

**SCHOOL OF MATHEMATICAL AND  
PHYSICAL SCIENCES**



**THE UNIVERSITY OF  
NEWCASTLE  
AUSTRALIA**

**HONOURS PROGRAM IN STATISTICS**

**2010**

## 1. Introduction

Newcastle is the largest non-capital city in Australia. Its features include magnificent beaches, which host international surf events, parklands and nature reserves and its proximity to the renowned Hunter Valley vineyards.

The University of Newcastle's Callaghan campus resides in a bushland setting which harmonises with the nearby wetlands centre. The campus provides many sporting facilities along with the University's cultural offerings in theatre and music. The latter complement the activities of professional theatre and music which flourish in the heart of Newcastle.

The above provides a congenial environment for teaching and learning at The University of Newcastle.

The Statistics Discipline is part of the Discipline of Mathematics, and lies within the School of Mathematical and Physical Sciences and Faculty of Science and Information Technology. The Statistics Discipline comprises continuing and casual academic staff, research staff and postgraduate research students ('The Statistics Group'). It is broadened by strong cross-disciplinary links in research and teaching within and outside the University, national and international linkages in both research and teaching, and strong collaboration with commercial research groups.

The Statistics Group's mission:

*To provide appropriate and innovative solutions and contributions to the development of statistical theory, modelling, analysis and reporting with a primary focus on application. The group will become known for its breadth and depth of applications and knowledge, accessibility, professionalism and friendliness, and successful collaboration with researchers and the professional community across many fields.*

*The group will fulfill the above through the members' established research interests and outcomes, continued individual innovation and self-development, collaborative efforts with both intra- and inter-institutional researchers and the community, involvement with community and professional societies, continued journal publications, grant applications and peer-reviewing of journals' submitted articles.*

The Statistics Group offers a Statistical Support Service (SSS) to postgraduates, research staff and external clients. Guided hands-on experience in statistical consulting through the SSS can be an integral part of the Honours programme.

Many of the B.Math. Honours graduates have continued on to PhD study both in Australia and overseas. Those who have wished to enter the work force directly from the Honours year are strongly sought for their skills in quantitative reasoning, statistical theory and methodology, and ability to apply analytical, reporting and communication skills to answer questions and solve problems based on data. Employers appreciate the communication, report-writing, problem-solving and

research skills developed in the Honours programme. Section 5 lists some of our Honours graduates and their careers.

Beyond Honours, the Statistics staff within the School of Mathematical and Physical Sciences are also very active and successful in research and research training. If you are interested, now or in the future, in Honours and/or postgraduate research in Statistics then you should seek further information by contacting:

- Dr Peter Howley: ph. 49 21 5518, email Peter.Howley@newcastle.edu.au, (presently also the coordinator of students undertaking a B.Math. Honours in Statistics);
- Statistics Office : ph 49 21 5515. fax 49 21 6898.

## **2. The Honours Degree Programme**

To be eligible to enter an Honours degree programme in Statistics you must achieve a minimum of a credit level average over at least four 3000 level (undergraduate third-year) 10-unit Statistics courses or their equivalent (where eight 10-unit courses is considered the typical full time annual load) in your undergraduate degree.

Note that most of the Honours degree courses assume knowledge from 3000 level courses. At the discretion of the Head of School special consideration may be given to students who wish to enter the programme with a different background. See Section 4 for more details on courses offered in the Honours year.

The Honours programme in Statistics aims to:

- extend your undergraduate knowledge and expertise in the analysis and application of statistical techniques;
- deepen your understanding of a particular area of Statistics, whilst broadening your knowledge of related areas;
- increase your capability of understanding statistical literature;
- develop your ability to critically appraise existing research and statistical methods;
- improve your written and oral communication skills;
- develop your ability to undertake research, both theoretical and applied.

These aims are achieved via courses in advanced topics in Statistics, a supervised Honours dissertation (project) and seminar presentation.

### **2.1 What does the Honours' Project involve ?**

The project involves a detailed study of a particular area of Statistics, under the guidance of one or more members of the Statistics staff. The study is likely to involve identification of the project topic and aims of the study, a literature search and review of the area based upon peer-reviewed journal articles, a critical analysis of the literature, computer programming, mathematical calculations and comparisons, data and/or theoretical comparisons and analysis, the drawing of conclusions, reporting the results and identifications of limitations and future research. It should also involve some original research or novel contribution by the student, beyond the supervisor's directions, in order to achieve a high mark.

The project ultimately requires you to produce a dissertation on a particular area of Statistics which will be examined by staff, as well as presenting your project's research to members of the School of Mathematical and Physical Sciences, interested visitors and other students at a seminar.

Statistics staff members are relatively flexible about the areas in which they will supervise students. Prospective students should start talking to staff about possible project topics during their final semester or as soon as possible after their final undergraduate examinations. An early decision about a topic will facilitate an early start, improved progress and a more evenly-spread workload for the project. Supervision by individual lecturers is subject to the availability, and agreement, of the staff member.

Whilst many staff may have some project ideas you are encouraged to consider your own project topic and discuss this with staff. The Statistics Honours Coordinator is a good person to initially contact to discuss your ideas.

Honours' projects may also be taken in collaboration with industry. An agreed research programme is developed with the student, Statistics supervisor and industry partner. Through this process, the student gains valuable work-based experience and is able to evaluate career prospects in an area of interest. Honours' students who are already employed may thus undertake research and problem-solving relevant to their workplace.

## **2.2 The formal requirements of the Honours' Degree Programme**

The workload in the Honours Degree Programme consists of undertaking 5 Honours courses (with permission of the Honours coordinator, one of these courses can be from the 3000 level) and the Honours project. These courses may involve lecture-and-tutorial style presentation (similar to most undergraduate courses), distance education (involving a more self-directed style of learning based upon course notes and online tutorials and discussions, and/or the use of the Access Grid Room which enables students live audio and visual access to courses being taught at other Australian universities), reading courses (involving smaller group discussions between the educator and student, with the student set additional reading (usually from a set textbook) and assessment tasks, which can include small projects based upon the reading materials).

Final assessment for each course is based on the set progressive assessment work and/or final examination.

The courses studied by the student will be determined in consultation with the Head of the Statistics Discipline and the Honours' programme coordinator. You may include courses from Mathematics and other disciplines with the agreement of the Honours' Coordinator.

The length of the Honours' Degree Programme is two semesters of full-time study, or four semesters of part-time study. It is possible for students to undertake a mixture of full- and part-time studies.

A joint Honours degree with many other disciplines is possible. Students might consider joint Statistics/Science, Statistics/Engineering, Statistics/Computer Science, Statistics/Business, Statistics/Behavioural Science and Statistics/Arts Honours degrees. These degrees comprise a project in Statistics and a mix of courses from Statistics and the other disciplines.

You are invited to come and discuss your interest in Honours with either the Honours' coordinator or the Head of the Statistics Discipline. In any case, before enrolling in the Statistics Honours' programme, you will need permission from the Head of School; to enrol in a *combined* Honours' degree programme, you will need permission from *both* Heads of School. The final decision will be based on 3000-level course results. Do not leave planning until your final undergraduate results are known. Contact the coordinator for a friendly chat as soon as possible.

The University can allow students to begin their Honours' year at the start of second semester; again, please discuss your desired plans with the coordinator.

### 2.3 Course Marks and Final Grades

The project is weighted at contributing 37.5% of the Honours Programme's final grading, and the coursework at 62.5%. The Honours project is examined independently by at least two sufficiently qualified examiners or members of academic staff and an external examiner, and a written report is provided by your supervisor.

The project is to be submitted to your supervisor for marking by the end of the first week of the semester's exam period in which the student expects to complete his or her programme.

<b>Class of Honours</b>	<b>Marks Required*</b>
Class I	mark of 85% or over in the 80 honours units with a minimum of 75% from each examiner for the dissertation/project
Class II, Division 1	mark of 75% - 84% in the 80 honours units with an average mark of over 65% for the dissertation/project;
Class II, Division 2	mark of 65% - 74% in the 80 honours units with a minimum of 50% from each examiner for the dissertation/project
Class III	mark of 50% - 64% in the 80 honours units with a minimum of 50% from each examiner for the dissertation/project
Fail	mark less than 50%

\* A student must achieve a mark of 50% or more in each course and the final project, otherwise a Fail for Honours will be awarded.

Following the completion of initial assessment items and courses, students will be informed by the Statistics' Honours' Coordinator of the Class of Honours at which they are presently performing. Students should use this information as a guide to their study in the remainder of their courses and project finalisation.

### 3. Honours' Projects

The Statistics staff offer expert supervision across a wide range of modern statistics. Staff members are flexible about the areas in which they will supervise students. If you do not see an area in which you are immediately interested, talk to the Honours' coordinator. Staff who can supervise Honours' projects are listed below along with their areas of interest. Note that not all staff are available every semester.

A/Prof Eric Beh

**Areas of Interest:** Correspondence analysis, ecological inference, categorical data analysis, measures of association, modelling scores for rain-affected cricket matches.

Dr Peter Howley

**Areas of Interest:** Process improvement, statistical process control, performance measurement, Bayesian hierarchical modelling, survey design and analysis, health services research, education.

Dr Robert King

**Areas of Interest:** Study of distributions, estimation/data fitting, extremes and quantile estimation, ecological statistics, socio-spacial modelling, statistics for software engineering.

Dr Darfiana Nur

**Areas of Interest:** Linear time series analysis and modelling, nonlinear time series modelling, Markov chain Monte Carlo convergence, DNA modelling in Bioinformatics, Ergodicity theory.

Prof. John Rayner

**Areas of Interest:** Smooth tests of goodness of fit, statistical model assessment, nonparametric analysis of experimental designs, nonparametric methods.

Mr Paul Rippon

**Areas of Interest:** Industrial statistics, statistical process control, process improvement, evolutionary operation and total quality management.

Dr Elizabeth Stojanovski

**Areas of Interest:** Multivariate and longitudinal modelling, Frequentist and Bayesian meta-analysis, biostatistics, statistical applications in public health.

Dr Frank Tuyl

**Areas of Interest:** Bayesian inference, Industrial statistics, statistical process control, medical statistics

Further information is available at [http://www.newcastle.edu.au/school/math-physical-science/research/statistical\\_research.html](http://www.newcastle.edu.au/school/math-physical-science/research/statistical_research.html)

## 4. Honours' Courses

A provisional listing of the Honours' courses to be offered is normally available by early December of the previous year. A timetable for lectures in each semester is decided at the meeting held at 1.00p.m. in V129 on the first Tuesday of each semester. The following provides a list of courses, although not all of these courses are available every year:

- Advanced Bayesian Methods
- Categorical Data Analysis
- Heteroscedastic Financial Modelling
- Nonlinear Time Series
- Nonparametric Statistics
- Statistical Consulting
- Statistical Methods for Process Improvement
- Surveys and Experimental Design

Students in their Honours' year can also do 3000 level courses which have not been undertaken in their undergraduate programme. These courses may be modified to provide some Honours' level content.

## 5. Examples of Previous Honours' Students

The following lists a sample of students who have completed Statistics Honours degrees at The University of Newcastle.

Megan Ford (2009) obtained First Class Honours and in 2009 began working for Macquarie Bank's Australian Equities Division in Sydney as a quantitative analyst. Her Honours' thesis was entitled "A comparison of beta-binomial posterior predictive and CUSUM control charts for clinical indicator data"

Fiona Mill (2005) worked for the Australian Prudential Regulation Authority whilst undertaking her Honours programme part-time, and after completion. Her thesis was entitled "Forecasting Value at Risk in financial time series: a comparison of models".

Chris Oldmeadow (2005) completed a thesis entitled "Short sequence DNA signal recognition". In 2008 he completed a PhD at the Queensland University of Technology.

Melanie Watson (2005) completed a thesis entitled "Analysing EEG measurements to detect absence epilepsy" and obtained First Class Honours in Statistics. Melanie began working at the Australian Bureau of Statistics in 2005.

Leone Wardman (2005) completed a thesis entitled "Evaluating the effect of heteroscedasticity of variance and covariance on the outcomes of repeated measures response time data". She began working at the Australian Bureau of Statistics in 2005 as a Graduate Research Officer. See <http://www.newcastle.edu.au/school/math-physical-science/testimonials/leone.html> for more details.

Brent Hudson (2003) obtained First Class Honours in Statistics. His honour's project was entitled "A review of methods for time series analysis". Brent proceeded to study for a PhD and began working for Country Energy.

Stephen Mildenhall (2000) was awarded a University Medal. Stephen began working in the Department of Defence in Canberra.

Elizabeth Stojanovski (1996) obtained First Class Honours in Statistics. Her Honours project was entitled “Models to predict the probability of success with the In-Vitro-Fertilisation procedure” and involved collaborative work with Lingard Hospital.

Elizabeth completed a PhD thesis entitled “Statistical Assessment of the Relationship between life events and health”. This involved the longitudinal assessment of the association between life events and health via structural equation models and meta-analyses in the frequentist framework as well as by developing extensions in the Bayesian framework to accommodate different forms of uncertainty. Elizabeth became a member of the Statistics staff at The University of Newcastle in 2006. Prior to joining the Statistics Department, Elizabeth worked as a research academic with the Faculty of Health on projects that focused on psycho-oncology aspects of care and population health. She is involved with collaborative projects assessing strengths of interventions at the oncologist level to aid in improving needs of patients and implementing interventions at hospital level to improve smoking cessation rates among patients. Her academic interests lie with research and application of statistics in the fields of health, psychology and industry.

Peter Howley (1994) obtained First Class Honours in Statistics. His honours’ project was entitled ‘Some Problematic Issues in Statistical Process Control’. Its primary contribution was an assessment of the effects on average run lengths when the assumptions of independence and normality of the data are not satisfied. From 1995-1998, Peter worked as a statistician with the Health Services Research Group: major projects included the Quality In Australian Health Care Study (a Commonwealth-funded project to assess the level of errors in the health care system and identify areas for improvement) and Cancer Action in Rural Towns (assessing the impact of anti-smoking campaigns on communities). Peter is currently a Senior Lecturer in Statistics at The University of Newcastle. He completed PhD research into Bayesian techniques for analysing and reporting clinical indicators (measures of performance in a clinical setting). His academic interests lie with research and application of statistics in the fields of health, business and management and quality improvement activity in industry, business, health care and education.

Stefan Kuegler (1994) completed Honours in Statistics, with a thesis entitled “Estimation of Discontinuous Functions: Using Edge Location and Local Linear Kernel Estimators”, and began work as a statistician in the health industry. After 2 years at two different hospitals and some time spent traveling overseas, Stefan moved into a Market Research position at the start of 2000 and worked his way from Taylor Nelson Sofres to ACNielsen to Colmar Brunton Research Pty Ltd where he is currently the Data Analysis Manager. As a data analyst he performs statistical analyses to identify profitable market areas for future products/services and facilitate an understanding of consumer preferences to new products and what drives their decisions. His hobbies and other interests include volleyball, basketball, writing, travelling and music.