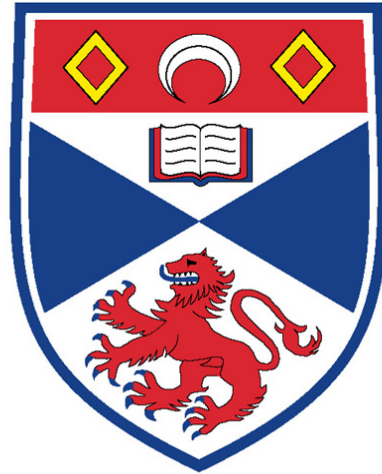


# School of Mathematics & Statistics



University  
of  
St Andrews

**Honours Handbook**

**2011–12**

# School of Mathematics & Statistics

## Honours Handbook

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# 1. Introduction

Welcome into the Honours programme in the School of Mathematics & Statistics.

This handbook is designed to provide undergraduate students in the Honours programme with essential information concerning the School and its undergraduate programmes.

You should also refer to the University Student Handbook. This resource can be found at the following link

<http://www.st-andrews.ac.uk/studenthandbook/>

and includes the following information:

- Advising, matriculation & Orientation Week
- Attendance & progression
- Careers & employability
- Diversity & equality
- Examinations & assessment
- Facilities & services
- Health
- IT facilities
- Library & information services
- Money matters
- Regulations & policies
- Scholarships, prizes, medals & awards
- Student feedback & representation
- Student organisations
- Support & guidance (including Student Services)
- Support for learning
- University information on dates, government & graduation

## 2. Programmes & Modules

### Advising Guidelines

Section 3 gives details on the requirements for each programme in the School. The choice of modules is not entirely free, though the range of possibilities is substantial. At matriculation in September you must have your programme of study approved by one of the Honours Advisers of Studies.

Special attention should be given to the prerequisites for the modules and the timetables (given in Section 4) may impose additional constraints on choice. Modules that appear in the same slot in the timetable cannot be taken in the same year, but in some cases you will be able to take one module in this slot in your Junior Honours year and one later in your Senior Honours year. It is advisable, as far as is possible, to divide your workload evenly over the semesters in your Honours years.

When you see your Adviser of Studies at the beginning of each year, you need only have your choices for that year submitted and approved. Nevertheless, at the start of your Honours programme *you should map out module choices for subsequent years* to ensure that you have a viable route though to the end of your degree programme which (i) fulfils the programme requirements and (ii) permits some flexibility in case you change your mind as to which modules you wish to take.

As with your subhonours studies, your Adviser of Studies can only approve changes to your module choices up to the end of Week 2 of the relevant semester. Any changes after that will require the approval of the appropriate Pro-Dean and this is usually only given in exceptional circumstances. Many students begin by attending more modules than required at the start of a semester, but drop excess choices before the end of Week 2.

### Programmes

There are many different types of programme running within the School of Mathematics & Statistics. They are summarised as follows (but full details appear in Section 3):

**M.Math. degree programme:** The M.Math. degree is a 600-credit programme of which 330 credits are at Honours level.

The majority of students follow the “fast track” route where they take 30 credits before entering Honours (usually MT3501 and MT3503 in the second-year of study) and then take 300 credits of Honours modules in two Honours years (an average of 150 credits per Honours year). For this route, only the Honours modules taken in the two Honours years are taken into account when calculating the final degree classification.

A smaller number of students follow the 5-year M.Math. programme (some do this by taking 2<sup>nd</sup>-year entry). The Honours programme consists of three years and a total of 360 credits (an average of 120 credits per Honours year) of which 330 credits must be Honours modules. (This permits a possibility of dipping-down to take 30 credits of subhonours modules.) For this route, all Honours modules taken during the three Honours year contribute to the degree classification.

**B.Sc./M.A. degree programme:** The B.Sc. and M.A. degrees are 480-credit programmes of which 210 credits are at Honours level. (This permits a possibility of dipping-down to take 30 credits of subhonours modules.) In a single Honours B.Sc. or M.A. degree, all modules should be taken from the School of Mathematics & Statistics. For a joint degree, 120 credits should be taken in each School.

**M.Phys. degree programme:** The M.Phys. Mathematics & Theoretical Physics degree is a joint degree run with the School of Physics & Astronomy. It is a 5-year programme consisting of 600 credits, though many students take 2<sup>nd</sup>-year Entry. The Honours programme consists of three years of study (360 credits of which 330 are Honours modules). The credits should be split equally between MT modules and PH modules.

## Module Prerequisites

In most cases, students are expected to have completed all the necessary prerequisites before taking a module. In exceptional cases, students who wish to take a particular module but do not have the stated prerequisite must seek the permission of their Honours Adviser of Studies and consult the lecturer of the module concerned.

## “Dip Downs”

Provided there is enough room in the degree requirements (see above comments about programmes and degree requirements in Section 3), students are allowed to *dip down*, that is, take subhonours modules, up to a total of 30 credits. There is usually only space for this in a B.Sc./M.A. or 5-year M.Math./M.Phys. programme. Students must have the specific permission from their Honours Adviser. Such a dip down should primarily be used to open up options in the degree programme (e.g., to take a 2000-level module that was not taken during Subhonours) and should only be taken in Junior Honours.

Note that only Honours modules taken during the Honours programme are used in the Classification Algorithm. Any dip-down module is not used in the calculation and so cannot be used as an “easy” option to inflate the grade-point average.

## **Honours projects**

During their final year of study, all students studying for an Honours degree in the School must take a supervised Honours project. Those enrolled on B.Sc. or M.A. programmes take MT4599 and submit a substantial written report. Those enrolled on M.Math. programmes take MT5999 which involves writing a substantial report and a short oral presentation. At 5000-level, students are expected to consult advanced textbooks and/or research papers. This also applies to students on the M.Phys. degree in Mathematics & Theoretical Physics, unless they take the equivalent 5000-level Honours project offered by the School of Physics & Astronomy.

Information on Honours projects are found in the project booklets which are distributed to students in April of their Junior Honours year. There are separate books for the B.Sc./M.A. and for the M.Math./M.Phys. programmes. The booklets for the current year are available at the following link:

<http://www-maths.mcs.st-andrews.ac.uk/documentation/>

### 3. Degree Requirements

The official regulations concerning each degree's programme requirements are found in the University Course Catalogue. This can be downloaded at the following link:

<http://www.st-andrews.ac.uk/coursecatalogue/ug/2011-2012/>

A summary of these requirements is as follows:

#### **M.Math. Mathematics:**

You must take:

- MT3501, MT3503 and MT3504
- At least one of MT3600, MT3601 and MT3606
- At least two of MT4003, MT4004, MT4509, MT4510 and MT4606
- At least one of MT3607, MT4111, MT4112 or MT5611
- A total of 120 credits of 5000-level including:
- At least 60 credits from MT5751–MT5753, MT5757–MT5759, MT5802, MT5806, MT5809, MT5810, MT5823–MT5830 and MT5990
- Honours project MT5999

#### **M.Math. Applied Mathematics:**

You must take:

- MT3501, MT3503, MT3504 and MT3601
- MT4005, MT4509 and MT4510
- At least one of MT4111, MT4112 or MT5611
- A total of 120 credits at 5000-level including:
- at least three of MT5802, MT5806, MT5809, MT5810 and MT5990
- Honours project MT5999

#### **M.Math. Pure Mathematics:**

You must take:

- MT3501, MT3503, MT3504 and MT3600
- MT4003 and MT4004
- At least one of MT4111, MT4112 or MT5611
- A total of 120 credits at 5000-level including:
- At least three of MT5823–MT5830 and MT5990
- Honours project MT5999

**M.Math. Statistics:**

You must take:

- MT3501, MT3606 and MT3607
- One of MT4527 and MT4608
- A total of 120 credits at 5000-level including:
- one of MT5701 and MT5831
- two of MT5751, MT5752, MT5757, MT5758 and MT5759
- MT5753
- Honours project MT5999

**B.Sc. or M.A. Mathematics:**

You must take:

- MT3501, MT3503 and MT3504
- At least one of MT3600, MT3601 and MT3606
- At least one of MT3607, MT4111 and MT4112
- Honours project MT4599

**B.Sc. or M.A. Statistics:**

You must take:

- MT3501, MT3606, MT4606, MT4607
- At least one of MT3607, MT4111 and MT4112
- At least two of MT4531, MT4608 and MT4609
- Honours project MT4599

**Joint B.Sc./M.A. Mathematics and another subject:**

You must take:

- At least two of MT3501, MT3503 and MT3504
- At least one of MT3600 and MT3601
- At least one of MT4111 and MT4112
- Honours project MT4599

**Joint B.Sc./M.A. Statistics and another subject:**

You must take:

- MT3501, MT3606
- At least two of MT3706, MT4531, MT4606–MT4609
- Honours project MT4599

**B.Sc./M.A. Mathematics *with* French, German, Geography, Russian or Spanish:**

You must take 180 credits of MT modules including:

- At least two of MT3501, MT3503 and MT3504
- At least one of MT3600 and MT3601
- At least one of MT4111 and MT4112
- Honours project MT4599

**M.Phys. Mathematics & Theoretical Physics:**

You must take the following MT modules:

- MT3501 and MT3504
- At least three 4000-level MT modules
- Honours project either MT5999 or PH5102
- At least a further 40 credits in 5000-level MT modules
- Normally 180 credits of MT modules

**M.Chem. Chemistry with Mathematics:**

You must take the following MT modules:

- Two of MT3501, MT3503 or MT3504
- MT3600 or MT3601
- Three further 3000- or 4000-level MT modules

## 4. Honours Timetables

### Honours Timetable for Session 2011–12

#### Semester 1

	<b>Mondays (odd), Wednesdays and Fridays</b>	<b>Mondays (even), Tuesdays and Thursdays</b>
9	MT3504 Differential Equations	MT4112 Computing in Maths MT4530 Population Genetics
10	MT3601 Fundamentals of Applied Maths MT5824 Topics in Groups	MT3600 Fundamentals of Pure Maths MT5825 Measure & Ergodic Theory
11	MT3606 Fundamentals of Statistics MT3802 Numerical Analysis MT5809 Advanced Fluid Dynamics	MT3706 Markov Chains and Processes MT4005 Linear & Non Linear Waves MT4516 Finite Maths
12	MT3503 Complex Analysis MT4501 History of Mathematics	MT3501 Linear Mathematics MT5810 Advanced Solar Theory MT5812 Global Capital Markets [M.Sci. Applied Quantitative Finance only]
2	MT5753 Statistical Modelling MT5757 Advanced Data Analysis	

#### Semester 2

	<b>Mondays (odd), Wednesdays and Fridays</b>	<b>Mondays (even), Tuesdays and Thursdays</b>
9	MT3607 Computing in Statistics MT5823 Semigroups	MT4003 Groups
10	MT4551 Financial Mathematics MT4606 Statistical Inference MT5701 Advanced Statistical Inference	MT4508 Dynamical Systems MT4519 Number Theory MT5758 Applied Multivariate Analysis
11	MT4510 Solar Theory MT5759 Knowledge Discovery & Datamining MT5826 Finite Fields	MT4004 Real and Abstract Analysis MT4509 Fluid Dynamics MT4537 Spatial Processes
12	MT3832 Mathematical Programming MT4526 Topology MT5802 Adv Analytic Techniques	MT4513 Fractal Geometry MT4531 Bayesian Inference MT5831 Advanced Bayesian Inference MT5806 Adv Computational Techniques MT5812 Global Capital Markets [M.Sci. Applied Quantitative Finance only]
2	MT5751 Estimating Animal Abundance MT5752 Modelling Ecological Dynamics	

## Provisional Honours Timetable for Session 2012–13

### Semester 1

	<b>Mondays (odd), Wednesdays and Fridays</b>	<b>Mondays (even), Tuesdays and Thursdays</b>
9	MT3504 Differential Equations	MT4511 Asymptotic Methods MT4607 GLMs & Data Analysis
10	MT3601 Fundamentals of Applied Maths MT4608 Sampling Theory MT5824 Topics in Groups	MT3600 Fundamentals of Pure Maths MT4613 Statistical Research in Practice [whole year, half-time] MT5825 Measure & Ergodic Theory
11	MT3802 Numerical Analysis MT4517 Rings & Fields MT4527 Forecasting MT5809 Advanced Fluid Dynamics	MT3606 Fundamentals of Statistics MT4005 Linear & Non Linear Waves
12	MT3503 Complex Analysis	MT3501 Linear Mathematics MT5810 Advanced Solar Theory MT5812 Global Capital Markets [M.Sci. Applied Quantitative Finance only]
2	MT5753 Statistical Modelling MT5757 Advanced Data Analysis	

### Semester 2

	<b>Mondays (odd), Wednesdays and Fridays</b>	<b>Mondays (even), Tuesdays and Thursdays</b>
9	MT4111 Symbolic Computation MT5611 Adv Symbolic Computation	MT3607 Computing in Statistics MT4003 Groups
10	MT4551 Financial Mathematics MT4613 Statistical Research in Practice [whole year, half-time] MT5830 Topics in Geometry & Analysis	MT4507 Classical Mechanics MT4514 Graph Theory
11	MT4510 Solar Theory MT4609 Multivariate Analysis MT5759 Knowledge Discovery & Datamining MT5826 Finite Fields	MT4004 Real and Abstract Analysis MT4509 Fluid Dynamics MT4531 Bayesian Inference MT5831 Advanced Bayesian Inference
12	MT3833 Utilities, Decisions & Invents MT5802 Adv Analytic Techniques	MT4515 Functional Analysis MT5758 Applied Multivariate Analysis MT5806 Adv Computational Techniques MT5812 Global Capital Markets [M.Sci. Applied Quantitative Finance only]
2	MT5751 Estimating Animal Abundance MT5752 Modelling Ecological Dynamics MT5829 Group Rings	

## 5. Assessment and Feedback

This section should be read in conjunction with the University Student Handbook, the relevant sections of the Senate Regulations and the Course Catalogue.

### Honours Grading Criteria

A student's overall performance in each module is reported on the University's 20-point grading scale. For Honours modules in the School of Mathematics & Statistics, the following criteria are applied.

<b>Degree Class</b>	<b>Grade Range</b>	<b>Criteria:</b> Students are expected to...
First Class	17, 18, 19 & 20	demonstrate a command and secure understanding of most of the material examined and show evidence of insight into the subject. Standard arguments and techniques will be presented accurately and solutions will be predominantly correct.
Upper Second	14, 15, 16	display a good knowledge and understanding of the examined material. The ability to apply standard techniques to a range of problems should be evident with some substantially correct solutions.
Lower Second	11, 12, 13	have some knowledge and understanding of the examined material, although areas of weakness will be evident. The ability to solve routine problems (or parts of problems) will be expected but little progress will be made with the more challenging aspects of the course.
Third	8, 9, 10	demonstrate an ability to apply some basic techniques to routine problems (or parts of problems) in a familiar context. Solutions to problems will often be largely incomplete or contain significant errors of understanding.
Pass	7	show that they have acquired some appreciation of the content of the course.
Fail (with right to reassessment)	4, 5, 6	A candidate who fails to demonstrate even a rudimentary appreciation of the course will not be awarded credit for the module.
Fail with no right to reassessment	1, 2, 3	

As a rough guide, the following percentages give guidelines as to the conversion of marks to grades around the boundaries for each degree class. These are adjusted for individual modules according to the difficulty as determined by a careful statistical analysis.

26%: Pass (Grade 7)

32%: Grade 8

46%: Grade 11

60%: Grade 14

80%: Grade 17

## **Absence from examinations**

A student who is absent from an examination without an adequate reason will be deemed to have failed the module and will forfeit the right to reassessment. A student who, due to certified medical illness, cannot attend an examination will be assessed for the module by a deferred assessment as determined by the Board of Examiners.

If you are unable to attend an examination, you should follow the usual University procedures as set out in the Student Handbook. You should also *immediately* contact the School's Examination Officer to ensure an appropriate deferred assessment can be arranged. You will be informed in due course whether such a deferred assessment is permitted, what form it will take and when it will take place.

The School website contains the following two documents:

[http://www.mcs.st-and.ac.uk/documentation/  
misssed\\_exam\\_advice.pdf](http://www.mcs.st-and.ac.uk/documentation/misssed_exam_advice.pdf)

[http://www.mcs.st-and.ac.uk/documentation/  
maths\\_exam\\_guidelines.pdf](http://www.mcs.st-and.ac.uk/documentation/maths_exam_guidelines.pdf)

These contain, respectively, advice for students on the procedures to follow if they miss an examination and a summary of how the School implements the University's policy on deferred assessments.

## **Reassessment**

Anyone who fails the assessment in an Honours module but retains the right to reassessment (i.e., a grade in the range 4.0–6.9) will be offered a reassessment. The format of this reassessment will be determined by the School and the student will be informed what is expected from them. There is no resit examination diet for Honours modules.

## **Examination feedback**

The School runs special sessions in the first week of each semester where students will have the opportunity to see their exam scripts. Timetables will be posted on the noticeboard in the Mathematical Institute at the start of each semester specifying where and when each exam feedback session will take place. There is no fee charged for this type of feedback.

## **Special circumstances**

If you feel that your performance in any assessment or examination has been adversely affected by, for example, ongoing illness, close family bereavement or other significant personal difficulties, you should bring this to the attention of the Director of Teaching and/or Examination Officer (in the case of performance in examinations) and make a formal request for S-coding.

Details of what this means can be found at:

[http://www.st-andrews.ac.uk/staff/policy/tlac/  
examinations/procedures/s-code/](http://www.st-andrews.ac.uk/staff/policy/tlac/examinations/procedures/s-code/)

In the specific case of examinations, for reporting special circumstances, requesting S-coding or reporting absence from an examination, contact the Examinations Officer in the first instance. If he is unavailable, contact the Director of Teaching.

## **6. Further Information**

### **Chartered Mathematician / Graduate Statistician status**

The School's Honours degree programmes have been approved by the Institute of Mathematics and its Applications (IMA) for the Education requirement of the status of *Chartered Mathematician*, CMath. For full details see:

<http://www.ima.org.uk/Membership/cmth.htm>

The School has obtained accreditation from the Royal Statistical Society (RSS) for its degree programmes in Statistics. Graduates can apply for the title of *Graduate Statistician*. Further details are available at:

<http://www.mcs.st-and.ac.uk/documentation/gradstat.shtml>

### **e-mail**

Information on a variety of topics will be sent to you by e-mail. You are reminded of the University regulation obliging you to activate your University e-mail account and to check it at least every two days.

### **English Language Support**

The English Language Training Centre runs an In-sessional English Language Support Service, which offers free language support to matriculated students who are non-native speakers of English. Support is offered in a range of forms, ranging from one-to-one tutorials to weekly workshops on writing, conversational speaking and grammar. This service may be of use to you at any stage of your degree programme, but may be of particular use when writing your Honours project. Further information is available at:

<http://www.st-andrews.ac.uk/elt/students/support/>

### **Ethics**

All research in all Schools of the University that involves data collection from questionnaires (etc.), interviews of, interactive investigation of, experimentation upon or demonstrations involving living human subjects, tissues and/or samples requires formal approval from the University Teaching and Research Ethics Committee (UTREC).

It is University policy that any research involving children under 18 should be reviewed by the UTREC Child Panel and that the researcher should hold an 'Enhanced Disclosure Scotland' (EDS) certificate. The principal supervisor is responsible for ensuring that the

student has received the appropriate ethical clearance from UTREC and the Child Panel prior to research commencing.

It is a requirement that any undergraduate Honours dissertation that requires ethical approval from UTREC has the letter or email of ethical approval bound into the appendix before submission.

## **Prizes & Medals**

The following prizes and medals are available to be awarded to students studying at Honours level:

- *Duncan Prize and Medal*: Awarded to the student(s) who completes the best Senior Honours dissertation(s) in Mathematics.
- *Duncan Prize (Applied Mathematics Senior Honours)*: Awarded to the best student of Applied Mathematics in the Senior Honours year.
- *Duncan Prize (Statistics Junior Honours)*: Awarded to the best student of Statistics in the Junior Honours year.
- *Duncan Prize (Statistics Senior Honours)*: Awarded to the best student of Statistics in the Senior Honours year.
- *Arthur Hinton Read Memorial Prize*: Awarded to the student(s) who shows greatest distinction in Pure Mathematics in the final Honours examinations.
- *D.E. Rutherford Prize*: Awarded to the best student(s) in the Junior Honours class in Applied Mathematics.
- *Alexander Stewart Prize*: Awarded to the best student in the Junior Honours class in Pure Mathematics.
- *Brian Shaw Memorial Prize*: Awarded to the best student in Numerical Analysis.
- *Sanderson Prize*: Awarded to the best overall final year student in the School.
- *Third level B.Sc. Mathematics medal*
- *Third level M.Math. Mathematics medal*
- *Third level B.Sc. Statistics medal*
- *Third level M.Math. Statistics medal*
- *Fourth level B.Sc. Statistics medal*
- *Fourth level M.Math. Mathematics medal*
- *Fourth level B.Sc. Statistics medal*
- *Fourth level M.Math. Statistics medal*

## **Reading Parties**

All Honours students taking any single or joint degree involving Mathematics or Statistics are required to give a short talk on a mathematical or statistical topic during Senior Honours. These talks are not used in any way for assessment. They are simply to give students an opportunity to exercise their ability to talk about their subjects before a non-critical and sympathetic audience.

There is a choice of settings for the talks:

- **A reading party at The Burn, Edzell**  
Talks will be interspersed with ample opportunities for leisure activities. This arrangement has been very successful for many years. Students will have to pay a contribution which will be £20 for two days (including travel, accommodation and full board). The School will pay the rest of the cost.
- **A meeting in St Andrews** (free)

These events will take place simultaneously, from the afternoon of Wednesday 16<sup>th</sup> to Friday 18<sup>th</sup> of November 2011 (Week 8 of the first semester). All Senior Honours students will be required to attend either the reading party or the meeting in St Andrews. There will be no Honours lectures during the Thursday or Friday of this week.

## **Staff-Student Council**

The Staff-Student Council meets once each semester. Representatives from both Junior and Senior Honours will be elected to this committee. Any student can raise any matter with their representative and ask for it to be discussed at the meeting. The committee is chaired by the School President. **Callum Arthur** has been elected School President for 2011–12 and he can be contacted via the e-mail address:

`mathspresident@st-andrews.ac.uk`

## **Vacation Scholarships**

Scholarships are available for students to spend some time in St Andrews during the summer between their Junior and Senior Honours years and work in an area of their choice. Support may be available either from the Carnegie Trust (for those with a sufficiently strong Scottish connection!), from the Nuffield or Cormack Foundations, from a URIP Scholarship (administered by the University) or from School funds.

Details will be circulated to appropriate students after the January examination diet.

## **Research in Mathematics and Statistics in St Andrews**

St Andrews has a very high rating in research. An opportunity will be given during students' Senior Honours year to discuss the possibility of staying on and doing postgraduate work in St Andrews. Members of staff are always happy to discuss the possibility for research in St Andrews or elsewhere.

## 7. Contacts (Extension numbers & University e-mail)

Head of School:	Prof N. Ruskuc	3787	mathshead
Deputy Head:	Prof T. Neukirch	3713	tn3
Director of Teaching:	Dr M. Quick	3752	mq3
Deputy Director of Teaching:	Dr D.H. Mackay	3760	dhm
Director of Research	Prof S.T. Buckland	1841	steve@mcs
Disabilities Coordinator	Dr G.E. Bell	3700	geb
School Examination Officer	Dr J.N. Reinaud	3742	jnr1
Health & Safety Officer	Dr I.B.J. Goudie	3705	ig

Honours Advisers:	JH	Dr I. De Moortel	3757	idm2
		Dr M. Neunhöffer	3807	mn50
		Dr L. Thomas	1801	lt5
SH	Dr A.P. Naughton	3712	an18	
	Dr A.N. Wright	3736	anw	

If you need your Adviser urgently and he or she is unavailable, please try one of the other Advisers for your year-group.