School of Mathematics & Statistics

General degree students wishing to enter 3000-level modules and non-graduating students wishing to enter 3000-level, 4000-level or 5000-level modules must consult with the relevant Honours Adviser within the School to confirm they are permitted to enter the module.

Mathematics & Statistics (MT) modules

MT3501 Linear Mathematics 2

SCOTCAT Credits:	15	SCQF Level 9	**Semester:**	1
Academic year:	2017/8 & 2018/9			
Planned timetable:	12.00 noon Mon (even weeks), Tue and Thu			
This module continues the study of vector spaces and linear transformations begun in MT2501. It aims to show the importance of linearity in many areas of mathematics ranging from linear algebra through to geometric applications to linear operators and special functions. The main topics covered include: diagonalisation and the minimum polynomial; Jordan normal form; inner product spaces; orthonormal sets and the Gram-Schmidt process; adjoint and self-adjoint operators.				
Programme module type:	Compulsory for all MMath programmes, BSc Statistics, BSc joint Honours Statistics programmes, MPhys Mathematics and Theoretical Physics and MPhys Theoretical Physics. Optional for all other undergraduate programmes in the School of Mathematics & Statistics.			
Pre-requisite(s):	MT2001 or MT2501			
Required for:	MT4003, MT4111, MT4112, MT4501, MT4513, MT4519, MT4607, MT4608, MT4614, MT5827			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 90%, Practical Examinations = 0%, Coursework = 10%			
	As used by St Andrews: 2-hour Written Examination = 90%, Coursework = 10%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr J D Mitchell			
Module teaching staff:	Dr J D Mitchell, Dr L S Theran			

MT3502 Real Analysis

SCOTCAT Credits:	15	SCQF Level 9	**Semester:**	1
Academic year:	2017/8 & 2018/9			
Planned timetable:	11.00 am Mon (even weeks), Tue & Thu			
This module continues the study of analysis begun in the 2000-level module MT2502 Analysis. It considers further important topics in the study of real analysis including: integration theory, the analytic properties of power series and the convergence of functions. Emphasis will be placed on rigourous development of the material, giving precise definitions of the concepts involved and exploring the proofs of important theorems. The language of metric spaces will be introduced to give a framework in which to discuss these concepts.				
Programme module type:	Compulsory for MMath Mathematics, Applied Mathematics and Pure Mathematics programmes Optional for all other undergraduate programmes in the School of Mathematics & Statistics.			
Pre-requisite(s):	MT2502			
Required for:	MT4004, MT4111, MT4501, MT4513, MT4519, MT5825, MT5830			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5-hours of lectures and 1 tutorial.			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 90%, Class Test = 10%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr J M Fraser			
Module teaching staff:	Dr J M Fraser, TBC			

MT3503 Complex Analysis

SCOTCAT Credits:	15	SCQF Level 9	**Semester:**	1
Academic year:	2017/8 & 2018/9			
Planned timetable:	12.00 noon Mon (odd weeks), Wed and Fri			
This module aims to introduce students to analytic function theory and applications. The topics covered include: analytic functions; Cauchy-Riemann equations; harmonic functions; multivalued functions and the cut plane; singularities; Cauchy's theorem; Laurent series; evaluation of contour integrals; fundamental theorem of algebra; Argument Principle; Rouche's Theorem.				
Programme module type:	Compulsory for MMath Applied Mathematics, MMath Mathematics, and MMath Pure Mathematics.Optional for all other undergraduate programmes in the School of Mathematics & Statistics.			
Pre-requisite(s):	MT2502 or MT2503 or MT2001			
Required for:	MT4005, MT4111, MT4112, MT4501, MT4513, MT4519, MT4608, MT5802			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
	Scheduled learning: 34 hours		**Guided independent study:** 116 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 90%, Practical Examinations = 0%, Coursework = 10%			
	As used by St Andrews: 2-hour Written Examination = 90%, Coursework = 10%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr M Quick			
Module teaching staff:	Dr M Quick			

MT3504 Differential Equations

SCOTCAT Credits:	15	SCQF Level 9	**Semester:**	1
Academic year:	2017/8 & 2018/9			
Planned timetable:	9.00 am Mon (odd weeks), Wed and Fri			
The object of this module is to provide a broad introduction to analytical methods for solving ordinary and partial differential equations and to develop students' understanding and technical skills in this area. This module is a prerequisite for several other Honours options. The syllabus includes: existence and uniqueness of solutions to initial-value problems; non-linear ODE's; phase-plane analysis; Green's functions for ODE's; Sturm-Liouville problems; first order PDE's; method of characteristics; classification of second order linear PDE's; method of separation of variables; characteristics and reduction to canonical form.				
Programme module type:	Compulsory for MMath Applied Mathematics, MMath Mathematics, MMath Pure Mathematics, MPhys Mathematics and Theoretical Physics. Optional for all other undergraduate programmes in the School of Mathematics & Statistics.			
Pre-requisite(s):	MT2001 or MT2503			
Required for:	MT3506, MT4005, MT4111, MT4112, MT4501, MT4507, MT4508, MT4509, MT4510, MT4511, MT4513, MT4519, MT4551, MT4552, MT4608, MT5852			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 examples class (week 2 - 11).			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: Written Examination = 100% (2-hour final exam = 90%, class test = 10%)			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr A L Wilmot-Smith			
Module teaching staff:	Dr A L Wilmot-Smith, Prof D G Dritschel			

MT3505 Algebra: Rings and Fields

SCOTCAT Credits:	15	SCQF Level 9	**Semester:**	2
Academic year:	2017/8 & 2018/9			
Planned timetable:	11.00 am Mon (odd weeks), Wed & Fri			
This module continues the study of algebra begun in the 2000-level module MT2505 Abstract Algebra. It places emphasis on the concept of a ring and their properties, which give insight into concepts of factorisation and divisibility. Important examples such as polynomial rings will be used to motivate and illustrate the theory developed.				
Programme module type:	Compulsory for MMath Pure Mathematics Optional for all other undergraduate programmes in the School of Mathematics & Statistics.			
Pre-requisite(s):	MT2505		**Anti-requisite(s):**	MT4517
Required for:	MT4111, MT4501, MT4519, MT5823, MT5827, MT5836			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 hours of lectures and 1 tutorial.			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 90%, Practical Examinations = 0%, Coursework = 10%			
	As used by St Andrews: 2-hour Written Examination = 90%, Coursework = 10%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr S Huczynska			

Module teaching staff:	Dr S Huczynska			

MT3506 Techniques of Applied Mathematics

SCOTCAT Credits:	15	SCQF Level 9	**Semester:**	2
Academic year:	2017/8 & 2018/9			
Planned timetable:	12.00 noon Mon (odd weeks), Wed & Fri			
Differential equations are of fundamental significance in applied mathematics. This module will cover important and common techniques used to solve the partial differential equations that arise in typical applications. The module will be useful to students who wish to specialise in Applied Mathematics in their degree programme.				
Programme module type:	Compulsory for MMath Applied Mathematics Optional for all other undergraduate programmes in the School of Mathematics & Statistics.			
Pre-requisite(s):	MT2506 and MT3504		**Anti-requisite(s):**	MT3601
Required for:	MT4111, MT4501			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 hours of lectures and 1 tutorial.			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 90%, Practical Examinations = 0%, Coursework = 10%			
	As used by St Andrews: 2-hour Written Examination = 90%, Coursework = 10%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr R K Scott			
Module teaching staff:	Dr R K Scott			

MT3507 Mathematical Statistics

SCOTCAT Credits:	15	SCQF Level 9	**Semester:**	1
Academic year:	2017/8 & 2018/9			
Planned timetable:	11.00 am Mon (odd weeks), Wed & Fri			
Together with MT3508, this module provides a bridge between second year and Honours modules in statistics. It will provide students with a solid theoretical foundation on which much of more advanced statistical theory and methods are built. This includes probability generating functions and moment generating functions, as well as widely used discrete distributions (binomial, Poisson, negative binomial and multinomial) and continuous distributions (gamma, exponential, chi-squared, beta, t-distribution, F-distribution, and multivariate normal). It will also provide a foundation in methods of statistical inference (maximum likelihood and Bayesian) and model selection methods based on information theory (AIC and BIC).				
Programme module type:	Compulsory for BSc/MA Statistics degrees (both single and joint Honours) and for MMath Statistics Optional for all other undergraduate programmes in the School of Mathematics & Statistics.			
Pre-requisite(s):	MT2508		**Anti-requisite(s):**	MT3606
Required for:	MT4501, MT4531, MT4537, MT4606, MT4609, MT5701, MT5751			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 hours of lectures and 1 tutorial.			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 90%, Class Test = 10%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof S T Buckland			

Module teaching staff:	Prof S T Buckland			
MT3508 Applied Statistics				
SCOTCAT Credits:	15	SCQF Level 9	**Semester:**	2
Academic year:	2017/8			
Planned timetable:	12.00 noon Mon (even weeks), Tue & Thu			
Together with MT3507, this module provides a bridge between second year and Honours modules in statistics. It deals with the application of statistical methods to test hypotheses and draw inferences from data. This includes a number of nonparametric methods and statistical tests (permutation and randomization tests, goodness-of-fit tests and tests of independence). Inference methods include model fitting by least squares and maximum likelihood, and variance estimation by means of the information matrix and by bootstrap. Applications include multiple regression, analysis of variance, the general (normal) linear model and an introduction to generalized linear models and generalized additive models.				
Programme module type:	Compulsory for BSc/MA Statistics degrees (both single and joint Honours) and for MMath Statistics Optional for all other undergraduate programmes in the School of Mathematics & Statistics.			
Pre-requisite(s):	MT2508		**Anti-requisite(s):**	MT3606
Required for:	MT4501, MT5751			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 hours of lectures and 1 tutorial.			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 90%, Practical Examinations = 0%, Coursework = 10%			
	As used by St Andrews: 2-hour Written Examination = 90%, Coursework (Project) = 10%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof D L Borchers			
Module teaching staff:	Prof D L Borchers			

Changes to MT3508 between 2017/8 and 2018/9
also see next page

MT3508 Applied Statistics

SCOTCAT Credits:	15	SCQF Level 9	**Semester:**	2
Academic year:	2018/9			
Planned timetable:	12.00 noon Mon (even weeks), Tue & Thu			
Together with MT3507, this module provides a bridge between second year and Honours modules in statistics. It deals with the application of statistical methods to test hypotheses and draw inferences from data. This includes a number of nonparametric methods and statistical tests (goodness-of-fit tests and tests of independence). Inference methods include model fitting by least squares and maximum likelihood, and variance estimation by means of the information matrix and by bootstrap. Applications include multiple regression, analysis of variance, the general (normal) linear model and an introduction to generalized linear models.				
Programme module type:	Compulsory for BSc/MA Statistics degrees (both single and joint Honours) and for MMath Statistics Optional for all other undergraduate programmes in the School of Mathematics & Statistics.			
Pre-requisite(s):	MT2508		**Anti-requisite(s):**	MT3606
Required for:	MT4501, MT5751			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 hours of lectures and 1 tutorial.			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 90%, Practical Examinations = 0%, Coursework = 10%			
	As used by St Andrews: 2-hour Written Examination = 90%, Coursework (Project) = 10%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof D L Borchers			
Module teaching staff:	Prof D L Borchers			

MT3802 Numerical Analysis

SCOTCAT Credits:	15	SCQF Level 9	**Semester:**	1
Academic year:	2017/8 & 2018/9			
Planned timetable:	10.00 am Mon (odd weeks), Wed and Fri			
The module will introduce students to some topics in numerical analysis, which may include methods of approximation, iterative methods for solving systems of linear equations, numerical techniques for differential equations.				
Programme module type:	Optional for all programmes in the School.			
Pre-requisite(s):	MT2001 or MT2501		**Required for:**	MT5806
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 70%, Practical Examinations = 0%, Coursework = 30%			
	As used by St Andrews: 2-hour Written Examination = 70%, Coursework = 30%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr A P Naughton			
Module teaching staff:	Dr A P Naughton			

MT3832 Mathematical Programming

SCOTCAT Credits:	15	SCQF Level 9	**Semester:**	2
Academic year:	2017/8			
Planned timetable:	12.00 noon Mon (odd weeks), Wed and Fri			
The aim of this module is to introduce students to the formulation and solution of various linear programming problems. The subject matter will be illustrated by applying the methods of solution to real examples. The syllabus includes: formulation of linear problems; solution graphically and by simplex algorithm; sensitivity analysis; duality; transportation and transshipment; the assignment problem.				
Programme module type:	Compulsory for all single and joint Honours BSc Management Science degree programmes Optional for all programmes in the School			
Pre-requisite(s):	MT2001 or MT2501 or (MT1002 and MN2002)			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 0.5 tutorial (weeks 2 - 11).			
	Scheduled learning: 30 hours		**Guided independent study:** 120 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr M Papathomas			
Module teaching staff:	Dr M Papathomas, TBC			

MT3852 Automata, Languages and Complexity

SCOTCAT Credits:	15	SCQF Level 9	**Semester:**	2
Academic year:	2018/9			
Availability restrictions:	Not available to Joint Honours Mathematics and Computer Science students.			
Planned timetable:	10.00 am Mon (even weeks) and 2.00 pm - 4.00 pm Mon			
This module begins with finite state machines, context-free grammars and big-O notation. Turing machines, non-determinism and pushdown automata are introduced, followed by studies on decidability, simulation and the Halting problem. The complexity classes P, NP, co-NP, NP-hard, etc., are described via analysis of SAT and graph isomorphism. Strengths and limitations of the abstract approach to complexity are discussed, followed by an introduction to practical complexity.				
Programme module type:	Optional to all programmes in the School of Mathematics & Statistics - except Computer Science - Mathematics joint Honours			
Pre-requisite(s):	MT2504 or ((CS2001 or CS2101) and CS2002)		**Anti-requisite(s):**	CS3052
Learning and teaching methods and delivery:	**Weekly contact**: 2 hours of lectures (x 11 weeks), .5-hour tutorial (x 10 weeks)			
	Scheduled learning: 27 hours		**Guided independent study:** 123 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 60%, Practical Examinations = 0%, Coursework = 40%			
	As used by St Andrews: 2-hour Written Examination = 60%, Coursework = 40%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr C Roney-Dougal			
Module teaching staff:	Dr C Roney-Dougal, Dr S Sarkar			

MT4003 Groups

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2017/8 & 2018/9			
Planned timetable:	9.00 am Mon (even weeks), Tue and Thu			

This module introduces students to group theory, which is one of the central fields of the 20th century mathematics. The main theme of the module is classifying groups with various additional properties, and the development of tools necessary in this classification. In particular, the students will meet the standard algebraic notions, such as substructures, homomorphisms, quotients and products, and also various concepts peculiar to groups, such as normality, conjugation and Sylow theory. The importance of groups in mathematics, arising from the fact that groups may be used to describe symmetries of any mathematical object, will be emphasised throughout the module.

Programme module type:	Compulsory for MMath Pure Mathematics. At least two from MT4003, MT4004, MT4509, MT4510 and MT4606 are compulsory for MMath Mathematics. Optional for all other programmes in the School.	
Pre-requisite(s):	MT3600 or (MT2002 and MT3501) or MT2505	
Required for:	MT5823, MT5824, MT5827	
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10), 1 tutorial and 1 examples class (weeks 2 - 11).	
	Scheduled learning: 45 hours	**Guided independent study:** 105 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%	
	As used by St Andrews: 2-hour Written Examination = 100%	
Re-assessment pattern:	2-hour Written Examination = 100%	
Module coordinator:	Dr M R Quick	
Module teaching staff:	Dr M R Quick	

MT4004 Real and Abstract Analysis

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2017/8 & 2018/9			
Planned timetable:	11.00 am Mon (even weeks), Tue and Thu			
This module continues the development of real analysis that was begun in MT2502 and continued through MT3502. Topics covered will include limits and continuity in metric spaces, differentiation in higher dimensions and the theoretical underpinning of Fourier series. This module will present some of the highlights of the study of analysis, such as Baire's Category Theorem, the Contraction Mapping Theorem, the Weierstrass Approximation Theorem, and the Inverse Function Theorem.				
Programme module type:	Compulsory for M.Math. Pure Mathematics. At least two from MT4003, MT4004, MT4509, MT4510 and MT4606 compulsory for M.Math. Mathematics. Optional for all other programmes in the School.			
Pre-requisite(s):	MT3502			
Required for:	MT4526, MT5825, MT5830			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10), 1 tutorial (weeks 2 - 11).			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof L Olsen			
Module teaching staff:	Prof L Olsen			

MT4005 Linear and Nonlinear Waves

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2017/8 & 2018/9			
Planned timetable:	11.00 am Mon (even weeks), Tue and Thu			
This module gives an introduction to wave motion and its importance in many areas of applied mathematics. It begins with a discussion of the linear approximation for small amplitude waves and discusses properties of these such as dispersion relations, phase and group velocities, dissipation and dispersion. Some nonlinear effects such as wave steepening are then treated and an introduction given to some of the equations, for example Burger's and Korteweg de Vries, which are used to model nonlinear wave propagation.				
Programme module type:	Compulsory for MMath Applied Mathematics. Optional for all other programmes in the School.			
Pre-requisite(s):	(MT2003 or MT2506 or PH3081) and (MT3503 or MT3504)			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr A N Wright			
Module teaching staff:	Dr A N Wright			

MT4111 Symbolic Computation

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2018/9			
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.				
Programme module type:	At least one of MT4111, MT4112 and MT5611 compulsory for MMath Applied Mathematics and MMath Pure Mathematics At least one of MT3607, MT4111, MT4113 and MT5611 compulsory for MMath Mathematics At least one of MT3607, MT4111 and MT4113 compulsory for BSc/MA Mathematics and BSc/MA Statistics Optional for all other programmes in the School.			
Pre-requisite(s):	Any of MT3501 - MT3506		**Anti-requisite(s):**	MT5611
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 practical session (weeks 2 - 11)			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 70%, Practical Examinations = 0%, Coursework = 30%			
	As used by St Andrews: 2-hour Written Examination = 70%, Coursework = 30%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr J D Mitchell			
Module teaching staff:	Dr J D Mitchell, Dr C M Roney-Dougal, Dr L Theran			

MT4112 Computing in Mathematics

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2017/8			
Planned timetable:	9.00 am Mon (even weeks), Tue and Thu			
This module is intended to introduce students to FORTRAN and the writing of computer codes to implement mathematical algorithms. The module includes a basic introduction to FORTRAN, and the implementation of mathematical algorithms in a well-documented FORTRAN program. Students are required to complete a project in addition to sitting the examination.				
Programme module type:	At least one of MT4111, MT4112 and MT5611 compulsory for MMath Applied Mathematics and MMath Pure Mathematics At least one of MT3607, MT4111, MT4113 and MT5611 compulsory for MMath Mathematics At least one of MT3607, MT4111 and MT4113 compulsory for BSc/MA Mathematics and BSc/MA Statistics Optional for all other programmes in the School.			
Pre-requisite(s):	either pre- or co-requisites MT3501, MT3503 or MT3504		**Anti-requisite(s):**	MT5612, Honours or Joint Honours Programme in Computer Science.
Co-requisite(s):	either pre- or co-requisites MT3501, MT3503 or MT3504		**Required for:**	MT5806
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10).			
	Scheduled learning: 25 hours		**Guided independent study:** 125 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 70%, Practical Examinations = 0%, Coursework = 30%			
	As used by St Andrews: 2-hour Written Examination = 70%, Coursework: Project = 30%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof D H Mackay			
Module teaching staff:	Prof D H Mackay, Dr T Elsden			

MT4113 Computing in Statistics

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2017/8 & 2018/9			
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.				
Programme module type:	Compulsory for MMath Statistics. At least one of MT4111 – MT4113 or MT5611 is compulsory for MMath Mathematics. At least one of MT4111 – MT4113 is compulsory for BSc/MA Mathematics and BSc/MA Statistics Optional for all other programmes in the School of Mathematics & Statistics			
Pre-requisite(s):	pre- or co-requisite MT2508 or MT2004		**Anti-requisite(s):**	MT3607
Co-requisite(s):	pre- or co-requisite MT2508 or MT2004			
Learning and teaching methods and delivery:	**Weekly contact**: 1.5-hour lectures (x 10 weeks), 2-hour practical classes (x 10 weeks)			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 40%, Practical Examinations = 0%, Coursework = 60%			
	As used by St Andrews: 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:	Prof L Thomas			
Module teaching staff:	Prof L Thomas, Dr E Rexstad			

MT4501 Topics in the History of Mathematics

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2017/8			
Planned timetable:	12.00 noon Mon (odd weeks), Wed and Fri			
The aim of this module is to give students an insight into the historical development of mathematics. Topics to be covered may include some of: the development of algebra, the origins of the calculus, the history of logarithms, the work of some individual mathematicians.				
Programme module type:	Optional for all programmes in the School.			
Pre-requisite(s):	either pre- or co-requisites: Any of MT3501 - MT3508 or MT3606		**Anti-requisite(s):**	MT5613
Co-requisite(s):	either pre- or co-requisites: Any of MT3501 - MT3508 or MT3606			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 50%, Practical Examinations = 0%, Coursework = 50%			
	As used by St Andrews: Written Examination = 50% (2 x 1-hour class tests), Coursework: Project = 50%			
Re-assessment pattern:	Coursework (new project) = 100%			
Module coordinator:	Dr I J Falconer			
Module teaching staff:	Dr I J Falconer, Dr C P Bleak, Prof M A J Chaplain			

MT4507 Classical Mechanics

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2018/9			
Planned timetable:	10.00 am Mon (even weeks), Tue and Thu			
The object of this module is to introduce students to some of the ideas and mathematical techniques used in understanding the behaviour of dynamical systems that obey Newton's Laws. These notions are arguably the foundations of physics and applied mathematics. The module will include: Newton's laws of motion; conservative forces; central forces; non-inertial/accelerating frames of reference; dynamics of a system of particles; mechanics of a rigid body; Euler's equations; Lagrange's equations; Hamilton's equations.				
Programme module type:	Optional for all programmes in the School			
Pre-requisite(s):	(MT2003 or MT2503 or PH3081) and MT3504		**Required for:**	PH4032, PH5004
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof T Neukirch			
Module teaching staff:	Prof T Neukirch			

MT4508 Dynamical Systems

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2017/8			
Planned timetable:	10.00 am Mon (even weeks), Tue and Thu			
This module aims to introduce students to the basic ideas of the modern theory of dynamical systems and to the concepts of chaos and strange attractors. The module will include: period doubling; intermittency and chaos; geometrical approach to differential equations; homoclinic and heteroclinic orbits; Poincaré sections; the Smale horseshoe mapping; centre manifold theory.				
Programme module type:	Optional for all programmes in the School.			
Pre-requisite(s):	MT3504			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr V Archontis			
Module teaching staff:	Dr V Archontis			

MT4509 Fluid Dynamics

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2017/8 & 2018/9			
Planned timetable:	11.00 am Mon (even weeks), Tue and Thu			
This module provides an introduction to the theory of incompressible fluid dynamics, which describes the motion of liquids and gases at speeds small compared to the sound speed. Special attention is paid to a precise foundation of the various conservation laws that govern fluid dynamics, as this provides a convenient framework in which to study specific examples as well as extensions of the basic theory.				
Programme module type:	Compulsory for MMath Applied Mathematics. At least two from MT4003, MT4004, MT4509, MT4510 and MT4606 compulsory for MMath Mathematics. Optional for all other programmes in the School.			
Pre-requisite(s):	(MT2506 and MT3504) or MT3601		**Required for:**	MT5809
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: Written Examination = 100% (2-hour final exam = 90%, class test = 10%)			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr M Carr			
Module teaching staff:	Dr M Carr			

MT4510 Solar Theory

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2017/8 & 2018/9			
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.				
Programme module type:	Compulsory for MMath Applied Mathematics. At least two from MT4003, MT4004, MT4509, MT4510 and MT4606 compulsory for MMath Mathematics. Optional for all other programmes in the School.			
Pre-requisite(s):	(MT2506 and MT3504) or MT3601		**Anti-requisite(s):**	MT4504, MT5804
Required for:	MT5810			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof I De Moortel			
Module teaching staff:	Prof I De Moortel			

MT4511 Asymptotic Methods

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2018/9			
Planned timetable:	9.00 am Mon (even weeks), Tue and Thu			
This module is designed to introduce students to asymptotic methods used in the construction of analytical approximations to integrals and solutions of differential equations.				
Programme module type:	Optional for all programmes in the School			
Pre-requisite(s):	MT3504			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
	Scheduled learning: 34 hours		**Guided independent study:** 116 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr A Wilmot-Smith			
Module teaching staff:	Dr A Wilmot-Smith			

MT4513 Fractal Geometry

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2017/8			
Planned timetable:	12.00 noon Mon (even weeks), Tue and Thu			
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 may include topics 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.				
Programme module type:	Optional for all programmes in the School.			
Pre-requisite(s):	(MT2503 or MT2001) and any one of MT3501 - MT3504		**Anti-requisite(s):**	MT5813
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof K J Falconer			
Module teaching staff:	Prof K J Falconer			

MT4514 Graph Theory

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2018/9			
Planned timetable:	10.00 am Mon (even weeks), Tue and Thu			
The aim of this module is to introduce students to the study of graph theory as a tool for representing connections between data. Topics to be covered may include: basic theory and applications, Eulerian graphs, Hamiltonian graphs, planar graphs, spanning trees and applications, networks, matching problems.				
Programme module type:	Optional for all programmes in the School.			
Pre-requisite(s):	MT1003 or MT2504 or MT2005		**Required for:**	MT5821
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof N Ruskuc			
Module teaching staff:	Prof N Ruskuc			

MT4515 Functional Analysis

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2018/9			
Planned timetable:	12.00 noon Mon (even weeks), Tue and Thu			
This object of this module is to 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 may include topics such as spectral theory and the Hahn-Banach theorem.				
Programme module type:	Optional for all programmes in the School			
Pre-requisite(s):	MT2002 or (MT2501 and MT2502)		**Required for:**	MT5830
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof K Falconer			
Module teaching staff:	Prof K Falconer			

MT4516 Finite Mathematics

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2017/8			
Planned timetable:	10.00 am Mon (even weeks), Tue and Thu			
The aim of this module is to introduce students to some topics in the mathematics of combinatorial structures. This theory has wide applications, both in classical mathematics and in theoretical computer science. Topics to be covered may include: coding theory, finite geometries, Latin squares, designs.				
Programme module type:	Optional for all programmes in the School.			
Pre-requisite(s):	MT2504 or MT2505 or MT2002 or MT2005		**Required for:**	MT5826
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr C M Roney-Dougal			
Module teaching staff:	Dr C M Roney-Dougal			

MT4519 Number Theory

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2017/8			
Planned timetable:	10.00 am Mon (even weeks), Tue and Thu			
The aim of this module is to introduce students to some important topics in number theory. Topics to be covered may include: prime numbers, cryptography, continued fractions, Pell's equation, the Gaussian integers and writing numbers as sums of squares.				
Programme module type:	Optional for all programmes in the School.			
Pre-requisite(s):	(MT2505 or MT2002) and one of MT3501 - MT3505			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	TBC			
Module teaching staff:	TBC			

MT4526 Topology

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2017/8			
Planned timetable:	10.00 am Mon (odd weeks), Wed and Fri			
This module introduces the ideas of metric and topological spaces. A metric space is simply a set together with a 'distance' between any two points. This idea is pervasive in mathematics: from situations such as the usual distance in n-dimensional space, to the Hamming distance between words in an error-correcting code and the distance between functions approximating a given function. Metric spaces can be thought of as particular instances of topological spaces, where the fundamental concept is that of points being 'close' to each other rather than the precise distance between points. Topological spaces are a powerful generalisation of metric spaces, and have had a profound influence in the development of mathematics. Many examples of metric spaces and topological spaces will be introduced and fundamental ideas within topology will be discussed, including separation axioms, compactness and connectedness.				
Programme module type:	Optional for all programmes in the School.			
Pre-requisite(s):	MT2002 or MT2502 or MT3600 or MT4004			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr L S Theran			
Module teaching staff:	Dr L S Theran			

MT4527 Time Series Analysis

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2018/9			
Planned timetable:	10.00 am Mon (even weeks), Tue and Thu			
This module provides an introduction to univariate linear times series models (ARIMA processes) and univariate non-linear times-series models (ARCH and GARCH). The syllabus includes: forecasting methods for constant mean and trend models, the ARIMA class of models (including seasonal ARIMA models), fitting and forecasting ARIMA models, ARCH and GARCH processes.				
Programme module type:	MT4527 or MT4608 is compulsory for MMath Statistics. At least two from MT3706, MT4527, MT4528, MT4608 compulsory for BSc Management Science (single Honours). Optional for all programmes in the School.			
Pre-requisite(s):	MT2004 or MT2508			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 0.5 tutorial (weeks 2 - 11).			
	Scheduled learning: 30 hours		**Guided independent study:** 120 hours	
Assessment pattern:	**As defined by QAA:** 2-hour Written Examination = 100%			
	As used by St Andrews: 2-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr V M Popov			
Module teaching staff:	Dr V M Popov			

MT4528 Markov Chains and Processes

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2017/8			
Planned timetable:	11.00 noon Mon (even weeks), Tue and Thu			
This module provides an introduction to the theory of stochastic processes and to their use as models, including applications to population processes and queues. The syllabus includes the Markov property, Chapman-Kolmogorov equations, classification of states of Markov chains, decomposition of chains, stationary distributions, random walks, branching processes, the Poisson process, birth-and-death processes and their transient behaviour, embedded chains, Markovian queues and hidden Markov models.				
Programme module type:	At least two from MT3706, MT4527, MT4528, MT4608 compulsory for BSc Management Science (single Honours). Optional for all undergraduate programmes in the School of Mathematics & Statistics.			
Pre-requisite(s):	MT2504 or MT2004		**Anti-requisite(s):**	MT3706
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 8 tutorials over the semester.			
	Scheduled learning: 33 hours		**Guided independent study:** 117 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof D L Borchers			
Module teaching staff:	Prof D L Borchers, Dr V M Popov			

MT4530 Population Genetics

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2017/8			
Planned timetable:	9.00 am Mon (even weeks), Tue and Thu			
This module aims to show how the frequencies of characteristics in large natural populations can be explained using mathematical models and how statistical techniques may be used to investigate model validity. The syllabus includes: Mendel's First and Second Laws, random mating and random union of gametes, Hardy-Weinberg equilibrium, linkage, inbreeding, assortative mating, X-linked loci, selection and mutation.				
Programme module type:	Optional for all programmes in the School.			
Pre-requisite(s):	MT2004 or MT2508			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 0.5 tutorial (weeks 2 - 11).			
	Scheduled learning: 30 hours		**Guided independent study:** 120 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr I B J Goudie			
Module teaching staff:	Dr I B J Goudie			

MT4531 Bayesian Inference

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2017/8 & 2018/9			
Planned timetable:	10.00 am Mon (even weeks), Tue and Thu			
This module is intended to offer a re-examination of standard statistical problems from a Bayesian viewpoint and an introduction to recently developed computational Bayes methods. 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:	At least two of MT4531 (or MT5831), MT4608 and MT4609 compulsory for BSc Statistics. MT4531 or MT4606 (or MT5831 or MT5701) compulsory for BSc/MA joint Honours Statistics programmes. Optional for all other undergraduate programmes in the School of Mathematics & Statistics.			
Pre-requisite(s):	MT3507 or MT3606		**Anti-requisite(s):**	MT5831
Learning and teaching methods and delivery:	**Weekly contact**: 24 lectures and 7 practical classes over the semester.			
	Scheduled learning: 31 hours		**Guided independent study:** 119 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 80%, Practical Examinations = 0%, Coursework = 20%			
	As used by St Andrews: 2-hour Written Examination = 80%, Coursework = 20%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr M Papathomas			
Module teaching staff:	Dr M Papathomas			

MT4537 Spatial Processes

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2017/8			
Planned timetable:	10.00 am Mon (even weeks), Tue and Thu			
This module will study probabilistic and inferential problems for spatial processes. It commences with a discussion on different types of spatial data. In the context of spatial point processes functional and non-functional summary characteristics for point patterns are considered. Spatial point process models, including homogeneous and inhomogeneous Poisson processes as well as Gibbs processes and Cox processes along with the approaches to parameter estimation and model evaluation, are introduced. Models in geostatistics based on empirical variograms and kirging approaches and spatial models for lattice data (CAR model, Gauss Markov random fields) are also discussed.				
Programme module type:	Optional for all programmes in the School.			
Pre-requisite(s):	MT3507 or MT3606		**Anti-requisite(s):**	MT4536
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 4 tutorials over the semester.			
	Scheduled learning: 29 hours		**Guided independent study:** 121 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr J B Illian			
Module teaching staff:	Dr J B Illian			

MT4539 Quantitative Risk Management

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2017/8 & 2018/9			
Planned timetable:	12.00 noon Wed, Fri and odd Mon, 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.				
Programme module type:	Optional for all undergraduate programmes in the School of Mathematics & Statistics			
Pre-requisite(s):	MT2504, MT2508			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (x 10 weeks), 5 tutorials and 5 practical sessions.			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 80%, Practical Examinations = 0%, Coursework = 20%			
	As used by St Andrews: 2-hour Written Examination = 80%, Coursework = 20%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr V Popov			
Module teaching staff:	Dr V Popov			

MT4551 Financial Mathematics

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2017/8			
Planned timetable:	10.00 am Mon (odd weeks), Wed and Fri			
Students are introduced to the application of mathematical models to financial instruments. The course will include an overview of financial markets and the terminology in common usage but the emphasis will be on the mathematical description of risk and return as a means of pricing contracts and options.				
Programme module type:	Optional for all programmes in the School of Mathematics & Statistics.			
Pre-requisite(s):	(MT2001 or MT2503) and (MT1007 or MT2004 or MT2504 or EC2003) and MT3504			
Required for:	MT5812			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof D H Mackay			
Module teaching staff:	Prof D H Mackay			

MT4552 Mathematical Biology 1

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2017/8 & 2018/9			
Planned timetable:	9.00 am Mon (even weeks), Tue and Thu			
This module will explore real world applications of mathematics to biological problems e.g. harvesting of fish stocks, host-parasitoid systems, predator-prey dynamics, molecular interactions. The mathematical techniques used in the modelling will be nonlinear difference equations and ordinary 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 programmes in the School of Mathematics & Statistics.			
Pre-requisite(s):	MT3504			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 90%, Coursework (Class Test) = 10%			
Re-assessment pattern:	Take-Home Examination = 100%			
Module coordinator:	Dr C Venkataraman			
Module teaching staff:	Dr C Venkataraman			

MT4553 Theory of Electric and Magnetic Fields

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2018/9			
Planned timetable:	10.00 am Mon (odd weeks), Wed, Fri			
The module will consider the mathematical and physical principles that describe the theory of electric and magnetic fields. It will first describe the basic principles of electrostatics and magneto-statics and following this electrodynamics. Next Maxwell's equations are described along with the properties of electro-magnetic waves in a variety of media. Finally an application to the area of plasma physics is carried out through considering the orbits of charged particles in a variety of spatially and time varying magnetic fields.				
Programme module type:	Optional for all programmes within the School of Mathematics & Statisticd (except Joint Mathematics and Physics or Mathematics and Theoretical Physics)			
Pre-requisite(s):	MT2503, MT2506 and MT3504		**Anti-requisite(s):**	PH3007
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 hours of lectures (x 10 weeks), 1-hour tutorial (x 10 weeks)			
	Scheduled learning: 35 hours		**Guided independent study:** 120 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 90%, Practical Examinations = 0%, Coursework = 10%			
	As used by St Andrews: 2-hour Written Examination = 90%, Coursework (class test) = 10%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof D H Mackay			
Module teaching staff:	Prof D H Mackay			

MT4599 Project in Mathematics / Statistics

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	Whole Year
Academic year:	2017/8 & 2018/9			
Availability restrictions:	Available only to students in the final year of a BSc/MA Honours degree programme in the School			
Planned timetable:	none			
The student will choose a project from a list published annually although a topic outwith the list may be approved. Students will be required to report regularly to their supervisor and a report of no more than 5,000 words must be submitted by the end of the April.				
Programme module type:	Compulsory for BSc/MA Mathematics, BSc/MA Statistics, all BSc/MA joint Honours Mathematics programmes (including Mathematics 'with' degrees) and all BSc/MA joint Honours Statistics programmes			
Learning and teaching methods and delivery:	**Weekly contact**: Typically and on average, 20 mins of project supervisions per week over whole year.			
	Scheduled learning: 8 hours		**Guided independent study:** 142 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 20%, Coursework = 80%			
	As used by St Andrews: Coursework = 100%: Project = 80%, Presentation = 20%			
Re-assessment pattern:	Resubmission of project = 100%			
Module coordinator:	Prof C E Parnell			

MT4606 Statistical Inference

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2017/8			
Planned timetable:	10.00 am Mon (odd weeks), Wed and Fri			
This module aims to show how the methods of estimation and hypothesis testing met in 2000- and 3000-level Statistics modules can be justified and derived; to extend those methods to a wider variety of situations. The syllabus includes: comparison of point estimators; the Rao-Blackwell Theorem; distribution theory; Fisher information and the Cramer-Rao lower bound; maximum likelihood estimation; hypothesis-testing; confidence sets.				
Programme module type:	Optional for all other undergraduate programmes in the School.			
Pre-requisite(s):	MT3507 or MT3606		**Anti-requisite(s):**	MT5701
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 0.5 tutorial (weeks 2 - 11).			
	Scheduled learning: 30 hours		**Guided independent study:** 120 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof A G Lynch			
Module teaching staff:	Prof A G Lynch			

MT4607 Generalised Linear Models and Data Analysis

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2018/9			
Planned timetable:	9.00 am Mon (even weeks), Tue and Thu			
This module aims to demonstrate the power and elegance of unifying a large number of simple statistical models within the general framework of the generalised 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.				
Programme module type:	MT4607 (or MT5753) compulsory for BSc/MA single and joint Honours Statistics. Optional for all other undergraduate programmes in the School.			
Pre-requisite(s):	(MT2001 or MT2503), (MT2004 or MT2508) and either pre- or co-requisite MT3501		**Anti-requisite(s):**	MT5753
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 8 tutorials over the semester			
	Scheduled learning: 33 hours		**Guided independent study:** 117 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 80%, Practical Examinations = 0%, Coursework = 20%			
	As used by St Andrews: 2-hour Written Examination = 80%, Coursework: Project = 20%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr M Papathomas			
Module teaching staff:	Dr M Papathomas			

MT4608 Sampling Theory

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	1
Academic year:	2018/9			
Planned timetable:	10.00 am Mon (odd weeks), Wed and Fri			
The aims of this module are to introduce students to and interest them in the principles and methods of design-based inference, to convince them of the relevance and utility of the methods in a wide variety of real-world problems, and to give them experience in applying the principles and methods themselves. By the end of the module students should be able to recognise good and poor survey design and analysis, to decide upon and implement the main types of survey design in relatively straightforward settings, and analyse the resulting survey data appropriately. The syllabus includes fundamentals of design based vs model-based inference, simple random sampling, sampling with replacement, ratio and regression estimators, stratified sampling, cluster sampling and unequal probability sampling.				
Programme module type:	MT4527 or MT4608 is compulsory for MMath Statistics. At least two of MT4531 (or MT5831), MT4608 and MT4609 are compulsory for BSc Statistics. At least two from MT3706, MT4527, MT4528, MT4608 are compulsory for BSc Management Science (single Honours). Optional for all other undergraduate programmes in the School.			
Pre-requisite(s):	MT2004 or MT2508		**Co-requisite(s):**	either pre or co-requisite: One of MT3501, MT3503, MT3504, MT3606 or any 3000-level MN module
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 8 tutorials over the semester.			
	Scheduled learning: 33 hours		**Guided independent study:** 117 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 85%, Practical Examinations = 0%, Coursework = 15%			
	As used by St Andrews: 2-hour Written Examination = 85%, Coursework: Project = 15%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr J B Illian			
Module teaching staff:	Dr J B Illian			

MT4609 Multivariate Analysis

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2018/9			
Planned timetable:	10.00 am Mon (odd weeks), Wed and Fri			
This module aims to introduce students to the ideas and techniques of multivariate statistical analysis. The syllabus includes mean vectors, covariance matrices, correlation matrices; basic properties of multivariate normal distributions; checking multivariate normality; the likelihood ratio and union-intersection principles for constructing multivariate tests; the one-sample and two-sample Hotelling's T-squared tests; tests on covariance matrices, tests of independence; linear discriminant analysis; principal components analysis; canonical correlation.				
Programme module type:	At least two of MT4531 (or MT5831), MT4608 and MT4609 are compulsory for BSc Statistics. Optional for all other undergraduate programmes in the School.			
Pre-requisite(s):	MT3507 or MT3606			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 0.5 tutorial (weeks 2 - 11).			
	Scheduled learning: 30 hours		**Guided independent study:** 120 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr I B J Goudie			
Module teaching staff:	Dr I B J Goudie			

MT4614 Design of Experiments

SCOTCAT Credits:	15	SCQF Level 10	**Semester:**	2
Academic year:	2017/8 & 2018/9			
Availability restrictions:	Availability subject to confirmation			
Planned timetable:	9.00 am Mon (odd weeks), Wed and Fri			
This module introduces a wide range of features that occur in real comparative experiments, such as choice of blocks and replication as well as type of design. It includes enough about the analysis of data from experiments to show what has to be considered at the design stage. It includes consultation with the scientist and interpretation of the results.				
Programme module type:	Optional for all programmes in the School (including MSc programmes).			
Pre-requisite(s):	(MT2004 or MT2508) and MT3501			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and either tutorial or practical (weeks 2 - 11).			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 80%, Practical Examinations = 10%, Coursework = 10%			
	As used by St Andrews: 2-hour Written Examination = 80%, Presentation = 10%, Coursework = 10%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof R A Bailey			
Module teaching staff:	Prof R A Bailey			

MT4794 Joint Dissertation (30cr)

SCOTCAT Credits:	30	SCQF Level 10	**Semester:**	Whole Year
Academic year:	2017/8 & 2018/9			
Availability restrictions:	Available only to students in the Second year of the Honours Programme, who have completed the Letter of Agreement, downloadable from https://www.st-andrews.ac.uk/coursecatalogue). No student may do more than 60 credits in Dissertation or Project modules.			
Planned timetable:	To be arranged.			
The dissertation must consist of approximately 6,000 words of English prose on a topic agreed between the student and two appropriate members of staff (who act as supervisors). The topic does not have to relate to work covered in previous Honours modules, though it may be helpful to the student if it builds on previous work. The topic and range of sources should be chosen in consultation with the supervisors in order to determine that the student has access to sources as well as a clear plan of preparation. (Guidelines for printing and binding dissertations can be found at: http://www.st-andrews.ac.uk/printanddesign/dissertation/)				
Programme module type:	Optional for Joint or 'with' Honours in the School of Mathematics & Statistics			
Pre-requisite(s):	A Letter of Agreement			
Anti-requisite(s):	More than 30 credits in other dissertation / project modules			
Learning and teaching methods and delivery:	**Weekly contact**: As per Letter of Agreement.			
	Scheduled learning: hours	**Guided independent study:** hours		
Assessment pattern:	**As defined by QAA:** Written Examinations = %, Practical Examinations = %, Coursework = %			
	As used by St Andrews: As per Letter of Agreement.			
Re-assessment pattern:	As per Letter of Agreement.			
Module coordinator:	As per Letter of Agreement.			

MT4796 Joint Project (30cr)

SCOTCAT Credits:	30	SCQF Level 10	**Semester:**	Whole Year
Academic year:	2017/8			
Availability restrictions:	Available only to students in the Second year of the Honours Programme, who have completed the Letter of Agreement, downloadable from https://www.st-andrews.ac.uk/coursecatalogue). No student may do more than 60 credits in Dissertation or Project modules.			
Planned timetable:	To be arranged.			
The aim of the project is to develop and foster the skills of experimental design, appropriate research management and analysis. The topic and area of research should be chosen in consultation with the supervisors in order to determine that the student has access to sources as well as a clear plan of preparation.				
Programme module type:	Optional for Joint or 'with' Honours in the School of Mathematics & Statistics			
Pre-requisite(s):	A Letter of Agreement			
Anti-requisite(s):	More than 30 credits in other dissertation / project modules			
Learning and teaching methods and delivery:	**Weekly contact**: As per Letter of Agreement.			
	Scheduled learning: hours		**Guided independent study:** hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = %, Practical Examinations = %, Coursework = %			
	As used by St Andrews: As per Letter of Agreement.			
Re-assessment pattern:	As per Letter of Agreement.			
Module coordinator:	As per Letter of Agreement.			

MT5611 Advanced Symbolic Computation

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	2
Academic year:	2018/9			
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:	At least one of MT4111, MT4112 and MT5611 compulsory for MMath Applied Mathematics and MMath Pure Mathematics. At least one of MT3607, MT4111, MT4113 and MT5611 compulsory for MMath Mathematics. Optional for all other undergraduate programmes in the School.			
Pre-requisite(s):	at least one MT4000-level module		**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).			
	Scheduled learning: 35 hours		**Guided independent study:** 165 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 55%, Practical Examinations = 0%, Coursework = 45%			
	As used by St Andrews: 2-hour Written Examination = 55%, Coursework: Project = 45%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr J D Mitchell			
Module teaching staff:	Dr J D Mitchell, Dr C M Roney-Dougal, Dr L Theran			

MT5701 Advanced Statistical Inference

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	2
Academic year:	2017/8			
Planned timetable:	10.00 am Mon (odd weeks), Wed and Fri			
This module consists of MT4606 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 includes: comparison of point estimators; the Rao-Blackwell Theorem; distribution theory; Fisher information and the Cramer-Rao lower bound; maximum likelihood estimation; hypothesis-testing; confidence sets.				
Programme module type:	MT5701 or MT5831 is compulsory for MMath Statistics Optional for all other undergraduate programmes in the School.			
Pre-requisite(s):	(MT3507 or MT3606) and any MT4000-level module		**Anti-requisite(s):**	MT4606
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 0.5 tutorial (weeks 2 - 11).			
	Scheduled learning: 30 hours		**Guided independent study:** 170 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 75%, Practical Examinations = 0%, Coursework = 25%			
	As used by St Andrews: 2-hour Written Examination = 75%, Coursework: Project = 25%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof A G Lynch			
Module teaching staff:	Prof A G Lynch			

MT5751 Estimating Animal Abundance

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	2
Academic year:	2018/9			
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:	At least two of MT5751, MT5752, MT5757, MT5758 and ID5059 compulsory for MMath Statistics. At least 60 credits from MT5751 - MT5753, MT5757, MT5758, MT5802, MT5806, MT5809, MT5810, MT5821, MT5823 - MT5830, MT5836, MT5852 and MT5990 compulsory for MMath Mathematics. Optional for all other undergraduate programmes in the School.			
Pre-requisite(s):	(MT3507 or MT3508 or MT3606) and any MT4000-level module			
Learning and teaching methods and delivery:	**Weekly contact**: 1.5 hrs lecture, 1 hr practical, 0.5 hr tutorial (weeks 1 - 10)			
	Scheduled learning: 30 hours		**Guided independent study:** 120 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 50%, Practical Examinations = 0%, Coursework = 50%			
	As used by St Andrews: 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 D L Borchers, Prof S T Buckland, Dr E Rexstad			

MT5753 Statistical Modelling

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	1
Academic year:	2017/8 & 2018/9			
Planned timetable:	2.00 pm - 5.00 pm Mon - Thu and 2.00 pm - 3.30 pm Fri (Weeks 5,7,8 and 9)			

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.

Programme module type:	Compulsory for MMath Statistics		
Pre-requisite(s):	at least one MT4000-level module	**Anti-requisite(s):**	MT4607
Required for:	MT5757		
Learning and teaching methods and delivery:	**Weekly contact**: 6 hours lectures, 1.5 hours tutorials and 6 hours practicals (x 5 weeks).		
	Scheduled learning: 54 hours	**Guided independent study:** 146 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 50%, Practical Examinations = 0%, Coursework = 50%		
	As used by St Andrews: 2-hour Written Examination = 50%, Coursework = 50%		
Re-assessment pattern:	2-hour Written Examination = 100%		
Module coordinator:	Dr L A Scott-Hayward		
Module teaching staff:	Dr L A Scott-Hayward		

MT5757 Advanced Data Analysis

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	2
Academic year:	2017/8 & 2018/9			
Planned timetable:	12.00 noon Mon (even weeks), Tue and Thu			

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.

Programme module type:	At least two of MT5751, MT5752, MT5757, MT5758 and ID5059 compulsory for MMath Statistics. At least 60 credits from MT5751 - MT5753, MT5757, MT5758, MT5802, MT5806, MT5809, MT5810, MT5823 - MT5830, MT5852 and MT5990 compulsory for MMath Mathematics. Optional for all other undergraduate programmes in the School.	
Pre-requisite(s):	MT4607 or MT5753	
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 8 tutorials over the semester.	
	Scheduled learning: 33 hours	**Guided independent study:** 167 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 60%, Practical Examinations = 0%, Coursework = 40%	
	As used by St Andrews: 2-hour Written Examination = 60%, Coursework = 40%	
Re-assessment pattern:	2-hour Written Examination = 100%	
Module coordinator:	Dr L Scott-Hayward	
Module teaching staff:	Dr L Scott-Hayward	

MT5758 Applied Multivariate Analysis

SCOTCAT Credits:	15	SCQF Level 11	**Semester:**	2
Academic year:	2017/8 & 2018/9			
Planned timetable:	11.00 am Mon (even weeks), Tue and Thu			
This module provides introductory and advanced training in the applied analysis of multivariate data. The module emphasis is upon practical analysis of data and the extraction of answers from real-life data. Basic theory is given covering matrix algebra, metrics and general measures of similarity. The most common and fundamental methods including dimension reduction and classification are covered e.g. Multivariate Analysis of Variance, Principal Components Analysis, multidimensional scaling, Factor Analysis, clustering methods. The practical component of the module focuses on analysis of real data using the commercial software tools Excel, SAS and SPSS.				
Programme module type:	At least two of MT5751, MT5752, MT5757, MT5758 and ID5059 compulsory for MMath Statistics. At least 60 credits from MT5751 - MT5753, MT5757, MT5758, MT5802, MT5806, MT5809, MT5810, MT5821, MT5823 - MT5830, MT5836, MT5852 and MT5990 compulsory for MMath Mathematics. Optional for all other undergraduate programmes in the School.			
Pre-requisite(s):	Acceptance on to MMath Statistics or MMath Mathematics programmes		**Anti-requisite(s):**	MT4609
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10), and 4 tutorials and 4 project group meetings over the semester.			
	Scheduled learning: 33 hours		**Guided independent study:** 117 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 50%, Practical Examinations = 0%, Coursework = 50%			
	As used by St Andrews: 2-hour Written Examination = 50%, Coursework = 50%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof L Thomas			
Module teaching staff:	Prof L Thomas, Dr V M Popov			

MT5802 Advanced Analytical Techniques

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	2
Academic year:	2017/8 & 2018/9			
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:	At least three from MT5802, MT5806, MT5809, MT5810, MT5852 and MT5990 compulsory for MMath Applied Mathematics. At least 60 credits from MT5751 - MT5753, MT5757, MT5758, MT5802, MT5806, MT5809, MT5810, MT 5821, MT5823 - MT5830, MT5836, MT5852 and MT5990 compulsory for MMath Mathematics. Optional for all other undergraduate programmes in the School.			
Pre-requisite(s):	MT3503			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
	Scheduled learning: 35 hours		**Guided independent study:** 165 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 75%, Practical Examinations = 0%, Coursework = 25%			
	As used by St Andrews: 2-hour Written Examination = 75%, Coursework = 25%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr C V Tran			
Module teaching staff:	Dr C V Tran			

MT5806 Advanced Computational Techniques

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	2
Academic year:	2017/8 & 2018/9			
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:	At least three from MT5802, MT5806, MT5809, MT5810, MT5852 and MT5990 compulsory for MMath Applied Mathematics. At least 60 credits from MT5751 - MT5753, MT5757, MT5758, MT5802, MT5806, MT5809, MT5810, MT 5821, MT5823 - MT5830, MT5836, MT5852 and MT5990 compulsory for MMath Mathematics. Optional for all other undergraduate programmes in the School.			
Pre-requisite(s):	MT3802 and MT4112			
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)			
	Scheduled learning: 25 hours		**Guided independent study:** 175 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 0%, Coursework = 100%			
	As used by St Andrews: Coursework = 100%			
Re-assessment pattern:	Resubmission of projects = 100%			
Module coordinator:	Dr S J Brooks			
Module teaching staff:	Dr S J Brooks			

MT5809 Advanced Fluid Dynamics

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	1
Academic year:	2017/8 & 2018/9			
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:	At least three from MT5802, MT5806, MT5809, MT5810, MT5852 and MT5990 compulsory for MMath Applied Mathematics. At least 60 credits from MT5751 - MT5753, MT5757, MT5758, MT5802, MT5806, MT5809, MT5810, MT 5821, MT5823 - MT5830, MT5836, MT5852 and MT5990 compulsory for MMath Mathematics. Optional for all other undergraduate programmes in the School.	
Pre-requisite(s):	MT4509	
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).	
	Scheduled learning: 35 hours	**Guided independent study:** 165 hours
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%	
	As used by St Andrews: 2.5-hour Written Examination = 100%	
Re-assessment pattern:	2-hour Written Examination = 100%	
Module coordinator:	Dr J Reinaud	
Module teaching staff:	Dr J Reinaud	

MT5810 Advanced Solar Theory

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	1
Academic year:	2017/8 & 2018/9			
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:	At least three from MT5802, MT5806, MT5809, MT5810, MT5852 and MT5990 compulsory for MMath Applied Mathematics. At least 60 credits from MT5751 - MT5753, MT5757, MT5758, MT5802, MT5806, MT5809, MT5810, MT 5821, MT5823 - MT5830, MT5836, MT5852 and MT5990 compulsory for MMath Mathematics. Optional for all other undergraduate programmes in the School.			
Pre-requisite(s):	MT4510			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
	Scheduled learning: 35 hours		**Guided independent study:** 165 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2.5-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof C E Parnell			
Module teaching staff:	Prof C E Parnell			

MT5821 Advanced Combinatorics

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	2
Academic year:	2017/8 & 2018/9			
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:	At least three from MT5821, MT5823 - MT5830, MT5836 and MT5990 compulsory for MMath Pure Mathematics. At least 60 credits from MT5751 - MT5753, MT575 - MT5759, MT5802, MT5806, MT5809, MT5810, MT5821, MT5823 - MT5830, MT5836, MT5852, MT5990 and ID5059 compulsory for MMath Mathematics. Optional for all other undergraduate programmes in the School.			
Pre-requisite(s):	MT4514 or MT4516			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5-hour lectures (weeks 1 - 10) and 1-hour tutorial (weeks 2 - 11).			
	Scheduled learning: 35 hours		**Guided independent study:** 165 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2.5-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof P J Cameron			
Module teaching staff:	Prof P J Cameron			

MT5823 Semigroups

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	2
Academic year:	2017/8			
Planned timetable:	9.00 am Mon (odd weeks), Wed and Fri			
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.				
Programme module type:	At least three from MT5821, MT5823 - MT5830, MT5836 and MT5990 compulsory for MMath Pure Mathematics. At least 60 credits from MT5751 - MT5753, MT575 - MT5759, MT5802, MT5806, MT5809, MT5810, MT5821, MT5823 - MT5830, MT5836, MT5852, MT5990 and ID5059 compulsory for MMath Mathematics. Optional for all other undergraduate programmes in the School.			
Pre-requisite(s):	MT4003 or MT3505 or MT4517			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10), 1 tutorial and 1 examples class (weeks 2 - 11).			
	Scheduled learning: 45 hours		**Guided independent study:** 155 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 75%, Practical Examinations = 0%, Coursework = 25%			
	As used by St Andrews: 2-hour Written Examination = 75%, Coursework = 25%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr J D Mitchell			
Module teaching staff:	Dr J D Mitchell			

MT5824 Topics in Groups

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	1
Academic year:	2017/8 & 2018/9			
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:	At least three from MT5821, MT5823 - MT5830, MT5836 and MT5990 compulsory for MMath Pure Mathematics. At least 60 credits from MT5751 - MT5753, MT575 - MT5759, MT5802, MT5806, MT5809, MT5810, MT5821, MT5823 - MT5830, MT5836, MT5852, MT5990 and ID5059 compulsory for MMath Mathematics. Optional for all other undergraduate programmes in the School.			
Pre-requisite(s):	MT4003			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10), 1 tutorial and 1 examples class (weeks 2 - 11).			
	Scheduled learning: 45 hours		**Guided independent study:** 155 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2.5-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr C P Bleak			
Module teaching staff:	Dr C P Bleak			

MT5825 Measure and Probability Theory

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	1
Academic year:	2017/8 & 2018/9			
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 and mathematical probability theory 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 mathematical foundations for probability theory, law of large numbers. Mathematical analysis and the use of probabilistic methods in analysis is one of the active research areas within the School, and the choice of topics will reflect current activity.				
Programme module type:	At least three from MT5821, MT5823 - MT5830, MT5836 and MT5990 compulsory for MMath Pure Mathematics. At least 60 credits from MT5751 - MT5753, MT575 - MT5759, MT5802, MT5806, MT5809, MT5810, MT5821, MT5823 - MT5830, MT5836, MT5852, MT5990 and ID5059 compulsory for MMath Mathematics. Optional for all other undergraduate programmes in the School.			
Pre-requisite(s):	MT3502 or MT4004			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
	Scheduled learning: 35 hours		**Guided independent study:** 165 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 75%, Practical Examinations = 0%, Coursework = 25%			
	As used by St Andrews: 2-hour Written Examination = 75%, Coursework = 25%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Prof L Olsen			
Module teaching staff:	Prof L Olsen			

MT5827 Lie Algebras

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	2
Academic year:	2017/8			
Planned timetable:	11.00 am Mon (odd weeks), Wed and Fri			
The aim of this module is to classify the semi-simple Lie algebras over an algebraically closed field. Lie algebra has important applications to theoretical physics and is used in the classification of finite simple groups.				
Programme module type:	At least three from MT5821, MT5823 – MT5830, MT5836 and MT5990 compulsory for MMath Pure Mathematics. At least 60 credits from MT5751 – MT5753, MT575 – MT5759, MT5802, MT5806, MT5809, MT5810, MT5821, MT5823 – MT5830, MT5836, MT5990 and ID5059 compulsory for MMath Mathematics. Optional for all other undergraduate programmes in the School.			
Pre-requisite(s):	MT3501 and (MT3505 or MT4003 or MT4517)			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
	Scheduled learning: 35 hours		**Guided independent study:** 165 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2.5-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr A Detinko			
Module teaching staff:	Dr A Detinko			

MT5830 Topics in Geometry and Analysis

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	2
Academic year:	2018/9			
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:	At least three from MT5821, MT5823 – MT5830, MT5836 and MT5990 compulsory for MMath Pure Mathematics. At least 60 credits from MT5751 – MT5753, MT575 – MT5759, MT5802, MT5806, MT5809, MT5810, MT5821, MT5823 – MT5830, MT5836, MT5990 and ID5059 compulsory for MMath Mathematics. Optional for all other undergraduate programmes in the School.			
Pre-requisite(s):	MT3502 or MT4004 or MT4515		**Anti-requisite(s):**	MT5828
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
	Scheduled learning: 35 hours		**Guided independent study:** 165 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2.5-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr M Todd			
Module teaching staff:	Dr M Todd			

MT5831 Advanced Bayesian Inference

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	1
Academic year:	2017/8 & 2018/9			
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:	MT5701 or MT5831 is compulsory for MMath Statistics. Optional for all other undergraduate programmes in the School.			
Pre-requisite(s):	MT4507 or MT3606		**Anti-requisite(s):**	MT4531
Learning and teaching methods and delivery:	**Weekly contact**: 24 lectures and 7 practical classes over semester.			
	Scheduled learning: 31 hours		**Guided independent study:** 169 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 60%, Practical Examinations = 0%, Coursework = 40%			
	As used by St Andrews: 2-hour Written Examination = 60%, Coursework = 40%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	Dr M Papathomas			
Module teaching staff:	Dr M Papathomas			

MT5836 Galois Theory

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	2
Academic year:	2018/9			
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:	At least three from MT5821, MT5823 - MT5830, MT5836 and MT5990 compulsory for MMath Pure Mathematics. At least 60 credits from MT5751 - MT5753, MT575 - MT5759, MT5802, MT5806, MT5809, MT5810, MT5821, MT5823 - MT5830, MT5836, MT5852, MT5990 and ID5059 compulsory for MMath Mathematics. Optional for all other undergraduate programmes in the School.			
Pre-requisite(s):	MT3505 or MT4517		**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.			
	Scheduled learning: 35 hours		**Guided independent study:** 165 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2.5-hour Written Examination = 100%			
Re-assessment pattern:	2-hour Written Examination = 100%			
Module coordinator:	TBC			
Module teaching staff:	TBC			

MT5837 Ergodic Theory and Dynamical Systems

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	2
Academic year:	2017/8			
Planned timetable:	9.00 am - 10.00 am Mon (even teaching weeks), Tue, Thu			
This module introduces the modern ergodic theory approach to understanding chaotic dynamical systems. Topics include recurrence, consequences of ergodicity, entropy, the structure of the space of invariant measures and unique ergodicity. This will give students an insight into a thriving field of mathematics, which is at the core of the research interests of many faculty in the Pure Division in the School of Mathematics and Statistics.				
Programme module type:	Optional for MMath Mathematics or MMath Pure Mathematics			
Pre-requisite(s):	MT5825			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (x 10 weeks), 1 tutorial (x 10 weeks)			
	Scheduled learning: 35 hours		**Guided independent study:** 165 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2.5-hour Written Examination = 100%			
Re-assessment pattern:	2.5-hour Written Examination = 100%			
Module coordinator:	Dr M Todd			
Module teaching staff:	Dr M Todd			

MT5852 Mathematical Biology 2

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	1
Academic year:	2017/8 & 2018/9			
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 undergraduate programmes in the School of Mathematics & Statistics.			
Pre-requisite(s):	MT3504			
Learning and teaching methods and delivery:	**Weekly contact**: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11).			
	Scheduled learning: 35 hours		**Guided independent study:** 115 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 100%, Practical Examinations = 0%, Coursework = 0%			
	As used by St Andrews: 2-hour Written Examination = 90%, Coursework (Class Test) = 10%			
Re-assessment pattern:	Take-Home Examination = 100%			
Module coordinator:	Dr T Lorenzi			
Module teaching staff:	Dr T Lorenzi			

MT5990 Independent Study Module

SCOTCAT Credits:	20	SCQF Level 11	**Semester:**	1 or 2
Academic year:	2017/8 & 2018/9			
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:	At least three from MT5802, MT5806, MT5809, MT5810, MT5852 and MT5990 compulsory for MMath Applied Mathematics. At least three from MT5821, MT5823 - MT5830, MT5836 and MT5990 compulsory for MMath Pure Mathematics. At least 60 credits from MT5751 - MT5753, MT5757, MT5758, MT5802, MT5806, MT5809, MT5810, MT5821, MT5823 - MT5830, MT5836, MT5852 and MT5990 compulsory for MMath Mathematics. Optional for MMath Statistics and MPhys Mathematics and Theoretical Physics.			
Pre-requisite(s):	Permission from the Head of School			
Learning and teaching methods and delivery:	**Weekly contact**: Typically 1 hour project supervisions.			
	Scheduled learning: 12 hours		**Guided independent study:** 188 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 0%, Coursework = 100%			
	As used by St Andrews: Coursework = 100%			
Re-assessment pattern:	Resubmission of coursework = 100%			
Module coordinator:	Dr A L Wilmot-Smith			

MT5991 Professional Skills for Mathematical Scientists

SCOTCAT Credits:	30	SCQF Level 11	**Semester:**	Whole Year
Academic year:	2017/8 & 2018/9			
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:	In exceptional circumstances and with the approval of the Head of School, optional for final year of MMath Programme.			
Learning and teaching methods and delivery:	**Weekly contact**: Varies. Typically 1 project supervision per week over whole year.			
	Scheduled learning: 24 hours		**Guided independent study:** 276 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 0%, Coursework = 100%			
	As used by St Andrews: Coursework = 100%			
Re-assessment pattern:	Resubmission of coursework = 100%			
Module coordinator:	Dr J D Mitchell			
Module teaching staff:	n/a			

MT5999 Advanced Project in Mathematics / Statistics

SCOTCAT Credits:	40	SCQF Level 11	**Semester:**	Whole Year
Academic year:	2017/8 & 2018/9			
Availability restrictions:	Available only to students in the final year of an MMath or MPhys Honours programme in the School			
Planned timetable:	To be arranged.			
This is a more substantial project which, for MMath students, will replace the existing Honours project. The project will be chosen from an approved list of topics. The student will be required to investigate a topic in some depth, submit a report by the end of April and give a presentation.				
Programme module type:	Compulsory for MMath Applied Mathematics, MMath Mathematics, MMath Pure Mathematics and MMath Statistics. Either MT5999 or PH5102 is compulsory for MPhys Mathematics and Theoretical Physics.			
Pre-requisite(s):	Entry to an MPhys or MMath programme			
Learning and teaching methods and delivery:	**Weekly contact**: Typically and on average, 40 mins of project supervisions per week over whole year			
	Scheduled learning: 16 hours		**Guided independent study:** 384 hours	
Assessment pattern:	**As defined by QAA:** Written Examinations = 0%, Practical Examinations = 0%, Coursework = 100%			
	As used by St Andrews: Coursework = 100%: Project = 80%, Presentation = 20%			
Re-assessment pattern:	Resubmission of project = 100%			
Module coordinator:	Prof C E Parnell			