

Mathematics (MT) Modules

MT4113 Computing in Statistics				
SCOTCAT Credits:	15	SCQF Level 10	Semester	1
Academic year:	2019/0			
Planned timetable:	12.00 noon Mon (odd weeks) and Wed, 12.00 noon - 2.00 pm Fri			
The aim of this module is to teach computer programming skills, including principles of good programming practice, with an emphasis on statistical computing. Practical work focusses on the widely-used statistical language and environment R. Practical skills are developed through a series of computing exercises that include (1) modular programming; (2) manipulating data; (3) simulating data with specific statistical properties, (4) investigating behaviour of statistical procedures under failure of statistical assumptions.				
Learning and teaching methods of delivery:	Weekly contact: 1.5-hour lectures (x 10 weeks), 2-hour practical classes (x 10 weeks)			
Assessment pattern:	2-hour Written Examination = 40%, Coursework = 60%			
Re-assessment pattern:	1-hour 40 minute Written Examination = 40%, Coursework (4 new programming assignments) = 60%			
Module coordinator:	Mr R Glennie			
Module teaching staff:	Mr Richard Glennie			

MT4510 Solar Theory				
SCOTCAT Credits:	15	SCQF Level 10	Semester	2
Academic year:	2019/0			
Planned timetable:	11.00 am Mon (odd weeks), Wed and Fri			
The object of this module is to describe the basic dynamic processes at work in the Sun, a subject which is being enlivened by dramatic new results from space missions.				
Pre-requisite(s):	Before taking this module you must pass MT2506 and pass MT3504			
Learning and teaching methods of delivery:	Weekly contact: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
Assessment pattern:	2-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof I De Moortel			
Module teaching staff:	Prof Ineke De Moortel, Dr Andrew Wright			

MT4539 Quantitative Risk Management				
SCOTCAT Credits:	15	SCQF Level 10	Semester	2
Academic year:	2019/0			
Planned timetable:	12.00 noon Mon (odd), Wed, Fri, and 2.00 pm Fri			
The module introduces the concept of financial risk and discusses the importance of its regulation. The emphasis is laid on the popular risk measure Value at Risk (VaR). After a brief discussion on asset returns, various modelling techniques - ranging from the simple Historical Simulation to the more advanced ARMA and GARCH models - are presented and applied for the calculation of VaR using real financial data. The aim of this module is to provide a solid basis in risk management for those students considering a career in finance.				
Pre-requisite(s):	Before taking this module you must pass MT2504 and pass MT2508			
Learning and teaching methods of delivery:	Weekly contact: 2.5 lectures (x 10 weeks), 5 tutorials and 5 practical sessions.			
Assessment pattern:	2-hour Written Examination = 80%, Coursework = 20%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr V M Popov			
Module teaching staff:	Dr V Popov			

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MT5098 Group Dissertation for MSc Programme/s				
SCOTCAT Credits:	60	SCQF Level 11	Semester	Full Year
Academic year:	2019/0			
Availability restrictions:	Available only to students enrolled on the MSc in Applied Statistics and Datamining			
Planned timetable:	To be arranged.			
This module is a group-based dissertation which is supervised by members of the teaching staff who will advise on the choice of subject and provide guidance and structure throughout the progress of the dissertation. This module results in an individually written and submitted dissertation of not more than 15,000 words. This dissertation may also include an agreed collaboratively written group report, but this report will constitute no more than 30% of the module grade. Each student is assessed taking into account both individual and group submissions.				
Anti-requisite(s)	You cannot take this module if you take MT5099			
Learning and teaching methods of delivery:	Weekly contact: 1-hour supervision (x 13 weeks)			
Assessment pattern:	Dissertation = 100%			
Re-assessment pattern:	Resubmission of dissertation = 100%			
Module teaching staff:	To be arranged			

MT5099 Dissertation for MSc Programme/s				
SCOTCAT Credits:	60	SCQF Level 11	Semester	Full Year
Academic year:	2019/0			
Planned timetable:	At times to be arranged with the supervisor.			
Student dissertations will be supervised by members of the teaching staff who will advise on the choice of subject and provide guidance throughout the progress of the dissertation. The completed dissertation must be no more than 15,000 words.				
Learning and teaching methods of delivery:	Weekly contact: Individual supervision			
Assessment pattern:	Dissertation = 100%			
Re-assessment pattern:	No Re-Assessment Available			
Module coordinator:	Prof J D Mitchell			

MT5590 Independent Study Module				
SCOTCAT Credits:	15	SCQF Level 11	Semester	Both
Academic year:	2019/0			
Availability restrictions:	Available only to students on an MMath, MPhys or MSc degree programme in the School			
Planned timetable:	Weekly supervision as arranged with supervisor.			
This module provides the opportunity for a student to study an Advanced topic as a reading course under the supervision of a member of staff. The topic will be disjoint from that of other taught modules, broadening the selection of advanced material available. Students will meet regularly with their supervisor and follow a planned programme of independent study, with associated assessment, as specified in the Letter of Agreement.				
Pre-requisite(s):	The student requires a letter of agreement			
Anti-requisite(s)	You cannot take this module if you take MT5990			
Learning and teaching methods of delivery:	Weekly contact: Typically 1 hour supervision each week.			
Assessment pattern:	Coursework = 100%			
Re-assessment pattern:	2-hour written examination = 100%			
Module coordinator:	Dr A L Wilmot-Smith			
Module teaching staff:	As Letter of Agreement			

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MT5599 Advanced Project in Mathematics / Statistics				
SCOTCAT Credits:	30	SCQF Level 11	Semester	Full Year
Academic year:	2019/0			
Availability restrictions:	Available only to students in the final year of a MMath/MPhys Honours degree programme in the School.			
Planned timetable:	Regular supervision as arranged with supervisor.			
This is a substantial project for final year students on integrated Masters degrees. The project will be chosen from a list published annually in the project booklet. It is also possible for students to nominate their own project, by agreement with a supervisor. Students will be required to investigate a topic in some depth, reporting regularly to their supervisor, submit a report by the end of April and give a presentation.				
Pre-requisite(s):	Available only to students in the final year of a mmath/mphys honours degree programme in the school.			
Learning and teaching methods of delivery:	Weekly contact: Typically and on average, 40 mins of project supervisions per week over whole year			
Assessment pattern:	Coursework = 100% (Project = 80%, Presentation = 20%)			
Re-assessment pattern:	Resubmission of project = 100%			
Module coordinator:	Prof N Ruskuc			
Module teaching staff:	Team Taught			

MT5758 Multivariate Analysis				
SCOTCAT Credits:	15	SCQF Level 11	Semester	2
Academic year:	2019/0			
Planned timetable:	11.00 am Mon (even weeks), Tue and Thu			
This module provides theory and application for the analysis of multivariate data. Fundamental matrix material is presented including mean vectors, covariance matrices, correlation matrices and basic properties of multivariate normal distributions. Multivariate extensions to common univariate tests are subsequently covered. Distance metrics and general measures of similarity are explored, leading to the broader utility of multivariate methods in real-world problems, particularly for classification and dimension reduction. The most common and fundamental methods are covered, including Principal Components Analysis, multidimensional scaling, clustering and discriminant analyses. The practical component of the module focuses on analysis of real data using widespread software.				
Pre-requisite(s):	The student must have been accepted on to mmath statistics or mmath mathematics programmes.			
Anti-requisite(s)	You cannot take this module if you take MT4609			
Learning and teaching methods of delivery:	Weekly contact: 2.5 lectures (weeks 1 - 10), and 4 tutorials and 4 project group meetings over the semester.			
Assessment pattern:	2-hour Written Examination = 50%, Coursework = 50%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr V M Popov			
Module teaching staff:	Dr Valentin Popov, Dr Steven Drasco			

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MT5761 Applied Statistical Modelling using GLMs				
SCOTCAT Credits:	15	SCQF Level 11	Semester	1
Academic year:	2019/0			
Planned timetable:	Mon, Tues, Thur, Fri 3:00 - 4:00 (lectures), Tues, Thur 4:00 - 5:00 (practicals)			
<p>This applied statistics module covers the main aspects of linear models (LMs) and generalized linear models (GLMs). In each case the course describes model specification, various options for model selection, model assessment and tools for diagnosing model faults. Common modelling issues such as collinearity and residual correlation are also addressed, and as a consequence of the latter the Generalized Least Squares (GLS) method is described. The GLM component has emphasis on models for count data and presence/absence data while GLMs for multinomial (sometimes called choice-based models) are also covered for nominal and ordinal response outcomes. The largest part of the course material is taught inside an environmental impact assessment case study with reality-based research objectives. Political and medical examples are used to illustrate the multinomial models.</p>				
Pre-requisite(s):	Undergraduates must have passed at least one of MT4113, MT4527, MT4528, MT4530, MT4531, MT4537, MT4539, MT4606, MT4608, MT4609, MT4614.			
Anti-requisite(s)	You cannot take this module if you take MT4607 or take MT5753			
Learning and teaching methods of delivery:	Weekly contact: 4 lectures (x 5 weeks), 2 practicals (x 5 weeks)			
Assessment pattern:	2-hour Written Examination = 50%, Coursework = 50%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof D L Borchers			
Module teaching staff:	Prof David Borchers, Dr Valentin Popov			

MT5762 Introductory Data Analysis				
SCOTCAT Credits:	15	SCQF Level 11	Semester	1
Academic year:	2019/0			
Availability restrictions:	Not available to Undergraduate students.			
Planned timetable:	Mon, Tue, Fri 2:00 - 3:30, Thur 3:30 - 5:00			
<p>This module provides coverage of essential statistical concepts and analysis methods relevant to commercial analysis. Specifically: the different types of data and their numerical/graphical treatment; basic probability theory and concepts of inference; fundamental statistical concepts with particular emphasis on sampling issues; basic statistical models and tests; linear models; introductory computer-intensive inference. This module is a short intensive course and is a core, preliminary, requirement for the MSc in Applied Statistics and Datamining. It covers material essential for study of the more advanced statistical methods encountered in subsequent modules.</p>				
Pre-requisite(s):	Students must have gained admission onto an MSc programme			
Anti-requisite(s)	You cannot take this module if you take MT5756			
Learning and teaching methods of delivery:	Weekly contact: Four 1.5-hour lectures (x 5 weeks)			
Assessment pattern:	Coursework = 100%			
Module coordinator:	Dr C R Donovan			
Module teaching staff:	Dr Carl Donovan, Prof David Borchers			

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MT5763 Software for Data Analysis				
SCOTCAT Credits:	15	SCQF Level 11	Semester	1
Academic year:	2019/0			
Planned timetable:	Mon, Tues, Fri 3:30 - 4:30 (lectures). Mon, Tues, Fri 4:30 - 5:30 (Practicals)			
<p>This module covers the practical computing aspects of statistical data analysis, focussing on packages most widely used in the commercial sector (R, SAS, SPSS and Excel). We cover the accessing, manipulation, checking and presentation of data (visual and numerical). We fit various statistical models to data, with subsequent assessment, interpretation and presentation. Good practice and 'reproducible research' is covered, as is computer intensive inference and big data considerations. This module is a short intensive course and is a core, preliminary requirement for the MSc in Applied Statistics and Datamining and the MSc in Data Intensive Analysis. It covers material essential for study of the more advanced statistical methods encountered in subsequent modules.</p>				
Pre-requisite(s):	Before taking this module you must pass MT1007 or pass MT3507 or pass MT3508 or take MT5762			
Anti-requisite(s)	You cannot take this module if you take MT5756			
Learning and teaching methods of delivery:	Weekly contact: Three 2-hour lecture/practical classes (x 5 weeks)			
Assessment pattern:	Coursework = 100%			
Re-assessment pattern:	Coursework = 100%			
Module coordinator:	Dr C R Donovan			
Module teaching staff:	Dr Carl Donovan			

MT5764 Advanced Data Analysis				
SCOTCAT Credits:	15	SCQF Level 11	Semester	2
Academic year:	2019/0			
Planned timetable:	Mon 12:00-1:00 Weeks 2, 4, 5, 8, 10 Tues, Thur 12:00-2:00, Weeks 1-10 (lectures) Tues 2:00 - 3:00 Weeks 2-9 (practicals)			
<p>This module covers modern modelling methods for situations where the data fails to meet the assumptions of common statistical models and simple remedies do not suffice. This represents a lot of real world data. Methods covered include: nonlinear models; basic splines and Generalised Additive Models; LASSO and the Elastic Net; models for non-independent errors and random effects. Pragmatic data imputation is covered with associated issues. Computer intensive inference is considered throughout. Practical applications build sought-after skills in R and the commercial packages SAS.</p>				
Pre-requisite(s):	Before taking this module you must pass MT3508 and (pass MT4606 or pass MT5761)			
Anti-requisite(s)	You cannot take this module if you take MT5757			
Learning and teaching methods of delivery:	Weekly contact: 2.5 hours of lectures lectures (Weeks 1 - 10) and 8 practicals over the semester.			
Assessment pattern:	2-hour Written Examination = 60%, Coursework = 40%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof L J Thomas			
Module teaching staff:	Prof Leonard Thomas			

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MT5765 Medical Statistics				
SCOTCAT Credits:	15	SCQF Level 11	Semester	2
Academic year:	2019/0			
Planned timetable:	10:00 - Mon (odd weeks), Wed, Fri			
This module will cover a number of topics in medical statistics, that are important areas both in terms of methodological development and application. The main topic covered will be Survival Analysis, with others selected from Meta-analysis, Power calculations, Prospective vs Observational studies, Sequential analyses, Clinical trials.				
Pre-requisite(s):	Before taking this module you must pass MT3507 or pass MT3508			
Learning and teaching methods of delivery:	Weekly contact: 2.5 lectures (x 10 weeks), 1 tutorial (x 10 weeks)			
Assessment pattern:	Coursework = 35%, 2-hour Written Examination = 65%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof A G Lynch			
Module teaching staff:	Prof Andrew Lynch			

MT5846 Advanced Computational Techniques				
SCOTCAT Credits:	15	SCQF Level 11	Semester	2
Academic year:	2019/0			
Planned timetable:	12 noon Monday (even weeks), Tuesday, Thursday.			
This module introduces students to some of the ideas, techniques and constraints that underpin modern approaches to the numerical modelling of physical processes that may be described by partial differential equations. Students will gain experience in implementing a variety of standard numerical methods where they will carry out three projects involving code development, testing and analysis/interpretation of results.				
Pre-requisite(s):	Before taking this module you must pass MT3802 and pass MT4112			
Anti-requisite(s)	You cannot take this module if you take MT5806			
Learning and teaching methods of delivery:	Weekly contact: 2 lectures (x 10 weeks), 1 practical (x 11 weeks)			
Assessment pattern:	Coursework = 100%			
Re-assessment pattern:	Oral examination = 100%			
Module coordinator:	Dr S J Brooks			
Module teaching staff:	Dr Stephen Brooks, Dr Richard Scott			

MT5849 Geophysical Fluid Dynamics				
SCOTCAT Credits:	15	SCQF Level 11	Semester	1
Academic year:	2019/0			
Planned timetable:	11am Monday (odd weeks), Wednesday, Friday			
This module will examine current research in fluid dynamics, with a particular focus on meteorology and oceanography. The large-scale atmosphere and oceans behave quite unlike a 'classical' fluid owing to the presence of stable density stratification and rotation. As a result, the fluid motion is dominated by slow, 'vortical' or eddying motions (like cyclones) which generally spin slower than the Earth. Superimposed on this slow motion are relatively fast wave-like motions analogous to surface waves on a pond. These lectures describe the mathematical basis of these fundamentally different types of motion, and furthermore illustrate the increasingly important role of computer modelling in this research.				
Pre-requisite(s):	Before taking this module you must pass MT4509			
Anti-requisite(s)	You cannot take this module if you take MT5809			
Learning and teaching methods of delivery:	Weekly contact: 2.5 lectures, 1 tutorial			
Assessment pattern:	2-hour written examination = 100%			
Re-assessment pattern:	2-hour written examination = 100%			
Module coordinator:	Dr R K Scott			
Module teaching staff:	Dr Richard Scott			

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MT5850 Advanced Solar Theory				
SCOTCAT Credits:	15	SCQF Level 11	Semester	1
Academic year:	2019/0			
Planned timetable:	12 noon Monday (even weeks), Tuesday, Thursday			
This module describes the magnetohydrodynamic processes at work in the solar atmosphere, using modern techniques of applied mathematics, and discusses the latest theories in relation to aspects of current research within the School.				
Pre-requisite(s):	Before taking this module you must pass MT4510			
Anti-requisite(s)	You cannot take this module if you take MT5810			
Learning and teaching methods of delivery:	Weekly contact: 2.5 lecture (x 10 weeks), 1 tutorial (x 10 weeks)			
Assessment pattern:	2-hour written examination = 100%			
Re-assessment pattern:	2-hour written examination = 100%			
Module coordinator:	Prof T Neukirch			
Module teaching staff:	Dr Thomas Neukirch			

MT5853 Mathematical Biology 2				
SCOTCAT Credits:	15	SCQF Level 11	Semester	1
Academic year:	2019/0			
Planned timetable:	9am, Monday (odd weeks), Wednesday, Friday			
This module will explore real world applications of mathematics to biological and medical problems (e.g. cell movement, pattern formation in animal coat markings, spread of infectious diseases). The mathematical models that will be considered are mostly formulated in terms of nonlinear partial differential equations whose solutions can exhibit a range of interesting behaviour. The module will be useful to students who wish to specialise in Applied Mathematics in their degree programme.				
Pre-requisite(s):	Before taking this module you must pass MT3504			
Anti-requisite(s)	You cannot take this module if you take MT5852			
Learning and teaching methods of delivery:	Weekly contact: 2.5 lectures (x 10 weeks), 10 tutorials (x 10 weeks)			
Assessment pattern:	50 minute class test = 10%, 2-hour written examination = 90%			
Re-assessment pattern:	2-hour written examination = 100%			
Module coordinator:	Dr T Lorenzi			
Module teaching staff:	Dr Tommaso Lorenzi			

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MT5854 Mathematical Oncology				
SCOTCAT Credits:	15	SCQF Level 11	Semester	2
Academic year:	2019/0			
Planned timetable:	9am, Monday (odd weeks), Wednesday, Friday			
<p>Cancer is a complex disease, the second largest cause of death throughout the world (after cardiovascular diseases). Beginning with genetic mutations in a single cell, cancer progresses through several key growth phases - the avascular growth phase (nutrient delivered by diffusion of oxygen), tumour-induced angiogenesis (blood vessel growth), invasion and metastasis (spread to secondary parts of the body). Because of its complexity and multiscale nature (temporal and spatial), treatment of cancer is challenging. This module will introduce students to the mathematical modelling of the key phases of cancer growth and treatment via immunotherapy, chemotherapy and radiotherapy. The mathematical techniques used in the modelling will be nonlinear partial differential equations, and students will be exposed to current research taking place within the Mathematical Biology research group in the School of Mathematics and Statistics.</p>				
Pre-requisite(s):	Before taking this module you must pass MT3504			
Learning and teaching methods of delivery:	Weekly contact: 2.5 lectures (x 10 weeks), 1 tutorial (x 10 weeks)			
Assessment pattern:	50 minute class test = 10%, 2-hour written examination = 100%			
Re-assessment pattern:	2-hour written examination = 100%			
Module coordinator:	Dr N Sfakianakis			
Module teaching staff:	Dr Nikolaos Sfakianakis			

MT5861 Advanced Combinatorics				
SCOTCAT Credits:	15	SCQF Level 11	Semester	1
Academic year:	2019/0			
Planned timetable:	12 noon Monday (even weeks), Tuesday, Thursday			
<p>Combinatorics underlies and interacts many topics in discrete mathematics including group theory, statistical design, and statistical mechanics, as well as being a lively subject in its own right. The module will give students a good grounding in the techniques and will engage students with research-level problems. It is designed to make a wide area of combinatorics available to students.</p>				
Pre-requisite(s):	Before taking this module you must pass MT4514 or pass MT4516			
Anti-requisite(s)	You cannot take this module if you take MT5821			
Learning and teaching methods of delivery:	Weekly contact: 2.5 lectures (x10 weeks), 1 tutorial (x10 weeks)			
Assessment pattern:	2-hour written examination = 100%			
Re-assessment pattern:	2-hour written examination = 100%			
Module coordinator:	Prof P J Cameron			
Module teaching staff:	Prof Peter Cameron			

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MT5862 Discrete Geometry				
SCOTCAT Credits:	15	SCQF Level 11	Semester	1
Academic year:	2019/0			
Availability restrictions:	Module runs in alternating odd years			
Planned timetable:	Lectures - Monday (odd weeks), Wednesday, Friday - 11am			
Discrete geometry is concerned with combinatorial properties of geometric objects such as point sets, arrangements of affine and projective subspaces, convex polytopes, and geometric graphs. This module introduces the area, covering the basic objects and selected key results. Topics that will be covered include: affine and projective spaces; combinatorics of subspace arrangements and polytopes; geometric graphs.				
Pre-requisite(s):	Before taking this module you must (pass MT2504 and pass MT3501) and pass MT3502 or pass MT3505 or pass MT3852 or pass MT4003 or pass MT4514 or pass MT4516			
Learning and teaching methods of delivery:	Weekly contact: 2.5 hour lectures (9 weeks), 1 hour tutorial (10 weeks)			
Assessment pattern:	2-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr L S Theran			
Module teaching staff:	Dr Louis Theran			

MT5863 Semigroups				
SCOTCAT Credits:	15	SCQF Level 11	Semester	2
Academic year:	2019/0			
Planned timetable:	9am Monday (odd weeks), Wednesday, Friday			
The general aim of this module is to introduce students to semigroup theory, which is the study of sets with one associative binary operation defined on them. In the process, the common aims and concerns of abstract algebra will be emphasised and illustrated by drawing comparisons between semigroups, groups and rings				
Pre-requisite(s):	Before taking this module you must pass MT3505 or pass MT4003			
Anti-requisite(s)	You cannot take this module if you take MT5823			
Learning and teaching methods of delivery:	Weekly contact: 2.5 lectures (x 10 weeks), 1 tutorial (x 10 weeks)			
Assessment pattern:	2-hour written examination = 100%			
Re-assessment pattern:	2-hour written examination = 100%			
Module coordinator:	Prof J D Mitchell			
Module teaching staff:	Prof James Mitchell			

MT5990 Independent Study Module				
SCOTCAT Credits:	20	SCQF Level 11	Semester	1
Academic year:	2019/0			
Availability restrictions:	Available only to students on an MMath, MPhys or MSc degree programme in the School			
Planned timetable:	To be arranged.			
This module provides the opportunity for a student to study an Advanced topic as a reading course under the supervision of a member of staff. The topic will be disjoint from those available in other modules.				
Pre-requisite(s):	In taking this module undergraduate students must have permission of head of school.			
Learning and teaching methods of delivery:	Weekly contact: Typically 1 hour project supervisions.			
Assessment pattern:	Coursework = 100%			
Re-assessment pattern:	Resubmission of coursework = 100%			
Module coordinator:	Dr A L Wilmot-Smith			
Module teaching staff:	Dr A Wilmot-Smith			

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MT5991 Professional Skills for Mathematical Scientists				
SCOTCAT Credits:	30	SCQF Level 11	Semester	Full Year
Academic year:	2019/0			
Availability restrictions:	Available only to students studying MSc Mathematics			
Planned timetable:	To be arranged.			
<p>This module encompasses a range of skills, both generic and topic specific, together with taught components aimed at providing an appreciation of both breadth and depth of research areas in Pure or Applied Mathematics. The precise programme of study, together with the identification of the relevant software expertise required, will be determined in consultation with the student's supervisor.</p>				
Learning and teaching methods of delivery:	Weekly contact: Varies. Typically 1 project supervision per week over whole year.			
Assessment pattern:	Coursework = 100%			
Re-assessment pattern:	Resubmission of coursework = 100%			
Module coordinator:	Prof J D Mitchell			
Module teaching staff:	Prof James Mitchell			