BCA

Biostatistics Collaboration of Australia

BCA PROGRAM OUTLINE - 2010

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BCA Coordinating Office

The BCA Coordinating Office is the central liaison point for the BCA. Staff at this office can help with enquiries about the program and are available at all times to assist enrolled students.

Please contact:

email: bca@ctc.usyd.edu.au

phone: 02-9562 5076/5324

website: www.bca.edu.au

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 bio-statisticians. 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

The Australian National University is a participating university in the BCA Program. A unit of study is delivered by the ANU, but students can't enrol in the program at this university.

All units of study are delivered by distance learning.

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

The BCA has support from the Commonwealth Department of Health and Ageing.

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 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 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 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

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 such as the BCA.

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 course-work 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.

You can find contact details here:
www.bca.edu.au/awardinguni.htm

BCA curriculum 2010

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

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

✓ 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.

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.

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

	Exemptions				
	No exemptions	**EPI only**	**MBB only**	**EPI+MBB**	**MBB+PDT+PSI**
Year 1					
Sem 1	MBB + EPI	MBB + DMC	EPI + DMC	PDT + DMC	EPI + DMC
Sem 2	PDT + DES	PDT + DES	PDT + DES	PSI + DES	LMR + DES
Year 2					
Sem 1	PSI + DMC	PSI + HIS/CLB	PSI + HIS/CLB	HIS + CLB	SVA + HIS/CLB
Sem 2	LMR + CDA	LMR + CDA	LMR + CDA	LMR + CDA	CDA + ACT/BAY/BIF
Year 3					
Sem 1	SVA + WPP/HIS/ CLB/ LCD	SVA + WPP/HIS/ CLB/ LCD	SVA + WPP/HIS/ CLB/ LCD	SVA + WPP/ LCD	WPP/HIS/CLB/ LCD
Sem 2	WPP/ACT/BAY/BIF	WPP/ACT/BAY/BIF	WPP/ACT/BAY/BIF	WPP/ACT/BAY/BIF	WPP/ACT/BAY/BIF

TABLE B: for students starting in Semester 1 and studying **one unit per semester**

	Exemptions				
	No exemptions	**EPI only**	**MBB only**	**EPI+MBB**	**MBB+PDT+PSI**
Year 1					
Sem 1	MBB	MBB	DMC	PDT	EPI
Sem 2	PDT	PDT	PDT	PSI	LMR
Year 2					
Sem 1	DMC	DMC	EPI	DMC	DMC
Sem 2	PSI	DES	DES	LMR	CDA/DES
Year 3					
Sem 1	EPI	PSI	PSI	SVA	SVA
Sem 2	LMR	LMR	LMR	CDA/DES	DES/CDA
Year 4					
Sem 1	SVA	HIS/CLB/SVA	SVA	HIS/CLB/LCD	HIS/CLB/LCD
Sem 2	DES/CDA	CDA	CDA	DES/CDA	ACT/BAY/BIF
Year 5					
Sem 1	HIS/CLB/WPP	HIS/CLB/SVA/LCD	HIS/CLB/LCD	HIS/CLB/LCD	HIS/CLB/LCD
Sem 2	CDA/DES	ACT/BAY/BIF	ACT/BAY/BIF	ACT/BAY/BIF	ACT/BAY/BIF
Year 6					
Sem 1	WPP/HIS/CLB/LCD	WPP/HIS/CLB/LCD	WPP/HIS/CLB/LCD	WPP/HIS/CLB/LCD	WPP/HIS/CLB/LCD
Sem 2	WPP/ACT/BAY/BIF	WPP/ACT/BAY/BIF	WPP/ACT/BAY/BIF	WPP/ACT/BAY/BIF	WPP/ACT/BAY/BIF

TABLE C: for students starting in Semester 2 and studying **two units per semester**

	Exemptions				
	No exemptions[#]	**EPI only**[§]	**MBB only**[¤]	**EPI+MBB**	**MBB+PDT+PSI**
Year 1					
Sem 2	MBB + DMC	MBB + DMC	PDT+ DMC	PDT + DES	EPI + LMR[⬩]
Year 2					
Sem 1	PDT + EPI	PDT + HIS	PSI + EPI	PSI + DMC	DMC + SVA
Sem 2	PSI + DES	PSI + DES	LMR + DES	LMR + CDA	CDA + DES
Year 3					
Sem 1	HIS + CLB	CLB[§]	SVA + HIS/CLB	SVA + HIS/CLB/LCD	HIS/CLB/ LCD
Sem 2	LMR + CDA	LMR + CDA	CDA + WPP/ACT/BIF	WPP/ACT/BAY/BIF	WPP/ACT/BAY/BIF
Year 4					
Sem 1	SVA + WPP[#]	SVA + WPP/ LCD	WPP/HIS/ CLB/ LCD	WPP/HIS/ CLB/ LCD	WPP/HIS/CLB/ LCD
Sem 2		WPP/ACT/BAY/BIF			

⬩ 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 BAY 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**

	Exemptions				
	No exemptions	**EPI only**	**MBB only**	**EPI+MBB**	**MBB+PDT+PSI**
Year 1					
Sem 2	MBB	MBB	PDT	PDT	DMC
Year 2					
Sem 1	PDT	DMC	EPI	PSI	EPI
Sem 2	PSI	PDT	DMC	LMR	LMR
Year 3					
Sem 1	EPI	PSI	PSI	DMC	SVA
Sem 2	LMR	LMR	LMR	CDA/DES	CDA/DES
Year 4					
Sem 1	DMC	SVA	SVA	SVA	HIS/CLB/LCD
Sem 2	DES/CDA	DES/CDA	DES/CDA	DES/CDA	DES/CDA
Year 5					
Sem 1	SVA	HIS/CLB/LCD	HIS/CLB/LCD	HIS/CLB/LCD	HIS/CLB/LCD
Sem 2	CDA/DES	CDA/DES	CDA/DES	ACT/BAY/BIF	ACT/BAY/BIF
Year 6					
Sem 1	HIS/CLB/LCD	WPP/HIS/CLB/LCD	WPP/HIS/CLB/LCD	WPP/HIS/CLB/LCD	HIS/CLB/LCD
Sem 2	WPP/ACT/BAY/BIF	WPP/ACT/BAY/BIF	WPP/ACT/BAY/BIF	WPP/ACT/BAY/BIF	WPP/ACT/BAY/BIF
Year 7					
Sem 1	WPP/HIS/CLB/LCD	WPP/HIS/CLB/LCD	WPP/HIS/CLB/LCD	WPP/HIS/CLB/LCD	WPP/HIS/CLB/LCD

Unit of study outlines

Units of study available for the program in biostatistics

Unit outlines 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 or courses. 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, 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 **and** Microsoft Access 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.

  Details for compulsory textbooks and statistical software packages, including purchasing advice, can be found in the Textbook and Software Guide at: www.bca.edu.au/currentstudentsinfo.htm

  - **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: The length of ISBN codes has been increased from 10 to 13 digits. From Jan 2007, all ISBN-10s were officially changed to ISBN-13s (by adding the Bookland EAN prefix '978' and recalculating the final check digit).

    Note that any ISBN-13 (prefixed with '978') can be converted to an ISBN-10. (For details and ISBN converter, see: **www.bisg.org/isbn-13/faq.html**).

    All ISBNs listed in this Outline 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) (along with Access, which is available as part of the full MS Office package) 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.

SUPPORT FOR SOFTWARE: Unit coordinators may specify that students can use either Stata or SAS or both for some of or the entire unit. 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.

- **Online interaction materials**

  Most BCA units use the online facility eLearning via the BCA online learning site. Exceptions are Epidemiology (EPI) and Survival Analysis (SVA), which use the online facilities at the delivering university. SVA is delivered by Macquarie 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.

Title:	**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 7 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.

Coordinator:	Dr Andrew Page
Assessment:	Three written assignments (20%, 25%, 35%) and an end of semester online exam 20%
Prescribed text:	Nil

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; the role of epidemiology in health services research and policy.
Assessment:	As prescribed by university
Prescribed texts:	As prescribed by university
Special computer requirements:	Nil
Resources for distance students:	Printed course notes and assignment material by mail, and online interaction facilities[1]

[1] Resources dependent on delivering university facilities

Title:	**Mathematical Background for Biostatistics (MBB)**
Coordinators:	Semester 1: Dr Keith Dear, National Centre for Epidemiology & Population Health, The Australian National University Semester 2: Dr Murizio Manuguerra, Department of Statistics, Macquarie University
Prerequisites:	None
Semester availability:	Semester 1 and semester 2
Time commitment:	8-12 hours total study time per week
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 (20%) calculus (40%) matrices and numerical methods (40%)
Prescribed texts:	Anton H, Bivens I, Davis S. *Calculus: early transcendentals version,* 8th edition. Wiley, 2005. ISBN 978-0-471-47244-5 Note: Be sure you have the correct version: **not** "late transcendentals", and **not** the "brief edition". The ISBN identifies the right one. Useful but not essential text: Healy, M.J.R. *Matrices for Statistics*, 2nd edition. Oxford University Press, 2000. ISBN 978-0-19-850702-4
Special computer requirements:	Microsoft Excel OR Stata statistical software
Resources for distance students:	Printed course notes and assignment material by mail, email, and online interaction facilities

Title:	**Probability and Distribution Theory (PDT)**
Coordinators:	Semester 1: Prof Andrew Forbes Dept of Epidemiology & Preventive Medicine, Monash University Semester 2: A/Prof Rory Wolfe Dept of Epidemiology & Preventive Medicine, Monash University
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:	Assignments 80% (two written assignments, each worth 40%) and submission of selected practical written exercises 20%,
Prescribed texts:	Wackerly DD, Mendenhall W, Scheaffer RL. Mathematical Statistics with Applications, 7th edition, 2008, Duxbury Press, USA. ISBN 978-0-495-11081-1
Special computer requirements:	Stata statistical software
Resources for distance students:	Printed course notes and assignment material by mail, email, and online interaction facilities

Title:	**Health Indicators and Health Surveys (HIS)**
Coordinator:	Mr Kevin McGeechan, 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 92% (4 written assignments, 2 worth 20%, 2 worth 26%), 8% for contributions to online discussions
Prescribed texts:	Scheaffer RL, Mendenhall W, Ott RL. *Elementary Survey Sampling.* 6th edition. Wadsworth 2006. ISBN 978-0-534-41805-2
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

Title:	**Data Management and Statistical Computing (DMC)**
Coordinators:	Semester 1: Prof Cate D'Este; Mr Stephen Halpin Centre for Clinical Epidemiology and Biostatistics The University of Newcastle Semester 2: Dr Lyle Gurrin and Mr Kris Jamsen, 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 course is to introduce students to essential concepts and tools required for the management and analysis of data using modern statistical software. Data management principles and concepts are developed using relational database software (Microsoft Access). Data manipulation, descriptive analyses and interpretation are introduced using SAS and Stata statistical software. Students will also acquire skills in data display, summary presentation and pattern recognition using these tools.
Content:	Data Management Concepts, Introduction to Stata and SAS, Data Management Using Stata and SAS
Assessment:	Assignments 60% (3 written assignments worth 15%, 15% and 30%), at-home examination 40%
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. Cody R, Smith J. *Applied Statistics & the SAS Programming Language.* 5th edition. Prentice Hall 2005. ISBN 978-0-13-146532-9 Hills M & De Stavola B. *A Short Introduction to Stata for Biostatistics.* Timberlake 2007. ISBN 978-0-9557076-1-2 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 **and** Microsoft Access For advice about purchasing these packages (at education license prices), see "Textbook and Study Guide for Students" at: http://www.bca.edu.au/currentstudentsinfo.htm 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, email, and online interaction facilities

Title:	**Principles of Statistical Inference (PSI)**
Coordinator:	Semester 1: Ms Rachel O'Connell and Ms Liz Barnes 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; an introduction to distribution-free statistical methods.
Assessment:	Assignments 70% (2 written assignments worth 35% each) and submission of selected practical exercises 30%
Prescribed texts:	Recommended – not compulsory: Azzalini, A. *Statistical Inference: Based on the Likelihood.* Chapman and Hall, London 1996. ISBN 978-0-412-60650-2 Clayton and Hills. *Statistical Models in Epidemiology.* Oxford University Press, Oxford, 1993. ISBN 978-0-19-852221-8 Wackerley, D., Mendenhall, W., & Schaeffer RL. *Mathematical Statistics with Applications.* Duxbury Press, 2007. ISBN 978-0495110811
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

Title:	**Clinical Biostatistics (CLB)**
Coordinator:	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

Title:	**Design of Randomised Controlled Trials (DES)**
Coordinator:	Prof Philip Ryan, Data Management & Analysis Centre, 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%)
Prescribed texts:	Piantadosi S. *Clinical Trials a Methodological Perspective, 2nd edition*. John Wiley & Sons 2005. ISBN 978-0-471-72781-1
Special computer requirements:	Nil
Resources for distance students:	Printed course notes and assignment material by mail, email, and online interaction facilities

Title:	**Linear Models (LMR)**
Coordinators:	Prof Andrew Forbes, Dept of Epidemiology & Preventive Medicine, Monash University Prof John Carlin, School of Population Health, University of Melbourne
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 75% (two case study assignments worth 35% and 40% respectively), submission of selected practical exercises 20%, online quizzes 5%
Prescribed texts:	Recommended – not compulsory: Kutner MH, Nachtsheim CJ, Neter J, Li W. *Applied Linear Statistical Models.* 5th edition. McGraw-Hill/Irwin 2005. ISBN 978-0-07-310874-2
Special computer requirements:	Stata statistical software
Resources for distance students:	Printed course notes and assignment material by mail, email, and online interaction facilities

Title:	**Categorical Data and Generalised Linear Models (CDA)**
Coordinator:	A/Prof Michael Coory, 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:	The assessment is based entirely on assignments, submitted exercises and online discussion. There is no examination. There are two assignments each worth 35% of the marks. In addition, for each Module there will be assessment worth 5% of which 4% will be for a Submitted Exercise and 1% for Online Discussion contributions (So the allocation of marks is: Assignments, 35 + 35 = 70; Submitted Exercises, 6x4 = 24: and Online Discussions 6x1 = 6: total = 100%.)
Prescribed texts:	No compulsory text (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

Title:	**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 66% (3 written assignments worth 22% each), online participation 8%, at-home examination 26%
Prescribed texts:	Hosmer D W, Lemeshow S, May S. *Applied Survival Analysis: Regression modeling of time to event data, 2nd Edition.* Wiley Interscience 2008. ISBN 978-0-471-75499-2 Recommended – not compulsory: Cleves M, Gould W, Gutierrez R. *An Introduction to Survival Analysis Using Stata,* 2004. Stata Press - http://survey-design.com.au/ ISBN 978-1-881228-84-4
Special computer requirements:	Stata statistical software
Resources for distance students:	Printed course notes and assignment material by mail, email, and online interaction facilities

Title:	**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: **www.bca.edu.au/studentinfo.htm** (see 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.

Title:	**Bayesian Statistical Methods (BAY)**
Coordinator:	Dr 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
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 will 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%
Prescribed texts:	Gelman, A., Carlin, JB, Stern, HS and Rubin, DB. *Bayesian Data Analysis*, 2nd edition. Chapman and Hall 2003. ISBN 978-1-58488-388-3
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.

Title:	**Advanced Clinical Trials (ACT)**
Coordinator:	Prof Val Gebski, 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. ISBN 978-0471496533 Jennison C. and B.W. Turnbull. *Group sequential methods with applications to clinical trials* 1999, Chapman & Hall. ISBN 978-0849303166
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.

Title:	**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
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% (20% practical exercises, in 4 parts and including a component for on-line group discussion, and two written assignments worth 40% and requiring about 12 hours time each)
Prescribed texts:	Recommended – not compulsory: Fitzmaurice G, Laird N, Ware J. Applied Longitudinal Analysis. John Wiley and Sons, 2004. ISBN 978-0-471-21487-8
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

Title:	**Bioinformatics (BIF)**
Coordinator:	Prof Graham Wood Department of Statistics, Macquarie University
Co/prerequisites:	Mathematical Background for Biostatistics, Database 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; Functional Genomics; Use of R in bioinformatics applications.
Assessment:	Assignments 60% (three written assignments, each worth 20%). Final at-home examination 40%.
Prescribed texts:	Durbin R, Eddy S, Krogh A, Mitchison G. Biological Sequence Analysis: Probabilistic models of proteins and nucleic acids. Cambridge University Press, 1998. ISBN 978-0521629713
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