**MT1001 Introductory Mathematics**

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| **SCOTCAT Credits:** | 20 | SCQF level 7 | **Semester** | 1 |
| **Academic year:** | 2020-2021 | | | |
| **Planned timetable:** | 9.00 am | | | |
| This module is designed to give students a secure base in elementary calculus to allow them to tackle the mathematics needed in other sciences. Students wishing to do more mathematics will be given a good foundation from which they can proceed to MT1002. Some of the work covered is a revision and reinforcement of material in the Scottish Highers and many A-Level syllabuses. | | | | |
| **Pre-requisite(s):** | Students must have Higher or A-level mathematics (AS-level mathematics with approval of Head of School). | | | |
| **Anti-requisite(s)** | You cannot take this module if you have passed any of MT1003, MT2501-MT5999. | | | |
| **Learning and teaching methods of delivery:** | **Weekly contact**: 5 lectures (x 10 weeks), 1 tutorial (x 5 weeks), 1 examples class (x 5 weeks) | | | |
| | **Scheduled learning:** 70 hours | | **Guided independent study:** 130 hours | |
| **Assessment pattern:** | **As defined by QAA:** Written Examinations = 70%, Practical Examinations = 0%, Coursework = 30% | | | |
| | **As used by St Andrews:** 70% exam, 30% continual assessment | | | |
| **Re-assessment pattern:** | 2-hour Written Examination = 100% | | | |
| **Module coordinator:** | Dr T D H Coleman | | | |
| **Module teaching staff:** | Dr Thomas Coleman: Dr Vasilis Archontis | | | |

**MT1002 Mathematics**

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|---|---|---|---|---|
| **SCOTCAT Credits:** | 20 | SCQF level 7 | **Semester** | Both |
| **Academic year:** | 2020-2021 | | | |
| **Planned timetable:** | 9.00 am | | | |
| This module is designed to introduce students to the ideas, methods and techniques which they will need for applying mathematics in the physical sciences or for taking the study of mathematics further. It aims to extend and enhance their skills in algebraic manipulation and in differential and integral calculus, to develop their geometric insight and their understanding of limiting processes, and to introduce them to complex numbers and matrices. | | | | |
| **Pre-requisite(s):** | Before taking this module you must pass MT1001. If MT1001 has not been passed, you must have at least grade b in advanced higher mathematics or grade b in A-Level mathematics or an equivalent level mathematics qualification. | | | |
| **Learning and teaching methods of delivery:** | **Weekly contact**: 5 lectures (x 10 weeks), 1 tutorial (x 5 weeks), 1 examples class (x 5 weeks) | | | |
| | **Scheduled learning:** 66 hours | | **Guided independent study:** 134 hours | |
| **Assessment pattern:** | **As defined by QAA:** Written Examinations = 70%, Practical Examinations = 0%, Coursework = 30% | | | |
| | **As used by St Andrews:** 70% exam, 30% continual assessment | | | |
| **Re-assessment pattern:** | 2-hour Written Examination = 100% | | | |
| **Module coordinator:** | Dr A N Wright | | | |
| **Module teaching staff:** | Semester 1: Dr Andrew Wright, Prof Lars Olsen, Dr Isobel Webster, Dr Louis Theran<br>Semester 2: Dr Mike Todd, Dr Isobel Webster, Dr Deborah Kent | | | |

**MT1003 Pure and Applied Mathematics**

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|---|---|---|---|---|
| **SCOTCAT Credits:** | 20 | SCQF level 7 | **Semester** | 2 |
| **Academic year:** | 2020-2021 | | | |
| **Planned timetable:** | 9.00 am | | | |
| The aim of this module is to provide students with a taste of both pure and applied mathematics, to give them insight into areas available for study in later years and to provide them with the opportunity to broaden their mathematical experience. | | | | |
| **Pre-requisite(s):** | Before taking this module you must pass MT1002 | | | |
| **Learning and teaching methods of delivery:** | **Weekly contact**: 5 lectures (x 10 weeks), 1 tutorial (x 10 weeks) | | | |
| | **Scheduled learning:** 70 hours | | **Guided independent study:** 130 hours | |
| **Assessment pattern:** | **As defined by QAA:** Written Examinations = 70%, Practical Examinations = 0%, Coursework = 30% | | | |
| | **As used by St Andrews:** 70% exam, 30% continual assessment | | | |
| **Re-assessment pattern:** | 2-hour Written Examination = 100% | | | |
| **Module coordinator:** | Dr A Naughton | | | |
| **Module teaching staff:** | Dr Aidan Naughton; Dr Thomas Coleman; Dr Antonia Wilmot-Smith | | | |

**MT1007 Statistics in Practice**

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|---|---|---|---|---|
| **SCOTCAT Credits:** | 20 | SCQF level 7 | **Semester** | 2 |
| **Academic year:** | 2020-2021 | | | |
| **Planned timetable:** | 11.00 am | | | |
| This module provides an introduction to statistical reasoning, elementary but powerful statistical methodologies, and real world applications of statistics. Case studies based on environmental impact assessment, medicine and economics and finance are used throughout the module to motivate and demonstrate the principles. Students get hands-on experience exploring data for patterns and interesting anomalies as well as experience using modern statistical software to fit statistical models to data. | | | | |
| **Pre-requisite(s):** | Students must have at least GCSE (at A) or National 5 Mathematics (at A) or AS-Level/Higher Mathematics (at C). | | | |
| **Learning and teaching methods of delivery:** | **Weekly contact**: 4 lectures (x 10 weeks), 1 tutorial and 1 laboratory (x 10 weeks). | | | |
| | **Scheduled learning:** 60 hours | | **Guided independent study:** 140 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 = 75%, Existing Coursework = 25% | | | |
| **Module teaching staff:** | To be arranged | | | |

**MT1010 Topics in Mathematics: Problem-solving Techniques**

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| **SCOTCAT Credits:** | 10 | SCQF level 7 | **Semester** | 1 |
| **Academic year:** | 2020-2021 | | | |
| **Availability restrictions:** | Available only to students on the Fast Track route through the MMath degree programme. | | | |
| **Planned timetable:** | 10.00 am Mon (odd weeks), Wed and Fri | | | |
| This module introduces some important basic concepts in mathematics and also explores problem-solving in the context of these topics. It is intended to strengthen the mathematical skills of an undergraduate entering on the Fast Track route into the MMath degree programme. | | | | |
| **Pre-requisite(s):** | Students must have gained admission onto the Fast Track route through the MMath degree programme. | | | |
| **Learning and teaching methods of delivery:** | **Weekly contact**: 1.5-hour lecture, 1 practical and 1 tutorial (x 10 weeks) | | | |
| | **Scheduled learning:** 35 hours | | **Guided independent study:** 65 hours | |
| **Assessment pattern:** | **As defined by QAA:** Written Examinations = 50%, Practical Examinations = 0%, Coursework = 50% | | | |
| | **As used by St Andrews:** 1.5-hour Written Examination = 50%, Coursework = 50% | | | |
| **Re-assessment pattern:** | 1.5-hour Written Examination = 50%, Existing Coursework = 50% | | | |
| **Module coordinator:** | Dr T D H Coleman | | | |
| **Module teaching staff:** | Dr Thomas Coleman; Dr Louise Burt; Dr Isobel Webster | | | |

**MT2501 Linear Mathematics**

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|---|---|---|---|---|
| **SCOTCAT Credits:** | 15 | SCQF level 8 | **Semester** | Both |
| **Academic year:** | 2020-2021 | | | |
| **Planned timetable:** | 12.00 noon Mon (odd weeks), Wed and Fri [Semester 1]; 11.00 am Mon (even weeks), Tue and Thu [Semester 2] | | | |
| This module extends the knowledge and skills that students have gained concerning matrices and systems of linear equations. It introduces the basic theory of vector spaces, linear independence, linear transformations and diagonalization. These concepts are used throughout the mathematical sciences and physics. It is recommended that students in the Faculties of Arts and Divinity take an even number of the 15-credit 2000-level MT modules. | | | | |
| **Pre-requisite(s):** | If MT1002 has not been passed, A at Advanced Higher Mathematics, or A at A-level Further Mathematics, or A at both A-level Mathematics and A-level Physics.. Before taking this module you must pass MT1002 | | | |
| **Learning and teaching methods of delivery:** | **Weekly contact**: 2.5-hours lectures (x 10 weeks), 1 tutorial (x 5 weeks), 1 examples class (x 5 weeks) | | | |
| | **Scheduled learning:** 35 hours | | **Guided independent study:** 115 hours | |
| **Assessment pattern:** | **As defined by QAA:** Written Examinations = 85%, Practical Examinations = 0%, Coursework = 15% | | | |
| | **As used by St Andrews:** 2-hour Written Examination = 70%, Coursework (including class test 15%) = 30% | | | |
| **Re-assessment pattern:** | 2-hour Written Examination = 100% | | | |
| **Module coordinator:** | Professor N Ruskuc | | | |
| **Module teaching staff:** | Semester 1: Professor Nik Ruskuc Semester 2: Antonia Wilmot-Smith | | | |
| **Additional information from Schools:** | For guidance on module choice at 2000-level in Mathematics and Statistics please consult the School Handbook, at https://www.st-andrews.ac.uk/maths/current/ug/programmes/ | | | |

**MT2502 Analysis**

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| **SCOTCAT Credits:** | 15 | SCQF level 8 | **Semester** | 1 |
| **Academic year:** | 2020-2021 | | | |
| **Planned timetable:** | 11.00 am Mon (even weeks), Tue and Thu | | | |
| The main purpose of this module is to introduce the key concepts of real analysis: limit, continuity and differentiation. Emphasis will be placed on the rigorous development of the material, giving precise definitions of the concepts involved and exploring the proofs of important theorems. This module forms the prerequisite for all later modules in mathematical analysis. It is recommended that students in the Faculties of Arts and Divinity take an even number of the 15-credit 2000-level MT modules. | | | | |
| **Pre-requisite(s):** | If MT1002 has not been passed, Advanced Higher Mathematics (at grade A) or A-Level Further Mathematics (at grade A) or admission to a Fast Track MMath programme. . Before taking this module you must pass MT1002 | | | |
| **Learning and teaching methods of delivery:** | **Weekly contact**: 2.5 hours lectures (x 10 weeks), 1-hour tutorial (x 5 weeks), 1-hour examples class (x 5 weeks) | | | |
| | **Scheduled learning:** 35 hours | | **Guided independent study:** 115 hours | |
| **Assessment pattern:** | **As defined by QAA:**<br>Written Examinations = 85%, Practical Examinations = 0%, Coursework = 15% | | | |
| | **As used by St Andrews:**<br>2-hour Written Examination = 70%, Coursework (including class test 15%) = 30% | | | |
| **Re-assessment pattern:** | 2-hour Written Examination = 100% | | | |
| **Module coordinator:** | Dr J M Fraser | | | |
| **Module teaching staff:** | Dr Jonathan Fraser | | | |
| **Additional information from Schools:** | For guidance on module choice at 2000-level in Mathematics and Statistics please consult the School Handbook, at https://www.st-andrews.ac.uk/maths/current/ug/programmes/ | | | |

**MT2503 Multivariate Calculus**

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|---|---|---|---|---|
| **SCOTCAT Credits:** | 15 | SCQF level 8 | **Semester** | Both |
| **Academic year:** | 2020-2021 | | | |
| **Planned timetable:** | 12.00 noon Mon (even weeks), Tue and Thu [Semester 1];<br>9.00 am Mon (odd weeks), Wed and Fri [Semester 2] | | | |
| This module extends the basic calculus in a single variable to the setting of real functions of several variables. It introduces techniques and concepts that are used throughout the mathematical sciences and physics: partial derivatives, double and triple integrals, surface sketching, cylindrical and spherical coordinates. It is recommended that students in the Faculties of Arts and Divinity take an even number of the 15-credit 2000-level MT modules. | | | | |
| **Pre-requisite(s):** | Before taking this module you must pass MT1002. If MT1002 has not been passed then A at Advanced Higher Mathematics, or A at A-level Further Mathematics, or A at both A-level Mathematics and A-level Physics | | | |
| **Learning and teaching methods of delivery:** | **Weekly contact**: 2.5-hours lectures (x 10 weeks), 1 tutorial (x 5 weeks), 1 examples class (x 5 weeks) | | | |
| | **Scheduled learning:** 35 hours | | **Guided independent study:** 115 hours | |
| **Assessment pattern:** | **As defined by QAA:**<br>Written Examinations = 85%, Practical Examinations = 0%, Coursework = 15% | | | |
| | **As used by St Andrews:**<br>2-hour Written Examination = 70%, Coursework (including class test 15%) = 30% | | | |
| **Re-assessment pattern:** | 2-hour Written Examination = 100% | | | |
| **Module coordinator:** | Dr A Naughton | | | |
| **Module teaching staff:** | Semester 1: Dr Jean Reinaud, Prof. David Dritschel Semester 2: Dr Aidan Naughton | | | |
| **Additional information from Schools:** | For guidance on module choice at 2000-level in Mathematics and Statistics please consult the School Handbook, at https://www.st-andrews.ac.uk/maths/current/ug/programmes/ | | | |

**MT2504 Combinatorics and Probability**

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|---|---|---|---|---|
| **SCOTCAT Credits:** | 15 | SCQF level 8 | **Semester** | 1 |
| **Academic year:** | 2020-2021 | | | |
| **Planned timetable:** | 11am Mondays (Odd), Wednesdays and Fridays | | | |
| This module provides an introduction to the study of combinatorics and finite sets and also the study of probability. It will describe the links between these two areas of study. It provides a foundation both for further study of combinatorics within pure mathematics and for the various statistics modules that are available. It is recommended that students in the Faculties of Arts and Divinity take an even number of the 15-credit 2000-level MT modules. | | | | |
| **Pre-requisite(s):** | Before taking this module you must pass MT1002. If MT1002 has not been passed, A at Advanced Higher Mathematics or A at A-level Further Mathematics, or Co-requisite MT1010. | | | |
| **Learning and teaching methods of delivery:** | **Weekly contact**: 2.5 hours of lectures (x 10 weeks), 1-hour tutorial (x 4 weeks), 1-hour examples class (x 5 weeks) | | | |
| | **Scheduled learning:** 34 hours | | **Guided independent study:** 116 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 S C Drasco | | | |
| **Module teaching staff:** | Dr Steve Drasco; Dr Louis Theran | | | |

**MT2505 Abstract Algebra**

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|---|---|---|---|---|
| **SCOTCAT Credits:** | 15 | SCQF level 8 | **Semester** | 2 |
| **Academic year:** | 2020-2021 | | | |
| **Planned timetable:** | 11.00 am Mon (odd weeks), Wed and Fri | | | |
| This main purpose of this module is to introduce the key concepts of modern abstract algebra: groups, rings and fields. Emphasis will be placed on the rigourous development of the material and the proofs of important theorems in the foundations of group theory. This module forms the prerequisite for later modules in algebra. It is recommended that students in the Faculties of Arts and Divinity take an even number of the 15-credit 2000-level MT modules. | | | | |
| **Pre-requisite(s):** | Before taking this module you must pass MT1002. If MT1002 has not been passed, A at Advanced Higher Mathematics or A at A-level Further Mathematics. | | | |
| **Learning and teaching methods of delivery:** | **Weekly contact**: 2.5 hours of lectures (x 10 weeks), 1-hour tutorial (x 5 weeks), 1-hour examples class (x 5 weeks) | | | |
| | **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 M Quick | | | |
| **Module teaching staff:** | Dr Martyn Quick | | | |
| **Additional information from** | For guidance on module choice at 2000-level in Mathematics and Statistics please consult the School Handbook, at https://www.st-andrews.ac.uk/maths/current/ug/programmes/ | | | |

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| **Schools:** | |

**MT2506 Vector Calculus**

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| **SCOTCAT Credits:** | 15 | SCQF level 8 | **Semester** | 2 |
| **Academic year:** | 2020-2021 | | | |
| **Planned timetable:** | 9.00 am Mon (even weeks), Tue and Thu | | | |
| This module introduces students to some of the fundamental techniques that are used throughout the mathematical modelling of problems arising in the physical world such as grad, div and curl as well as cylindrical and spherical coordinate systems. Fundamental theorems such as Green's Theorem, Stokes' Theorem and Gauss's Divergence Theorem will also be studied. It provides the foundation for many of the modules available in applied mathematics later in the Honours programme. It is recommended that students in the Faculties of Arts and Divinity take an even number of the 15-credit 2000-level MT modules. | | | | |
| **Pre-requisite(s):** | Before taking this module you must pass MT2503 | | | |
| **Learning and teaching methods of delivery:** | **Weekly contact**: 2.5 hours of lectures (x 10 weeks), 1-hour tutorial (x 5 weeks), 1-hour examples class (x 5 weeks) | | | |
| | **Scheduled learning:** 35 hours | | **Guided independent study:** 115 hours | |
| **Assessment pattern:** | **As defined by QAA:**<br>Written Examinations = 85%, Practical Examinations = 0%, Coursework = 15% | | | |
| | **As used by St Andrews:**<br>2-hour Written Examination = 70%, Coursework (including class test 15%) = 30% | | | |
| **Re-assessment pattern:** | 2-hour Written Examination = 100% | | | |
| **Module coordinator:** | Dr I Webster | | | |
| **Module teaching staff:** | Dr Isobel Webster; Dr Chuong Tran | | | |
| **Additional information from Schools:** | For guidance on module choice at 2000-level in Mathematics and Statistics please consult the School Handbook, at https://www.st-andrews.ac.uk/maths/current/ug/programmes/ | | | |

**MT2507 Mathematical Modelling**

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|---|---|---|---|---|
| **SCOTCAT Credits:** | 15 | SCQF level 8 | **Semester** | 2 |
| **Academic year:** | 2020-2021 | | | |
| **Planned timetable:** | 12.00 noon Mon (odd weeks), Wed and Fri | | | |
| This module provides an introduction to a variety of techniques that are used throughout applied mathematics. It discusses how to translate physical problems into mathematics and covers such topics as differential equations, dynamics, numerical methods and Fourier series. It illustrates how these are used when solving problems. It is recommended that students in the Faculties of Arts and Divinity take an even number of the 15-credit 2000-level MT modules. | | | | |
| **Pre-requisite(s):** | Before taking this module you must pass MT2503 | | | |
| **Learning and teaching methods of delivery:** | **Weekly contact**: 2.5 hours of lectures (x 10 weeks), 1-hour tutorial (x 5 weeks), 1-hour examples class (x 5 weeks) | | | |
| | **Scheduled learning:** 35 hours | | **Guided independent study:** 115 hours | |
| **Assessment pattern:** | **As defined by QAA:**<br>Written Examinations = 70%, Practical Examinations = 0%, Coursework = 30% | | | |
| | **As used by St Andrews:**<br>2-hour Written Examination = 70%, Coursework = 30% | | | |
| **Re-assessment pattern:** | 2-hour Written Examination = 100% | | | |
| **Module coordinator:** | Professor T Neukirch | | | |
| **Module teaching staff:** | Prof Thomas Neukirch | | | |
| **Additional information from Schools:** | For guidance on module choice at 2000-level in Mathematics and Statistics please consult the School Handbook, at https://www.st-andrews.ac.uk/maths/current/ug/programmes/ | | | |

| **MT2508 Statistical Inference** | | | | |
|---|---|---|---|---|
| **SCOTCAT Credits:** | 15 | SCQF level 8 | **Semester** | 2 |
| **Academic year:** | 2020-2021 | | | |
| **Planned timetable:** | 12.00 noon Mon (even weeks), Tue and Thu | | | |
| This module provides an introduction to the mathematical models of randomness. These models are used to perform statistical analysis, where the aim is to evaluate our uncertainty on a certain quantity after observing data. Important topics in statistics are described including maximum likelihood estimation, confidence intervals and hypothesis testing, permutation tests, and linear regression. It forms a prerequisite for the statistics modules in the Honours programme. It is recommended that students in the Faculties of Arts and Divinity take an even number of the 15-credit 2000-level MT modules. | | | | |
| **Pre-requisite(s):** | Before taking this module you must pass MT2504 | | | |
| **Anti-requisite(s)** | You cannot take this module if you take EC2003 | | | |
| **Learning and teaching methods of delivery:** | **Weekly contact**: 2.5 hours of lectures (x 10 weeks), 1-hour tutorial (x 5 weeks), 1-hour examples class (x 5 weeks) | | | |
| | **Scheduled learning:** 35 hours | | **Guided independent study:** 115 hours | |
| **Assessment pattern:** | **As defined by QAA:**<br>Written Examinations = 70%, Practical Examinations = 0%, Coursework = 30% | | | |
| | **As used by St Andrews:**<br>2-hour Written Examination = 70%, Coursework = 30% | | | |
| **Re-assessment pattern:** | 2-hour Written Examination = 100% | | | |
| **Module coordinator:** | Dr V M Popov | | | |
| **Module teaching staff:** | Dr Valentin Popov | | | |
| **Additional information from Schools:** | For guidance on module choice at 2000-level in Mathematics and Statistics please consult the School Handbook, at https://www.st-andrews.ac.uk/maths/current/ug/programmes/ | | | |