# Postgraduate Handbook 2005

**Introduction from Professor Chris Wild**

Hi,

I'm Chris Wild Head of the Department of Statistics. If you are considering graduate study in statistics and thinking, "Maybe Auckland?", then this booklet was designed with you in mind. We hope that it will help you to make the decision that is right for you.

If you do decide that you are interested in joining the postgraduate programme in Statistics at The University of Auckland, the sooner you establish contact with our Graduate Officers, Associate Professors Brian McArdle and David Scott the better. They can be reached at:


| | | |
|---|---|---|
| Department of Statistics | Phone | (64 9) 373 7999 (via human operator) |
| The University of Auckland | | (64 9) 373 7599 (via automatic operator) |
| Private Bag 92019 | Ext | 86830 or 85845 |
| Auckland | Fax | (64 9) 373 7018 |
| NEW ZEALAND | Email | gradofficer@stat.auckland.ac.nz |


All the best,

Chris Wild

Most of our information is online. Statistics Department home page:
http://www.stat.auckland.ac.nz

The online information tends to be more up to date than the information in this booklet.

For more information please contact:


Department of Statistics
Phone: (64 9) 373 7999 (ext 86893 or 87510)

or email: gradofficer@auckland.ac.nz
http://www.stat.auckland.ac.nz

# Important Dates 2005

**1 December 2004**

Deadline for new students to submit Application for Admission if 2005 programme includes Summer School courses.

Application for Admission also closes 1 December for all students applying to Sport and Exercise Science and Optometry

**8 December 2004**

Deadline for new students to submit Application for Admission if 2005 programme includes Semester 1 and Semester 2 courses only.

If you are a new student, only one Application for Admission is required. This form is due on either 1 December or 8 December, depending on whether you want to take Summer School courses as well

Applications received after these dates may be accepted if there are places available.

**Summer School 2005**

| | |
|---|---|
| Orientation Day | 5 January |
| Lectures Begin | 6 January |
| Auckland Anniversary Day | 31 January |
| Waitangi Day | 6 February |
| Lectures End | 10 February |
| Exams | 14 - 16 February |
| Summer School Ends | 16 February |

**Semester 1 - 2005**

| | |
|---|---|
| Semester 1 Begins | 28 February |
| Easter Break | 25 March - 29 March |
| Mid Semester Break | 18 April - 26 April |
| ANZAC Day | 25 April |
| Queen's Birthday | 6 June |
| Lectures End | 4 June |
| Study Break/Exams | 4 - 25 June |
| Semester 1 Ends | 25 June |
| Inter Semester Break | 27 June - 16 July |

**Semester 2 - 2005**

| | |
|---|---|
| Semester 2 Begins | 18 July |
| Mid Semester Break | 29 August - 10 September |
| Labour Day | 24 October |
| Lectures End | 22 October |
| Study Break/Exams | 22 Oct - 12 November |
| Semester 2 Ends | 12 November |

**Semester 1 - 2006**

| | |
|---|---|
| Semester 1 Begins | 27 February 2006 |

# Table of Contents

# Academic Staff

**Head of Department**

| | |
|---|---|
| Chris Wild | PhD Waterloo |

**Graduate Officers**

| | |
|---|---|
| David Scott | PhD A.N.U |
| Brian McArdle | DPhil York |
| Renate Meyer | PhD RWTH Aachen |

**Professors**

| | |
|---|---|
| Alastair J. Scott | PhD Chicago, FRSNZ, FASA, FIMS |
| George A. F. Seber | PhD Manchester, FRSNZ |
| Christopher J. Wild | PhD Waterloo |

**Associate Professors**

| | |
|---|---|
| Alan J. Lee | PhD North Carolina |
| Brian McArdle | DPhil York |
| Russell Millar | PhD Washington |
| David Scott | PhD A.N.U |
| Christopher M. Triggs | PhD Auckland |

**Senior Lecturers**

| | |
|---|---|
| Marti Anderson | PhD Sydney |
| Ross Ihaka | PhD California |
| Patricia A. Metcalf | PhD Auckland |
| Renate Meyer | PhD RWTH Aachen |
| Peter Mullins | MSc Auckland |
| Paul Murrell | PhD Auckland |
| Maxine Pfannkuch | PhD Auckland |
| Geoffrey Pritchard | PhD Wisconsin |
| Thomas W. Yee | PhD Auckland |
| Ilze Ziedins | PhD Cambridge |

**Lecturers**

| | |
|---|---|
| Andrew Balemi | PhD Auckland |
| Mik Black | PhD Purdue |
| Rachel Fewster | PhD St Andrews |
| Arden E. Miller | PhD Waterloo |
| Wiremu Solomon | PhD Wisconsin |
| Yong Wang | PhD Waikato |

**Senior Tutors**

| | |
|---|---|
| Joss Cummings | BA, DipTchg |
| Mike Forster | BCom |
| Christine Miller | BCom |
| Ross Parsonage | MSc Auckland |
| Matthew Regan | BSc, DipStats Auckland |
| David Smith | BSc, DipStats, DipCompSci |

**Honorary Professor**

| | |
|---|---|
| Peter Davis | PhD |

**Other University of Auckland Staff (with close connections with the Department)**

| | |
|---|---|
| Colin Fox | PhD Cambridge |
| Roger J. Marshall | PhD Bristol |
| Geoff Nicholls | PhD Cambridge |
| David Ryan | PhD A.N.U. |

# Graduate Officers

You need to discuss your course of study with the appropriate Graduate Officer before you enrol in any graduate courses in the Department of Statistics.

### Overseas Enquiries

Renate Meyer

Email: meyer@stat.auckland.ac.nz , Extn: 85755, Room: 210

Anyone from outside New Zealand should address their enquiries about our Postgraduate programmes to Renate Meyer.

### Postgraduate Diplomas

Brian McArdle

Email: bmcardle@stat.auckland.ac.nz , Extn: 85845, Room: 213

Brian McArdle is the Graduate Officer who looks after students doing Postgraduate Diplomas.

### BSc (Hons), BA (Hons) and Masters

David Scott

Email: d.scott@stat.auckland.ac.nz , Extn: 86830 / 85055, Room: T723.318 / 220

David Scott is the Graduate Officer who looks after students doing Honours degrees and Masters degrees. He will also help you choose your project.

### PhDs

Renate Meyer

Email: meyer@stat.auckland.ac.nz , Extn: 85755, Room: 210

Renate Meyer is the Graduate Officer who looks after students doing a PhD.

### Graduate Advocate

Rachel Fewster

Email: fewster@stat.auckland.ac.nz , Extn: 83946, Room: 206

The Graduate Advocate provides a confidential forum in which graduate students may safely air any concerns or suggestions regarding courses or research work in the Department.

### Statistics Graduate Representative

James Russell

Email: jrussell@stat.auckland.ac.nz , Extn: 88679, Room: 218

As the post-graduate representative, my role is to present the concerns of the students to the Head of Department and/or Faculty of Science Postgraduate Committee. These issues are confidential and can be as personal as post-graduate supervision or as general as computing resources. I often work closely with the Graduate Advocate and, at times, discuss student concerns with the Graduate Officer. While I am pleased to say that these matters have been few, feel free to drop in or drop me an email if you have any concerns.

# Applying and Enrolling for Postgraduate Programmes in 2005

## Introducing the Department of Statistics

The Department of Statistics at the University of Auckland, founded in 1994 with George Seber and Alastair Scott as foundation professors, is the largest Statistics Department in Australia and New Zealand. It has a staff establishment of more than 30 including 22 permanent appointments.

Our Department has been best known as the birthplace of the statistical computer system R, and for research in sample survey theory, biometrics (particularly animal abundance), linear and nonlinear models, medical statistics, nonparametric statistics, applied probability, and forensic science. However, the recent influx of younger statisticians has further strengthened statistical computing and broadened the Department's range to include strength in such areas as stochastic operations research, bioinformatics, statistics education, and industrial statistics (see "Research in Statistics").

Ours is an outward-looking department. We actively collaborate with researchers in other disciplines in universities and government research institutes, both inside New Zealand and internationally. Many of us are also involved in contract research and consultancy with business and industry. We also collaborate in teaching with academics from other disciplines, and are committed to providing a supportive environment for students which is conducive to learning and personal growth.

## Why Do Graduate Study in Statistics?



The fascination of advanced study and the excitement of a career in statistics is one of the world's best kept secrets. What other discipline can accommodate people whose passions are as disparate as pure mathematics (well, almost pure!), computer science, medical research, research in biology, social research, engineering, forensics, image reconstruction..., or encompass several of these? Statistics can provide a home for people who love playing with theoretical abstractions. It can also provide a home for people who are driven by the desire to solve practical problems - people who have little patience with abstraction unless they can see direct practical applications.

Few other areas can give you as wide a range of employment possibilities. Do you know yet whether you want to be an academic? Or to work in business or industry? In agriculture? The health sector? Private consultancy? Public sector analysis and planning? Postgraduate study in statistics can help prepare you for any of these. And to a large extent, you can postpone making such difficult choices!

Our recent graduates have found employment in industry, research institutes, medical research teams, government departments, market research companies, insurance companies, investment banks, and in universities. For many of these jobs, a postgraduate degree has been essential.

## Why Auckland?

We are New Zealand and Australia's largest statistics department (in both staff and student numbers) and are situated in New Zealand's largest, best known and most productive research-university (26,000 students).

Large undergraduate numbers have given us many research-active staff. This in turn translates into plenty of exciting things happening, and a wide choice of research topics and supervisors. In many universities, one or two well known staff members are overloaded with research students to the extent that they can no longer cope. It is not like that at Auckland. We have an excellent reputation. Our students are sought after by some of the most prestigious of North American institutions. We have many international visitors and close links with other disciplines. We have very good library and computer facilities. In short, we can provide a rich, exciting and rewarding environment.

There are a variety of means by which you can obtain money to help fund your studies described in our section on funding.

Auckland is also a great place to live. It has a temperate climate and it is a large (pop. approx. 1 million) cosmopolitan city with a rich ethnic mix and all that implies in terms of facilities and entertainment. Built on two harbours lined with popular beaches and surrounded by islands, Auckland is a yachting paradise and, until recently, home of the America's Cup. And only 30 minutes from downtown Auckland one can be lost in unspoilt, bush-clad, coastal ranges, or be walking on wild, windswept ocean beaches and cliff tops.



### A Bit About New Zealand

New Zealand is an independent country located in the South Pacific, just to the west of the international date line an about 2000km east of Australia, and geographically similar in size to Britain and Japan. It has a population of 4 million, mostly of European descent, with about 12% indigenous (Maori) and increasing numbers of people from other backgrounds particularly Polynesian and Asian nations.

## Overview of Postgraduate Degree Programmes

This section gives a quick overview of the types of postgraduate qualification that a student can study for in the Department of Statistics. More detailed descriptions of these programmes are given later in the section "More Details About Degree Programmes" see page 23.

On entering the statistics postgraduate programme after a Bachelors degree, most of our students have begun with a one-year ***Postgraduate Diploma of Science*** (or ***PgDipSci***) which they have then followed with a further year of study to obtain a ***Masters degree***. This could be either a ***MSc*** (or MA) ***in Statistics***, or it could be a ***MSc in Medical Statistics***.

A Masters degree takes two years of study after a Bachelors degree. Crediting the first year of that study to a *PgDipSci* gives you flexibility. If you decide to leave and get a job after only one year, you will be able do so having gained a postgraduate qualification in statistics. The *MSc in Statistics* is a very flexible degree programme allowing considerable choice. The *MSc in Medical Statistics* is a more tightly defined programme designed for those wanting a qualification that is more clearly targeted at

careers in the medical area. Those wanting to do the *MSc in Medical Statistics* must ensure that they do not make course choices for their first postgraduate year that will prevent them from meeting the requirements of the degree by the end of their second year.

Another option for A-students just competing a degree at Auckland is to enrol for a ***BSc(Hons)*** for their first postgraduate year. This involves one year of postgraduate study following the Bachelors degree. It differs from the *PgDipSci* in that it is awarded with a class of honours and, whereas our *PgDipSci* consists of 7 courses, our *BSc(Hons)* consists of 6 courses and a research dissertation (with the weighting of one course). The *BSc(Hons)* qualification has been particularly useful for students who have wanted to do a PhD overseas but not take the time to complete their Masters here before leaving. As with the *PgDipSci*, one can obtain a Masters degree with one year of study after completing a *BSc(Hons)*.

The ***PhD*** in statistics is our most advanced qualification. A qualified student can embark on a *PhD* after a *BSc (Hons)* degree, but preferably after a *Masters* degree. It is intended to train students to undertake research in statistics and its more advanced applications. It takes about 3 years of study.

# Research in the Department of Statistics

### Biostatistics and Novel Regression Methodologies



Statisticians at Auckland are developing new statistical methods for a whole range of problems, many of which originally came to the notice of the statistical community in a medical or biostatistical context, but whose solutions are generally applicable. Much of this work relates to forms of regression, i.e. to finding novel ways to understand or predict the behaviour of variables of compelling interest using information gathered on other variables. Examples include models and generalised estimating equation methods to better understand correlated binary data, improved methods for longitudinal data analysis, using smoothing techniques to reveal relationships in multivariate data without making restrictive assumptions, adapting regression methods to allow novel approaches to sampling that can increase the efficiency of observational studies (e.g., generalisations of case-control sampling). Several researchers are also actively involved in practical medical research.

### Statistical Computing

Standard commercial statistical packages are good for routine analyses of sets of data without non-standard features. Such data sets are rarer than you might think. Commercial packages are fast and implement algorithms and procedures that were seen to be viable at the time the package was written. For statistical research one requires more flexibility than these packages generally provide. A statistician has an idea for a non-standard approach to the problem and wants to try it out. In these situations a more flexible system is required. It is not the time it takes the computer to execute the commands that is important but rather the time it takes the statistician to develop new software. Ongoing research and software development in the Statistics Department is building computing environments that increase the effectiveness and efficiency of the statistician. There is associated research on statistical graphics, on developing software to implement specific new statistical methods and on computer-intensive statistical methods such as Markov Chain Monte Carlo.

**The Analysis of Survey Data**

Over the years, researchers have been analysing data from complex surveys as if it came from random samples. The results of such analyses can be extremely misleading. Standard methods have to be adapted to allow for the special features of survey data. Alastair Scott has been a world authority in this area for many years. Research is also being done into novel ways of obtaining and analysing market research data, multilevel modelling, the effects of interviewer variability on subsequent analyses, and the design of panel studies.

**Statistical Ecology and Bioinformatics**

Our department has an extensive and world-renowned research group in statistical ecology and bioinformatics, whose members have a broad range of areas of expertise and interests. Building on the great legacy of **George Seber**, a senior professor and world authority on the estimation of animal abundances, we have **Rachel Fewster**, who works on statistical methods for population abundance assessment - how many whales are there in the ocean, or goats in the Hunua Ranges? She also works with models to investigate how a population spreads through its environment, for example rats colonizing islands off the NZ coast or rare birds surviving in a managed forest habitat. **Brian McArdle** and **Marti Anderson** work on multivariate modeling of ecological communities, including the development of novel statistical methods for environmental sampling and assessment in marine and terrestrial environments. Anderson's work includes active field research and collaborations with the Auckland Regional Council, the Department of Conservation, NIWA, and the University's Leigh Marine Laboratory. **Russell Millar** specialises in the modelling of marine fish populations from catch data. In particular, he uses recently developed likelihood and Bayesian techniques for analysing things like gear selectivity, fish growth and doing sequential population analysis. **Chris Triggs** specialises in experimental design and generalised linear models, particularly in their application to microarray experiments, population genetics, and crop variety trials. The most recent member of our team is **Mik Black**, whose main research interests are in the areas of bioinformatics and Bayesian statistics. He analyses data from gene expression microarray experiments, using both frequentist and Bayesian techniques, and is also interested in medical statistics and statistical genetics. Though not formally a member of the group, **Thomas Yee** has made important contributions to statistical modelling in plant ecology and retains an interest in the area.

**Forensic Statistics**

Statistical models are becoming increasingly important in forensic science. Our department has had a longstanding research partnership with ESR Forensic, the Crown Research Institute with primary responsibility for forensic science in New Zealand. ESR have provided scholarships for research students in our department and we have responsibility for teaching some courses in the M.Sc in Forensic Science programme. **Chris Triggs** and **John Buckleton** are interested in applications of statistics and population genetics in forensic science including DNA fingerprinting and the interpretation of physical evidence such as toolmarks, marks on ammunition, and fragmentary evidence from glass and fibres.

**Statistics Education**

Statistics education is an emerging and growing research area. Auckland is known for its research on characterising statistical thinking in empirical enquiry. We have an active research programme involving a project in a secondary school that aims to develop students' statistical thinking and an undergraduate project that aims to develop students' statistical literacy. Chris Wild is currently President of the International Association of Statistical Education (IASE). Quality management as a means of achieving continuous improvement in a teaching environment is an associated research area being developed.

**Experimental Design and Quality Improvement**

The design and analysis of experiments is still a fertile research area. It has received renewed impetus because the emphasis quality improvement gives to using experimentation to obtain good quality data to make improvements, in areas where obtaining data is often extremely expensive. Improvements in computation have also allowed increased flexibility in choice of design and analysis. We have several researchers working in this area.

**Operations Research and Stochastic Processes**

Stochastic models of systems and their performance are important in many fields. The group at Auckland has a wide range of interests with varied applications. **Geoffrey Pritchard** models fluctuations in the electricity market. **David Scott** is investigating an unusual class of flexible distributions with applications in finance and other areas. **Wiremu Solomon** is interested in models of traffic networks and biological systems. **Ilze Ziedins** works on performance analysis and optimal control of networks such as the Internet and telecommunications networks. **Rachel Fewster** works on the modelling and control of predator populations such as rats, and other ecological problems.



**Bayesian Statistics**

The department of Statistics in Auckland has a strong Bayesian research group which is part of the Australian-NZ ARC Network on Bayesian Modelling and the International Society for Bayesian Analysis. Interdisciplinary collaborations in biology, bioinformatics, ecology, econometrics, engineering, fisheries, forensics, medicine and physics offer opportunities for keen graduate students to participate in cutting-edge research. Members of the group are working on philosophical aspects of Bayesian inference, applied Bayesian data analysis and highly computationally intensive Markov chain Monte Carlo (MCMC) simulation techniques. **Renate Meyer** is working on Bayesian semi-parametric survival analysis techniques with applications in medical statistics and engineering, stochastic volatility models for analysing financial time series, population dynamics models for fisheries stock assessment and inverse problems of marine ecosystems, and MCMC techniques for cosmic microwave background and gravitational radiation data analysis in astrophysics. **Mik Black's** main research area is bioinformatics. He analyses data from gene expression microarray experiments, using both frequentist and Bayesian techniques, and is also interested in medical statistics and statistical genetics. **Russell Millar** specialises in the modelling of marine fish populations from catch data. In particular, he uses recently developed likelihood and Bayesian techniques for analysing gear selectivity and fish growth and for sequential population analysis. **David Scott's** research

comprises the application of MCMC methods to genetics, time series and medical statistics. **Chris Triggs** is interested in the application of Markov Chain Monte Carlo methods to problems in population genetics.

# Areas of Current Research activity

**Sampling and the analysis of survey data**

Alastair Scott, George Seber, Peter Danaher

**Estimation of animal abundance and adaptive sampling**

George Seber, Russell Millar, Rachel Fewster

**Longitudinal data and correlated responses**

Alastair Scott, Alan Lee, Chris Wild, Thomas Yee

**Nonparametric Regression**

Alan Lee, Marti Anderson, Thomas Yee

**Case-control sampling and extensions**

Alastair Scott, Chris Wild, Alan Lee

**Statistical Computing and the "R" statistical programming language**

Ross Ihaka, Paul Murrell, Yong Wang, Thomas Yee, Alan Lee, Chris Triggs, David Scott



**Medical Statistics**

Patricia Metcalf, Renate Meyer, Alastair Scott, Chris Wild, George Seber, Alan Lee, David Scott, Roger Marshall, Thomas Yee

**Forensic Statistics**

Chris Triggs, John Buckleton

**Nonparametric methods**

Alan Lee

**Operations Research**

Ilze Ziedins, Wiremu Solomon, Geoffrey Pritchard, David Ryan

**Experimental design**

Chris Triggs, Arden Miller, Marti Anderson

**Improvement and Industrial Statistics**

Arden Miller, Peter Mullins, Chris Wild

**Multivariate Analysis**

Renate Meyer, Chris Triggs, Brian McArdle, Marti Anderson

**Statistics Education**

Maxine Pfannkuch, Chris Wild, Matt Regan, Ross Parsonage, Rachel Cunliffe, Stephanie Budgett

**Stochastic Processes / Applied Probability**

Ilze Ziedins, David Scott, Geoffrey Pritchard, Wiremu Solomon

**Time Series Analysis**

Ross Ihaka, Alan Lee

**Analysis of circular and spherical data**

Alan Lee

**Markov chain Monte Carlo methods**

Renate Meyer, David Scott, Geoff Nicholls, Ilze Ziedins, Wiremu Solomon

**Fisheries gear selectivity, fish growth, sequential population analysis**

Russell Millar

**Philosophy of Statistics (e.g. the role of conditioning)**

Russell Millar

**Statistical Ecology**

Russell Millar, Brian McArdle, George Seber, Marti Anderson, Rachel Fewster

**Multivariate Modelling and Inference**

Brian McArdle, Marti Anderson

**Fitting Statistical Models to Population Density Data**

Brian McArdle, Rachel Fewster, Marti Anderson

**Bioinformatics**

Mik Black, Chris Triggs

# Postgraduate Courses Offered

In the list below, some courses have meaningful names and a description of their contents. These courses are normally taught every second year and some centrally important courses are taught every year. Others are ``topics" courses: These indicate areas where we have staff who are willing (indeed keen) to put on special courses whenever student interest and resources permit. International visitors also often teach a course that is close to their research interests when they are in Auckland.

All programmes allow the inclusion of one or more undergraduate courses. These courses are described in the Statistics Department's ***Undergraduate Handbook***.

You will also be allowed to include some courses from other Departments that complement your studies in statistics.

If you decide you wish to enrol at Auckland, ask for our booklet ***Postgraduate Courses for 2005***. This publication describes in more detail which of the courses listed below that will actually be taught in the coming year (or semester) and gives other information including prerequisites which is useful for graduate students studying in our department. The Postgraduate Courses booklet applicable to the coming year is not produced until the teaching programme has been finalised. This seldom happens until fairly late in the current year. Occasionally, there are last minute changes in (or additions to) the course offerings facilitated by such things as the arrival of an overseas visitor.



### The Academic Year

The University of Auckland works on a semester system. There are two semesters in a year. 2005 dates are: (First Semester) 28 February- 25 June; (Second Semester) 18 July - 12 November (for detailed dates, see page 2). Each semester follows a pattern of a 12 teaching weeks, with a 2-week break in the middle, followed by an examination period. A standard full time course-load is 7 courses over two consecutive semesters corresponding to 4 courses in one semester and three in the other. Enrolment can begin in the first or second semester of an academic year. A selection of the following courses is offered each year. For the current offering see the publication ***Postgraduate Courses for 2005***.

### List of Graduate Courses

#### BIOSCI 744 Advanced Bioinformatics 2

[This course was taught in 2003 as STATS 771 Topic in Biostatistics A (Bioinformatics)]

This course gives an introduction to structural, functional and comparative genomic analysis, and the analysis of microarray and gene expression data. It will also survey recent developments in bioinformatics.

Microarray technology allows the simultaneous measurement of gene expression (the level of activation of a gene) for thousands of genes in a single experiment. This powerful technology has become incredibly popular in genetics research, as it is able to provide researchers with huge amounts of information about genetic activity. The amount of data that is generated, however, poses problems in terms of analysis (data

sets can easily have tens, or even hundreds of thousands of data points), making statistical methodology useful in processing such large amounts of data. This course aims to teach students how to analyze the data produced by gene expression experiments, a skill which is in high demand by biotechnology, bioinformatics and pharmaceutical companies throughout the world. The skills learned in this course will also be applicable to other problems involving large data sets, such as data-mining and proteomics.

Topics covered include: basic biology as it relates to microarray analysis, microarray technology and methodology, experimental design, linear models (ANOVA, mixed models), multiple comparisons procedures, clustering, and non-parametric techniques.

**STATS 708 Topics in Statistical Education**

This course will cover a wide range of research in statistics education at the school and tertiary level. The course will begin with a consideration of and an examination of the issues involved in statistics education in the curriculum, teaching, learning, and assessment areas. The theories and ideas from recent research will be critically examined, discussed, and developed.

Topics studied include: Probability - decision making under uncertainty, concepts of randomness, combinatoric reasoning; Statistical Reasoning - students' understanding of specific statistics content such as averages, distributions, inference; Statistical Investigations- critical teaching and learning barriers; Statistics and Technology- data analysis software, learning statistical concepts using technology; Interpreting Statistical Information- graphicacy theory, statistical literacy; Statistical Thinking- key ideas underlying data-based enquiry; Statistics in the Curriculum - current conceptual framework including assessment.

By the end of this course all students should have aimed to produce a scholarly paper on one aspect of statistics education. This will involve a literature review on that aspect; the writing of the paper to a publishable standard; and a presentation of that paper to an audience.

**STATS 710 Probability Theory**

This course covers the fundamental notions of probability theory from an advanced standpoint.

Topics studied include: Probability with sigma-fields and measurable spaces, the weak and strong laws of large numbers, characteristic functions, the Central Limit Theorem. Additional topics may include ergodic theory, stable distributions.

**STATS 720 Stochastic Processes**

A range of stochastic processes are covered in this course, with some emphasis on applied point processes. Other topics will be selected from Markov processes, queues, reliability models, and arima models. A working knowledge of applied probability is essential to successfully complete the course (equivalent to STATS 210 and one of STATS 320 or STATS 325). Some familiarity with a programming language will be an advantage, as the course includes a discussion of simulation methods.

Topics will be selected from: Point processes - marked processes and shot noise models, spatial processes; Inference for stochastic models - likelihood functions; Markov and semi-Markov processes; Queues - M/M/1 and k-server queues; Reliability - hazard rates, non-homogenous Poisson process; Arima models - discrete-time processes.

**STATS 723 Stochastic Methods in Finance**

This is a course in mathematical finance. We will use the techniques of probability and stochastic processes to study derivative securities that are traded in financial markets. The course is suitable for students of statistics, finance, accounting, economics, or mathematics.

Topics studied include: Probability and background - Random variables, distributions, equivalent measures. Essential notions - financial derivatives, arbitrage, replicating portfolios, risk-neutral pricing, complete markets. Martingales. Mathematical finance in discrete time -equivalent martingale measures, Fundamental Theorem of Asset Pricing, Cox-Ross-Rubinstein model. Option pricing, including path-dependent options. Continuous-time stochastic processes - Brownian motion, stochastic integral, Ito's lemma, stochastic differential equations. Mathematical finance in continuous time - Fundamental Theorem of Asset Pricing in continuous time. The Black-Scholes world. Hedge sensitivities ("Greeks"). Further topics - a selection from: volatility estimation, volatility smiles; risk management and hedging, risk measures (VaR and CVaR); multi-factor and other models, Monte Carlo simulation; incomplete markets.



**STATS 724 Operations Research**

This is a course about stochastic modeling and optimization that follows on from STATS 320 and STATS 325. Students should have done either STATS 325 or STATS 720. Students who have done very well in STATS 320 may also be allowed into the course- please see Ilze Ziedins if you fall into this category. The course will cover a range of stochastic models, giving both theory and some discussion of applications. The emphasis will be on Markov models. Some queueing theory will be presented as part of the applied section. Some computing experience (a working knowledge of R or Splus or Matlab) will be useful.

Topics covered may include: Markov processes in continuous time - definitions, Q-matrix, recurrence, stationary and limiting distributions, migration processes, reversibility. Queueing theory, including material on queueing networks. A key component of the course this year will be Markov decision processes and optimization. If time permits, the course may include some additional material on renewal theory and semi-Markov processes.

**STATS 725 Topic in Operations Research**

**STATS 726 Time Series**

A general introduction to the theory of time series and prediction including stationary processes, moving average and autoregressive (ARIMA) models, modelling and estimation in the time domain, seasonal models, forecasting, spectral analysis and bivariate processes. This foundation course is particularly suitable for students in economics and finance, and in the engineering and physical sciences.

Specific topics covered include: the basic theory of stationary processes; spectral or Fourier models; AR, MA and ARMA models; linear filtering; time series inference; prediction and other topics such as the sampling of continuous time processes.

**STATS 730 Statistical Inference**

STATS 730 gives you general-purpose skills to model real data, using likelihood-based statistical inference. It begins by looking at how likelihood is used by frequentist and Bayesian inference, and uses statistical brain-teasers to demonstrate the difference between these two paradigms. Focus then shifts to establishing the properties of maximum likelihood inference within the frequentist paradigm. Maximum likelihood is then applied in a wide variety of settings with examples in both R and SAS. (Students may chose either of these languages for their homeworks.) The course concludes by looking at extensions of maximum likelihood for models with nuisance parameters, including quasi-likelihood, conditional likelihood, and mixture models.

STATS 730 provides the tools and skills used by many other graduate courses on offer in this department, and it gives exposure to statistical programming in both R and SAS.

**STATS 731 Bayesian Methods**

This is an introductory course in Bayesian inference starting from first principles with major emphasis on Bayesian methods in applied data analysis. The Bayesian approach is based on a different paradigm than the classical frequentist approach to statistical inference that is traditionally taught in undergraduate courses. Over the last decade, the Bayesian approach has revolutionised many areas of applied statistics such as biometrics, econometrics, market research, statistical ecology and physics. Although the Bayesian approach dates back to the 18th century, its rise and enormous popularity today is due to the advances made in Bayesian computation through computer-intensive simulation methods. Knowledge of Bayesian procedures and software packages will become indispensable for any career in Statistics. The students will be introduced to the software packages FirstBayes and BUGS.

Topics covered include: the Bayesian approach, conjugate distributions, using FirstBayes, prior distributions, simulation methods, Markov chain Monte Carlo methods, using the BUGS software, and applications to data analysis.

**STATS 732 Topic in Statistical Inference**

**STATS 740 Sample Surveys**

This is a course in the design, management and analysis of sample surveys, with particular emphasis on surveys in the health sector.

Topics studied include: Revision of statistical aspects of sampling. Preparing surveys. Research entry: problem selection, sponsorship and collaboration. Research design: methodology and data collection; Issues of sample design and sample selection. Conducting surveys: Questionnaires and questions; Non-sampling issues; Project management; Maintaining data quality. Concluding surveys: Analysis; Dissemination. Other types of Surveys.

**STATS 747 Statistical Methods in Market Research**

This course discusses statistical issues that arise and statistical techniques that are used in market research.

Topics studied include: stochastic models of brand choice and usage, conjoint analysis, sampling, weighting, imputation and variance estimation, advertising media models and marketing response models, and applications of generalised linear models, data mining and multivariate analysis in market research.

**STATS 750 Experimental Design**

This course will focus on factorial and fractional factorial designs. It will take an applied approach but doses of theory will be applied at the lecturer's discretion.

Topics studied include: fractions of 2-level and 3-level designs, Plackett-Burman designs, the concepts of resolution and aberration, blocking fractional factorial designs, central composite design, and response surface methodology.

**STATS 760 Regression Modelling**

This is an overview course aimed at giving students an introduction to, and some practical experience with, many of the most important forms of statistical analysis. The emphasis is on breadth rather than depth. In general, students will study a subset of the areas introduced here in depth in the rest of their postgraduate programme.



Topics studied may include: generalised linear models; robust statistics; nonlinear models; random and fixed-effects models; modern regression; survival analysis; multivariate analysis; tree-based methods; time series; spatial statistics; classification.

**STATS 761 Mixed Models (Topics in Regression Modelling)**

A useful course for those contemplating a career in Medical Statistics. This course will describe statistical techniques for analysis of data from medical studies, with an emphasis on mixed modelling. This is predominantly a practical rather than theoretical course. Students will be expected to program in SAS and to be able to interpret the resulting output. Examples of SAS code will be given in the lecture notes and explained. Coursework will involve using SAS to analyse real data sets.

Topics studied include: Use of SAS for analysing medical data, with applications in epidemiology. Analysis of multicentre trials (random effects models), repeated measures data (covariance pattern and random coefficient models), and matched case-control studies. Use of generalized linear models in medical statistics.

**STATS 764 The Analysis of Failure Time Data**

This course will cover topics in the theory and analysis of time to event data, otherwise known as survival data, or failure time data. Here the variable of primary interest is the time elapsed until some event occurs (e.g. death of a person, or failure of a component). Such data are often subject to censoring and truncation and thus require specialised methods of analysis. Two of the most important areas of application are the health sciences and industrial testing (where the term reliability is often used).

Topics studied include: Censoring and truncation; commonly used distributions; nonparametric estimation (including Kaplan-Meier estimators); exploring censored

data; parametric regression models; semiparametric regression models emphasizing the proportional hazards model; time-dependent covariates; rank tests; and multivariate survival times.

**STATS 766 Multivariate Analysis**

This course focuses on the analysis of data with several response variables using modern computational techniques. Students will be expected to have some experience of a general statistics package (e.g. SAS or S-Plus/ R).

Topics studied include: the Biplot, Correspondence Analysis, Preference Mapping (PREFMAP) and non-linear extensions, Canonical Correspondence Analysis and non-linear multivariate modelling. Selection of topics from multivariate inference (one and two samples, multivariate regression and analysis of variance), dimension reducing techniques (including principal components, factor analysis and multidimensional scaling), discriminant analysis and cluster analysis.

**STATS 767 Topic in Multivariate Analysis**

**STATS 770 Introduction to Medical Statistics**

A broad introduction to ideas of importance in medical statistics, such as measures of disease risk, types of disease, diagnosis, clinical and epidemiological studies, and reviews of common methodologies.

Topics studied include: Topics are covered under three general headings: treatment, risk and diagnosis. Treatment will cover clinical trial methodology; study design; sample size; and analysis. Risk will cover statistical measures of risk in epidemiology and their estimation; data sources; analysis of mortality data; epidemiological study designs. Diagnosis will cover ideas about the nature of disease, statistical and probabilistic approaches to diagnosis; diagnostic test theory; screening for disease; logistic and discriminant classifying models; other methods of classification including tree models.



**STATS 771 Topics in Biostatistics 1**

In 2005, this number will be used to enrol students doing the Bioinformatics course (see BIOSCI 744) for the MSc in Medical Statistics. All others will be enrolled in BIOSCI 744.

Note: No knowledge of basic biology will be assumed in this course

**STATS 772 Topics in Biostatistics 2**

**STATS 773 Design and Analysis of Clinical Trials**

This course is directed at students interested in medical statistics and covers the design and analysis of clinical trials. The emphasis will be on practice rather than theory, and the course will cover some of the management issues arising in clinical trials such as ensuring data integrity and confidentiality as well as the statistical issues. An extensive case study will be discussed.

**STATS 775 Design of Ecological Experiments**

Systems in nature have intrinsic spatial and temporal variability, which means that most studies of natural systems must involve complex experimental designs. This

course covers the fundamental considerations in the design and analysis of experiments in ecological, biological and environmental scientific work. The emphasis is on linking the design with an appropriate statistical analysis. The course is particularly focused on hypothesis-testing methods and the interpretation of statistical results for complex experimental designs commonly used or encountered in these fields.

This is a practical course, which emphasises statistics in the context of particular ecological and biological studies and examples. There are no explicit pre-requisites, but familiarity with the material in STATS 340 is an advantage.

Topics studied include: The logical use of statistics and tests in ecological and environmental research; Replication and pseudo-replication for experiments in natural systems; Controls, sampling strategies and scales of observation in spatially and temporally variable systems; Factorial designs, nested hierarchies and mixed models; Fixed versus random factors in experiments and the consequences for analysis and interpretation; Calculating expected mean squares and constructing appropriate F-ratios for terms in complex designs in analysis of variance; How to interpret significant interactions and their scientific value; Asymmetric designs, contrasts and a posteriori tests; Experimental designs for detecting environmental impacts, including repeated measures, BACI and beyond BACI; Permutation tests, bootstrapping and Monte Carlo sampling methods for complex designs and misbehaving data.



**STATS 776 Topic in Environmental and Ecological Statistics**

The aim of this course is to apply a number of statistical techniques for analysing a number of ecological models used in the estimation of animal abundance. As a large number of models are used in research, the emphasis will be on the types of models that one might encounter and on the way models are constructed. You will need to revise some of the methods from STATS 210 (details in class). Notes for the course will be handed out.

Topics studied include a selection from: univariate discrete distributions and the multinomial distribution applied to capture-recapture models for closed populations, double tagging methods to estimate tag loss, simple straight line regression models using capture-recapture; spatial modeling and clustering (Poisson, negative binomial, log normal distributions); line transect methods; simple catch-effort models used in fisheries; change in ratio models used for wildlife; some open population models including simple bird banding models; sampling theory using indicator functions, quadrat sampling; Horvitz-Thompson and Hansen-Horowitz estimators; two stage sampling, adaptive sampling.

**STATS 780 Statistical consulting**

This course is designed to give students training in statistical consulting, i.e., applying statistical methods to practical research problems in other disciplines.

The first half of the course mostly consists of lectures and assignments. The second half of the course focuses on a group project; together with a member of staff of the Statistics Department, small groups of students will discuss with researchers and other clients the design and analysis of quantitative investigations. The course is not designed to teach students specific statistical techniques, but focuses instead on the other skills required for statistical consulting.

Students will be assessed on their ability to present both written and verbal reports. This will include a seminar based on the group project to be delivered to the client and members of the Statistics Department. It is assumed that students will have passed STATS 330 and STATS 340. There is no final exam.

**STATS 782 Computing for Statisticians**

[Compulsory for BSc(Hons), PGDipSci and Masters]

This course , which is compulsory for a BSc(Hons), PGDipSci or Masters degree in Statistics, is an introduction to the computer as a tool for the professional statistician. The course will provide an introduction to: computers and their architecture; non-numerical computing including data manipulation; text processing and typesetting; and numerical computing using statistical packages and traditional computer languages.

During the course as taught in the first Semester, students will be expected to become reasonably familiar with the Unix operating system, the XEmacs editor, the LaTeX text processing system, the S-Plus statistical environment and the file processing language PERL.

In the course as taught in the second semester, the focus will be on Microsoft Windows and the packages used will be mostly free or shareware versions of LaTeX, R, and PERL, as well as Microsoft Excel and Powerpoint. The second Semester course may also include some elementary analysis.



**STATS 783 Topic in Statistical Computing**

The aim of this course is to give a practical introduction to modern simulation and Monte Carlo techniques. These techniques use random numbers to simulate real situations and to solve difficult statistical inferential problems whose mathematical analysis is hard or even intractable. Being a practical course in nature, any theory involved is restricted to the minimum level needed. The use of computers is a central element of this course. Previous programming experience, in particular in R/S-Plus, is a great advantage.

Topics studied include: introduction to statistical inference and computing, random number generation (uniform; non-uniform; vector), Monte Carlo integration, variance reduction techniques (correlated sampling; antithetic variates; control variables; conditional expectation; stratified sampling; importance sampling), data resampling techniques and applications (bootstrap; jackknife; cross-validation; prediction error estimation; model selection; nonparametric regression; bootstrap confidence intervals; resampling hypothesis tests), introduction to Markov chains (discrete/continuous state), Monte Carlo optimization (simulated annealing; recursive integration; genetic algorithms; Monte Carlo EM), algorithms and applications of Markov chain Monte Carlo (Metropolis-Hastings algorithm; Gibbs sampler; completion construction; data augmentation; random effects models).

**STATS 784 Statistical Data Mining**

This course will discuss the nature of data mining and a selection of topics from: the classification problem, regression and decision trees, neutral networks, fraud detection, data cleaning.

**STATS 785 Topic in Statistical Data Management**

**STATS 787 Topic in Computational Data Analysis and Graphics**

This course will cover some important topics in statistical graphics, including: the production of dynamic and interactive graphics for data exploration; the production of high-quality static graphics for presentation; human perception and its impact on the design of graphics; the selection of appropriate graphics formats.

# More Details About Degree Programmes

**Postgraduate Diploma in Science - PgDipSci**

This diploma is designed for candidates who have a Bachelors degree with a substantial concentration in statistics and mathematics, and who want a one-year postgraduate qualification with the option of a further year leading to a Master's degree.

**Admission**

The admission criteria are essentially as for Masters (see below). However, we do not enforce the requirement for four courses (8 points) at the 300-level in cases provided the student has sufficient prerequisites to gain entry to four relevant 700-level statistics courses. If your background is not strong enough to gain entry to the PGDipSci, you should consider the Transitional Certificate (come and talk to the Graduate Officer for PGDips).



**Requirements**

This is usually a one-year programme but it may be undertaken on a part-time basis. The PGDipSci programme in statistics consists of 7 courses. All students will take STATS 782 and at least four courses from courses STATS 708 - STATS 787 listed above. Up to two 300-level (undergraduate) courses may be incorporated in the 7 course total. Full-time students normally take 3 or 4 courses in each semester.

All PGDipSci programmes in statistics must be personally approved by the Graduate Officer. Ideally, you will map out your course in consultation with the Graduate Officer well before the official enrolment dates. Enrolment must be done in person.

**Level of Honours**

The PGDipSci is awarded with Distinction if a GPA of 7.00 or more is achieved.

**Masters Degree**

This is the standard post-bachelor degree qualification. Candidates with a BSc enrol for an MSc, those with a BA enrol for an MA, while those from other backgrounds tend to enrol for an MSc. Our Masters programme is a two-year programme (or 3 years part time with the possibility of a year's extension) which can be completed in a shorter period of time by well motivated students who study over the intervening summer. Alternatively, it may be completed in one year by holders of a Postgraduate Diploma in Statistics, a BSc/BA (Hons) in Statistics or a BTech in Industrial Mathematics.

**Admission**

For Auckland students: STATS 210 and one of MATHS 208, MATHS 230, MATHS 252, plus 8 points in courses at 300 level or higher. At least 6 of these 8 points shall

normally be from courses in Statistics. At least a "B-" average is required over the 300-level courses.

For students from outside Auckland: You will be admitted if you have attained a similar level to the local students. This will normally be true if you have obtained your bachelor degree from a reputable university, have done at least two years study in both Pure Mathematics and Statistics, and have satisfactorily passed some advanced statistics courses in the final year of your degree (whether it be a 3 or 4 year degree). We assume a minimal level of statistical theory of about the level of Hogg and Craig ("Introduction to Mathematical Statistics" - the Professor of Statistics at your university should know what that means). In some cases, we may insist that you enrol for a preparatory semester before studying for a Master's degree. It is difficult to give specific guidelines and each case will be considered on its own merits.

**Requirements**

Courses worth 14 points including STATS 782 (up to 6 of these 14 points may be chosen from masters level courses in related subjects with the approval of the Head of Department) and either; STATS 796 Masters Thesis in Statistics (14 points), or Masters courses in Statistics worth 14 points including at least 4 points of project work.

**The first year**

The first year of the programme (7 courses) is made up entirely of formal courses.

**The second year**

For most students, the second year is normally made up of 5 courses and a project worth 2 courses. You will normally work on your project throughout the year rather than doing all of the work in a single semester. Guidelines on presentation will be given. You will be expected to give a short talk on your project. Some students are permitted to do 4 courses and a 3-course project. Very well-motivated and prepared students with a burning interest in a particular topic will be permitted to work on a thesis that is worth 7 courses.

**Students who have already completed a BSc/BA(Hons), BTech or Postgraduate Diploma (PGDipSci)**

Students who have already completed a BSc/BA(Hons), PGDipSci or BTech only enrol for the second year of Masters (work worth 7 courses) as described above. Students must have at least a B- average over their best 5 courses to be eligible for this option.

**Level of Honours**

The MSc and MA degree may be awarded with First Class Honours (corresponding to a GPA of 7.00 or more), or Second Class Honours, or as a Pass. Second Class Honours are classified either as Division I (GPA between 6.99 and 6.00) or Division II (GPA between 5.99 and 4.0).

**Enrolment**

- Year 1 for MA and MSc: Enrol for each individual course
- Year 2 for MA and MSc: Enrol for each individual course and/or a project or thesis of the required size, chosen from
- STATS 790 Masters Dissertation A (4 points),

- STATS 791 Masters Dissertation B (6 points),

or

- STATS 796 Masters Thesis in Statistics (14 points)

All Masters programmes in Statistics must be personally approved by the Graduate Officer. Preferably, your course will be mapped out in consultation with the Graduate Officer long before the official enrolment dates. Enrolment must be done in person.

**The Masters in Medical Statistics**

This degree allows the student to take a mix of courses in epidemiology and statistics, and is excellent preparation for a career in medical statistics (biostatistics in the US).

**Admission**

As for the MSc in Statistics, except that students entering the program with a BSc (Hons) or a PGDipSci must have already taken sufficient of the compulsory courses below to complete the program in one year.

**Enrolment**

Year 1: Enrol for each individual course

Year 2: Enrol for four individual courses and STATS 788.



**Requirements**

The programme consists of 28 points chosen as follows:

**Compulsory Courses**

STATS 780 Statistical Consulting
STATS 782 Computing for Statisticians
STATS 788 Project in Biostatistics (6 pts, equivalent to 3 courses)

**Two points chosen from:**

COMHLTH 703 Epidemiology
COMHLTH 720 Clinical Epidemiology

**At last eight points chosen from:**

STATS 740 Sample Surveys
STATS 760 Regression Modelling
STATS 761 Topics in Regression Modelling
STATS 764 The Analysis of Failure Time Data
STATS 771 Topics in Biostatistics 1
STATS 772 Topics in Biostatistics 2
STATS 773 Design and Analysis of Clinical Trials

plus optional courses from the School of Medicine (see in particular the Department of Community Health Postgraduate Handbook) and the Department of Statistics, to make up a total of 28 points for the whole course.

[Note for 2005: STATS 771 and BIOSCI 744 will be identical. MSc (Medical Statistics) students should ensure that they get enrolled for STATS 771 rather than BIOSCI 744. All others will be enrolled in BIOSCI 744.]

**BSc(Hons), BA(Hons)**

This course is open to students who are about to complete BSc or BA degrees in statistics at Auckland (or some other New Zealand or Australian university). It is essentially the first year of a Masters degree and can provide a suitable basis for PhD study.

**Admission**

For Auckland students: STATS 210 and one of MATHS 208, MATHS 252, MATHS 230, plus 10 points in courses at 300 level or higher. At least 6 of these 10 points shall normally be from courses in Statistics. At least a "B" average is required over the Stage 3 courses - we prefer a B+. For other Australasian students: We will seek reassurance of a similar coverage and level of performance in the Bachelors degree to that expected of Auckland students.

**Requirements**

This is a one-year programme. The statistics BSc/BA(Hons) programme consists of 6 courses and a 1-course project STATS 789 (Hons) dissertation). Statistics students select the majority of their courses from courses STATS 708 - STATS 787 listed above. They may select some 700-level courses from other departments and may incorporate one 300-level (undergraduate) course in their 6 course total. It is normal for students to take 3 courses per semester and work on their project throughout the year, depending on when they first enrol. Under special circumstances they may be permitted to take 4 courses in their first semester of enrolment followed by 2 courses and the project in their second semester. All BSc/BA(Hons) programmes in statistics must be personally approved by a Graduate Officer. Ideally, you will map out your course in consultation with the Graduate Officer for BSc/BA(Hons) well before the official enrolment dates. Enrolment must be done in person.



**Level of Honours**

The BSc/BA(Hons) degree is awarded with First Class Honours or Second Class Honours. Second Class Honours are classified either as Division I or Division II.

**Doctor of Philosophy (PhD)**

The PhD degree in statistics is intended to train the student to be able to undertake research in statistics and its more advanced applications. One learns to do research by actually working on a major research project with individual coaching and assistance from one or more supervisors. The work done should result in the preparation of a thesis based on original research that makes a significant contribution to the area of specialisation.

**Enrolment**

Admission Graduates of New Zealand universities admitted to our PhD programme normally have a Masters or Bachelors Honours degree awarded with 1st Class Honours or 2nd Class, Division 1 Honours. For students from other countries, we look for evidence of similar ability. A Masters degree is required in most cases. We normally require a background in statistics with good supporting mathematics. However, we would also be very happy to consider other applicants with a background suited to any particular part of our research programme, for example, good mathematicians with less statistical knowledge, or good computer scientists with interests in statistical computing issues. Some of our research students do PhDs

in cross-disciplinary areas involving another subject (e.g. a medical discipline) and applied statistics. These PhDs typically have two supervisors, one from statistics and one from another department of the University.

**Enrolment Requirements**

Formally, the PhD degree in statistics or biostatistics at the University of Auckland is a thesis-only research degree with no formal coursework requirements. In practice, you may be required to take some courses to fill important gaps in your background. Students from universities that we do not have close contacts with are often enrolled in a Masters degree initially and then have their enrolment transferred to a PhD when they show that they are performing well.

The PhD degree takes a minimum of 2 years although 3 years is the norm for full-time students. If you are concurrently holding a half-time Temporary Tutorship, you should expect to take 4 years, although some students in this position have completed in 3 years. To gain admittance to our PhD program, you should enter into correspondence with our Graduate Officer. Successful PhD applicants are matched with a supervisor before they are formally enrolled in the program. Enrolment for a PhD can take place at any time of the year.

# Admission and Enrolment Procedures

### Applying for admission: New Students

There are special admission requirements for postgraduate programs. The first step is to contact one of the Graduate Officers in the Department of Statistics. You then have to complete an Application for Admission Form. This is done using nDeva, the University's on-line admission and enrolment system. The deadline for applications for Semester 1 2005 is 8th December 2004.

**Note**: If you do not have web access or cannot come on to campus to our help labs you should phone 0800 61 62 63 (or 64 9 308 23 86 if outside New Zealand) or email studentinfo@auckland.ac.nz for further information. The procedure is slightly different depending on whether or not you are a NZ citizen (or a holder of a permanent residence permit).

**International Students**: Candidates who are not citizens or permanent residents of New Zealand need to apply for admission through the International Students Office on an Application for Admission form. Visit the International Students Office website for useful information about entry requirements, fees and course availability. Alternatively, you can contact the International Students Office at

International Office
The University of Auckland
Private Bag 92019
Auckland
New Zealand
Telephone (+649) 373-7405 or 373-7599 Ext. 87556
Fax (+649) 373-7405
http://www.auckland.ac.nz/io

**Citizens and Permanent Residents of New Zealand**: If you are not an Auckland graduate, you need to apply for recognition of your previous academic study (ROPAS) using the Application for Admission form for recognition of graduate status. Further information about this procedure can be obtained from the Admissions and Enrolment Office. Students will be required to provide an official academic transcript from their university of graduation. Contact

Admissions and Enrolment Office

Room 116
Level 1
The ClockTower
22 Princes Street
Auckland City Campus

Telephone: (+649) 373 7599 Ext. 82867 or 85013
Email: enrol@auckland.ac.nz

**Auckland graduates**: If you are an Auckland graduate, you apply for admission by using 'Change Programme" on nDeva.

### 2005 Enrolment

All students, whether new students who have been granted admission to the University, or returning students, should discuss their choice of program and courses for 2005 with the appropriate departmental Graduate Officer.

Note that admission and enrollment are two different processes. You first apply for (and get) admission to the University, then enrol in the program and course of your choice, in consultation with the Graduate Officers.

The University will be open for enrolment from November 2004 to the end of February 2005. You are welcome to attend at any time during normal office hours to seek academic or enrolment advice or assistance in completing your enrolment.

**Fees**

Local fees apply to:

- citizens and permanent residents New Zealand and of Australia.
- French and German citizens doing postgraduate study (because of reciprocal arrangements).

The fees for the 2004 academic year were:

- Local Students: $3708.00(Masters degrees) $3301.00 (PhD)
- International Students: NZ$23,000 per year.

Note that these figures are only approximate.

Details of criteria for Permanent Residency may be obtained either from the nearest NZ Diplomatic Post or The NZ Immigration Service, Private Bag, Auckland, New Zealand, http://www.immigration.govt.nz/.

# Funding Postgraduate Study

Most students do at least some work for the Department to help finance their studies. Private tutoring of students in the final years of high school and first year university has been quite lucrative for some of our students. With sufficient notice, scholarships can sometimes be obtained from Research Institutes, companies or medical research funds to fund PhD research on projects of mutual interest and benefit. The funding opportunities for Masters students are more limited, but again, each applicant is looked at on a case-by-case basis. In addition, students with outstanding records can win competitively awarded scholarships. There are also competitive scholarships available from various organisations for niche areas of study, for members of several ethnic groups, and for women.

Funding is described under 5 headings:

- Employment provided by the Department
- University Scholarships for NZ Citizens/Permanent Residents
- Other Awards for Citizens/Permanent Residents
- Scholarships for International Students
- Scholarships Open to Both NZ and International Students

Online, the University's "Scholarships & Financial Support" homepage can be found at http://www.auckland.ac.nz/scholarships. Use the links on the right-hand menu. Amongst the many links is one to "Maori and Polynesian Scholarships" and one to "International Scholarships".



### Employment Provided by The Department

Working for the Department has two advantages. Firstly, there is the money. Secondly, a proven track record as a teacher is helpful, and often necessary, for obtaining academic jobs. The Department offers Teaching Assistant work to all postgraduate students.

- Marking is made available to all graduate students who want it.
- Depending upon background and communication skills, tutoring in Help Clinics and Computer Laboratories is made available.

2004 pay rates for Teaching Assistants are $17.54 an hour.

Part-time (15%) temporary tutorships (2004 range $6142-$7183) are available for PhD students. These usually involve some lecturing or supervision of tutorials. Paid summer Teaching and Research Assistant jobs are made available for a limited number of students by the Department and by the Faculty of Science.

Students who are not NZ or Australian citizens or permanent residents should note that present immigration policy states that they shall not be employed in any capacity for more than eight hours per week during the teaching year (February to November). People who are hired as full-time Assistant Lecturers and gain work permits will be permitted to engage in PhD study.

**University Scholarships For NZ Citizens/Permanent Residents**

Graduate Scholarships are available on a competitive basis. Major scholarships offered at the University of Auckland to Masters and PhD students who are citizens or permanent residents of NZ include:

**Doctoral Scholarships from the Royal Society of New Zealand**

See "Top Achievers Scholarships" and "Enterprise scholarships at http://www.frst.govt.nz/students/awards-fellowships.cfm. Both are worth $25,000 per annum plus fees and some other allowances.

**The University of Auckland Doctoral Scholarships**

For full-time doctoral study. $20,000 plus fees per annum.

**The University of Auckland Masters/Honours Scholarship**

$9,000 per annum.

**Faculty of Science Fees Bursaries**

For Masters or PhD study. Provides tuition for first year of enrolment for Masters or PhD.

**Department of Statistics Scholarships**

In some years, the Department is able to fund a limited number of PhD scholarships

**The University of Auckland Maori and Polynesian Graduate Scholarships**



For Maori and Polynesian students studying for a PhD or Masters Degree. $20,000 plus fees (PhD) or $7,000 (Masters) per annum. In addition, the University offers a variety of scholarships and prizes. Information regarding the details for these are available from the Awards Handbook and the NZVCC Scholarships Handbook. The University publication "Next Week" regularly includes notices of scholarships, bursaries and prizes currently offered in addition to the student union notice boards.

**Auckland City Council QEII Scholarships.**

For students of Pacific Island Polynesian descent. Provides financial assistance for one or more years of undergraduate or postgraduate study.

**New Zealand Federation of Graduate Women (Auckland Branch) Doctorial Award**

For a female doctoral candidate. Up to $5,000 per annum for up to six semesters.

**Industrial Research Ltd (IRL) Postgraduate Scholarships**

For PhD research in fields nominated by IRL. Details of the current fields can be obtained from the Dean of Science. $12,000 per annum plus research costs.

See also the section entitled Other Awards Available to citizens/permanent residents to follow.

Further information is available from the Scholarships Officer, The University of Auckland (currently Jody Pratt ext 87566).

**Other Awards For Citizens/Permanent Residents**

The following awards are available to at least some statistics students. PhD students who choose to do research in a cross-disciplinary area (between statistics and another area) are eligible for some of the targeted scholarships (e.g., for traffic engineering).

**Administered by the New Zealand Vice-Chancellor's Committee Bank of New Zealand Graduate Scholarships**

The purpose of the Bank of New Zealand Graduate Scholarships is to encourage university study in fields that are likely to be of direct benefit to New Zealand and its people. $4,000 per annum.

**William Georgetti Scholarships**

For postgraduate study and research, in a field which, in the opinion of the Scholarship Board, is important to the social, cultural or economic development of New Zealand, up to $12,000 per annum for 3 years overseas study, and $6,000 per annum for 3 years study within New Zealand.

**Ministry of Transport Maori Scholarship**

For Maori students to study for a degree that will prepare them for employment in the Ministry of Transport. $5,000 per annum.

**Pukehou Pouto Scholarship**

For postgraduate study in agricultural science or silviculture science (forestry). $5,000 per annum for 2 years.



**Road Safety Research Scholarships**

For graduate study in areas consistent with the priorities set out in the booklet Road Safety Research: Now and in the Future, published by the Road Traffic Safety Research Council. Provides $5,500, up to $2,000 towards fees and up to $2,000 towards research expenses for Masters thesis year, or $15,000, up to $2,000 towards fees and up to $2,000 towards research expenses per year for Doctoral students.

**Shirtcliffe Fellowships**

To assist students of outstanding ability and character who are PhD graduates. $2,500 per annum. For more information about the above scholarships contact the Scholarships Officer, New Zealand Vice-Chancellors' Committee, Box 11-915, Wellington (e-mail schols@nzvcc.ac.nz ). Website: http://www.nzvcc.ac.nz

**Leonard Condell Scholarships**

For research for the benefit of some branch of agriculture in NZ. Application forms can be obtained from the Registrar, Massey University, Palmerston North.

**New Zealand Federation of Graduate Women Post-doctorial Research Award**

For women to undertake doctoral or post-doctoral study, up to $15,000 per annum. More information can be obtained from the Scholarships Officer, University of Auckland.

**June Opie Fellowship**

For graduate students with a severe disability. Provides about $10,000 towards costs. For more information contact the Scholarships Officer, University of Auckland.

**Freemasons Scholarships**

For the final year or Bachelor's degree, BScHons or Postgraduate Diploma. $2,7500 for one year. Applications are open to NZ Citizens or Permanent Residents only. Application forms are available from the Scholarships Officer, University of Auckland.

**Freemasons Postgraduate Scholarship**

For Masters degree or PhD. $5,500 for one year. Application forms are available from the Scholarships Officer, University of Auckland.

### Scholarships For International Students

The University is able to offer financial aid to a few applicants from outside the country intending to pursue postgraduate study. Each applicant is assessed individually. Limited opportunities also exist for Teaching Assistantships. All financial support and scholarships are awarded on a competitive basis.

In some years, the Department is able to offer a limited number of fees bursaries for PhD students on a competitive basis.



The "International Students" homepage can be found by clicking on "STUDENTS" on university's main page http://www.auckland.ac.nz, and then clicking on "International Students" on the left-hand menu. When you get to the "International Students" page, use the links in the right-hand menu. Amongst the many links is one to "International Scholarships". Additionally, there is a different special section for International Students accessible from "Scholarships" on the University's "Scholarships & Financial Support" page.

### Scholarships Open To Both NZ And International Students

**Pacific Islands Leadership Trust Awards**

For students of Pacific Island background. Further information can be obtained from the Secretary, Pacific Island Youth Leadership Trust, Box 7291, Auckland.

**Department of Statistics Scholarship**

The Department can sometimes offer scholarships of varying amount to high-calibre PhD students. These are usually supplements to another award. Students who are not NZ or Australian citizens or permanent residents should note that present immigration policy states that they shall not be employed in any capacity for more than eight hours per week during the teaching year (February to November).

# General Information For Students

For the range of services to students, see http://www.auckland.ac.nz/cir_students/.

We highlight a few here.

### Accommodation

For information contact the Student Accommodation Bureau, http://accommodation.auckland.ac.nz/, Telephone (+64-9) 373 7599 ext 87691; email accom@auckland.ac.nz . Advertisements for flats/flatmates can also be found in the NZ Herald (http://www.nzherald.co.nz/classifieds/) Auckland's daily newspaper.

### English Language Requirements

You will need to be proficient at speaking, reading and writing in English to cope with studying postgraduate statistics at Auckland. The University formally requires that applicants whose first language is not English provide evidence of their proficiency in the English language. For requirements and advice, see http://www.auckland.ac.nz/cir_visitors/index.cfm?action=display_page&page_title=international_english.

### Students With Disabilities

Information about assistance and support for students with disabilities is available at http://www.disability.auckland.ac.nz/. Alternatively, visit Room 036, Clock Tower, 22 Princess Street, phone ext. 88808 or 87330, or email disabilities@auckland.ac.nz .



### Harassment

Information on university services to help you if you feel you are being harrassed in any way by staff or students is available at http://www.auckland.ac.nz/mdr.

### Complaints

If you have any complaints about the way you have been treated by the Department, our Head of Department invites you to discuss them with him directly. If you find the prospect of approaching the HoD daunting, other avenues for making complaints are through your graduate representative, or Rachel Fewster who is the Graduate Advocate for Statistics (ext 83946, Room 206).

### Important Locations

**Department of Statistics Office**: Room 203 on the second floor of the Science Centre, Building 303, straight opposite the lifts (telephone ext. 86893 or 87510).

**Statistics Graduate Room**: Room 299/1, Science Centre Building 303.

### Tamaki Campus

The Tamaki Campus is located at the corner of Merton and Morrin Roads in Glen Innes. (There are free buses for students with courses at the Tamaki campus which leave from the City Campus and Tamaki Campus approximately every hour, operating on a reduced schedule during the holiday period. The buses depart from Alfred Street, outside the General Library on the City Campus at five minutes past

the hour and depart from infront of building 723 at the Tamaki Campus at thirty-five minutes past the hour). The Tamaki Library is in Building 710.2 near the south entrance to the Campus.

**The Student Information Centre**: Room 112, Level 1 (Ground Floor), the ClockTower Building, 22 Princes Street, Auckland City Campus (telephone extensions 88378, 88199).

**Main Library**: 5 Alfred Street.

# Staff Directory

**Email** **name@stat.auckland.ac.nz**

Replace 'name' with person's email alias

| | Ext | Room | E-mail |
|---|---|---|---|
| **Head of Department** | | | |
| Wild, Chris | 88797 | 201 | wild |
| **Departmental Manager** | | | |
| Walker, Sharon | 86836 | 202 | sharon |
| **Departmental Secretary** | | | |
| Herle, Suryashobha | 86893 | 203 | shobha |
| **Temporary Office Staff** | | | |
| Moala, Antonina | 87510 | 203 | antonina |
| Wong, Nancy | 87510 | 203 | nancy |
| **Staff in Alphabetical Order** | | | |
| Balemi, Andrew | 85713 | 224 | balemi |
| Bennett, Derek | 84724 | | d.bennett@ctru.auckland.ac.nz |
| Berg, Andreas | 82447 | 276 | andreas |
| Black, Mik | 88811 | 207 | black |
| Boyle, Leila | 88755 | 221 | leila |
| Budgett, Stephanie | 85756 | 225 | budgett |
| Cumming, Joss | 85756 | 225 | cumming |
| Cunliffe, Rachel | 85237 | 205 | rachel |
| Ferreira, Sam | 89623 | 224 | ferreira |
| Fewster, Rachel | 83946 | 206 | fewster |
| Ford, Richard | 83608 | 134 | r.ford@auckland.ac.nz |
| Ihaka, Ross | 85054 | 275 | ihaka |
| Latu, Viliami | 83063 | 121 | latu@math.auckland.ac.nz |
| Marshall, Roger | 86363 | | r.j.marshall@auckland.ac.nz |
| McArdle, Brian | 85845 | 213 | bmcardle |
| Metcalf, Patricia | 88856 | 265 | metcalf |
| | 86355 | | |
| Meyer, Renate | 85755 | 210 | meyer |
| Miller, Arden | 85053 | 208 | miller |
| Miller, Christine | 84275 | 204 | c.miller@auckland.ac.nz |
| Murrell, Paul | 85392 | 273 | paul |
| Nathan, Garry | 83063 | | nathan@math.auckland.ac.nz |
| Pfannkuch, Maxine | 88794 | 310 | m.pfannkuch |
| Philpott, Andy | 88394 | 4.618 | a.philpott@auckland.ac.nz |
| Pritchard, Geoffrey | 87400 | 212 | g.pritchard |
| Regan, Matt | 85242 | 205 | regan |
| Ryan, David | 88398 | 4.605 | d.ryan@auckland.ac.nz |
| Scott, Alastair | 84556 | 228 | scott |
| Seber, George | 85274 | 214 | seber |
| Smith, David | 85390 | 226 | dsmith |
| Solomon, Wiremu | 88771 | 209 | solomon |
| Turuwhenua, Jason | 82755 | 277 | turuwhenua@auckland.ac.nz |

| | | | |
|---|---|---|---|
| Wang, Yong | 84700 | 271 | yongwang |
| Wingfield, Susan | 84934 | 119 | wingfield@math.auckland.ac.nz |
| Ziedins, Ilze | 85051 | 211 | ilze |
| **Computing / Technical Staff** | | | |
| Cope, Stephen | 89621 | 205 | s.cope |
| Schmidt, Werner | 87973 | 269 | schmidt |
| Wu, Michael | 83785 | 267 | wu |
| **Tamaki Staff** | | | |
| Anderson, Marti | 85052 | 721.330 | mja |
| | | 303.215 | |
| Forster, Mike | 88759 | 721.309 | forster |
| Holcombe, Bronwyn | 86832 | 721.310 | bronwyn |
| Lee, Alan | 88749 | 721.332 | lee |
| | 84556 | 303.228 | |
| McTaggart, Stephen | 87034 | 721.313 | sm.mctaggart@auckland.ac.nz |
| Millar, Russell | 85289 | 721.333 | millar |
| Mullins, Peter | 85267 | 721.317 | mullins |
| Parsonage, Ross | 86608 | 721.305 | r.parsonage@auckland.ac.nz |
| | 89622 | 303.205 | |
| Scott, David | 86830 | 721.304 | d.scott |
| | 85055 | 303.220 | |
| Sporle, Andrew | 88735 | 721.312 | a.sporle@auckland.ac.nz |
| Triggs, Chris | 88750 | 721.319 | triggs |
| | 85274 | 303.216 | |
| Yee, Thomas | 86857 | 721.331 | t.yee@auckland.ac.nz |
| | 85055 | 303.220 | |
| **Student Resource Centre** | | | |
| Venugopalon, Jaya | 85510 | B01 | jaya@math.auckland.ac.nz |
| **Student Resource Centre, Tamaki** | | | |
| Robyn Marshall | 85230 | T710.105 | robyn.marshall@auckland.ac.nz |
| Gayle Woodward | 85251 | T710.105 | g.woodward@auckland.ac.nz |
| **Other** | | | |
| Computer Lab, 2nd Floor | | | |
| | 85931 | 219 | |
| Copy Room, 3rd Floor | 88793 | 333 | |
| Staff Common Room, | 88746 | 223 | |

**Unisafe, 24 Hour Service** **85000**