

Applied Statistics and Datamining

Programme Requirements:

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| Applied Statistics and Datamining - MSc |
| 105 credits from Module List: MT4113, MT5758, MT5761 - MT5764, ID5059 and 15 credits from Module List: MT3000 - MT4598, MT4600 - MT5998, CS5052, IS5102 and MT5099 (60 credits) |

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| Applied Statistics and Datamining - PG Dip |
| 105 credits from Module List: MT4113, MT5758, MT5761 - MT5764, ID5059 and 15 credits from Module List: MT3000 - MT4598, MT4600 - MT5998, CS5052, IS5102 |

Compulsory modules:

| MT4113 Computing in Statistics | | | | |
|---|--|---------------|-----------------|---|
| SCOTCAT Credits: | 15 | SCQF Level 10 | Semester | 1 |
| Academic year: | 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. | | | |
| Pre-requisite(s): | Before taking this module you must pass MT2508 | | | |
| Learning and teaching methods of delivery: | Weekly contact: 1.5-hour lectures (x 10 weeks), 2-hour practical classes (x 10 weeks) | | | |
| Assessment pattern: | 2-hour Written Examination = 40%, Coursework = 60% | | | |
| Re-assessment pattern: | 1-hour 40 minute Written Examination = 40%, Coursework (4 new programming assignments) = 60% | | | |
| Module coordinator: | Prof L J Thomas | | | |
| Module teaching staff: | Prof L Thomas | | | |

Mathematics & Statistics - Applied Statistics and Datamining - 2018/9 - August 2018

MT5758 Applied Multivariate Analysis

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|---|---|---------------|-----------------|---|
| SCOTCAT Credits: | 15 | SCQF Level 11 | Semester | 2 |
| Academic year: | 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. | | | | |
| Pre-requisite(s): | The student must have been accepted on to mmath statistics or mmath mathematics programmes | | | |
| Anti-requisite(s) | You cannot take this module if you take MT4609 | | | |
| Learning and teaching methods of delivery: | Weekly contact: 2.5 lectures (weeks 1 - 10), and 4 tutorials and 4 project group meetings over the semester. | | | |
| Assessment pattern: | 2-hour Written Examination = 50%, Coursework = 50% | | | |
| Re-assessment pattern: | 2-hour Written Examination = 100% | | | |
| Module teaching staff: | TBC | | | |

MT5761 Statistical Modelling

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|--|---|---------------|--|---|
| SCOTCAT Credits: | 15 | SCQF Level 11 | Semester | 1 |
| Academic year: | 2018/9 | | | |
| Planned timetable: | Mon, Tues, Thur, Fri 3:00 - 4:00 (lectures), Tues, Thur 4:00 - 5:00 (practicals) | | | |
| 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. | | | | |
| Pre-requisite(s): | Undergraduates must have passed at least one of MT4113, MT4527, MT4528, MT4530, MT4531, MT4537, MT4539, MT4606, MT4608, MT4609, MT4614. | | | |
| Anti-requisite(s) | You cannot take this module if you take MT4607 or take MT5753 | | | |
| Learning and teaching methods of delivery: | Weekly contact: 4 lectures (x 5 weeks), 2 practicals (x 5 weeks) | | | |
| | Scheduled learning: 30 hours | | Guided independent study: 117 hours | |
| Assessment pattern: | As used by St Andrews: 2-hour Written Examination = 50%, Coursework = 50% | | | |
| Re-assessment pattern: | 2-hour Written Examination = 100% | | | |
| Module teaching staff: | TBC | | | |

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MT5762 Introductory Data Analysis

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|--|---|---------------|-----------------|---|
| SCOTCAT Credits: | 15 | SCQF Level 11 | Semester | 1 |
| Academic year: | 2018/9 | | | |
| Availability restrictions: | Not available to Undergraduate students. | | | |
| Planned timetable: | Mon, Tue, Fri 2:00 - 3:30, Thur 3:30 - 5:00 | | | |
| <p>This module provides coverage of essential statistical concepts and analysis methods relevant to commercial analysis. Specifically: the different types of data and their numerical/graphical treatment; basic probability theory and concepts of inference; fundamental statistical concepts with particular emphasis on sampling issues; basic statistical models and tests; linear models; introductory computer-intensive inference. This module is a short intensive course and is a core, preliminary, requirement for the MSc in Applied Statistics and Datamining. It covers material essential for study of the more advanced statistical methods encountered in subsequent modules.</p> | | | | |
| Anti-requisite(s) | You cannot take this module if you take MT5756 | | | |
| Learning and teaching methods of delivery: | Weekly contact: Four 1.5-hour lectures (x 5 weeks) | | | |
| Assessment pattern: | Coursework = 100% | | | |
| Module coordinator: | Dr C R Donovan | | | |
| Module teaching staff: | Dr D Donovan, Dr L Scott-Hayward | | | |

MT5763 Software for Data Analysis

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|---|--|---------------|--|---|
| SCOTCAT Credits: | 15 | SCQF Level 11 | Semester | 1 |
| Academic year: | 2018/9 | | | |
| Availability restrictions: | Not available to Undergraduate students | | | |
| Planned timetable: | Mon, Tues, Fri 3:30 - 4:30 (lectures). Mon, Tues, Fri 4:30 - 5:30 (Practicals) | | | |
| <p>This module covers the practical computing aspects of statistical data analysis, focussing on packages most widely used in the commercial sector (R, SAS, SPSS & Excel). We cover the accessing, manipulation, checking and presentation of data (visual and numerical). We fit various statistical models to data, with subsequent assessment, interpretation and presentation. Good practice and 'reproducible research' is covered, as is computer intensive inference and big data considerations. This module is a short intensive course and is a core, preliminary, requirement for the MSc in Applied Statistics and Datamining and the MSc in Data Intensive Analysis. It covers material essential for study of the more advanced statistical methods encountered in subsequent modules.</p> | | | | |
| Pre-requisite(s): | Pass in MT1007 or MT3507 or MT3508 or be taking MT5762 | | | |
| Anti-requisite(s) | You cannot take this module if you take MT5756 | | | |
| Learning and teaching methods of delivery: | Weekly contact: Three 2-hour lecture/practical classes (x 5 weeks) | | | |
| | Scheduled learning: 30 hours | | Guided independent study: 120 hours | |
| Assessment pattern: | As used by St Andrews: Coursework = 100% | | | |
| Re-assessment pattern: | Coursework = 100% | | | |
| Module teaching staff: | TBC | | | |

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| MT5764 Advanced Data Analysis | | | | |
|--|--|---------------|--|---|
| SCOTCAT Credits: | 15 | SCQF Level 11 | Semester | 2 |
| Academic year: | 2018/9 | | | |
| Planned timetable: | Mon 12:00-1:00 Weeks 2, 4, 5, 8, 10 Tues, Thur 12:00-2:00, Weeks 1-10 (lectures) Tues 2:00 - 3:00 Weeks 2-9 (practicals) | | | |
| 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. | | | | |
| Pre-requisite(s): | Undergraduates must pass MT4607 or MT5753 or MT5761 | | | |
| Anti-requisite(s) | You cannot take this module if you take MT5757 | | | |
| Learning and teaching methods of delivery: | Weekly contact: 2.5 hours of lectures lectures (Weeks 1 - 10) and 8 practicals over the semester. | | | |
| | Scheduled learning: 33 hours | | Guided independent study: 116 hours | |
| Assessment pattern: | As used by St Andrews: 2-hour Written Examination = 60%, Coursework = 40% | | | |
| Re-assessment pattern: | 2-hour Written Examination = 100% | | | |
| Module teaching staff: | TBC | | | |

| ID5059 Knowledge Discovery and Datamining | | | | |
|---|---|---------------|-----------------|---|
| SCOTCAT Credits: | 15 | SCQF Level 11 | Semester | 2 |
| Academic year: | 2018/9 | | | |
| Planned timetable: | 11.00 am Mon (odd weeks), Wed and Fri | | | |
| Contemporary data collection can be automated and on a massive scale e.g. credit card transaction databases. Large databases potentially carry a wealth of important information that could inform business strategy, identify criminal activities, characterise network faults etc. These large scale problems may preclude the standard carefully constructed statistical models, necessitating highly automated approaches. This module covers many of the methods found under the banner of Datamining, building from a theoretical perspective but ultimately teaching practical application. Topics covered include: historical/philosophical perspectives, model selection algorithms and optimality measures, tree methods, bagging and boosting, neural nets, and classification in general. Practical applications build sought-after skills in programming (typically R, SAS or python). | | | | |
| Learning and teaching methods of delivery: | Weekly contact: Lectures, seminars, tutorials and practical classes. | | | |
| Assessment pattern: | 2-hour Written Examination = 60%, Coursework = 40% | | | |
| Re-assessment pattern: | 2-hour Written Examination = 60%, Existing Coursework = 40% | | | |
| Module coordinator: | Dr T W Kelsey | | | |
| Module teaching staff: | Dr T Kelsey, Dr R Hoffmann | | | |

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MT5099 Dissertation for MSc Programme/s

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|--|--|---------------|--|-----------|
| SCOTCAT Credits: | 60 | SCQF Level 11 | Semester | Full Year |
| Academic year: | 2018/9 | | | |
| Planned timetable: | At times to be arranged with the supervisor. | | | |
| Student dissertations will be supervised by members of the teaching staff who will advise on the choice of subject and provide guidance throughout the progress of the dissertation. The completed dissertation must be no more than 15,000 words. | | | | |
| Learning and teaching methods of delivery: | Weekly contact: Individual supervision | | | |
| | Scheduled learning: 0 hours | | Guided independent study: 0 hours | |
| Assessment pattern: | As used by St Andrews: Dissertation = 100% | | | |
| Re-assessment pattern: | No Re-Assessment Available | | | |
| Module coordinator: | Dr J D Mitchell | | | |

Optional modules:

MT4539 Quantitative Risk Management

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|--|---|---------------|-----------------|---|
| SCOTCAT Credits: | 15 | SCQF Level 10 | Semester | 2 |
| Academic year: | 2018/9 | | | |
| Planned timetable: | 12.00 noon Mon (odd), Wed, Fri, and 2.00 pm Fri | | | |
| The module introduces the concept of financial risk and discusses the importance of its regulation. The emphasis is laid on the popular risk measure Value at Risk (VaR). After a brief discussion on asset returns, various modelling techniques - ranging from the simple Historical Simulation to the more advanced ARMA and GARCH models - are presented and applied for the calculation of VaR using real financial data. The aim of this module is to provide a solid basis in risk management for those students considering a career in finance. | | | | |
| Pre-requisite(s): | Before taking this module you must pass MT2504 and pass MT2508 | | | |
| Learning and teaching methods of delivery: | Weekly contact: 2.5 lectures (x 10 weeks), 5 tutorials and 5 practical sessions. | | | |
| Assessment pattern: | 2-hour Written Examination = 80%, Coursework = 20% | | | |
| Re-assessment pattern: | 2-hour Written Examination = 100% | | | |
| Module teaching staff: | Dr V Popov | | | |

MT5611 Advanced Symbolic Computation

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|---|--|---------------|-----------------|---|
| 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. | | | | |
| Pre-requisite(s): | Before taking this module you must pass at least 4000-level mt module | | | |
| Anti-requisite(s) | You cannot take this module if you take MT4111 | | | |
| Learning and teaching methods of delivery: | Weekly contact: 2.5 lectures (weeks 1 - 10) and 1 practical session (weeks 2 - 11). | | | |
| Assessment pattern: | 2-hour Written Examination = 55%, Coursework: Project = 45% | | | |
| Re-assessment pattern: | 2-hour Written Examination = 55%, Coursework: Project = 45% | | | |
| Module teaching staff: | TBC | | | |

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MT5751 Estimating Animal Abundance

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|---|---|---------------|-----------------|---|
| SCOTCAT Credits: | 15 | 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. | | | | |
| Pre-requisite(s): | Before taking this module you must (pass MT3507 or pass MT3508) and pass one 4000-level mt module | | | |
| Learning and teaching methods of delivery: | Weekly contact: 1.5 hrs lecture, 1 hr practical, 0.5 hr tutorial (weeks 1 - 10) | | | |
| Assessment pattern: | 2-hour Written Examination = 50%, Coursework = 50% | | | |
| Re-assessment pattern: | 2-hour Written Examination = 100% | | | |
| Module teaching staff: | TBC | | | |

MT5765 Medical Statistics

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|---|---|---------------|-----------------|---|
| SCOTCAT Credits: | 15 | SCQF Level 11 | Semester | 2 |
| Academic year: | 2018/9 | | | |
| Planned timetable: | 10:00 - Mon (odd weeks), Wed, Fri | | | |
| This module will cover a number of topics in medical statistics, that are important areas both in terms of methodological development and application. The main topic covered will be Survival Analysis, with others selected from Meta-analysis, Power calculations, Prospective vs Observational studies, Sequential analyses, Clinical trials. | | | | |
| Learning and teaching methods of delivery: | Weekly contact: 2.5 lectures (x 10 weeks), 1 tutorial (x 10 weeks) | | | |
| Assessment pattern: | Coursework = 35%, 2-hour Written Examination = 65% | | | |
| Re-assessment pattern: | 2-hour Written Examination = 100% | | | |
| Module coordinator: | Prof A G Lynch | | | |
| Module teaching staff: | Prof A Lynch | | | |

MT5802 Advanced Analytical Techniques

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|--|---|---------------|-----------------|---|
| SCOTCAT Credits: | 20 | SCQF Level 11 | Semester | 2 |
| Academic year: | 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. | | | | |
| Pre-requisite(s): | Before taking this module you must pass MT3503 | | | |
| Learning and teaching methods of delivery: | Weekly contact: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11). | | | |
| Assessment pattern: | 2-hour Written Examination = 75%, Coursework = 25% | | | |
| Re-assessment pattern: | 2-hour Written Examination = 100% | | | |
| Module teaching staff: | TBC | | | |

MT5806 Advanced Computational Techniques

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|---|--|---------------|-----------------|---|
| SCOTCAT Credits: | 20 | SCQF Level 11 | Semester | 2 |
| Academic year: | 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. | | | | |
| Pre-requisite(s): | Before taking this module you must pass MT3802 and pass MT4112 | | | |
| Learning and teaching methods of delivery: | Weekly contact: 2 lectures (weeks 1 - 10) and a typical average of 0.5 hours of project supervisions (weeks 2 - 11) | | | |
| Assessment pattern: | Coursework = 100% | | | |
| Re-assessment pattern: | Resubmission of projects = 100% | | | |
| Module teaching staff: | Dr S J Brooks | | | |

MT5809 Advanced Fluid Dynamics

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|---|---|---------------|-----------------|---|
| SCOTCAT Credits: | 20 | SCQF Level 11 | Semester | 1 |
| Academic year: | 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. | | | | |
| Pre-requisite(s): | Before taking this module you must pass MT4509 | | | |
| Learning and teaching methods of delivery: | Weekly contact: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11). | | | |
| Assessment pattern: | 2.5-hour Written Examination = 100% | | | |
| Re-assessment pattern: | 2-hour Written Examination = 100% | | | |
| Module teaching staff: | Dr J Reinaud | | | |

MT5810 Advanced Solar Theory

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|---|---|---------------|-----------------|---|
| SCOTCAT Credits: | 20 | SCQF Level 11 | Semester | 1 |
| Academic year: | 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. | | | | |
| Pre-requisite(s): | Before taking this module you must pass MT4510 | | | |
| Learning and teaching methods of delivery: | Weekly contact: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11). | | | |
| Assessment pattern: | 2.5-hour Written Examination = 100% | | | |
| Re-assessment pattern: | 2-hour Written Examination = 100% | | | |
| Module teaching staff: | Prof C E Parnell | | | |

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| MT5821 Advanced Combinatorics | | | | |
|---|---|---------------|-----------------|---|
| SCOTCAT Credits: | 20 | SCQF Level 11 | Semester | 2 |
| Academic year: | 2018/9 | | | |
| 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. | | | | |
| Pre-requisite(s): | Before taking this module you must pass MT4514 or pass MT4516 | | | |
| Learning and teaching methods of delivery: | Weekly contact: 2.5-hour lectures (weeks 1 - 10) and 1-hour tutorial (weeks 2 - 11). | | | |
| Assessment pattern: | 2.5-hour Written Examination = 100% | | | |
| Re-assessment pattern: | 2-hour Written Examination = 100% | | | |
| Module teaching staff: | Prof P J Cameron | | | |

| MT5824 Topics in Groups | | | | |
|--|---|---------------|-----------------|---|
| SCOTCAT Credits: | 20 | SCQF Level 11 | Semester | 1 |
| Academic year: | 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, 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. | | | | |
| Pre-requisite(s): | Before taking this module you must pass MT4003 | | | |
| Learning and teaching methods of delivery: | Weekly contact: 2.5 lectures (weeks 1 - 10), 1 tutorial and 1 examples class (weeks 2 - 11). | | | |
| Assessment pattern: | 2.5-hour Written Examination = 100% | | | |
| Re-assessment pattern: | 2-hour Written Examination = 100% | | | |
| Module teaching staff: | TBC | | | |

| MT5825 Measure and Probability Theory | | | | |
|---|---|---------------|-----------------|---|
| SCOTCAT Credits: | 20 | SCQF Level 11 | Semester | 1 |
| Academic year: | 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. | | | | |
| Pre-requisite(s): | Before taking this module you must pass MT3502 or pass MT4004 | | | |
| Learning and teaching methods of delivery: | Weekly contact: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11). | | | |
| Assessment pattern: | 2-hour Written Examination = 75%, Coursework = 25% | | | |
| Re-assessment pattern: | 2-hour Written Examination = 100% | | | |
| Module teaching staff: | Prof L Olsen | | | |

MT5830 Hyperbolic Geometry

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|--|---|---------------|-----------------|---|
| SCOTCAT Credits: | 20 | SCQF Level 11 | Semester | 2 |
| Academic year: | 2018/9 | | | |
| Planned timetable: | 10.00 am Mon (odd weeks), Wed and Fri | | | |
| We study two dimensional hyperbolic space, which is a fundamental example of a non-Euclidean metric space. Hyperbolic space has a rich structure and many counter intuitive properties and this module will focus on the geometry of this space, including a detailed study of the geodesic structure, the group of isometries, and the actions of Fuchsian groups which lead to beautiful tilings and fractal limit sets. We will combine ideas from analysis, geometry and group theory, with a strong emphasis on visual intuition. | | | | |
| Pre-requisite(s): | Before taking this module you must pass MT2505 and pass MT3502 and pass MT3503 | | | |
| Learning and teaching methods of delivery: | Weekly contact: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11). | | | |
| Assessment pattern: | 2.5-hour Written Examination = 100% | | | |
| Re-assessment pattern: | 2-hour Written Examination = 100% | | | |
| Module teaching staff: | TBC | | | |

MT5831 Advanced Bayesian Inference

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|---|--|---------------|-----------------|---|
| SCOTCAT Credits: | 20 | SCQF Level 11 | Semester | 1 |
| Academic year: | 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. | | | | |
| Pre-requisite(s): | Before taking this module you must pass MT3507 or pass MT3508 or pass MT3506 | | | |
| Anti-requisite(s) | You cannot take this module if you take MT4531 | | | |
| Learning and teaching methods of delivery: | Weekly contact: 24 lectures and 7 practical classes over semester. | | | |
| Assessment pattern: | 2-hour Written Examination = 60%, Coursework = 40% | | | |
| Re-assessment pattern: | 2-hour Written Examination = 100% | | | |
| Module teaching staff: | TBC | | | |

MT5836 Galois Theory

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|--|--|---------------|-----------------|---|
| 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. | | | | |
| Pre-requisite(s): | Before taking this module you must pass MT3505 or pass MT4517 | | | |
| Learning and teaching methods of delivery: | Weekly contact: 2.5 lectures (weeks 1 - 10) and 10 tutorials/practical classes over semester. | | | |
| Assessment pattern: | 2.5-hour Written Examination = 100% | | | |
| Re-assessment pattern: | 2.5-hour Written Examination = 100% | | | |
| Module teaching staff: | TBC | | | |

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MT5852 Mathematical Biology 2

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|--|---|---------------|-----------------|---|
| SCOTCAT Credits: | 20 | SCQF Level 11 | Semester | 1 |
| Academic year: | 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. | | | | |
| Learning and teaching methods of delivery: | Weekly contact: 2.5 lectures (weeks 1 - 10) and 1 tutorial (weeks 2 - 11). | | | |
| Assessment pattern: | 2-hour Written Examination = 90%, Coursework (Class Test) = 10% | | | |
| Re-assessment pattern: | Take-Home Examination = 100% | | | |
| Module teaching staff: | TBC | | | |

MT5990 Independent Study Module

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|---|--|---------------|-----------------|------|
| SCOTCAT Credits: | 20 | SCQF Level 11 | Semester | Both |
| Academic year: | 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. | | | | |
| Pre-requisite(s): | In taking this module undergraduate students must have permission of head of school. | | | |
| Learning and teaching methods of delivery: | Weekly contact: Typically 1 hour project supervisions. | | | |
| Assessment pattern: | Coursework = 100% | | | |
| Re-assessment pattern: | Resubmission of coursework = 100% | | | |
| Module coordinator: | Dr A L Wilmot-Smith | | | |

MT5991 Professional Skills for Mathematical Scientists

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|--|--|---------------|-----------------|-----------|
| SCOTCAT Credits: | 30 | SCQF Level 11 | Semester | Full Year |
| Academic year: | 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. | | | | |
| Learning and teaching methods of delivery: | Weekly contact: Varies. Typically 1 project supervision per week over whole year. | | | |
| Assessment pattern: | Coursework = 100% | | | |
| Re-assessment pattern: | Resubmission of coursework = 100% | | | |
| Module coordinator: | Dr J D Mitchell | | | |
| Module teaching staff: | n/a | | | |

Mathematics & Statistics - Applied Statistics and Datamining - 2018/9 - August 2018

| CS5052 Data-Intensive Systems | | | | |
|---|--|---------------|-----------------|---|
| SCOTCAT Credits: | 15 | SCQF Level 11 | Semester | 2 |
| Academic year: | 2018/9 | | | |
| Planned timetable: | To be arranged. | | | |
| <p>The era of big data is upon us - the volume, velocity and variety of enterprise and scientific data are growing at an exponential rate and will continue to do so for the foreseeable future. This module presents the programming paradigms, algorithmic techniques and design principles for large-scale distributed systems, such as those utilised by companies such as Google, Amazon and Facebook. This module is different in scope from CS4103 (distributed systems) as it focuses primarily on building and utilising large-scale clusters. The module will cover: distributed systems architecture, replication and fault tolerance, storage, coordination, scheduling algorithms, cluster computing, cloud computing, virtualisation, programming models (e.g., MapReduce), stream processing, decentralised systems (e.g., Chord), incentive-based systems (e.g., BitTorrent), and social computing (e.g., crowd sourcing techniques). This module will draw from the latest research in both academia and industry.</p> | | | | |
| Pre-requisite(s): | Undergraduate students must have passed CS2002 and (cs2001 or cs2101). Postgraduate students must pass CS5001 before taking this module. | | | |
| Learning and teaching methods of delivery: | Weekly contact: 2 lectures (x 11 weeks), 1 tutorial (x 5 weeks) | | | |
| Assessment pattern: | 2-hour Written Examination - 60%, Coursework = 40% | | | |
| Re-assessment pattern: | 2-hour Written Examination = 60%, Existing Coursework = 40% | | | |
| Module teaching staff: | TBC Module coordinator(s): Director of Postgraduate Teaching - Computer Science (dopgt-cs@st-andrews.ac.uk) | | | |

| IS5102 Database Management Systems | | | | |
|---|---|---------------|-----------------|---|
| SCOTCAT Credits: | 15 | SCQF Level 11 | Semester | 1 |
| Academic year: | 2018/9 | | | |
| Planned timetable: | To be arranged. | | | |
| <p>This module introduces the core principles and techniques required in the design and implementation of database systems. With a focus on relational database management systems, topics include database design theory; E-R modelling; data definition and manipulation languages; database security and administration. There is a significant practical element to the module, which will require students to build and manipulate a database.</p> | | | | |
| Learning and teaching methods of delivery: | Weekly contact: Lectures, seminars, tutorials and practical classes. | | | |
| Assessment pattern: | 2-hour Written Examination = 40%, Coursework = 60% | | | |
| Module teaching staff: | TBC Module coordinator(s): Director of Postgraduate Teaching - Computer Science (dopgt-cs@st-andrews.ac.uk) | | | |

