

## School of Mathematics & Statistics

**Head of School** Professor E F Robertson

### Degree Programmes

Graduate Diploma: Mathematics  
Statistics

M.Sc.: Mathematics  
Statistics

### Programme Requirements

#### Mathematics

Graduate Diploma: A total of 120 credits from MT modules at 3000 and 5000 level, including at least 60 credits at 5000 level, the course of study to be approved by the Head of School.

M.Sc.: 120 credits as for Graduate Diploma together with a dissertation comprising three months' full-time study, which will carry 60 credits

#### Statistics

Graduate Diploma: A total of 120 credits from MT modules at 3000 and 5000 level, including at least 60 credits at 5000 level, the course of study to be approved by the Head of School.

M.Sc.: 120 credits as for Graduate Diploma together with a dissertation comprising three months' full-time study, which will carry 60 credits

### Modules

**The anti-requisite for each module is the corresponding 3000 module.**

**The prerequisites for each module may be replaced by equivalent material from other institutions.**

#### MT5611 Advanced Symbolic Computation

Credits: 20.0 Semester: 2

Availability: 2002-03

Prerequisite: MT2001 or MT2101

Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.

Description: This module aims to enable students to use Maple as a tool in their other modules and to turn naturally to such a package when solving mathematical problems. The module aims to illustrate the following points: a symbolic computation package allows one to conduct mathematical experiments; a symbolic computation package allows one to collect data about a problem being studied. This is similar to the way other scientists work. It is easier to try several different approaches to a problem and see which works. The machine is stupid. Intelligence comes from the user. The user thinks, the user interprets, the computer calculates. Students will undertake a more substantial project than that required for MT3611.

Class Hour: 9.00 am

Teaching: Two lectures, one tutorial

Assessment: Project = 45%, 2 Hour Examination = 55%

## Mathematics & Statistics - 5000 Level modules

### MT5612 Advanced Computing in Mathematics

Credits: 20.0 Semester: 2

Availability: 2001-02

Prerequisites: (MT2001 or MT2101), MT2003

Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.

Description: This module consists of MT3612 with the addition of directed study on more advanced topics not covered in MT3612, for example, the use of NAG libraries and graphics packages plus aspects of Fortran 90 like dynamic allocatable arrays. In addition, the computing project will be more demanding than the project for MT3612. The syllabus includes: an introduction to good programming style through examples; the construction of a well documented Fortran program that implements a numerical algorithm; use of the advanced features of Fortran to, for example, (i) manipulate matrices, (ii) read and write to data files, (iii) implement library routines and (iv) use graphics packages. The students will also complete an advanced project that contributes up to 35% of the final marks for the module.

Class Hour: 9.00 am

Teaching: Two lectures and one tutorial.

Assessment: Project = 35%, 2 Hour Examination = 65%

### MT5701 Advanced Statistical Inference

Credits: 20.0 Semester: 1

Prerequisites: (MT2001 or MT2101), MT2004

Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.

Description: This module consists of MT3701 with the addition of directed reading on more advanced aspects of the subject and a requirement to write a review essay on an aspect of the subject. The syllabus will include: distribution theory – negative binomial, multinomial, gamma, beta, t and F distributions; point estimation – Mean square error; unbiasedness; sufficiency; the efficient score; Fisher Information; the Cramér-Rao lower bound; exponential families; attainment of the Cramér-Rao lower bound; multi-dimensional Cramér-Rao inequality; maximum likelihood estimation; consistency and asymptotic efficiency; hypothesis testing – Neyman-Pearson Lemma; uniformly most powerful tests; likelihood ratio tests; confidence sets – Pivotal quantities; Bayesian Inference – Bayes Theorem; highest posterior density intervals; Bayes estimators; prior distributions and subjective probability; conjugate priors.

Class Hour: 11.00 am

Teaching: Two lectures and one tutorial.

Assessment: Project = 25%, 2 Hour Examination = 75%

### MT5702 Advanced Generalized Linear Models and Data Analysis

Credits: 20.0 Semester: 1

Prerequisite: MT2004

Co-requisite: MT3501

Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.

Description: This module aims to demonstrate the power and elegance of unifying a large number of simple statistical models within the framework of the generalized linear model. It will train students in the interpretation, analysis and reporting of data, when a single response measurement is interpreted in terms of one or a number of other variables. As well as studying the material covered in MT3702, students will undertake a substantial piece of project work.

Class Hour: 11.00 am

Teaching: 2 lectures, 1 tutorial, practical classes and project related tutorials.

Assessment: Project = 40%, 2 Hour Examination = 60%

## Mathematics & Statistics - 5000 Level modules

### MT5704 Advanced Sampling Theory

Credits:	20.0	Semester:	2
Availability:	2002-03		
Prerequisite:	MT1004 or MT1007		
Programme(s):	Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.		
Description:	This module comprises MT3704 but with a more advanced project which will require some or all of the following: supplementary reading, a literature review, a critique of a survey, questionnaire and survey design, survey implementation, and data analysis. The primary goal of the advanced project will be to have students investigate in greater depth one or more specific topics encountered in MT3704.		
Class Hour:	12.00 noon		
Teaching:	Two lectures, one tutorial and practical classes.		
Assessment:	Project = 25%, 2 Hour Examination = 75%		

### MT5705 Advanced Multivariate Analysis

Credits:	20.0	Semester:	1
Availability:	2002-03		
Prerequisites:	MT2004, (MT2001 or MT3501)		
Programme(s):	Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.		
Description:	This module consists of MT3705 with the addition of directed reading on more advanced aspects of the subject and the requirement for students to analyse a data set. The syllabus includes: properties of the multivariate normal distribution; checking multivariate normality; hypothesis testing; the likelihood ratio and union-intersection principles; one-sample and two-sample Hotelling $T^2$ tests; tests on covariance matrices; tests of independence; discriminant analysis; principal components analysis; canonical correlation; analysis of data using a computer package.		
Class Hour:	9.00 am		
Teaching:	Two lectures and one tutorial.		
Assessment:	Project = 25%, 2 Hour Examination = 75%		

### MT5751 Estimating Animal Abundance

Credits:	10.0	Semester:	1 (2 weeks)
Programme(s):	Optional module for M. Res. Environmental Biology and M. Res. in Environmental Biology Conversion for Mathematical, Physical and Molecular Sciences Postgraduate Taught Programmes.		
Description:	The module will introduce students to the main types of survey method for wildlife populations. It will cover simple methods in some detail and provide students with a conceptual framework for building understanding of more advanced methods. By the end of the course, students will be able to identify an appropriate assessment method for a given population, be able to design a simple survey to assess the population, and perform simple analyses of survey data. Students will get experience in using the methods via computer practical sessions involving design and analyses of surveys conducted by computer simulation.		
Class Hour:	10.00 am.		
Teaching:	4 lectures, one tutorial and two practical classes each week for 2 weeks.		
Assessment:	Continuous Assessment = 33%, 2 Hour Examination = 67%		

## Mathematics & Statistics - 5000 Level modules

### MT5752 Modelling Ecological Dynamics

Credits: 20.0 Semester: 2 (4 weeks)

Prerequisite: BL5021 or substantial quantitative training

Programme(s): Compulsory module for M. Res. Environmental Biology and M. Res. in Environmental Biology Conversion for Mathematical, Physical and Molecular Sciences Postgraduate Taught Programmes.

Description: This module is designed to provide practical training in the construction and use of mathematical models of ecological dynamic systems. The module will start by covering basic dynamical concepts and mathematical tools, and will then cover modelling of individuals, single species populations, interacting populations and ecosystems. At all stages students will be expected to build and analyse models, with a combination of pencil and paper and computer software.

Class Hour: 10.00 am.

Teaching: 4 lectures, one tutorial and 3 practicals each week for 4 weeks.

Assessment: Continuous Assessment = 33%, 2 Hour Examination = 67%

### MT5753 Statistical Modelling

Credits: 20.0 Semester: 2 (4 weeks)

Programme(s): Compulsory module for M. Res. Environmental Biology and M. Res. in Environmental Biology Conversion for Mathematical, Physical and Molecular Sciences Postgraduate Taught Programmes.

Description: This course will introduce the main ideas of linear and generalised linear statistical modelling and will provide training in applied statistical modelling. The course structure is as follows: what statistical models are and what they are for; distributions, point and interval estimation and hypothesis testing; simple linear regression models for normal data; multiple regression; multiple regression with qualitative explanatory variables; less linear models for non-normal data; generalized linear models. Lectures will be built around the book "An Introduction to Statistical Modelling" (Krzanowski, 1998), which closely matches what we believe to be an ideal course structure.

Class Hour: 10.00 am.

Teaching: 4 lectures, one tutorial and 3 practicals each week for 4 weeks.

Assessment: Continuous Assessment = 33%, 2 Hour Examination = 67%

### MT5803 Advanced Interpolation and Approximation

Credits: 20.0 Semester: 2

Availability: 2001-02

Prerequisite: MT2001 or MT2101

Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.

Description: This module covers the material of MT3803, with the addition of topics, covered by directed reading and/or additional lectures, requiring a much more mature understanding of analysis.

Class Hour: 10.00 am

Teaching: Two lectures and one tutorial.

Assessment: Two-and-a-half Hour Examination = 100%

### MT5804 Advanced - The Sun

Credits:	20.0	Semester:	1
Prerequisite:	MT2003 or MT3601		
Programme(s):	Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.		
Description:	This module consists of MT3804 with the addition of directed reading on more advanced aspects of the subject and a requirement for students to carry out a detailed analytical investigation of a particular system or a detailed literature survey of a specific area. The syllabus includes: observations of the Sun and its magnetic phenomena; the equations of magnetohydrodynamics, their properties and application to solar magnetism; convection and diffusion of magnetic field; magnetic equilibria, force-free fields, magnetic flux tubes; MHD waves; waves in magnetic flux tubes, intense tubes, sunspots, coronal loops; coronal heating; prominences; Solar wind; helioseismology.		
Class Hour:	11.00 am		
Teaching:	Two lectures and one tutorial.		
Assessment:	Project = 25%, 2 Hour Examination = 75%		

### MT5805 Advanced Electromagnetism

Credits:	20.0	Semester:	2
Availability:	2002-03		
Prerequisite:	MT3601		
Programme(s):	Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.		
Description:	This module is an extension of MT3805 to include (i) the application of particle orbit theory to plasmas, (ii) the propagation of waves in plasmas. The syllabus also includes: electric and magnetic fields and polarisation; Maxwell's equations; wave equation for fields, properties of plane waves and Fresnel's relations; Poynting's theorem and energy flow; scalar and vector potential and the inhomogeneous wave equation; Green's function solution and retarded potentials; radiation from dipole and half wave antennas, and arrays of antennas; wave guides; motion of charged particles, adiabatic invariants and guiding centre drifts; particle orbit theory and its use in plasma physics; wave propagation in plasmas, cold plasma dispersion relation, cut-offs and resonances, CMA diagram, warm plasma modifications of cold plasma theory.		
Class Hour:	12.00 noon		
Teaching:	Two lectures and one tutorial.		
Assessment:	Two-and-a-half Hour Examination = 100%		

### MT5806 Advanced Numerical Solution of Partial Differential Equations

Credits:	20.0	Semester:	2
Availability:	2002-03		
Prerequisite:	MT3504 or MT3605		
Programme(s):	Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.		
Description:	This module consists of MT3806 with the addition that students will be required to gain expertise in a programming language and undertake computational projects. The syllabus includes: convergence and stability of finite-difference approximations to initial value problems in one and two space dimensions; the investigation of dispersion and dissipation in the approximation of conservative laws.		
Class Hour:	12.00 noon		
Teaching:	Two lectures and one tutorial.		
Assessment:	Project = 25%, 2 Hour Examination = 75%		

## Mathematics & Statistics - 5000 Level modules

### MT5807 Advanced Classical Mechanics

Credits: 20.0 Semester: 2  
Availability: 2002-03  
Prerequisite: MT2003

Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.

Description: The module consists of MT3807 with the addition of directed reading on advanced topics. The students will be asked to complete extra tutorial sheets covering the advanced material. The following material will also be covered: Newton's laws of motion – dynamics of a particle; momentum and energy; conservative forces – energy conservation; central forces – angular momentum conservation – planetary orbits; non-inertial/accelerating frames of reference, principle of equivalence, coriolis and centrifugal forces; dynamics of a system of particles; mechanics of a rigid body, moments and products of inertia, principal axes, impulsive forces, Euler's equations; Lagrange's equations, principle of least action, generalised co-ordinates, Euler's angles, Hamilton's equations.

Class Hour: 10.00 am  
Teaching: Two lectures and one tutorial.  
Assessment: Two-and-a-half Hour Examination = 100%

### MT5808 Advanced Dynamical Systems

Credits: 20.0 Semester: 2  
Availability: 2001-02  
Prerequisite: MT3504

Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.

Description: This module consists of MT3808 with the addition of directed reading on more advanced or technical aspects of the subject and a requirement for students to carry out a detailed analytic and numerical investigation of a particular system. The syllabus includes: discrete and continuous dynamical systems; period doubling, intermittency, bifurcations and chaos in mappings and differential systems; homoclinic and heteroclinic points and orbits and their role in the development of chaos; the Smale horseshoe mapping and symbolic dynamics; the bifurcations of codimension one and the use of centre manifold theory; Melnikov's method; Strange attractors, dimension and Lyapunov exponents; Hamiltonian dynamics and the Kolmogorov-Arnold-Moser theorem.

Class Hour: 10.00 am  
Teaching: Two lectures and one tutorial.  
Assessment: Project = 25%, 2 Hour Examination = 75%

### MT5809 Advanced Fluid Dynamics

Credits: 20.0 Semester: 2  
Prerequisite: MT3601

Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.

Description: This module consists of the module MT3809 with the addition of directed reading on more advanced aspects of the subject such as, compressible flow. Topics covered in MT3809 include: review of basic fluid properties, conservation laws, potential flows, free surface flows, vorticity evolution, fundamentals of atmosphere and ocean fluid dynamics.

Class Hour: 12.00 noon  
Teaching: Two lectures and one tutorial.  
Assessment: Two-and-a-half Hour Examination = 100%

**MT5811 Advanced Asymptotic Methods**

Credits: 20.0 Semester: 2

Availability: 2002-03

Prerequisites: MT3503, MT3504

Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.

Description: This module consists of MT3811 with the addition of directed reading on more advanced topics in both Asymptotic Analysis and Perturbation Theory. The advanced topics may include, for example, the method of steepest descents, advanced boundary layer methods and the Langer transformation for two turning point problems in WKB theory. Students will be asked to complete more demanding tutorial sheets and carry out detailed calculations using these more advanced techniques. The syllabus will include that for MT3811 plus advanced asymptotic and perturbation methods. For example, additional methods could be chosen from (i) the method of steepest descents, (ii) advanced boundary layer methods and (iii) Langer transformations for turning point problems.

Class Hour: 11.00 am

Teaching: Two lectures and one tutorial.

Assessment: Two-and-a-half Hour Examination = 100%

**MT5813 Advanced Fractal Geometry**

Credits: 20.0 Semester: 2

Availability: 2001-02

Prerequisites: MT2001 or MT2101

Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.

Description: This module consists of MT3813 with the addition of tutorials and directed reading on extensions of the subject and more sophisticated mathematical analysis. The aim of this module is to introduce the mathematics used to describe and analyse fractals and to show how the theory may be applied to examples drawn from across mathematics and science. The module discusses the philosophy and scope of fractal geometry; and covers concepts such as dimension, representation of fractals by iterated function systems, fractals in other areas of mathematics such as dynamical systems and number theory, Julia sets and the Mandelbrot set.

Class Hour: 12.00 noon

Teaching: Two lectures and one tutorial.

Assessment: Two-and-a-half Hour Examination = 100%

**MT5814 Advanced Graph Theory**

Credits: 20.0 Semester: 2

Availability: 2002-03

Prerequisite: MT1002

Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.

Description: This module includes and extends the contents of MT3814. Additional topics to be covered may include: applications of graphs to groups and other algebraic structures, automorphism groups, further algorithms, complexity of algorithms.

Class Hour: 10.00 am

Teaching: Two lectures and one tutorial.

Assessment: Project = 25%, 2 Hour Examination = 75%



## Mathematics & Statistics - 5000 Level modules

### MT5815 Advanced Functional Analysis

Credits: 20.0 Semester: 2

Availability: 2002-03

Prerequisite: MT2002

Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.

Description: This module consists of MT3815 with additional advanced material leading to a project. The module will familiarise students with the basic notions of functional analysis, that is analysis on normed spaces and Hilbert space. The module will cover normed spaces, convergence and completeness, operators, Hilbert spaces and topics such as spectral theory and the Hahn-Banach theorem.

Class Hour: 12.00 noon

Teaching: Two lectures and one tutorial.

Assessment: Project =25%, 2 Hour Examination = 75%

### MT5816 Advanced Finite Mathematics

Credits: 20.0 Semester: 2

Availability: 2001-02

Prerequisite: MT1002

Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.

Description: This module includes and extends the contents of MT3816. Additional topics to be covered may include: Boolean algebras, further combinatorial structures.

Class Hour: 12.00 noon

Teaching: Two lectures and one tutorial.

Assessment: Project = 25%, 2 Hour Examination = 75%

### MT5817 Advanced Rings and Fields

Credits: 20.0 Semester: 1

Availability: 2002-03

Prerequisite: MT2002

Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.

Description: This module consists of MT3817 together with additional advanced material, which is designed to give students a deeper understanding of the structure of rings and fields and their applications. It may include topics from radical theory, semisimplicity, Galois theory and primary ideals and decompositions.

Class Hour: 11.00 am

Teaching: Two lectures and one tutorial.

Assessment: Project =25%, 2 Hour Examination = 75%

### MT5818 Advanced Topics in Geometry

Credits: 20.0 Semester: 2

Availability: 2002-03

Prerequisite: MT2002

Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.

Description: This module includes and extends the contents of MT3818. Additional topics to be covered may include: crystallographic and frieze groups and their classification, an introduction to algebraic topology.

Class Hour: 11.00 am

Teaching: Two lectures and one tutorial.

Assessment: Two-and-a-half hour examination = 100%



## Mathematics & Statistics - 5000 Level modules

### MT5819 Advanced Number Theory

Credits: 20.0 Semester: 2  
Availability: 2002-03  
Prerequisite: MT2002  
Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.  
Description: This module includes and extends the contents of MT3819. Additional topics to be covered may include: quadratic reciprocity, quadratic forms, arithmetic functions, further Diophantine equations.  
Class Hour: 10.00 am  
Teaching: Two lectures and one tutorial.  
Assessment: Two-and-a-half hour examination = 100%

### MT5820 Advanced Linear Algebra

Credits: 20.0 Semester: 1  
Availability: 2001-02  
Prerequisite: MT2001  
Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.  
Description: This module consists of MT3820 with the addition of more advanced material. The syllabus includes bases, the dimension theorem, eigenvalues and eigenvectors, the Caley-Hamilton theorem, minimum polynomials, sums and direct sums of subspaces, the primary decomposition theorem, diagonalisation, similarity, various canonical forms.  
Class Hour: 11.00 am  
Teaching: Two lectures and one tutorial.  
Assessment: Two-and-a-half Hour Examination = 100%

### MT5822 Advanced Metric and Topological Spaces

Credits: 20.0 Semester: 2  
Availability: 2001-02  
Prerequisite: MT2002  
Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.  
Description: This module consists of MT3822 with additional advanced material leading to a project. This module extends ideas of convergence and continuity to very general settings. Topics include metric spaces, completeness and the contraction mapping theorem, compactness, topological spaces axiomatized via open sets, compactness and connectedness.  
Class Hour: 11.00 am  
Teaching: Two lectures and one tutorial.  
Assessment: Project = 25%, 2 Hour Examination = 75%

### MT5823 Advanced Semigroups

## Mathematics & Statistics - 5000 Level modules

Credits: 20.0 Semester: 2

Availability: 2002-03

Prerequisite: MT2002

Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.

Description: This module will consist of MT3823, together with additional advanced material, designed to take students to the frontiers of current research in semigroup theory. It may contain topics from: semigroup presentations, decidability problems, finiteness conditions, amalgamation, matrix semigroups and semigroup varieties.

Class Hour: 12.00 noon

Teaching: Two lectures and one tutorial.

Assessment: Project = 25%, 2 Hour Examination = 75%

### MT5824 Advanced Topics in Groups

Credits: 20.0 Semester: 2

Availability: 2001-02

Prerequisite: MT3603

Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.

Description: This module will consist of MT3824 together with additional advanced material, in which the results from the basic part of the module will be used to obtain deeper information about finite groups of small orders, simple groups, solubility problems for finitely presented groups and Burnside type problems. This additional part of the module will be designed so as to give students a taste of the current research in group theory.

Class Hour: 10.00 am

Teaching: Two lectures and one tutorial.

Assessment: Project =25%, 2 Hour Examination = 75%

### MT5825 Advanced Topics in Modern Analysis

Credits: 20.0 Semester: 2

Availability: 2001-02

Prerequisite: MT3604

Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.

Description: This module consists of MT3825 with additional advanced material leading to a project. This module introduces some of the powerful techniques and ideas of modern mathematical analysis that are important both in analysis in its own right and in its many applications in mathematics and science. The module will include topics such as: measure theory, the ergodic theorem, martingale theory, Fuchsian groups. Analysis is one of the active research areas at the school, and the choice of topics will reflect this.

Class Hour: 11.00 am

Teaching: Two lectures and one tutorial.

Assessment: Project =25%, 2 Hour Examination = 75%

### MT5831 Advanced Bayesian Inference

## Mathematics & Statistics - 5000 Level modules

Credits: 20.0 Semester: 2  
Availability: 2001-02  
Prerequisite: MT3701

Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.

Description: This module consists of MT3813 with an additional project which will give consideration to some more advanced aspects of the theory or to the application of Bayesian techniques. This may involve either directed reading or the use of the computer for simulation or data-based analyses. Foundations include: Bayes theorem (discrete and continuous cases); summarising posterior distributions; prediction; sufficiency; non-informative priors. Inference based on the Normal distribution includes: inference and prediction for a Normal sample; inverse gamma and Normal-gamma distributions; univariate Normal linear regression; prediction of observations satisfying a fitted linear model. Statistical Decision Theory includes: Bayes actions and Bayes rules; sampling costs; initial determination of sample size; one-step-look-ahead rules; optimal bounded sequential procedures; unbounded decision problems; approximation of optimal procedures by bounded procedures; computational Bayes methods.

Class Hour: 10.00 am

Teaching: Two lectures and one tutorial and practical classes.

Assessment: Project = 40%, 2 Hour Examination = 60%

### MT5832 Advanced Mathematical Programming

Credits: 20.0 Semester: 2  
Availability: 2001-02  
Prerequisite: MT1001 or MT1002

Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.

Description: This module consists of MT3832 with the addition of directed reading on more advanced aspects of the subject and a requirement for students to carry out a project. The syllabus includes: formulation of linear programming problems; solution graphically and by use of the simplex algorithm; sensitivity analysis; the dual problem and its relation to the primal problem; the transportation problem and its solution using the North West Corner method and Vogel's rule; the assignment problem and its solution; transshipment; nonlinear programming; integer programming.

Class Hour: 12.00 noon

Assessment: Project = 25%, 2 Hour Examination = 75%

### MT5834 Advanced Ecological Modelling

Credits: 20.0 Semester: 2  
Availability: 2001-02  
Prerequisite: MT2001 or MT2101

Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.

Description: This module consists of MT3834 with the addition of an advanced project, in the form of a literature review or a project on some aspect of modelling.

Class Hour: 10.00 am

Teaching: Two lectures and one laboratory.

Assessment: Essay = 10%, Advanced Project Report = 25%, 2 Hour Examination = 65%

### MT5835 Advanced Wildlife Population Assessment

## Mathematics & Statistics - 5000 Level modules

Credits: 20.0 Semester: 2  
Availability: 2001-02  
Prerequisite: MT2004  
Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.  
Description: This module consists of MT3835 with the addition of an advanced project, which might cover any aspect of the module.  
Class Hour: 11.00 am  
Teaching: Two lectures and one laboratory.  
Assessment: Advanced Project Report = 45%, 2 Hour Examination = 55%

### MT5838 Advanced Robust Statistical Methods

Credits: 20.0 Semester: 2  
Availability: 2002-03  
Prerequisite: MT2004  
Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.  
Description: This module consists of MT3838 with the addition of an advanced project, which might cover any aspect of the module.  
Class Hour: 11.00 am  
Teaching: Two lectures and one tutorial.  
Assessment: Continuous Assessment = 20%, Advanced Project = 25%, 2 Hour Examination = 55%

### MT5850 Advanced Lattice Theory

Credits: 20.0 Semester: 2  
Availability: 2002-03  
Prerequisites: MT2002  
Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.  
Description: This module consists of MT3850 with the addition of more advanced material. The aim of the module is to introduce students to the basic ideas of ordered sets and lattices, with particular emphasis on various types of distributive lattices. The syllabus includes: ordered sets and isotone mappings; infima and suprema; lattices and lattice morphisms; complete, modular, and distributive lattices and their Birkhoff characterisations; representation of a distributive lattice as a ring of sets; join-irreducible elements and finite duality; complementation and Boolean algebras; connection with boolean rings; the Lindenbaum-Tarski Theorem; congruences, principal congruences, the lattice of congruences; implicative and pseudo-complemented lattices; introduction to Ockham algebras.  
Class Hour: To be arranged.  
Teaching: Two lectures and one tutorial.  
Assessment: Project = 25%, Two Hour Examination = 75%

### MT5998 Advanced Project in Mathematics/Statistics

## Mathematics & Statistics - 5000 Level modules

Credits: 30.0 Semester: Whole Year  
Prerequisite: Entry to the MSci degree in Mathematics and Theoretical Physics  
Anti-requisite: MT5999  
Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.  
Description: The project will be chosen from an approved list of topics and the credit rating will reflect the content and depth of an investigation involved.  
Assessment: Project = 100%

### **MT5999 Advanced Project in Mathematics/Statistics**

Credits: 40.0 Semester: Whole Year  
Anti-requisite: MT5998  
Programme(s): Optional module for Mathematics and Statistics Postgraduate Taught Programmes. The course of study must be approved by the Head of School.  
Description: This is a more substantial project which, for M.Sci. students will replace the existing Honours project. The project will be chosen from an approved list of topics. The student may be required to review current literature and investigate a topic in some depth.  
Assessment: Project = 100%

