



The  
University  
Of  
Sheffield.

# **School Of Mathematics and Statistics**

## **Single and Dual Honours**

**Level Two Mathematics and Statistics Courses**  
**2017–2018**

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# 1 Introduction: Your Module Choices

This handbook gives details of the module choices you need to make for the coming session. Many of you will have taken all the mathematics and statistics modules available at Level 1; at Level 2 you need to select 120 credits from the 150 available, subject to various restrictions. Dual degree students have less choice and, again, the rules governing module choice are detailed in this handbook.

When considering which modules to take this year, you should always have in mind the effect of your choices on your options for Level 3 and beyond (even into your future career). The descriptions of individual modules at the end of this handbook list which Level 3 and 4 module have each Level 2 module as a prerequisite. You should discuss your module choices with your personal tutor before you complete module choice online.

The University of Sheffield runs a variety of single and dual degree programmes. The Single Honours programmes include Financial Mathematics and programmes which involve a year's study overseas. The three-year Bachelor of Science (BSc Mathematics) and four-year Master of Mathematics (MMath Mathematics) have the same syllabus for the first two years. The Level 3-4 handbook will carry details of the differences between the two programmes and how to switch from one to the other.

This handbook contains essential information to help you to make informed choices and will be useful throughout your second year. Please feel free to seek further information or advice from your personal tutor or any of your lecturers.

Prof. Neil Dummigan, Director of Teaching, SoMaS

## **2 Disclaimer**

**Every care has been taken to ensure the accuracy of the information in this booklet. To the best of our knowledge it was correct at the time at which it was prepared. The School of Mathematics and Statistics cannot accept responsibility for any errors which could occur should there be any further modification of the Regulations.**

### 3 Administrative Information

#### Dates of Semesters

##### Session 2017–2018

2017

25 September – 16 December Autumn Semester Teaching Period (12 weeks)

2018

15 January – 3 February Autumn Semester Examinations (3 weeks)

5 February – 24 March Spring Semester, First Teaching Period (7 weeks)

16 April – 19 May Spring Semester, Second Teaching Period (5 weeks)

21 May – 9 June Spring Semester Examinations (3 weeks).

#### Choice of Modules

As in your first year, most modules in mathematics will involve two lecture hours per week. There will generally be an associated tutorial or practical hour each fortnight. Some Maths courses at Level 2 last for one semester and will be examined at the end of that semester: such a course is a *10-credit module* (and is reckoned to involve a total of 100 hours work), except for MAS211 (Advanced Calculus and Linear Algebra) which is a *20-credit module* (and involves a total of 200 hours work). Several modules are 20 credits and run throughout both semesters - these will be examined at the end of the year. MAS279 (Career Development Skills) is a 10-credit course but runs over both semesters. All students need to take *120 credits* at the appropriate level for each year of the degree course. If you are registered for a dual honours degree then in your second year you will normally take 60 credits for each half of the dual (check the regulations for your dual degree - <http://www.sheffield.ac.uk/calendar/regs>).

Online module choice in 2017 runs from 2 – 19 May. You should ensure that you submit your choice of modules during this period. Details of the operation of online module choice will be given separately.

The choice of Level 2 modules which you make in May 2017 will be regarded as provisional. You will have an opportunity, when you return in September, to modify your choice in the light of your examination results.

#### Unrestricted Modules

The term unrestricted means you are free to choose either a mathematics or a statistics module or one outside the School of Mathematics and Statistics. The marks from such modules are used in assessing your final degree classification.

It is your responsibility to determine the prerequisites and timetable for any non-mathematical module and to obtain academic approval from the department which owns the module. The timetable for 2016–2017 is the best available guide, but this is subject to change for 2017–2018, and choices may need to be changed when the final timetable for 2017–2018 is known in September.

Note that some mathematics and statistics modules cannot be taken with certain modules from other departments; details are included in the information on individual modules.

You may not generally choose Level 1 modules as unrestricted modules at Levels 2, 3 or 4; as an exception, modules from the Modern Languages Teaching Centre (MLTC) may be permitted. You are also advised that the School will not permit its students to take any mathematics module from another University department as an unrestricted module at Level 2, 3 or 4.

## **Change of Choice of Modules**

The University allows you to change your choice of modules in the first three weeks of any semester. *If you do change your options early in a semester it is your responsibility to ensure not only that your timetable for that semester works but also that you will have suitable options available in future semesters for you to be able to complete your degree* (for example, you will have covered all prerequisites for your future choices). Change of choice of modules is done online.

The system can be accessed via MUSE. Log in as normal and go to the My Services tab then Module Add/Drop for the link to the online system. Follow the simple instructions on screen. Your core modules will already be listed when you access the online add/drop screens. Once you have entered and submitted your request to add and drop optional modules, your department will check and approve, or decline, your choices. You will receive an automated email, confirming when your record has been updated. If there are any problems with your choices, you will receive an email from your department advising you what action to take.

The online system is not available to distance learning students or to students taking modules in the Institute of Lifelong Learning. They will need to use the paper 'Add-Drop' form. Add-Drop forms are available from the Student Services Information Desk (SSiD) in the Union of Students, and can also be downloaded from the SSiD web site at <http://www.shef.ac.uk/ssid/forms>. When you have completed the form, you must have it signed, to signify the School's approval, by the Programme Leader for your degree programme – see the "Making changes" section of <http://shef.ac.uk/maths/current/admin>. The form should then be handed in at Hicks F10.

You can access the record of your choice of modules on central records. You must check that this record is correct in the fourth week of each semester. If it is not you will need to make the appropriate changes online or using an Add-Drop form.

## **Progression into the Second Year**

The rules for progression are given below and apply to the January and June exams taken together:

- (i) You may proceed to the second year without any resit if you have obtained 120 credits in your first year courses.
- (ii) If you have fewer than 120 credits but at least 100 credits and you have no mark below 30, then progress to Year 2 is at the discretion of the Board of Examiners; this is unlikely to be given in the event that a core module has been failed.

- (iii) If you have fewer than 100 credits or have a mark below 30, then you will be required to resit **ALL** your failed modules.
- (iv) If you have one or more 'Not Assessed' or 'Not Completed' modules, you will be required to resit these and any failed modules.

Note that for any Level 1 module you are only allowed TWO resit attempts (not including cases for which you are 'Not Assessed'). This includes any attempts made during subsequent academic years.

If you are required to resit any examinations, you will be informed of the arrangements by the University at the same time as you receive your official examination results via MUSE from Student Services which will be some time in July. Usually you will be required to pay a fee. If you are not obliged to resit a failed module but still wish to do so then you must either go to or write to the Examinations Office, and ask to register for the resit examination and pay the fee. A conceded pass (denoted by PC) automatically gives a candidate the right to proceed to the next level without taking further examinations.

If you wish to retake failed modules you should follow the instructions at <http://www.sheffield.ac.uk/ssid/exams/reassessment>. Any international student who wishes to take August 2018 resit examinations in their home country should apply to do so by the end of the Semester 2 examination period 2018. Further details can be found at <http://www.sheffield.ac.uk/ssid/exams/exabrinf>.

*The maximum score that can be credited as a result of a resit examination is 40.*

Students on the MMath Mathematics with a Year Abroad must obtain, at the first attempt, an average of at least 59.5 at Level 1 to be permitted to progress to Level 2 of that programme. Those who do not meet this requirement will be transferred to the MMath Mathematics.

Students on the MMath Mathematics with Study in Europe or one of the three MMath with Spanish/French/German Language degrees must obtain, at the first attempt, an average of at least 59.5 on the MAS modules at Level 1 to be permitted to progress to Level 2 of those programmes. Those who do not meet this requirement will be transferred to the BSc of their programme, to the BSc Mathematics with Study in Europe, or to the MMath Mathematics or BSc Mathematics.

Students on the MMath/BSc Mathematics with Study in Europe or one of the three MMath with Spanish/French/German Language degrees must normally obtain an average of at least 55 in the MLT units at Level 1 to be permitted to progress to Level 2 of those programmes. Those who do not meet this requirement will be transferred to the MMath Mathematics or BSc Mathematics.

### **Progression from the Second into the Third Year**

Since your Level 2 results contribute to your overall degree classification (unlike your Level 1 results), the rules for progression from Level 2 into Level 3 are slightly more involved.

For students on **BSc** degree programmes, the rules for progression from Level 2 to Level 3 are given below, and apply to the January and June exams taken together:

- (i) You may progress to Level 3 without any resit if you have obtained 120 credits in your

Level 2 modules.

- (ii) The Examiners have discretion to decide whether students who have been awarded 100 or 110 such credits may be deemed to have passed at Level 2 and permitted to proceed to Level 3. Permission to proceed in these circumstances is *NOT* automatic.

If you have obtained at least 100 credits but have failed one or two modules at Level 2, then you are *strongly advised to resit* any failed modules (even if the Examiners permit you to progress), because in all cases there is a minimum number of credits that must be obtained (over the second and subsequent years combined) if the degree is to be awarded.

- (iii) If you have only *90 or fewer credits* then you must resit *ALL* the modules you have failed.

Note that for any Level 2 module you are only allowed ONE resit attempt (not including cases for which you are 'Not Assessed'). If you are unable to pass Level 2 after the maximum number of attempts at each module, you will not be able to continue with your degree.

If you wish to retake failed modules you should follow the instructions at <http://www.sheffield.ac.uk/ssid/exams/reassessment>. Any international student who wishes to take August 2018 resit examinations in their home country should apply to do so by the end of the Semester 2 examination period 2018. Further details can be found at <http://www.sheffield.ac.uk/ssid/exams/exabrinf>.

*The maximum score that can be credited as a result of a resit examination is 40.*

Students on an **MMath** programme must, at the first attempt, obtain 120 credits at Level 2 with an average of at least 59.5 to be permitted to progress to Level 3 of the same programme; those who do not meet this requirement will be transferred to a BSc programme. For students on the MMath Mathematics with Study in Europe or one of the MMath with Spanish/French/German Language degrees this average is calculated only for the MAS modules.

Students on the MMath/BSc Mathematics with Study in Europe or one of the MMath/BSc with Spanish/French/German Language degrees must normally obtain an average of at least 55 in the MLT units at Level 2 to be permitted to progress to Level 3 of those programmes. Those who do not meet this requirement will be transferred to the MMath Mathematics or BSc Mathematics.

## **Degrees with Employment Experience**

The University of Sheffield recognises that both students and employers value the benefits that structured work experience can provide as part of a university degree programme. With this in mind, you can now choose to undertake a Degree with Employment Experience by participating in a year-long work placement. Students typically return from their placement year confident and highly-motivated, often with a graduate job lined up for after their degree.

Under this scheme, you spend your penultimate year (i.e., the year between Levels 2 and 3 of a three year degree, or between Levels 3 and 4 of a four year degree) in employment. This would then increase the length of your degree by a year. If successful, you will get a degree, the title of which bears the suffix 'with Employment Experience'.

The placement should involve work connected with your degree programme or with your proposed future employment. We recognize that many mathematics graduates go into graduate



jobs which do not use their degree directly, so a placement with, for example, an accountancy firm would be acceptable even if it did not involve the use of university-level mathematics. Students need to find their own company placement and the SoMaS Careers Officer, who administers the SoMaS scheme, should validate the placement. Mathematics students are very much in demand for year-long placements, and many companies with interesting jobs for mathematicians, but who do not provide summer placements, are willing to invest the training effort in year-long placements.

You will need to start planning for this a year before your placement starts. You are responsible for getting the placement, but the Careers Service will assist. You will need the approval of the department (or departments in the case of dual degree students), and when the placement is arranged, you will transfer to the appropriate 'with Employment Experience' degree programme. Entry to these programmes is only by transfer from normal degree programmes, which is why they do not appear on UCAS forms.

Your placement will be assessed on a pass or fail basis. It will not count towards your final degree classification; however, you will need to pass the formal assessment and complete the placement year in order to gain the amended degree title and graduate with a degree with employment experience. You will be required to complete and submit:

- Placement Journal (25%) – skills based journal, completed whilst on placement.
- Analytical Report (50%) – submitted at the end of the placement year, approximately 3000 words focusing on either: a critical evaluation of a management or technical issue that you have identified during your placement, or a critical evaluation of a project you have worked on during your placement.
- Presentation (25%) – upon your return to University you will be required to give a short presentation to your peers focusing on the skills you have developed during the placement year.

For further details, see <http://www.sheffield.ac.uk/placements/students/year>.

## **Avoiding Collusion and Plagiarism**

This has been extracted from the University's *Guidance for Students on the Use of Unfair Means*, available from the SSiD web page at <http://www.sheffield.ac.uk/ssid/exams/plagiarism>.

The University expects its graduates to have acquired certain attributes. Many of these relate to good academic practice.

Throughout your programme of studies at the University you will learn how to develop these skills and attributes. Your assessed work is the main way in which you demonstrate that you have acquired and can apply them. Using unfair means in the assessment process is dishonest and also means that you cannot demonstrate that you have acquired these essential academic skills and attributes.

### What constitutes unfair means?

The basic principle underlying the preparation of any piece of academic work is that the work submitted must be your own work. **Plagiarism, submitting bought or commissioned work, double submission (or self plagiarism), collusion and fabrication of results** are not allowed because they violate this principle (see definitions below). Rules about these forms of cheating apply to all assessed and non-assessed work.

- (i) **Plagiarism (either intentional or unintentional)** is using the ideas or work of another person (including experts and fellow or former students) and submitting them as your own. It is considered dishonest and unprofessional. Plagiarism may take the form of cutting and pasting, taking or closely paraphrasing ideas, passages, sections, sentences, paragraphs, drawings, graphs and other graphical material from books, articles, internet sites or any other source and submitting them for assessment without appropriate acknowledgement.
- (ii) **Submitting bought or commissioned work** (for example from internet sites, essay “banks” or “mills”) is an extremely serious form of plagiarism. This may take the form of buying or commissioning either the whole piece of work or part of it and implies a clear intention to deceive the examiners. The University also takes an extremely serious view of any student who sells, offers to sell or passes on their own assessed work to other students
- (iii) **Double submission (or self plagiarism)** is resubmitting previously submitted work on one or more occasions (without proper acknowledgement). This may take the form of copying either the whole piece of work or part of it. Normally credit will already have been given for this work.
- (iv) **Collusion** is where two or more people work together to produce a piece of work, all or part of which is then submitted by each of them as their own individual work. This includes passing on work in any format to another student. Collusion does not occur where students involved in group work are encouraged to work together to produce a single piece of work as part of the assessment process.
- (v) **Fabrication** is submitting work (for example, practical or laboratory work) any part of which is untrue, made up, falsified or fabricated in any way. This is regarded as fraudulent and dishonest.

### How can I avoid the use of unfair means?

To avoid using unfair means, any work submitted must be your own and must not include the work of any other person, unless it is properly acknowledged and referenced.

As part of your programme of studies you will learn how to reference sources appropriately in order to avoid plagiarism. This is an essential skill that you will need throughout your University career and beyond. You should follow any guidance on the preparation of assessed work given by the academic department setting the assignment.

You are required to **declare that all work submitted is entirely your own work**. Many departments will ask you to attach a declaration form to all pieces of submitted work (including work submitted online). Your department will inform you how to do this.

If you have any concerns about appropriate academic practices or if you are experiencing any personal difficulties which are affecting your work, you should consult your personal tutor, supervisor or other member of staff involved.

The following websites provide additional information on referencing appropriately and avoiding unfair means:

The **Library** provides online information literacy skills help <http://www.sheffield.ac.uk/library/infolit/index>

The **Library** also has information on reference management software <http://www.shef.ac.uk/library/refmant/refmant.html>

The **English Language Teaching Centre** operates a **Writing Advisory Service** through which students can make individual appointments to discuss a piece of writing. This is available for all students, both native and non-native speakers of English. <http://www.shef.ac.uk/eltc/languagesupport/writingadvisory/index>

### **What happens if I use unfair means?**

Any form of unfair means is treated as a serious academic offence and action may be taken under the Discipline Regulations. For a student registered on a professionally accredited programme of study, action may also be taken under the Fitness to Practise Regulations. Where unfair means is found to have been used, the University may impose penalties ranging from awarding no grade for the piece of work or failure in a PhD examination through to expulsion from the University in extremely serious cases.

### **Detection of Unfair Means**

The University subscribes to a national plagiarism detection service which helps academic staff identify the original source of material submitted by students. This means that academic staff have access to specialist software that searches a database of reference material gathered from professional publications, student essay websites and other work submitted by students. It is also a resource which can help tutors and supervisors to advise students on ways of improving their referencing techniques. Your work is likely to be submitted to this service.

For further information, see <http://www.shef.ac.uk/ssid/procedures/discipline> and [http://www.shef.ac.uk/ssid/procedures/grid\\_discipline](http://www.shef.ac.uk/ssid/procedures/grid_discipline)

## Failure to Comply with Assessment Requirements

Failure to attend an examination without adequate reason will result in a grade of 0 being awarded. If you have good reason to miss an exam due to circumstances beyond your control, you need to fill in an Extenuating Circumstances Form: <http://www.sheffield.ac.uk/ssid/forms/circs>. If the circumstances are medical and you are registered with the University Health Service (UHS), note what it says about filling in the electronic (or mobile app) version of the form and submitting it for UHS to add the documentation, and also that the doctor needs to have seen you while you are ill. (See the explanatory notes for this and more.) In all other cases, please take the completed form and any other supporting documentation to SoMaS Reception in F10 as soon as you reasonably can. If you become ill during an exam, please tell an invigilator.

Excuses such as misreading the timetable or oversleeping are **not** acceptable as reasons for absence, but any student who misses an exam for such a reason should report to SoMaS Reception in F10 as soon as possible.

All unauthorized material (such as revision notes, books, etc) must be left outside the examination hall. This includes notes on scraps of paper. Students should ensure that their pockets are empty of such notes before entering the examination room. Students must also ensure that there are no written notes on their hands when they enter the examination hall and must not write on their hands during an examination. For further details of examination procedures, students should consult the regulations on examinations: [http://calendar.dept.shef.ac.uk/calendar/06f\\_gen\\_regs\\_as\\_to\\_exams.pdf](http://calendar.dept.shef.ac.uk/calendar/06f_gen_regs_as_to_exams.pdf)

It is recommended that any student with personal circumstances continuing from the previous semester submits a new Extenuating Circumstances Form, to keep us up-to-date and to ensure that their case is not overlooked. Any student with a disability or chronic medical condition, for whom the Disability and Dyslexia Support Service has produced a learning support plan, need not keep filling in forms to inform us of their condition. In fact, disabilities and chronic medical conditions are not normally regarded as extenuating circumstances, the emphasis being on providing support to help students to do the best they can. However, it may be appropriate to submit an Extenuating Circumstances Form if there is a particular flare-up or complication at a time affecting exams.

Failure to hand in assessed coursework on time without good reason will result in the imposition of a penalty in accordance with the University's Penalties Policy. Late submission of a major piece of assessed coursework, such as a project dissertation, will result in the deduction of 5% of the total mark awarded for each of the first 5 'University Working Days' by which the submission is late; work submitted even later than that will receive a mark of 0. For pieces of assessed coursework that contribute only a small percentage of the overall assessment, the Faculty of Science has given the School approval to operate a policy of 'zero tolerance', under which any late submission receives a mark of 0.

Module leaders have the power to award dispensations in cases where the lateness was caused by certifiable medical problems or severe personal circumstances; requests for such dispensations should be made as soon as the problem is known, in writing or by e-mail to the module leader; students making such requests must also complete an 'Extenuating Circumstances Form' and hand it in at SoMaS Reception (F10).

## Statement on Assessment Criteria

Typical examinations in SoMaS involve several questions, each of which will have components of at least some of the following types: (i) explanation of theory developed in the module; (ii) standard problems solvable using methods seen in the module; (iii) more difficult unseen problems requiring knowledge of the module but also requiring some original thought. Students' scripts are assessed using a strict and detailed marking scheme, usually based on method and accuracy marks. The primary criterion is correctness, whether it be of calculation, method or explanation.

This produces a set of 'raw marks' which is then scaled, using the judgement of the examiner, to the University's 100-point reporting scale, which corresponds to degree classifications using the following rule:

70–100	:	Class I
60–69	:	Class II(i)
50–59	:	Class II(ii)
45–49	:	Class III
40–44	:	Pass.

If an examiner feels that a mark of 30% on the exam is deserving of a pass, then 30% will be scaled to 40 on the University's scale; there are similar points at each of the classification boundaries. The scaling is subjected to a central School scrutiny process involving the past record of each student who is registered for the module and for whom there are no abnormal circumstances.

Examination papers, including the past papers to which the students have access in advance, carry the distribution of marks between parts of questions.

The internal checker for each examination paper and the appropriate External Examiner are provided with copies of the module's objectives/learning outcomes, and these are also distributed to students.

The School operates a scheme whereby marking is checked for accuracy. In addition, on each paper at Level 2 and above selected scripts, usually from the border bands between classifications, are sent to the appropriate External Examiner. Before the Final Year Examination Board Meeting, the External Examiners have the opportunity to look at all final year scripts, and generally look at those of candidates that are very close to borderlines, as well as other special cases.

All examination marking and all discussion at formal Examination Board Meetings is conducted anonymously, that is, students are identified only by their registration numbers.

Students have the right to see their examination scripts after they are marked; this generally takes place around Week 3 of Semester 1 (for the previous session's June exams) and Week 6 of Semester 2 (for the January exams).

## Award of Degrees

In order to qualify for the award of a degree, students have to obtain a specified number of credits. Also, the 'level' of the credits is important. In what follows, 'Level 3 modules' refers to courses MAS3\*\*, normally (but not always) taken during Level 3, and 'Level 4 modules' refers to courses MAS4\*\*, normally (but not always) taken during Level 4. The pass mark for Level 3 modules is 40, and the pass mark for Level 4 modules is 50.

In order to be awarded an **honours degree of BSc**, you must obtain at least **200 credits**, of which at least **90 must be of Level 3 modules**, out of the overall **240 credits** possible on the second and third years combined.

This is a minimum requirement below which you cannot obtain an honours BSc degree: the granting of a pass degree (that is, without honours) to a student with fewer than 200 credits (or with fewer than 90 credits of Level 3 modules) is always at the discretion of the examiners, and requires the specific concurrence of the External Examiners. A minimum of 180 credits is required for the award of a pass degree.

Candidates for a BSc degree who have completed, and submitted themselves for assessment on, 120 credits at each of Levels 2 and 3 but have not been recommended for the award of a degree may enter for a subsequent examination for each failed module on one further occasion, but will only be eligible for the award of a BSc pass degree.

In order to be awarded an **honours degree of MMath**, you must take **120 credits** of Level 4 modules across Levels 3 and 4. You must obtain at least **320 credits**, of which at least **90 must be Level 4 modules**, out of the overall **360 credits** possible on the second, third and fourth years combined, provided the Examiners recommend a class II(ii) degree or above. (Classification of honours degrees is discussed in [the next subsection](#).) Candidates whom the Examiners would place in Class III will be recommended for the award of a BSc degree with honours; candidates whom the Examiners deem to be worthy of a pass shall be recommended for the award of a BSc pass degree.

In particular, **in order to be awarded an MMath degree, you must pass at least 90 credits of Level 4 modules.**

Candidates for an MMath degree who have completed, and submitted themselves for assessment on, 120 credits at each of Levels 2, 3 and 4 but have not been recommended for the award of a degree may enter for a subsequent examination for each failed Level 4 module on one further occasion, but will only be eligible for the award of a BSc pass degree.

## Classification of Honours Degrees

Under the current Regulations, for each module you complete you will be awarded a mark on the University 100-point scale. This subsection describes the way that these marks contribute to the final degree classification.

The full details are available from the the University's General Regulations for First Degrees at [http://calendar.dept.shef.ac.uk/calendar/06d\\_gen\\_regs\\_for\\_first\\_degrees.pdf](http://calendar.dept.shef.ac.uk/calendar/06d_gen_regs_for_first_degrees.pdf). Here are the main points.

*All* your module marks (including any for which the mark is a fail) for years 2, 3 (and 4 if appropriate) are averaged, but Level 2 marks are given half the weight of Level 3 and Level 4

marks.

For students on the MMath Mathematics with Study in Europe or Year Abroad programmes or the MMath Mathematics with Spanish/French/German Language programmes, Level 2 and Level 3 marks are given half the weight given to Level 4 marks. (The year abroad does not count towards the classification for the corresponding BSc degrees, although a pass in the year abroad is required to remain on the programme.)

Then two calculations are made.

**Calculation 1** (the weighted mean grade) is made in accordance with the following principles:

- where a candidate's weighted mean grade is of a value indicated in the first column, the outcome of Calculation 1 shall be the corresponding class indicated in the second column

69.5 or higher	: Class I
59.5 or higher	: Class II(i)
49.5 or higher	: Class II(ii)
44.5 or higher	: Class III
39.5 or higher	: Pass;

- where a candidate's weighted mean grade falls within the band indicated in the first column, the outcome of Calculation 1 shall be the borderline to the corresponding class indicated in the second column

68.0–69.4	: Class I
58.0–59.4	: Class II(i)
48.0–49.4	: Class II(ii)
43.5–44.4	: Class III
38.0–39.4	: Pass.

**Calculation 2** (the distribution of grades) is made in accordance with the following principles:

- where the best half of a candidate's weighted grades are of a value indicated in the first column, the outcome of Calculation 2 shall be the corresponding class indicated in the second column

69.5 or higher	: Class I
59.5 or higher	: Class II(i)
49.5 or higher	: Class II(ii)
44.5 or higher	: Class III
39.5 or higher	: Pass;

- where the best five twelfths of a candidate's weighted grades are of a value indicated in the first column, the outcome of Calculation 2 shall be the borderline to the corresponding class indicated in the second column above.

In recommending the *class of degree* to be awarded to each candidate, the Examiners shall take into account the outcomes of Calculations 1 and 2 in accordance with the following principles:

- where one Calculation places the candidate in one class and the other Calculation places the candidate in either the same class or the borderline to the same class, the candidate shall normally be recommended for the award of a degree of that class;
- where one Calculation places the candidate in one class, and the other Calculation places the candidate in the borderline to the class immediately above, the candidate shall normally be recommended for the award of a degree of the lower class;
- where one Calculation places the candidate in one class, and the other Calculation places the candidate in the class immediately below, the candidate shall be considered as being in the borderline to the higher class, and the class of the degree to be recommended by the Examiners shall normally correspond to the class indicated by the weighted mean of the grades at the final Level of study;
- where both Calculations place the candidate in the same borderline, the class of the degree to be recommended by the Examiners shall normally correspond to the class indicated by the weighted mean of the grades at the final Level of study;
- where one Calculation places the candidate in one class, or borderline to a class, and the other Calculation places the candidate in another class, or borderline to a class, neither immediately above nor below, the Examiners shall recommend the classification which, having regard to all the evidence before them, best reflects the overall performance of the candidate.

Note that the Examiners are free to vary from the formal rules for any candidate where there is strong evidence to support such a decision. In consideration of such evidence, the Examiners will seek guidance from the School's External Examiners. Also, if a candidate is awarded a classified degree (I, II(i), II(ii), or III) then the degree is an **honours** degree irrespective of whether the candidate has any failed modules.

There is a University appeals procedure, full details of which are displayed on the student notice boards listed later in this handbook. They may be also found on the web at <http://www.shef.ac.uk/ssid/procedures/grid>.



## **Prizes**

The following prize regulations include prizes that may be awarded to Level 2 students.

### **Sir Edward Collingwood Prizes in Probability and Statistics**

This prize was founded in 1970 by the Applied Probability Trust in memory of Sir Edward Collingwood, who was Chairman of the Trust from its inception in 1963 to 1970, and President of the London Mathematical Society in 1970.

1. Frequency of award: Two annually.
2. Value of prizes: £50 each.
3. Eligible candidates: (a) Students who have completed two years of a programme of study containing, in the opinion of the Head of School, a substantial amount of Probability and/or Statistics. (b) Students who are taking the Final Examination for the programmes of study in Mathematics and Statistics.
4. Assessor: The Head of School.
5. Criteria for assessment: The best overall performance in Probability and/or Statistics (not necessarily the highest marks in any examination).

### **T M Flett Prizes in Pure Mathematics**

These prizes were founded in 1977 from subscriptions in memory of Professor T M Flett, member of staff of the Department of Pure Mathematics from 1967 to 1976.

1. Frequency of award: One annually.
2. Value of prizes: £75
3. Eligible candidates: Students who are taking the Level 2 Examination for a programme of study which includes Pure Mathematics.
4. Assessor: The Head of School.
5. Criteria for assessment: The appropriate examination considered in conjunction with course work carried out during the year.

### **The Collins Prize in Applied Mathematics**

This prize was established in 2016 through the generosity of William Derek Collins, Professor of Applied Mathematics from 1974 to 1987. It was made in honour of his parents, William and Winifred, for the support they gave him as an undergraduate.

1. Frequency of award: One annually
2. Value of prize: £75
3. Eligible candidates: Students who have completed two years of a programme of study containing, in the opinion of the Head of the School of Mathematics and Statistics, a substantial amount of Applied Mathematics.
4. Assessor: The Head of the School of Mathematics and Statistics

5. Criteria for assessment: The best overall performance in Applied Mathematics (not necessarily the highest marks in any examination).

## 4 Help, Guidance and Information

### Personal Tutors

Students normally continue with the same personal tutor as in the first year. If you envisage any problem with this then please see the Senior Tutor; it is possible for you to request a change of personal tutor. Second-year students should go to see their tutors each semester, at the beginning of Semester 1 and in Semester 2 when the Semester 1 examination results have been published. However, questions about work concerning particular modules should generally be put to the lecturers concerned. All students are encouraged to keep in touch with their tutors who are then in a good position to act as referees when the time for job applications arrives.

There is in addition a Tutor for Women Students, who is available to discuss problems of a more personal or confidential nature. The Senior Tutor acts as a Tutor for Men Students.

If you have any difficulty in contacting your personal tutor, or he or she is unable to solve any problem or answer any query, then you can approach the Senior Tutor or other designated staff members (see the list at <http://www.maths.dept.shef.ac.uk/math/contact.php>).

Please make sure that your home address is correct on MUSE before you leave at the end of Semester 2. You will have the same University e-mail address in 2017–2018 as this year. You should make sure your tutor knows your e-mail address, and you should check for e-mail messages when you return to Sheffield in September.

### Higher Education Achievement Report

The University has introduced a new kind of degree transcript for all new undergraduate students: the Higher Education Achievement Report or 'HEAR'. The HEAR provides a comprehensive record of your university achievements and it recognises your extra-curricular achievements as well as your academic learning. It can be used to help you identify your strengths, and to plan how to build on these to achieve your goals, and it provides employers and others with evidence of your university learning and experiences.

Find out more by visiting the HEAR website <http://www.sheffield.ac.uk/ssid/hear>

The Sheffield Graduate Award (SGA) counts towards your HEAR, and recognises valuable skills and experience gained outside of your degree course. For more details see <http://www.sheffield.ac.uk/thesheffieldgraduateaward>.

### Student Advice Centre, SSiD, Counselling Service, University Health Service

The Student Advice Centre and Student Services Information Desk (SSiD) provide assistance on a wide range of problems. Specifically, they provide advice on housing, finance, problems about harassment, and help to international students; they also help with academic matters. The Counselling Service and the University Health Service are also there to help you; strict confidence is always observed.

## 301

301: Student Skills and Development Centre offers a range of services for all students:

- Maths and Statistics Help
- Academic Skills workshops
- Study Skills Sessions
- Specialist Dyslexia/SpLD tutorial Service
- Languages for All programme
- Writing Advisory Service

301 also offers an Academic Skills Certificate which can be included in your Higher Education Achievement Report (HEAR). For more details see <http://www.sheffield.ac.uk/ssid/301/services>

### What to do if things are not going right

Obviously, the School hopes that all of you will enjoy your degrees and your time in Sheffield. But we know that, for various reasons, some of you may have problems which may affect your studies, and that at times there are things which need to take precedence over your work.

Your first port of call within SoMaS should be your Personal Tutor, or the Senior Tutor. We may not be qualified to give you the help that you may need, but the University will have people who can, and your tutor can direct you to the appropriate help. There is a Student Advice Centre next to the Student Services Information Desk in the Student Union, who have a lot of leaflets and can also help advise you. See <http://www.sheffield.ac.uk/ssid/sos> for a range of services offered by the University.

For any issues that affect assessment, you need to complete an Extenuating Circumstances Form – see page 11.

If issues persist, or are very serious, you may want to take Leave of Absence, and return at a later date. For this, you will need to complete a Change of Status Form for Leave of Absence. Some issues are discussed at <http://www.shef.ac.uk/ssid/change-of-status/leave>; for example, there are likely to be some financial considerations, and overseas students may face visa issues. If medical issues are the cause of the request, you will need to satisfy the University that you have recovered sufficiently before you return. Any forms which affect your “status” will require the signature of the Senior Tutor; they should then be handed in at SoMaS Reception (F10) so that we can make a copy, before being sent to Taught Programmes Office.

All forms can be downloaded from <http://www.sheffield.ac.uk/ssid/forms>; paper copies of all these are also available from SoMaS Reception (F10).

### Nightline

Nightline is the University of Sheffield’s confidential listening and information telephone service. It is run by trained student volunteers, and operates from 8.00pm until 8.00am every night during term time. It offers students everything from the phone number of a twenty-four hour

taxi company, to examination dates, times and locations, and information about many issues that can be encountered within student life. It provides a vital support network for all students, so whatever you need to say, Nightline is listening, and the service can be called free from phones in halls of residence. If you think you would like to volunteer for Nightline, contact [nightline@shef.ac.uk](mailto:nightline@shef.ac.uk) for more information.

## **The Careers Service**

The Careers Service (whose web page is at <http://www.shef.ac.uk/careers/>) offers an excellent provision, backed up with a wealth of experience, to help students decide on a career and to find employment after graduation. You could also talk to the School's Careers Officer, listed on <http://www.maths.dept.shef.ac.uk/math/contact.php>.

Making good career decisions will involve you in thinking about your qualities and inclinations. The Careers Service provide resources on career planning, CV writing, job seeking, interview skills, and much else. They also organise an extensive programme of careers events, which provides valuable opportunities to meet prospective graduate employers, and find out what skills they are looking for. Similar skills sessions are also offered by the University's Enterprise Zone (<http://enterprise.shef.ac.uk/>).

Graduates from our degrees go on to a wide range of careers. Many go on to careers for which a mathematical degree is very important; others go on to careers where degree-level education is important, though not necessarily using mathematical skills. Mathematics graduates have a strong range of transferable skills, including excellent numeracy and analytical problem solving skills. Your degrees often make use of computer packages, and these IT skills are often adaptable to IT requirements of employers. Employers also value highly the ability to communicate mathematical ideas to lay audiences.

A number of our graduates have interest in teaching; the Postgraduate Certificate of Education (PGCE) is a common qualification, and is offered in mathematics by the University of Sheffield (and many other universities). It is administered by the Department of Education, and you should contact them for further information. Other graduates go on to more specialised postgraduate qualifications, including our own MSc in Statistics and MSc in Mathematics.

Students are strongly advised to make use of the wide range of resources that the Careers Service has to offer. The Careers Service is located at 241 Glossop Road in Edgar Allen House. There is also a Student Jobshop in the Student Union.

The Careers Service runs a 20-credit module CAS201 (Career Management Skills). The School of Mathematics and Statistics runs MAS279 (Career Development Skills), a dedicated careers module for Mathematics students, which is available to students on the single honours BSc Mathematics and MMath Mathematics programmes.

## **The Staff-Student Forum**

Nominations for the Staff-Student Forum will be requested at the start of the Autumn Semester. Please think about the possibility of standing for election to the Forum. It will give you an opportunity to have a role in the organisation and management of factors influencing student life in the School of Mathematics and Statistics. The Forum usually meets

twice a semester. A number of student members serve as student representatives on the School Teaching Committee.

Issues may be raised with forum members at any time. You can find more information at <http://www.sheffield.ac.uk/math/current/representation>, where you can also find a feedback form which goes to SoMaS Reception and eventually to the Director of Teaching.

There are further opportunities for student representation within the Faculty of Science.

## **Voluntary work**

The University encourages its students to consider undertaking some voluntary work. The text below has been provided by the Manager of Sheffield Volunteering, which is based in the Students' Union.

'Volunteering is a great way to get to know the city and its people. You can gain career-related experience or simply volunteer for something that appeals.

'You can do something just for a day or give a couple of hours each week or fortnight. It's really flexible and you won't be asked to help during exams or vacations.

'Choose from over 100 options — in student neighbourhoods and the city centre. Alternatively, we can help you to develop your own volunteer project involving other students and benefiting the wider community.

'Our staff can help you to find something that's right for you. Training and out-of-pocket expenses are provided too.

'Set yourself apart. Visit <http://www.sheffieldvolunteering.info> or see us in the Source (Level 3, Union Building).'

SoMaS arranges a small number of school volunteering activities itself. There is a mailing list ([somas-schools-volunteers@sheffield.ac.uk](mailto:somas-schools-volunteers@sheffield.ac.uk)) for interested students, with a very low level of traffic (maybe three emails per semester). An email will be sent around at the beginning of each academic year to find interested students, but students can be added to it at any time by emailing James Cranch ([j.d.cranch@sheffield.ac.uk](mailto:j.d.cranch@sheffield.ac.uk)).

## **Where else to find Information**

Information will be displayed in the Hicks Building on the notice boards outside F10.

Urgent messages will be displayed in the Entrance Foyer, or sent by e-mail. Please check notice boards and your e-mail regularly.

## **Office-holders in the School**

A list of the members of staff who currently hold various offices in the School of Mathematics and Statistics can be found at <http://www.maths.dept.shef.ac.uk/math/contact.php>.

## Official University Information for Students on the Web

General regulations (including degree regulations)

<http://www.shef.ac.uk/calendar/>

General Regulations relating to Academic Appeals

[http://calendar.dept.shef.ac.uk/calendar/06h\\_gen\\_regs\\_as\\_to\\_academic\\_appeals.pdf](http://calendar.dept.shef.ac.uk/calendar/06h_gen_regs_as_to_academic_appeals.pdf)

Regulations and procedures for grievances and complaints, Appeals

<http://www.shef.ac.uk/ssid/procedures/grid>

Specific SoMaS programme regulations

<http://www.shef.ac.uk/calendar/regs>

SSiD web pages (including exam information, fees, finance, etc.)

<http://www.shef.ac.uk/ssid/>

LeTS (Learning and Teaching Services)

<http://www.shef.ac.uk/lets/>

CICS IT information for students

<http://www.shef.ac.uk/cics/students/>

Students' Charter

<http://www.shef.ac.uk/ssid/ourcommitment/charter/>

Help and support for students

<http://www.shef.ac.uk/ssid/sos/>

Disability and dyslexia support

<http://www.shef.ac.uk/disability/>

Essential guide for mature students

<http://www.shef.ac.uk/ssid/student/mature/>

Information for international students

<http://www.shef.ac.uk/ssid/international/>

## 5 Health and Safety

### Smoking

Students are reminded that smoking is prohibited on all University premises – this includes the area under the canopy at the main entrance to the Hicks Building. In addition, we request that you refrain from smoking on the steps immediately outside the Hicks Building.

### First Aid

First Aid boxes are available in SoMaS Reception (Room F10) and the Porters Lodge (Hicks Foyer, D Floor). Lists of qualified first-aiders can be found outside, or near to, these locations.

### Fire Alarm

If the fire alarm sounds in the Hicks Building, please proceed calmly to the nearest exit and assemble in the designated area (on the concourse, underneath the road bridge). **Do not** use lifts. **Do not** re-enter the building until you have been told that it is safe to do so by a fire officer. Note that the alarm is tested for about 30 seconds on Mondays at about 9.50.



## 6 Information on Mathematics and Statistics Courses

### The Aims and Learning Outcomes of the Degree Programmes

The mission of the School of Mathematics and Statistics is

- to conduct high quality research in mathematics and statistics;
- to provide an excellent and inspiring education for students;
- to support, to promote and to increase the impact of our disciplines;
- to be a research-led school that maintains high standards in all activities.

### Aims

For all the School's undergraduate programmes, the aims are:

- to provide an intellectual environment conducive to learning;
- to prepare students for careers which use their mathematical and/or statistical training;
- to provide teaching which is informed and inspired by the research and scholarship of staff;
- to provide students with assessments of their achievements over a range of mathematical and statistical skills, and to identify and support academic excellence.

There are also additional aims for particular programmes.

- In all its first degrees the School aims to provide programmes with internal choice to accommodate the diversity of students' interests and abilities.
- In its single honours degrees, the School aims to provide a programme in which students may choose either to specialise in one mathematical discipline (Pure Mathematics, Applied Mathematics<sup>1</sup>, Probability and Statistics) or to follow a more balanced programme incorporating two or all three of these disciplines.
- In its dual degree programmes, the School aims to provide an appropriate Mathematics component.
- In all MMath programmes, the School aims to prepare students for progression to a research degree in one of the three mathematical disciplines or for careers in which the use of Mathematics is central.
- In its single honours programmes with Study in Europe and its programmes with Spanish, French or German Language, the School aims to offer students the opportunity to study Mathematics and Statistics in another European country.
- The programmes with a named language also aim to provide language instruction beyond that needed to study Mathematics and Statistics abroad, giving students the opportunity to acquire all-round fluency in the language.
- In its programme Mathematics with a Year Abroad, the School aims to give students the opportunity to benefit from the experience of studying in a different educational culture.

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<sup>1</sup>Students on the MMath/BSc Mathematics with Spanish/French/German Language programmes are not permitted to take any Applied Mathematics module.

## Learning Outcomes

In line with the requirements of HEFCE's Teaching Quality Information initiative, the University has introduced programme specifications for undergraduate and postgraduate taught programmes to provide clear and explicit information for existing and potential students so that they can make informed choices about their studies. In addition to the Aims of the School's undergraduate programmes listed above, there are Learning Outcomes that students are expected to have developed upon successful completion of the programme and achievement of which will usually have been demonstrated via the assessment process. These differ for each degree programme offered; students may consult the latest versions at <http://www.shef.ac.uk/calendar/progspec>.

## Module Questionnaires

Students are strongly encouraged to complete Module Questionnaires for every module they take. These questionnaires are now administered electronically, and instructions on how to complete the questionnaires will be issued every semester.

These questionnaires are important to the School. This is your formal opportunity to give your view on aspects of the course – you can also give comments informally via your Personal Tutor, the Staff-Student Forum, to the lecturer directly, etc., and this is also appreciated.

We are always keen to hear ways to improve our teaching and your learning experience. Considered and thoughtful feedback can provide an extremely helpful input into the School's teaching.

In the same way that receiving a piece of marked work with just a mark out of 10 is not as useful as comments showing how you can improve, we would like to encourage you to be specific and constructive in your questionnaire responses. Reasoned and constructive comments you make on modules can be very helpful, both to the individual lecturer concerned, and to the School, so that we can spread good practice.

Lecturers are human beings with feelings, just like students, and if you feel the need to be critical of aspects of a module, please try to offer criticism in a sensitive way. It is always good to read positive comments as well as critical ones, so if you feel that a lecturer is doing something well, please let them know!

The questionnaires and comments are considered by members of the Staff-Student Forum, and by the School's Teaching Committee. Comments have led to changes in School procedures, as well as to alterations in course content and practice of lecturers. They also form a valuable input to the annual appraisal of staff.

Questionnaire results (and any lecturer responses) are published on the Staff-Student Forum MOLE page, where they may be viewed by all SoMaS students. Your responses can help those at lower levels make their module choices. Your considered feedback plays a valuable part in improving our teaching.

## Degree Regulations

Full details of these Regulations are available on the web, as described in the section entitled '[Official University Information for Students on the Web](#)' on p.22. However, at the time of publication of this handbook, the Regulations on the web may be for 2016–2017 rather than 2017–2018. In particular, their lists of modules may reflect availability in 2016–2017 rather than in 2017–2018.

Details of SoMaS modules can be found at the end of this handbook.

### Specific degree regulations: Single Honours

#### BSc Mathematics (MASU01) Year 2, MMath Mathematics (MASU02) Year 2

You *must* take the *core* module:

[MAS211](#) Advanced Calculus and Linear Algebra [20 credits]

and modules worth between *60 credits* and *80 credits* from:

[MAS220](#) Algebra [20 credits]

[MAS221](#) Analysis [20 credits]

[MAS222](#) Differential Equations [20 credits]

[MAS223](#) Statistical Inference and Modelling [20 credits]

and modules worth up to *20 credits* from:

[MAS275](#) Probability Modelling [10 credits]

[MAS280](#) Mechanics and Fluids [10 credits]

and modules worth up to *30 credits* from:

[MAS212](#) Scientific Computing and Simulation [10 credits]

[MAS279](#) Career Development Skills [10 credits]

[MAS281](#) Probability and Statistics in Society [10 credits]

unrestricted modules to the value of 20 credits

**BSc Mathematics and Statistics (MASU38) Year 2, MMath Mathematics and Statistics (MASU39) Year 2**

These degrees were introduced from 2016 – 2017. If you are interested in switching to them please talk to the Senior Tutor about it. In particular you need to be sure that you have taken the correct modules at Level 1.

You *must* take:

- MAS211 Advanced Calculus and Linear Algebra [20 credits]
- MAS212 Scientific Computing and Simulation [10 credits]
- MAS221 Analysis [20 credits]
- MAS222 Differential Equations [20 credits]
- MAS223 Statistical Inference and Modelling [20 credits]
- MAS275 Probability Modelling [10 credits]

and modules worth *20 credits* from:

- MAS220 Algebra [20 credits]
  - MAS279 Career Development Skills [10 credits]
  - MAS280 Mechanics and Fluids [10 credits]
  - MAS281 Probability and Statistics in Society [10 credits]
- unrestricted modules to the value of 20 credits .

**BSc Financial Mathematics (MASU05) Year 2**

You *must* take the following modules:

- MAS211 Advanced Calculus and Linear Algebra [20 credits]
- MAS221 Analysis [20 credits]
- MAS223 Statistical Inference and Modelling [20 credits]
- MAS275 Probability Modelling [10 credits]

and one of the following modules:

- MAS279 Career Development Skills [10 credits]
- MAS281 Probability and Statistics in Society [10 credits]

and one of the following:

(i) modules worth *40 credits* from

- ECN201 Intermediate Microeconomics [20 credits]
- ECN202 Intermediate Macroeconomics [20 credits]
- ECN216 Econometrics [20 credits]

OR

- (ii) MGT230 Introduction to Corporate Finance and Asset Pricing [20 credits]
- MGT250 Financial Management [20 credits]

## **MMath Mathematics with Year Abroad (MASU15) Year 2**

You *must* take the following modules:

[MAS211](#) Advanced Calculus and Linear Algebra [20 credits]

[MAS220](#) Algebra [20 credits]

[MAS221](#) Analysis [20 credits]

and modules worth *60 credits* from:

[MAS212](#) Scientific Computing and Simulation [10 credits]

[MAS222](#) Differential Equations [20 credits]

[MAS223](#) Statistical Inference and Modelling [20 credits]

[MAS275](#) Probability Modelling [10 credits]

[MAS280](#) Mechanics and Fluids [10 credits]

[MAS281](#) Probability and Statistics in Society [10 credits]

You should bear in mind that you will be spending Level 3 abroad, and need to gather pre-requisites for Level 4 (some of which may be done abroad). Details for individual modules list later modules which directly depend on them. The Level 3/4 handbook may be found on the SoMaS web pages. You will need an average of 59.5 at the first sitting of MAS modules at Level 2 to be permitted to continue on this degree. Failure to achieve this will lead to an automatic transfer onto the BSc Mathematics degree.

## **MMath Mathematics with Study in Europe (MASU10) Year 2, BSc Mathematics with Study in Europe (MASU11) Year 2**

You *must* take the *core* module:

[MAS211](#) Advanced Calculus and Linear Algebra [20 credits]

and modules worth between *40 credits* and *60 credits* from:

[MAS220](#) Algebra [20 credits]

[MAS221](#) Analysis [20 credits]

[MAS222](#) Differential Equations [20 credits]

[MAS223](#) Statistical Inference and Modelling [20 credits]

and modules worth up to *20 credits* from:

[MAS275](#) Probability Modelling [10 credits]

[MAS279](#) Career Development Skills [10 credits]

[MAS280](#) Mechanics and Fluids [10 credits]

[MAS281](#) Probability and Statistics in Society [10 credits]

and *40 credits* of MLT modules.

You should bear in mind that you will be spending Level 3 abroad, and need to gather pre-requisites for Level 4 (some of which may be done abroad). Details for individual modules list later modules which directly depend on them. The Level 3/4 handbook may be found on the SoMaS web pages. You will need an average of 59.5 at the first sitting of MAS modules at Level 2 to be permitted to continue on the MMath, and an average of 55 in the MLT modules to be permitted to continue on these degrees. Failure to achieve these will lead to

an automatic transfer onto the MMath Mathematics, BSc Mathematics, or BSc Mathematics with Study in Europe degree.

**MMath Mathematics with Spanish/French/German Language (MASU12/13/14) Year 2, BSc Mathematics with Spanish/French/German Language (MASU18/19/20) Year 2**

You *must* take the following modules:

[MAS211](#) Advanced Calculus and Linear Algebra [20 credits]

[MAS221](#) Analysis [20 credits]

[MAS223](#) Statistical Inference and Modelling [20 credits]

and modules worth *20 credits* from:

[MAS220](#) Algebra [20 credits]

[MAS275](#) Probability Modelling [10 credits]

[MAS281](#) Probability and Statistics in Society [10 credits]

and *40 credits* in the appropriate European language.

See the University Regulations for detailed requirements.

You should bear in mind that you will be spending Level 3 abroad, and need to gather pre-requisites for Level 4 (some of which may be done abroad). Details for individual modules list later modules which directly depend on them. The Level 3/4 handbook may be found on the SoMaS web pages. You will need an average of 59.5 at the first sitting of MAS modules at Level 2 to be permitted to continue on the MMath, and an average of 55 in the MLT modules to be permitted to continue on these degrees. Failure to achieve these will lead to an automatic transfer onto the MMath Mathematics, BSc Mathematics, BSc Mathematics with Study in Europe or the corresponding BSc Mathematics with Spanish/French/German Language degree.

## Specific degree regulations: Dual Honours

This booklet contains only the relevant mathematics modules. The requirements laid down by the other subject in the Dual Honours School are contained in the University Regulations: <http://www.shef.ac.uk/calendar/regs>. You must consult the other Department for details of compulsory modules, possible options and prerequisites. You must take care in choosing your modules to check that you have the relevant prerequisites. You should also be careful to avoid timetable clashes (at Level 3 as well as Level 2, if appropriate).

### **BSc Computer Science and Mathematics (COMU109) Year 2, MComp Computer Science with Mathematics (COMU118) Year 2**

You *must* take:

**MAS211** Advanced Calculus and Linear Algebra [20 credits]

and one of the following modules:

**MAS220** Algebra [20 credits]

**MAS223** Statistical Inference and Modelling [20 credits]

and modules worth *20 credits* from:

**MAS221** Analysis [20 credits]

**MAS222** Differential Equations [20 credits]

**MAS275** Probability Modelling [10 credits]

**MAS281** Probability and Statistics in Society [10 credits]

and modules to the value of *60 credits* provided by the Department of Computer Science as laid down in the University Regulations.

### **BSc Mathematics and Philosophy (MASU25) Year 2**

You *must* take the following modules:

**MAS211** Advanced Calculus and Linear Algebra [20 credits]

**MAS220** Algebra [20 credits]

**MAS221** Analysis [20 credits]

and modules to the value of *60 credits* provided by the Department of Philosophy as laid down in the University Regulations.

**BA Accounting and Financial Management and Mathematics (MGTU14) Year 2, BA Business Management and Mathematics (MGTU13) Year 2**

You *must* take the following modules:

- MAS211 Advanced Calculus and Linear Algebra [20 credits]
- MAS223 Statistical Inference and Modelling [20 credits]
- MAS275 Probability Modelling [10 credits]
- MAS281 Probability and Statistics in Society [10 credits]

and modules to the value of *60 credits* provided by the Management School as laid down in the University Regulations.

**BSc Economics and Mathematics (ECNU16) Year 2**

You *must* take the following module:

- MAS211 Advanced Calculus and Linear Algebra [20 credits]

and one of the following:

- (i) MAS223 Statistical Inference and Modelling [20 credits]
- MAS275 Probability Modelling [10 credits]
- MAS281 Probability and Statistics in Society [10 credits]

OR

- (ii) MAS220 Algebra [20 credits]
- MAS221 Analysis [20 credits]

and modules to the value of *60 credits* provided by the Department of Economics as laid down in the University Regulations.



## 7 Cover sheet arrangements

There are some special arrangements for when assessed coursework is to be handed in at SoMaS Reception (F10).

- (i) All work that needs to be submitted to Reception needs to have a cover sheet.
- (ii) Students can access the cover sheet via <https://sciencecoversheet.group.sheffield.ac.uk/>:
  - (a) log in with your university user name and password;
  - (b) cover sheets become available to students one week before the deadline to avoid early submissions;
  - (c) cover sheets are unique to each student – printing out a coversheet for a friend doesn't work!
- (iii) This then needs to be stapled (or in a plastic wallet) and then posted into the drop box outside reception (the drop box is provided for work that is either late/early or being submitted out of office opening times).

If students have any problems with regards to viewing/accessing the cover sheets, contact [hickstudentsupport@sheffield.ac.uk](mailto:hickstudentsupport@sheffield.ac.uk) or visit Reception to try and sort out the problem.

## MAS211: Advanced Calculus and Linear Algebra

Semester: 1      20 credits

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Prerequisites:            MAS111 (Mathematics Core II)

Corequisites:

Cannot be taken with:

Prerequisite for:            Many Level 2, 3 and 4 mathematics modules

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### Description

Advanced Calculus and Linear Algebra are basic to most further work in pure and applied mathematics and to much of statistics. This course provides the basic tools and techniques and includes sufficient theory to enable the methods to be used in situations not covered in the course.

The material in this course is essential for further study in mathematics and statistics.

### Aims

- Build on the theory studied in the level 1 core to develop a solid foundation for calculus and linear algebra in  $n$ -dimensional space.
- Show how linear algebra is applied to calculus through such things as extreme value problems and multiple integrals.
- Demonstrate the value of viewing the derivative as a linear transformation.
- Teach understanding of why the new techniques introduced work, and to relate them to each other and what has been seen in other modules.
- Showcase some interesting examples of the techniques and applications in geometry and other parts of mathematics.

### Outline syllabus

- Review: basic matrices
- Derivative as a linear map
- Determinants and inverses
- Double and triple integrals
- Line integrals in the plane and space
- Subspaces and rank
- Gradient, divergence, curl
- Quadratic forms, max and min in several variables

### Module Format

Lectures	40	Tutorials	10	Practicals	0
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### Recommended books

- B** Jain and Gunawardena "Linear Algebra: An Interactive Approach" (Shelfmark 512.83(J), ISBN 0534409156)
- B** Lay "Linear Algebra and its Applications" (Shelfmark 512.83(L), ISBN 0201824787)
- B** Jordan and Smith "Mathematical Techniques (3rd edition)" (Shelfmark 510 (J), ISBN 0199249725)
- B** Kreyszig "Advanced Engineering Mathematics" (Shelfmark Q 510 (K), ISBN 047133328X)
- B** Spiegel "Advanced Calculus" (Shelfmark Q 515.076 (W), ISBN 0071375678)

### Assessment

One formal 2.5 hour written examination.

## MAS212: Scientific Computing and Simulation

Semester: 1      10 credits

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Prerequisites:	MAS115 (Mathematical Investigation Skills)
Corequisites:	MAS211 (Advanced Calculus and Linear Algebra); MAS222 (Differential Equations)
Cannot be taken with:	
Prerequisite for:	MAS316/414 (Mathematical Modelling of Natural Systems)

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### Description

This module further develops the students' skills in computer programming and independent investigation. They will learn how to solve algebraic and differential equations using the solvers in Python as well as Python codes developed by themselves. They will learn basic computing methods to visualise and analyse numerical results, and then apply the knowledge to explore the physical behaviours of model equations.

### Aims

- To develop programming skill in the context of scientific computing.
- To develop independent investigation skills.
- To develop the skills of data analysis.

### Outline syllabus

- Revision of Python.
- Animation using scitools in Python, applied to nonlinear ODEs.
- Elementary numerical methods, and their error, order and stability.
- Linear algebraic systems.
- Convergence of iterative methods.
- Fourier series and the Discrete Fourier Transform.

### Module Format

Lectures	10	Tutorials	0	Practicals	10
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### Recommended books

- B Langtangen "A Primer on Scientific Programming with Python" (ISBN 3642024742)
- B Burden and Faires "Numerical Analysis" (Shelfmark 518 (B), ISBN 0534404995)

### Assessment

Three assessed courseworks, 95%. One class test, 5%.

## MAS220: Algebra

Semester: Year      20 credits

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Prerequisites:	MAS110 (Mathematics Core I); MAS111 (Mathematics Core II); MAS114 (Numbers and Groups)
Corequisites:	MAS211 (Advanced Calculus and Linear Algebra)
Cannot be taken with:	
Prerequisite for:	MAS333/438 (Fields); MAS346 (Groups and Symmetry); MAS435 (Algebraic Topology); MAS436 (Functional Analysis); MAS439 (Commutative Algebra and Algebraic Geometry)

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### Description

This unit continues the study of abstract algebra begun in MAS114, going further with the study of groups, and introducing the concepts of a ring, which generalises the properties of the integers, and a vector space, which generalises the techniques introduced in linear algebra to many more examples.

As well as demonstrating the interest and power of abstraction, this course is vital to further studies in most of pure mathematics, including algebraic geometry and topology, functional analysis and Galois theory.

### Aims

- Show students the unifying power of abstract mathematical structures.
- Introduce universal ideas in algebra such as quotients and homomorphisms between groups, rings or vector spaces.
- Develop the notions of conjugacy for groups, Euclidean domains for rings, and inner product vector spaces.
- Apply the theory developed to novel and interesting examples the students will not have seen in previous courses, and which are not accessible without the abstract techniques developed.
- Give a sufficient foundation for further courses in abstract algebra, or which use abstract algebra.

### Outline syllabus

- Quotient Groups.
- Conjugacy.
- Homomorphisms.
- Introduction to rings.
- Subrings, Ideals and Quotients.
- Division and Factorisation.
- Vector spaces, Linear maps and Subspaces.
- Linear Independence, Bases and Dimension
- Matrix of a Linear Map
- Inner Product Spaces
- Linear Maps on Inner Product Spaces

### Module Format

Lectures	40	Tutorials	10	Practicals	0
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### Recommended books

- B** Chatters and Hajarnavis "An Introductory Course in Commutative Algebra" (Shelfmark 512.8 (C), ISBN 019853423x)
- B** Jordan and Jordan "Groups" (Shelfmark 512.86 (J), ISBN 034061045x)
- B** Allenby "Rings, Fields and Groups" (Shelfmark 512.8 (A), ISBN 0340544406)
- C** Halmos "Finite-dimensional Vector Spaces" (Shelfmark 512.83)
- C** Nicholson "Linear Algebra with Applications" (Shelfmark 512.5)

### Assessment

One formal 2.5 hour written examination [90%], one or more short tests [10%].

## MAS221: Analysis

Semester: Year      20 credits

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Prerequisites:	MAS111 (Mathematics Core II); MAS114 (Numbers and Groups)
Corequisites:	MAS211 (Advanced Calculus and Linear Algebra)
Cannot be taken with:	
Prerequisite for:	MAS331 (Metric Spaces); MAS350/451 (Measure and Probability); MAS352/452 (Stochastic Processes and Finance)

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Recommended for MAS362/462 (Financial Mathematics)

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### Description

This course is a foundation for the rigorous study of continuity and convergence of functions, both in one and in several variables. As well as providing the theoretical underpinnings of calculus, we develop applications of the theory in this course that use the theory, as well as examples that show why the rigour is needed, even if we are focused on applications.

The material in this course is vital to further studies in metric spaces, measure theory, parts of probability theory, and functional analysis.

### Aims

- Introduce the students properly to rigorous analysis.
- Help students appreciate the necessity of rigour through the use of examples.
- Show students the mathematical beauty of the principles in the development of calculus and its generalisations.
- Give students sufficient foundations in analysis to enable students to study further modules within analysis, or which use analysis.
- Show students significant applications of the theory developed in the module.

### Outline syllabus

- Supremum/infimum, Completeness Axiom
- Limits of sequences, Cauchy sequences
- Limits of functions, Continuity of functions
- Differentiation
- Series
- Integration
- Limits of sequences of functions
- The uniform convergence theorem and applications
- Open sets and sequences in  $\mathbf{R}^n$ .
- Continuity for functions of several variables.

### Module Format

Lectures	40	Tutorials	10	Practicals	0
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### Recommended books

- B** A Sasane “The how and why of one variable calculus” (ISBN 9781119043386)
- B** K E Hirst “Numbers, sequences and series” (Shelfmark 511 (H), ISBN 0340610435)
- B** M Spivak “Calculus” (Shelfmark 517 (S), ISBN 0521867444)
- B** P E Kopp “Analysis” (ISBN 0340645963)
- C** D Applebaum “Limits, Limits, Everywhere” (Shelfmark 515 (A), ISBN 0199640089)
- C** J J Duistermaat and J A Kolk “Multidimensional Real Analysis, Volume 1, Differentiation” (Shelfmark 515 (D), ISBN 0521551145)
- C** K Houston “How to Think Like a Mathematician: A Companion to Undergraduate Mathematics” (Shelfmark 510 (H), ISBN 052171978X)
- C** T W Korner “A Companion to Analysis: A Second First and First Second Course in Analysis” (Shelfmark 515 (K), ISBN 0821834479)

## **Assessment**

One formal 2.5 hour written examination [90%], one or more short tests [10%].

## MAS222: Differential Equations

Semester: Year      20 credits

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Prerequisites:	MAS110 (Mathematics Core I); MAS111 (Mathematics Core II)
Corequisites:	MAS211 (Advanced Calculus and Linear Algebra)
Cannot be taken with:	
Prerequisite for:	MAS212 (Scientific Computing and Simulation); MAS280 (Mechanics and Fluids); MAS320 (Fluid Mechanics I); MAS377 (Mathematical Biology); MAS316/414 (Mathematical Modelling of Natural Systems); MAS422 (Magnetohydrodynamics)

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### Description

Differential equations arise in most models of real phenomena, including particle mechanics, biology and economics. This module aims at developing a core set of advanced mathematical techniques essential to the study of applied mathematics. Topics include the qualitative analysis of ordinary differential equations, the solution of second order linear ordinary differential equations with variable coefficients, first and second order partial differential equations, the method of characteristics and the method of separation of variables.

### Aims

- To learn the qualitative analysis of ordinary differential equations.
- To learn how to solve second order ordinary differential equations with variable coefficients.
- To learn how to solve first order partial differential equations using the method of characteristics.
- To learn how to solve second order partial differential equations using the method of separation of variables.
- To learn the properties of the solutions of the classical partial differential equations.

### Outline syllabus

- Qualitative analysis of 1D and 2D systems of ordinary differential equations (ODEs)
- Classification of equilibrium points in 1D and 2D systems of ODEs
- Exact analysis of second order linear ODEs: normal form, reduction of order, and power series solutions
- Sturm-Liouville problems
- Second order partial differential equations (PDEs), wave equation, heat equation, separation of variables.
- First order PDEs, method of characteristics.
- Second order hyperbolic PDEs, method of characteristics.

### Module Format

Lectures	40	Tutorials	10	Practicals	0
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### Recommended books

- B** King, Billingham and Otto "Differential Equations: Linear, Nonlinear, Ordinary, Partial" (Shelfmark 515.35 (K), ISBN 0521016878)
- B** Simmons "Differential Equations with Applications and Historical Notes" (Shelfmark 517.9 (S), ISBN 0071128077)
- B** Boyce and Diprima "Elementary Differential Equations and Boundary Value Problems" (Shelfmark 517.9 (B), ISBN 0471644544)
- B** Trim "Applied Partial Differential Equations" (Shelfmark 517.944 (T), ISBN 0534982433)
- C** Jeffrey "Applied Partial Differential Equations: An Introduction" (Shelfmark 515.353 (J), ISBN 0123822521)
- C** Logan "Applied Partial Differential Equations" (Shelfmark 517.944 (L), ISBN 0387984399)

### Assessment

One formal 2.5 hour written examination at the end of Semester Two (90%), one formal 1 hour MOLE examination at the end of Semester One (10%).

## MAS223: Statistical Inference and Modelling

Semester: Year      20 credits

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Prerequisites:	MAS113 (Introduction to Probability and Statistics)
Corequisites:	MAS211 (Advanced Calculus and Linear Algebra)
Cannot be taken with:	
Prerequisite for:	MAS281 (Probability and Statistics in Society); Level 3 and 4 Probability and Statistics modules

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### Description

This unit develops tools and ideas underpinning probability and statistics at Level 2 and higher. It introduces some standard distributions beyond those met in MAS113. It proceeds to a systematic treatment of continuous multivariate distributions, with particular emphasis on the multivariate normal distribution. Transformations of univariate and multivariate continuous distributions are studied, with the derivation of sampling distributions of important summary statistics as applications. The idea of likelihood is developed, and the concept of maximum likelihood estimation.

The idea is developed of constructing simple statistical models to describe processes in the real world, for example patient responses to different treatments, or the effects of class sizes on examination results. In the presence of uncertainty, modelling can be used to infer relationships between different variables in the process and make predictions about future observations. A single class of models known as linear models will be considered, and it will be shown how these models are applicable in a wide variety of circumstances. Modelling and data analysis will be performed on practical examples using R.

### Aims

- Extend students' familiarity with standard probability distributions.
- Give practice in handling discrete and continuous distributions, especially continuous multivariate ones.
- Instil an understanding of the rationale and techniques of likelihood exploration and maximisation.
- To consider linear regression models in detail.
- To extend the comparison of means from two to several groups through ANOVA models.
- To give students experience in the use of R for fitting linear models.

### Outline syllabus

- Univariate distribution theory.
- Continuous multivariate distributions and the multivariate normal.
- Likelihood.
- Matrix representation of a linear model. Linear regression, polynomial regression and ANOVA models as examples of linear models.
- Parameter estimation using least squares, least squares estimators in matrix notation. Distributional properties of least squares estimators and the residual sum of squares.
- Hypothesis testing via model comparisons, the  $F$ -test for comparing nested linear models,  $t$ -tests.
- Confidence intervals and prediction intervals.
- Model checking using standardized residuals, transformations,  $R^2$ .
- Factor independent variables: ANCOVA and one-way and two-way ANOVA.
- Fitting linear models in R and interpreting the output.

### Module Format

Lectures	40	Tutorials	7	Practicals	3
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### Recommended books

- B** Mood, Graybill and Boes "Introduction to the Theory of Statistics" (Shelfmark 519.5 (M), ISBN 0070854653)
- B** Freund, Miller and Miller "John E. Freund's Mathematical Statistics with Applications" (Shelfmark 519.5 (F), ISBN 0131246461)



- B** Kleinbaum, Kupper, Muller and Nizam “Applied Regression Analysis and Other Multivariable Methods” (Shelfmark 519.536 (A), ISBN 0495384968)
- B** Faraway “Linear Models with R” (Shelfmark 519.538 (F), ISBN 1584884258)
- B** Draper and Smith “Applied Regression Analysis” (Shelfmark 519.536 (D), ISBN 0471170828)

### **Assessment**

One formal 2.5 hour written examination [90%]. Practical report [10%].

## MAS275: Probability Modelling

Semester: 2      10 credits

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Prerequisites:      MAS113 (Introduction to Probability and Statistics); [MAS211](#) (Advanced Calculus and Linear Algebra)

Corequisites:

Cannot be taken with:

Prerequisite for:      MAS371 (Applied Probability); MAS352/452 (Stochastic Processes and Finance)  
Recommended for MAS468 (Statistical Computing in R)

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### Description

The course introduces a number of general models for processes where the state of a system is fluctuating randomly over time. Examples might be the length of a queue, the size of a reproducing population, or the quantity of water in a reservoir. The aim is to familiarize students with an important area of probability modelling.

### Aims

- To introduce and study a number of general models for processes where the state of a system is fluctuating over a period of time according to some random mechanism.
- To illustrate the above models by example and by simulation.
- To familiarise students with an important area of probability modelling.

### Outline syllabus

- Introduction to Markov chains
- Discrete time renewal theory
- Limiting behaviour of Markov chains
- Applications of Markov chains
- Hitting times and probabilities
- Poisson processes

### Module Format

Lectures	22	Tutorials	5	Practicals	0
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### Recommended books

- C Parzen "Stochastic Processes" (Shelfmark 519.23 (P), ISBN 0898714419)
- C Grimmett and Stirzaker "Probability and Random Processes" (Shelfmark 519.2 (G), ISBN 0198572220)
- C Ross "Introduction to Probability Models" (Shelfmark 519.2 (R), ISBN 0123736358)
- C Feller "An Introduction to Probability Theory and its Applications" (Shelfmark 519.2 (F), ISBN 0471257087)

### Assessment

One formal 2 hour closed book examination.

## MAS279: Career Development Skills

Semester: Year      10 credits

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Prerequisites:

Corequisites:

Cannot be taken with: CAS201 (Career Management Skills)

Prerequisite for:

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### Description

Employability is one of the key aims of the University of Sheffield. This module will consist of various tasks to help students be more employable. Part of this will consist of general “careers skills” – researching careers and employers, CV writing, interview technique – and other parts will be more focused on employment in mathematical areas, where it may be necessary to present technical work to non-mathematicians.

### Aims

- To encourage students to analyse their own skills, aptitudes and career interests;
- To research a set of career opportunities;
- To gain a greater understanding of what makes a good CV;
- To gain practice in interview technique;
- To undertake a mini-project, with a presentation and written report aimed at a non-mathematical audience.

### Outline syllabus

- Self-assessment
- Researching career options
- CV/application writing
- Interviews
- Oral presentations
- Business report

### Module Format

Lectures	0	Tutorials	18	Practicals	0
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### Recommended books

- There are no recommended books for this course.

### Assessment

By a portfolio of work throughout the course [100%]. There is no formal exam (and no resit) for this module.

## MAS280: Mechanics and Fluids

Semester: 2      10 credits

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Prerequisites:	MAS112 (Vectors and Mechanics); <a href="#">MAS211</a> (Advanced Calculus and Linear Algebra) or MAS165 (Maths for Physicists) or PHY120 (Maths for Physicists and Astronomers)
Corequisites:	<a href="#">MAS222</a> (Differential Equations)
Cannot be taken with:	
Prerequisite for:	MAS310 (Continuum Mechanics); MAS320 (Fluid Mechanics I); MAS413 (Analytical Dynamics and Classical Field Theory); MAS422 (Magnetohydrodynamics)

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### Description

This course extends the principles of Newtonian mechanics from the mechanics of particles to the mechanics of three-dimensional (3D) bodies, first to the motion of solids, then to the motion of fluids (e.g. air and water). Mathematically, this course develops the vector calculus, the essential tool for describing a 3D world. The suffix notation and the Einstein summation convention are introduced as an alternative notation for the calculus. Properties of the vector gradient operator are first seen as a natural description for potential forces. For more advanced use of the vector calculus, the most intuitive setting to comprehend its properties is through the study of fluid motion. Topics include 3D extensions of the work-energy principle, planetary and satellite motion, elements of the motion of rigid bodies, and the motion of inviscid (frictionless) fluids.

### Aims

- To extend a working knowledge of Newtonian mechanics to a broader range of contexts.
- To develop and expand ability to use the vector calculus.
- To extend an understanding of planetary motions and the motion of rigid bodies.
- To recognise and understand key features of fluid motion.

### Outline syllabus

- Centre of mass and moment of inertia.
- The work-energy principle using the gradient operator.
- Planetary orbits.
- Motion of a rigid body.
- Suffix notation and a review of grad, div, curl and the integral theorems.
- Kinematics of fluid motions.
- Euler's equations of motion for an inviscid fluid.
- Irrotational flows and Bernoulli's principle.

### Module Format

Lectures	20	Tutorials	5	Practicals	0
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### Recommended books

- B** Collinson and Roper "Particle Mechanics" (Shelfmark 531 (C), ISBN 978-0340610466)
- B** Burghes "Further Mechanics" (Shelfmark 531 (B), ISBN 0435516094)
- B** Dyke and Whitworth "Guide to Mechanics" (Shelfmark 531 (D), ISBN 978-0333793008 )
- B** Acheson "Elementary Fluid Dynamics" (Shelfmark 532.5 (A), ISBN 0198596790)
- B** Paterson "A First Course in Fluid Dynamics" (Shelfmark 532.51 (P), ISBN 0521274249)

### Assessment

One formal 2 hour written examination [90%]. Two homeworks at 5% each.

## MAS281: Probability and Statistics in Society

Semester: 2      10 credits

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Prerequisites:      MAS113 (Introduction to Probability and Statistics)

Corequisites:      MAS223 (Statistical Inference and Modelling)

Cannot be taken with:

Prerequisite for:

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### Description

This module aims to demonstrate, through a series of case studies, the role that probability and statistics can play in areas of both everyday life and scientific understanding. It focuses on the importance of acknowledging uncertainty in many situations, and on the careful handling and interpretation of quantitative data. Examples include miscarriages of justice following poorly understood probabilistic evidence and public confusion surrounding the risks and benefits of particular behaviours and medical treatments. Relevant ideas from MAS113 will be reviewed in these contexts, and new methodology will be introduced where necessary.

### Aims

- To study, in depth, applications of probability and statistics that have had a significant impact on public life.
- To develop transferable skills: teamwork, report writing and computing.
- To consolidate understanding and further appreciate applications of key statistical concepts met in levels 1 and 2.

### Outline syllabus

- This module will cover a series of four self-contained topics, taught by different staff and related to their areas of expertise and research interests. The topics may vary from year to year, but possible examples would be: medical statistics, epidemiology, finance, probability and the law, genetics, environmental statistics and climate change, health economics, statistics in sport. In each case, the role of probability and statistics will be explored, appropriate new methods will be introduced, and skills in understanding and communicating technical ideas will be developed.

### Module Format

Lectures	20	Tutorials	0	Practicals	0
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### Recommended books

- C Goldacre "Bad Science" (Shelfmark 500 (G))
- C Blastland and Dilnot "The Tiger that isn't: seeing through a world of numbers" (Shelfmark 510 (B))
- C Silver "The Signal and the Noise: why most predictions fail, but some succeed" (Shelfmark 303.49 (S))

### Assessment

Four projects, including individual and group work. There is no exam for this module.