issues in sample size determination; intention-to-treat principle; phase I dose finding studies; phase II safety and efficacy studies; interim analyses and early stopping; multiple outcomes/endpoints, multiple tests and subgroup analyses, including adjustment of significance levels and P-values; reporting trial results and use of the CONSORT statement.

Assessment: Assignments 100% (three written assignments, the first two worth 30% each and the final assignment worth 40%)


For details, including ISBN, see the BCA Textbook and Software Guide

Special computer requirements: Nil – win_sam and PS software will be supplied by the unit coordinator

Resources for distance students: Printed course notes and assignment material by mail, email, and online interaction facilities
## Linear Models (LMR)

**Coordinators:**
- Prof Andrew Forbes, Dept of Epidemiology & Preventive Medicine, Monash University
- Prof John Carlin, School of Population Health, University of Melbourne

Either Prof Carlin or Prof Forbes will be the principal coordinator in a given semester.

**Prerequisites:**
- Epidemiology, Mathematical Background for Biostatistics, Probability and Distribution Theory
- Principles of Statistical Inference

**Co-requisite**
- Program Coordinator approval is required for taking EPI and LMR simultaneously

**Semester availability:** Semester 2

**Time commitment:** 8-12 hours total study time per week

**Aim:** To enable students to apply methods based on linear models to biostatistical data analysis, with proper attention to underlying assumptions and a major emphasis on the practical interpretation and communication of results.

**Content:**
- The method of least squares; regression models and related statistical inference; flexible nonparametric regression; analysis of covariance to adjust for confounding; multiple regression with matrix algebra; model construction and interpretation (use of dummy variables, parametrisation, interaction and transformations); model checking and diagnostics; regression to the mean; handling of baseline values; the analysis of variance; variance components and random effects.

**Assessment:**
- Assignments 60% (two assignments worth 30% each) and four shorter assignments including brief online quizzes, 40%.

**Prescribed texts:**
- Recommended – not compulsory:
  - For details, see the [BCA Textbook and Software Guide](#)

**Special computer requirements:** Stata statistical software

**Resources for distance students:** Printed course notes and assignment material by mail, email, and online interaction facilities
### Categorical Data and Generalised Linear Models (CDA)

**Coordinator:** Prof Annette Dobson, Dr Mark Jones, School of Population Health, University of Queensland

**Prerequisites:** Epidemiology, Mathematical Background for Biostatistics, Probability and Distribution Theory, Principles of Statistical Inference

**Co-requisite**: Linear Models

**Semester availability:** Semester 2

**Time commitment:** 8-12 hours total study time per week

**Aim:** To enable students to use generalized linear models (GLMs) and other methods to analyse categorical data with proper attention to the underlying assumptions. There is an emphasis on the practical interpretation and communication of results to colleagues and clients who may not be statisticians.

**Content:** Introduction to and revision of conventional methods for contingency tables especially in epidemiology: odds ratios and relative risks, chi-squared tests for independence, Mantel-Haenszel methods for stratified tables, and methods for paired data. The exponential family of distributions; generalized linear models (GLMs), and parameter estimation for GLMs. Inference for GLMs – including the use of score, Wald and deviance statistics for confidence intervals and hypothesis tests, and residuals. Binary variables and logistic regression models – including methods for assessing model adequacy. Nominal and ordinal logistic regression for categorical response variables with more than two categories. Count data, Poisson regression and log-linear models.

**Assessment:** Assignments 70% (two assignments each worth 35%); submitted exercises 24% (6 modules x 4%) and online discussions 6% (6 modules x 1%)

**Prescribed texts:** References will be listed in the unit Study Guide

**Special computer requirements:** Stata statistical software or similar

**Resources for distance students:** Printed course notes and assignment material by mail, email, and online interaction facilities
Survival Analysis (SVA)

Coordinator: Dr Ken Beath, Dept of Statistics, Macquarie University
Prerequisites: Epidemiology, Mathematical Background for Biostatistics, Probability and Distribution Theory, Principles of Statistical Inference, Linear Models
Semester availability: Semester 1
Time commitment: 8-12 hours total study time per week
Aim: To enable students to analyse data from studies in which individuals are followed up until a particular event occurs, e.g. death, cure, relapse, making use of follow-up data also for those who do not experience the event, with proper attention to underlying assumptions and a major emphasis on the practical interpretation and communication of results.
Content: Kaplan-Meier life tables; logrank test to compare two or more groups; Cox’s proportional hazards regression model; checking the proportional hazards assumption; time-dependent covariates; multiple or recurrent events; sample size calculations for survival studies.
Assessment: Assignments 85% (3 written assignments, 1st: 27%, 2nd: 31%, 3rd: 27%), Short answer exercises 15% (worth 5% each).
For details, including ISBN, see the BCA Textbook and Software Guide
Recommended – not compulsory:
Special computer requirements: Stata statistical software
Resources for distance students: Printed course notes and assignment material by mail, email, and online interaction facilities
Workplace Project Portfolio (WPP)

Coordinator: Coordinator will depend on university.

Prerequisites: Minimum of 4 units, including Linear Models and Data Management & Statistical Computing

Semester availability: Semesters 1 and 2 - upon arrangement with BCA Program Coordinator at the student’s home university

Unit options:
- a one-project unit - worth equivalent credit points to a single unit
- a two-project unit – worth equivalent credit points to 2 units

available at the University of Queensland:
- a four-project unit – worth equivalent credit points to 4 units

The schedule of study for students will be determined on a case-by-case basis with the BCA Program Coordinator at the students’ home university, based on student needs and goals.

Students choosing the one-project unit will need to make up credit points equal to the Masters Degree by choosing an elective.

Aim: The aim of this unit is that the student gains practical experience, usually in workplace settings, in the application of knowledge and skills learnt during the coursework of the masters program.

Content: The student will usually provide evidence of having met this goal by presenting a portfolio or thesis made up of a preface and project reports.

An outline of the options for the structure of this unit, including supervision and assessment requirements, is available here: Workplace Project Portfolio [WPP] Guidelines

PLEASE NOTE: Adequate supervisory arrangements must be in place before students commence this unit. Students wishing to complete the Masters Degree should discuss options for WPP with the BCA program coordinator at their home university.

The requirements of individual universities may differ. Depending on the university, 1, 2 and 4 unit options may be available for WPP.
Health Indicators and Health Surveys (HIS)

Coordinator: Prof Judy Simpson, School of Public Health, University of Sydney
Co/prerequisite*: Mathematical Background for Biostatistics
Semester availability: Semester 1
Time commitment: 8-12 hours total study time per week
Aim: On completion of this unit students should be able to derive and compare population measures of mortality, illness, fertility and survival, be aware of the main sources of routinely collected health data and their advantages and disadvantages, and be able to collect primary data by a well-designed survey and analyse and interpret it appropriately.
Content: Routinely collected health-related data; quantitative methods in demography, including standardisation and life tables; health differentials; design and analysis of population health surveys including the roles of stratification, clustering and weighting
Assessment: Assignments 100% (4 written assignments: 20%, 30%, 25%, 25%)
For details, including ISBN, see the BCA Textbook and Software Guide
Special computer requirements: SAS or Stata statistical software, and Microsoft Excel
Resources for distance students: Printed course notes and assignment material by mail, email, and online interaction facilities

* co-requisite, may be taken concurrently with MBB
Clinical Biostatistics (CLB)

Coordinator: Prof Annette Dobson, Dr Mark Jones, School of Population Health, University of Queensland

Prerequisites: Epidemiology, Mathematical Background for Biostatistics, Probability and Distribution Theory

Co-requisite*: Principles of Statistical Inference

Semester availability: Semester 1

Time commitment: 8-12 hours total study time per week

Aim: To enable students to use correctly statistical methods of particular relevance to evidence-based health care and to advise clinicians on the application of these methods and interpretation of the results.

Content: Clinical agreement (kappa statistics, Bland-Altman agreement method, intraclass correlation); diagnostic tests (sensitivity, specificity, predictive values, ROC curves, likelihood ratio); statistical process control (special and common causes of variation, Shewhart, CUSUM and EWMA charts); and systematic reviews (process, estimating treatment effect, assessing heterogeneity, publication bias).

Assessment: Assignments 92% (4 written assignments each worth 23%) and 8% for online discussions

Prescribed texts: References will be listed in the unit Study Guide

Special computer requirements: Stata statistical software

Resources for distance students: Printed course notes and assignment material by mail, email, and online interaction facilities
Longitudinal & Correlated Data (LCD)

Coordinators: Prof John Carlin, School of Population Health, University of Melbourne
               Prof Andrew Forbes, Dept of Epidemiology & Preventive Medicine, Monash University

Either Prof Carlin or Prof Forbes will be the principal coordinator in a given semester.

Prerequisites: Epidemiology, Mathematical Background for Biostatistics, Probability and Distribution Theory, Principles of Statistical Inference, Linear Models, Categorical Data and Generalised Linear Models

Semester availability: Semester 1

Time commitment: 8-12 hours total study time per week

Aim: To enable students to apply appropriate methods to the analysis of data arising from longitudinal (repeated measures) epidemiological or clinical studies, and from studies with other forms of clustering (cluster sample surveys, cluster randomised trials, family studies) that will produce non-exchangeable outcomes.

Content: Paired data; the effect of non-independence on comparisons within and between clusters of observations; methods for continuous outcomes: normal mixed effects (hierarchical or multilevel) models and generalised estimating equations (GEE); role and limitations of repeated measures ANOVA; methods for discrete data: GEE and generalized linear mixed models (GLMM); methods for count data.

Assessment: Assignments 100% (two major assignments worth 30% each and 4 shorter assignments worth 40%)

Prescribed texts: Recommended – not compulsory:


For details, including ISBN, see the BCA Textbook and Software Guide

Special computer requirements: Stata and SAS statistical software

Resources for distance students: Printed course notes and assignment material by mail, email, and online interaction facilities
Bayesian Statistical Methods (BAY)

Annual availability: BAY is delivered in alternate years. It IS available in 2014.

Coordinator: A/Prof Lyle Gurrin, School of Population Health, University of Melbourne

Prerequisites: Epidemiology, Mathematical Background for Biostatistics, Probability and Distribution Theory, Principles of Statistical Inference, Linear Models, Categorical Data and Generalised Linear Models

Semester availability: Semester 2 in year of delivery

Time commitment: 8-12 hours total study time per week

Aim: To achieve an understanding of the logic of Bayesian statistical inference, i.e. the use of probability models to quantify uncertainty in statistical conclusions, and acquire skills to perform practical Bayesian analysis relating to health research problems.

Content: Topics include simple one-parameter models with conjugate prior distributions; standard models containing two or more parameters, including specifics for the normal location-scale model; the role of noninformative prior distributions; the relationship between Bayesian methods and standard “classical” approaches to statistics, especially those based on likelihood methods; computational techniques for use in Bayesian analysis, especially the use of simulation from posterior distributions, with emphasis on the WinBUGS package as a practical tool; application of Bayesian methods for fitting hierarchical models to complex data structures.

Assessment: Assignments 60% (two major assignments worth 30% each) and submission of selected practical exercises 40%


For details, including ISBN, see the BCA Textbook and Software Guide

Special computer requirements: Unit coordinator will advise (no licensing costs involved)

Resources for distance students: Printed course notes, including published literature, and assignment material by mail and email, and online interaction facilities.
Advanced Clinical Trials (ACT)

Annual availability: ACT is delivered in alternate years. It is NOT available in 2014.

Coordinator: Dr Rachel O’Connell
NHMRC Clinical Trials Centre, University of Sydney

Prerequisites: Epidemiology, Mathematical Background for Biostatistics, Probability and Distribution Theory, Design of Experiments and RCTs, Principles of Statistical Inference, Linear Models

Semester availability: Semester 2
Time commitment: 8-12 hours total study time per week

Aim: This elective unit extends and enhances the concepts developed in Design of Experiments and RCTs. On completion, students have the knowledge and skills required at an advanced professional level to design and analyse clinical trials, including cross-over designs and equivalence trials, and to identify and implement statistical methods for trial monitoring and reporting, with appropriate knowledge of regulatory requirements.

Content: Methods in RCTs for determining: stopping rules for interim analyses (O’Brien-Fleming, Peto), spending functions, stochastic curtailment; statistical principles encountered in relation to aspects of regulatory guidelines (ICH, FDA, EMEA), and related to reports prepared for data safety and monitoring committees (DSMC); design and analysis of cross-over trials (period effects, interactions); equivalence and non-inferiority trials; problems of defining and using surrogate endpoints as alternatives to direct clinical outcomes.

Assessment: Assignments 60% (3 written assignments worth 25%, 25% and 10% respectively), at-home examination 40%

Prescribed texts: Recommended – not compulsory:

Senn S. Cross-over trials in clinical research, 2nd edition 2002, Wiley

Jennison C, Turnbull BW. Group sequential methods with applications to clinical trials 1999, Chapman & Hall

For details, including ISBN, see the BCA Textbook and Software Guide

Special computer requirements: Stata or SAS.
An ACT specific software (freeware) is supplied by the unit coordinator.

Resources for distance students: Printed course notes, including published literature, and assignment material by mail and email, and online interaction facilities.
Bioinformatics (BIF)

Annual availability: Delivery in 2014 to be advised

Coordinator: TBA

Co/prerequisites: Mathematical Background for Biostatistics, Data Management and Statistical Computing, Probability and Distribution Theory, Principles of Statistical Inference, Linear Models

Semester availability: Semester 2

Time commitment: 8-12 hours total study time per week

Aim: Bioinformatics addresses problems related to the storage, retrieval and analysis of information about biological structure. This unit provides a broad-ranging study of this application of quantitative methods in biology.

Content: Biology basics; Population genetics; Web-based tools, data sources and data retrieval; The analysis of single and multiple DNA or protein sequences; Hidden Markov Models and their applications; Evolutionary models; Phylogenetic trees; Analysis of microarrays; Use of R in bioinformatics applications.

Assessment: Assignments 60% (three written assignments, each worth 20%). Final at-home examination 40%.


For details, including ISBN, see the BCA Textbook and Software Guide

Special computer requirements: “R” (freeware – coordinator will give instructions on how to download)

Resources for distance students: Printed course notes and assignment material by mail, email, and online interaction facilities