Masters in Mathematics

Programme Requirements

Taught Element:

90 credits: 5000-level modules listed in this section of the Postgraduate Course Catalogue.

30 credits: from MT modules in the range MT3000 - MT4598 or MT4600 - MT5998.

Programmes of study are subject to approval by the Head of School.

MSc:

120 credits from the Taught Element together with a 60-credit dissertation (MT5099)

Modules

Compulsory module - Whole Year:

MT5099 Dissertation for MSc Programme/s				
SCOTCAT Credits:	60	SCQF Level 11	**Semester:**	Whole Year
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 of not more than 15,000 words must be submitted by the 21st of August.				
Programme module type:	Compulsory for MSc Programmes in Mathematics and in Statistics. Optional for Data-Intensive Analysis MSc Programme.			
Learning and teaching methods and delivery:	**Weekly contact**: Individual supervision			
Assessment pattern:	Dissertation = 100%			
Module Co-ordinator:	Dr J D Mitchell			

Optional modules:

MT5611 Advanced Symbolic Computation

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	1 or 2
Planned timetable:	9.00 am Mon (odd weeks), Wed and Fri			

This module aims to enable students to use a computer as a tool in their other modules and to turn naturally to a computer when solving mathematical problems. The module aims to illustrate the following points: computation allows one to conduct mathematical experiments; computation 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 computer is not intelligent; 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 MT4111.

Programme module type:	Optional for all Postgraduate Programmes within the School of Mathematics & Statistics, also for some Postgraduate programmes outwith the School.
Anti-requisite(s):	MT4111
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 practical session (weeks 2 - 11).
Assessment pattern:	2-hour Written Examination = 55%, Coursework: Project = 45%
Module Co-ordinator:	Dr J D Mitchell
Lecturer(s)/Tutor(s):	Dr J D Mitchell, Dr C M Roney-Dougal, TBC

MT5751 Estimating Animal Abundance

SCOTCAT Credits:	15	SCQF Level 11	**Semester:**	2
Planned timetable:	12.00 noon Mon (odd), Wed and Fri			

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.

Programme module type:	Optional for all Postgraduate Programmes within the School of Mathematics & Statistics, also for some Postgraduate programmes outwith the School.
Learning and teaching methods and delivery:	**Weekly contact**: 1.5 hrs lecture, 1 hr practical, 0.5 hr tutorial (weeks 1 - 10)
Assessment pattern:	2-hour Written Examination = 50%, Coursework = 50%
Module Co-ordinator:	Prof D L Borchers
Lecturer(s)/Tutor(s):	Prof D L Borchers

MT5802 Advanced Analytical Techniques

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	2
Planned timetable:	12.00 noon Mon (odd weeks), Wed and Fri			
This module introduces students to some further important applied analytic techniques such as Variational Calculus, Integral equations and transforms, and the theory of Steepest Descent.				
Programme module type:	Optional for all Postgraduate Programmes within the School of Mathematics & Statistics.			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
Assessment pattern:	2-hour Written Examination = 75%, Coursework = 25%			
Module Co-ordinator:	Dr C V Tran			
Lecturer(s)/Tutor(s):	Dr C V Tran			

MT5806 Advanced Computational Techniques

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	2
Planned timetable:	12.00 noon Mon (even weeks), Tue and Thu			
This module introduces students to some of the ideas, techniques and constraints that underpin modern approaches to the numerical modeling of physical processes that may be described by partial differential equations. Students will gain expertise in implementing standard methods and will submit a short dissertation together with a portfolio of computational work.				
Programme module type:	Optional for all Postgraduate Programmes within the School of Mathematics & Statistics.			
Learning and teaching methods and delivery:	**Weekly contact**: 2 lectures (weeks 1 - 10) and a typical average of 0.5 hours of project supervisions (weeks 2 - 11)			
Assessment pattern:	Coursework = 100%			
Module Co-ordinator:	Dr S J Brooks			
Lecturer(s)/Tutor(s):	Dr S J Brooks			

MT5809 Advanced Fluid Dynamics

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	1
Planned timetable:	11.00 am Mon (odd weeks), Wed and Fri			
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.				
Programme module type:	Optional for all Postgraduate Programmes within the School of Mathematics & Statistics.			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
Assessment pattern:	2.5-hour Written Examination = 100%			
Module Co-ordinator:	Prof D G Dritschel			
Lecturer(s)/Tutor(s):	Prof D G Dritschel			

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MT5810 Advanced Solar Theory

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	1
Planned timetable:	12.00 noon Mon (even weeks), Tue and Thu			

The object of this module is to describe the magnetohydrodynamic processes at work in the Sun, using modern techniques of applied mathematics, and to discuss the latest theories in relation to aspects of current research within the School.

Programme module type:	Optional for all Postgraduate Programmes within the School of Mathematics & Statistics.
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).
Assessment pattern:	2.5-hour Written Examination = 100%
Module Co-ordinator:	Prof C E Parnell
Lecturer(s)/Tutor(s):	Prof C E Parnell

MT5812 Advanced Financial Mathematics

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	1
Planned timetable:	2.00 pm Tue and Fri			

This module builds on the theory that has been taught in MT4551 by introducing further analytical and practical techniques that are used in the valuation and risk-management of all the mainstream vanilla and exotic derivatives in the Equity, Foreign Exchange, Fixed Income and Credit Markets. The focus will be on both understanding the theory as well as how it is applied in the real world environment of a derivatives trading desk. By means of lectures and practical assignments, students will also be introduced to Excel and the Visual Basic Programming language (as a working knowledge of these will be invaluable to anyone seeking a career in the areas of finance or business).

Programme module type:	Optional for all Postgraduate Programmes within the School of Mathematics & Statistics.
Learning and teaching methods and delivery:	**Weekly contact**: 2 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).
Assessment pattern:	2-hour Written Examination = 50%, Coursework = 50%
Module Co-ordinator:	Dr W R Campbell
Lecturer(s)/Tutor(s):	Dr W R Campbell

MT5821 Advanced Combinatorics

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	2	
Availability restrictions:	Availability subject to confirmation				
Planned timetable:	12.00 noon Mon (odd weeks), Wed and Fri				

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.

Programme module type:	Optional for all Postgraduate Programmes within the School of Mathematics & Statistics.
Learning and teaching methods and delivery:	**Weekly contact**: 2.5-hour lectures (weeks 1 - 10) and 1-hour tutorial (weeks 2 - 11).
Assessment pattern:	2.5-hour Written Examination = 100%
Module Co-ordinator:	Prof P J Cameron
Lecturer(s)/Tutor(s):	Prof P J Cameron

MT5824 Topics in Groups

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	1	
Planned timetable:	10.00 am Mon (odd weeks), Wed and Fri				

The overall aim of this module is to build on the foundations established in MT4003/MT4603, and take the students further into this important and beautiful branch of mathematics. More specifically, through a selection of topics, some of which will be of current research interest in St Andrews, it will introduce students to advanced techniques of handling groups and classifying them.

Programme module type:	Optional for all Postgraduate Programmes within the School of Mathematics & Statistics.
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10), 1 tutorial and 1 examples class (weeks 2 - 11).
Assessment pattern:	2.5-hour Written Examination = 100%
Module Co-ordinator:	Dr C P Bleak
Lecturer(s)/Tutor(s):	Dr C P Bleak

MT5825 Measure and Ergodic Theory

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	1	
Planned timetable:	11.00 am Mon (odd weeks), Wed and Fri				

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. Analysis is one of the active research areas within the School, and the choice of topics will reflect current activity.

Programme module type:	Optional for all Postgraduate Programmes within the School of Mathematics & Statistics.
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).
Assessment pattern:	2-hour Written Examination = 75%, Coursework = 25%
Module Co-ordinator:	Dr M Todd
Lecturer(s)/Tutor(s):	Dr M Todd

MT5830 Topics in Geometry and Analysis

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	2
Planned timetable:	10.00 am Mon (odd weeks), Wed and Fri			

The module will present new developments in geometry and analysis that relate to research interests in St Andrews. Building on 4000-level modules in analysis, it will introduce students to advanced results in this beautiful and important area of mathematics. The choice of specific topics may vary from year to year but will be chosen from Geometric Measure Theory, Non-commutative Geometry, Fuchsian Groups, Harmonic Analysis, and Measurable Dynamics.

Programme module type:	Optional for all Postgraduate Programmes within the School of Mathematics & Statistics.
Anti-requisite(s):	MT5828
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).
Assessment pattern:	2.5-hour Written Examination = 100%
Module Co-ordinator:	Dr J Fraser
Lecturer(s)/Tutor(s):	Dr J Fraser

MT5831 Advanced Bayesian Inference

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	1
Planned timetable:	10.00 am Mon (even weeks), Tue and Thu			

This module consists of MT4531 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. The syllabus includes Bayes' theorem, inference for Normal samples; univariate Normal linear regression; principles of Bayesian computational, Markov chain Monte Carlo - theory and applications.

Programme module type:	Optional for all Postgraduate Programmes within the School of Mathematics & Statistics.
Anti-requisite(s):	MT4531
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 8 tutorials/practical classes over semester.
Assessment pattern:	2-hour Written Examination = 60%, Coursework = 40%
Module Co-ordinator:	Dr L Thomas
Lecturer(s)/Tutor(s):	Dr L Thomas

MT5836 Galois Theory

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	2	
Planned timetable:	11.00 am Mon (odd weeks), Wed and Fri				

Galois theory is one of the most beautiful areas of mathematics, establishing a remarkable connection between the theory of polynomial equations and their roots and group theory. The subject brings together ideas from the theory of groups and fields in a powerful way, culminating in Galois' fundamental theorem. There are many applications of the work, for example demonstrating that certain ruler and compass constructions are impossible, and that there is no general formula for the solution of quintic equations.

Programme module type:	Optional for all Postgraduate Taught Programmes within the School of Mathematics & Statistics.
Anti-requisite(s):	MT5826
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 10 tutorials/practical classes over semester.
Assessment pattern:	2.5-hour Written Examination = 100%
Module Co-ordinator:	Dr S Huczynska
Lecturer(s)/Tutor(s):	Dr S Huczynska, Dr C Roney-Dougal

MT5852 Mathematical Biology 2

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	1	
Planned timetable:	9.00 am Mon (odd weeks), Wed and Fri				

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 diseases (AIDS, measles). The mathematical techniques used in the modelling will be nonlinear partial differential equations. The module will be useful to students who wish to specialise in Applied Mathematics in their degree programme.

Programme module type:	Optional for all MSc postgraduate programmes in the School of Mathematics & Statistics.
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).
Assessment pattern:	2-hour Written Examination = 90%, Coursework (Class Test) = 10%
Module Co-ordinator:	Prof M Chaplain
Lecturer(s)/Tutor(s):	Prof M Chaplain

MT5990 Independent Study Module

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	1 or 2	
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.

Programme module type:	Optional for all Postgraduate programmes within the School of Mathematics & Statistics.
Learning and teaching methods and delivery:	**Weekly contact**: Typically 1 hour project supervisions.
Assessment pattern:	Coursework = 100%
Module Co-ordinator:	Dr M L Mackenzie

MT5991 Professional Skills for Mathematical Scientists				
SCOTCAT Credits:	30	SCQF Level 11	**Semester:**	Whole Year
Availability restrictions:	Available only to students on an MSc Postgraduate programme or, exceptionally, on an MMath or MPhys Honours degree programme in the School			
Planned timetable:	To be arranged.			
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.				
Programme module type:	Optional for all Postgraduate programmes within the School of Mathematics & Statistics.			
Learning and teaching methods and delivery:	**Weekly contact**: Varies. Typically 1 project supervision per week over whole year.			
Assessment pattern:	Coursework = 100%			
Module Co-ordinator:	Dr J D Mitchell			

Further optional modules:

30 credits: from MT modules in the range MT3000 - MT4598 or MT4600 - MT5998.

For the available modules see: 2016/7 Honours Mathematics & Statistics