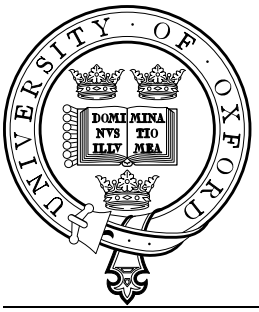

UNIVERSITY OF OXFORD
Department of Statistics

Mathematics and Statistics Undergraduate Handbook 2007–08

Welcome

Welcome to Oxford and to the Oxford Mathematics and Statistics course. We – the members of the Department of Statistics, and of the Faculty of Statistics – are very pleased to welcome you to Oxford. Of course, undergraduate mathematics students here have been able to study statistical subjects for a long time, and still can, but you will have the opportunity to study more of them, and in more depth, than those before you.

You join an expanding number of researchers, lecturers and graduate students in statistics at Oxford. We hope that, as the course progresses, we can show you the interest and excitement of statistics and its applications. We also hope that your enthusiasm for the subject increases as you develop your talents in this field, and that your education here will equip you well for your future, wherever that may be.

We hope you find your time in Oxford enjoyable, challenging and rewarding.

Matthias Winkel
Chairman, Statistics Academic Committee

Contents

If you think this handbook could be improved in some way, or if you find there is something misleading in it, please let us know by contacting the Academic Administrator in the Department of Statistics.

1 Sources of information

You will be given a lot of information in your first weeks in Oxford. The aim of what is included here is to add to that, not to repeat it nor replace it.

You will receive a copy of the *Handbook for the Undergraduate Mathematics Courses*. Although that handbook is intended primarily as a guide to the single subject Mathematics course, much of it is directly relevant for the Mathematics and Statistics course, in particular for the first year and general aspects of all the mathematics courses. You are referred to that handbook for the valuable general information it contains, rather than that being included here.

1.1 The Grey Book

The *Examination Decrees and Regulations*, often called 'The Grey Book', is the official and authoritative document on University examinations. You should receive a copy of this book through your college at the beginning of your first term. Changes to it are strictly regulated by the University to ensure that you are not disadvantaged by any changes to the syllabus which are made after you start your course.

1.2 Syllabus and synopses

The first year examination is called Honour Moderations, and the first year is usually referred to as 'Mods'. Note that, for the first four terms – see Section 3 – the Mathematics and Statistics course is identical to the single subject Mathematics course. So the first year examination is *Honour Moderations in Mathematics*, i.e. there is not a different Mods examination for Mathematics and Statistics students.

The second year examination is called Part A, the third year examination is called Part B, and the fourth year examination is called Part C. For Parts A, B and C, there are separate examinations for the Mathematics and Statistics course: however, many examination questions, and indeed some examination papers, are the same as those taken by students on the Mathematics course.

The syllabus and the lecture synopses for Mods are part of the Mathematics handbook, and are available on the Mathematical Institute website:

`http://www.maths.ox.ac.uk/current-students/undergraduates/handbooks-synopses/`

The syllabus and the lecture synopses for Parts A, B and C are part of this handbook, and are available on the Department of Statistics website:

`http://www.stats.ox.ac.uk/current_students/bammath/course_handbooks`

The synopses of the lecture courses extend the official syllabus by giving more detail about the contents of each course, rather than just listing the topics to be covered. They also include details of recommended reading.

1.3 Email

The people teaching you use email, and will expect you to use it too. Useful information about the course will be sent to you from time to time via email to your '@maths.ox.ac.uk' account. **Therefore it is very important that you read this account regularly, or that you forward email from this account to an account that you do read regularly.** Instructions on how to forward your email are in the Mathematics handbook and are also available on the web:

`http://www.maths.ox.ac.uk/help/faqs/email/forwarding`

2 Finding your way around

2.1 The Department of Statistics

The Department of Statistics, at 1 South Parks Road, houses a lecture theatre in which you will attend some lectures in the later years of your course. In fact, members of the Department are housed in both 1 and 2 South Parks Road, and also in the Peter Medawar Building for Pathogen Research, and the Oxford Centre for Gene Function (OCGF), on South Parks Road.

The work of the Department covers a very broad range of theoretical and applied statistics. There are large research groups in mathematical genetics and bioinformatics, working on mathematical methods to extract information from DNA sequence data. Other groups work on pattern recognition and image analysis, graphical models, drug design, medical and financial applications, and on the mathematics of operational research. The Head of Department is Professor Colin McDiarmid, and there are four statutory chairs, held by Peter Donnelly (Professor of Statistical Science), Brian Ripley (Professor of Applied Statistics), Steffen Lauritzen (Professor of Statistics), and Jotun Hein (Professor of Bioinformatics). In the most recent research ratings (the 2001 'RAE'), Statistics at Oxford was rated as 5^*.

The number of researchers, lecturers and graduate students in the Department has expanded rapidly in recent years. For example, this year there will be about 45 new graduate students in the Department, some on taught Masters courses (studying for MSc's in Applied Statistics or Bioinformatics), others starting research toward a doctorate (a DPhil). At undergraduate level, the four years of Mathematics and Statistics students add to that number.

You can find out more about the Department by visiting the Department's website:

`http://www.stats.ox.ac.uk`

2.2 The Mathematical Institute

The Mathematical Institute, on St Giles', provides a focus for mathematical activity in Oxford. Many of your lectures after your first year will take place in the Institute.

You can find out more about the Institute by visiting the Institute's website:

`http://www.maths.ox.ac.uk`

2.3 The University Museum

The Oxford University Museum of Natural History is on Parks Road. In addition to being a museum, it houses a large lecture theatre in which almost all first year lectures are held.

3 The Mathematics and Statistics course

Probability and Statistics, and related subjects, are available to students on several of the undergraduate mathematics courses. This section describes the contents of the Mathematics and Statistics course: some of the lecture courses below are only available to Mathematics and Statistics students, and students on other courses are limited as to how many statistical options they can take.

In Part A, the courses on Graph Theory, Simulation and Linear Programming are only available to Mathematics and Statistics students – see Section 3.2.

In Part B, students take the equivalent of four 32-hour units: a Mathematics and Statistics student takes at least two units in statistical subjects, whereas a Mathematics student can take at most one unit in a statistical subject – see Section 3.4.

In Part C, students take the equivalent of three 32-hour units: a Mathematics and Statistics student takes at least one and a half units in statistical subjects, whereas a Mathematics student can take at most one unit in a statistical subject – see Section 3.5.

In Parts A, B and C, Mathematics and Statistics students can choose their non-statistical options freely from the whole range of options available to Mathematics students.

Note that the formal details of which combination of papers you can offer in the examinations are published by the University in the *Examination Regulations*.

The course has been accredited by the Royal Statistical Society. This means that graduates of the course will be granted the Society's professional status of Graduate Statistician on application. This is a stepping stone on the way to the higher professional status of Chartered Statistician. You can find out more about accreditation by visiting the RSS website:

`http://www.rss.org.uk`

3.1 First year

In the first year, as described in Section 1.2, the Mathematics and Statistics course is identical to the single subject Mathematics course. The Mathematics handbook gives all of the details of the first year, which includes both probability and statistics.

The topics on the syllabus are arranged into four first year examination papers, two on pure mathematics, two on applied mathematics. All students take these four papers at the end of the first year, as well as doing practical work during the year for the computing course Exploring Mathematics with Maple.

3.2 Second year (Part A)

The second year consists of core material (compulsory subjects) on:

- Algebra
- Analysis
- Differential Equations
- Probability
- Statistics

plus options chosen from:

- Graph Theory
- Simulation
- Linear Programming
- Groups in Action
- Introduction to Fields
- Number Theory
- Integration
- Topology
- Multivariable Calculus
- Calculus of Variations
- Classical Mechanics
- Electromagnetism
- Fluid Dynamics and Waves
- Numerical Analysis

The core material is arranged as follows: Algebra, Analysis and Differential Equations are in Michaelmas Term; Probability and Statistics are in Hilary Term. The options are in Hilary, and the first half of Trinity Term.

The options on Graph Theory, Simulation and Linear Programming are of special relevance for Mathematics and Statistics students. These topics are of mathematical interest in their own right and have links with each other and a common link with operational research. If you take these options, approximately half of your second year would be in statistical, or statistically related, subjects. The other mathematical options above are all of those available to single subject Mathematics students.

3.3 Three or four years?

When you applied you will have been advised to assume that you are taking the four year course, and to inform your LEA accordingly. This precaution should be taken for funding reasons. At the beginning of your third year you should decide, taking into account the advice of your college tutors, whether you should choose the three or four year course. You will be asked to register this choice. The options in the fourth year contain more advanced material and your performance in tutorials, classes and examinations in earlier years will need to be taken into account.

You have to apply for entry to the four year course in the Michaelmas Term of your third year. Your College Tutor will be able to provide you with the appropriate application form, which will be available at `http://www.stats.ox.ac.uk`. If it is necessary for the numbers admitted to the four year course to be limited for resource reasons, one or two college references will be asked for, probably by the middle of Michaelmas Term; decisions should be communicated to students by the end of that term. For the Mathematics and Statistics course it has been possible, so far, to accommodate all who wish to do the four year course. Any student whose performance in the second and third year examination falls below 2.2 Honours standard will not be permitted to proceed to the fourth year.

3.4 Third year (Part B)

In the third year you will be expected to take the equivalent of four 32-hour units. The available units, and half units, will be designated as either H-level (aimed primarily at third year students) or M-level (aimed at fourth year or MSc students). You can take up to one unit at M-level in Part B (though there is no requirement to take anything at M-level in Part B).

All Mathematics and Statistics students must take the unit on Applied Statistics, which will include computer practicals. You must also take one full unit (and may take more) from the units and half-units offered on (i) Statistical Inference, (ii) Stochastic Modelling. There are further statistically-related units, for example on Actuarial Science and Mathematical Finance. The current edition of the *Examination Regulations* contains the formal details of which combinations of units you may take in Part B. These details are also summarised in the syllabus and synopses document for Part B, which gives details of all of the units available in Part B.

3.5 Fourth year (Part C)

A fourth year student will be expected to take the equivalent of three M-level 32-hour lecture units. One of these three units must be a statistics project, where statistics is understood in the broad sense including probability and operations research. All Mathematics and Statistics students must take a further half unit from the Statistics menu which currently includes Graphical Models and Inference, Statistical Data Mining, Bioinformatics and Computational Biology, Stochastic Models in Mathematical Genetics, Lévy Processes and Finance, and Probabilistic Combinatorics.

3.6 Changing course

Normally your college will have admitted you to study a specific course. Therefore you would need college permission to change to another course. The structure of the Mathematics and Statistics course, particularly having the first four terms in common with Mathematics, means that changing to or from Mathematics and Statistics is feasible until at least Christmas in your second year. Again, your College Tutor will be able to give you advice.

4 Learning and teaching

As for the other mathematics courses, there are lectures each term, supported by problem sheets, plus tutorials organised by your college, and, in the later years of the course, intercollegiate classes.

4.1 Practicals

In statistics, there will be practical classes associated with the third year unit on Applied Statistics, and also with the fourth year half unit on Statistical Data Mining. In addition to the theoretical work which you will do in statistics, we are keen as a Department that you acquire practical experience. The Applied Statistics unit is compulsory because we think it is essential that all students have experience of the application of statistical methods to the analysis of data.

For some other units there is also a component of compulsory practical work, for example for the first year Maple computing course.

4.2 Project

We also think there are many things to be gained from doing a statistics project, which is why all fourth year students must do a statistics project. Firstly, in terms of your statistical education, we think a project is an excellent opportunity to do a substantial and sustained piece of statistical work (and, for example, to develop further the skills learned in doing the third year practical work). In addition, the general skills of organising material and explaining it are important

to learn, and we also recognise that some students might show their abilities better in doing a project than on a three hour examination paper.

4.3 Examinations

It is by passing the University's 'public' examinations that you qualify for your degree.

The first public examination, called Honour Moderations (or 'Mods'), is at the end of the first year. As described in Section 1.2, all Mathematics and Statistics students take *Honour Moderations in Mathematics*. The marking conventions for Mods are given in the Mathematics handbook. You have to pass Mods, or a later re-sit examination called Prelims, to enter the second year of the course.

The second public examination is the Final Honour School (or 'Finals'). In contrast to Mods, there is a separate Final Honour School for Mathematics and Statistics students (i.e. it is different to that for single subject Mathematics). If you take the three year BA course, you will take Part A of the examination at the end of your second year and Part B at the end of your third year. If you take the MMath course, the second and third year will be similar to the BA, and you will also take Part C at the end of your fourth year. The formal details of which combination of papers you can offer in the examinations are published by the University in the *Examination Regulations*.

4.4 Feedback

There is plenty of opportunity, formal and informal, for you to comment on the course. Both the formal and informal ways you can do this are described in detail in the Mathematics handbook, and indeed the questionnaires used for mathematical and statistical courses are the same. One of the key committees which considers the information from questionnaires is the *Joint Consultative Committee with Undergraduates*, which deals with matters over the whole range of Mathematics, Computer Science and Statistics courses, and the action taken as a result of questionnaire comments is made known to your representatives through this channel.

4.5 Student representation

As described in the Mathematics handbook, the Mathematics Undergraduate Representative Committee (known as 'MURC') is a student body representing the interests of mathematics, computer science and statistics students. In particular, MURC sends student representatives to the termly meetings of the Faculty of Statistics where matters about the course are discussed.

5 If you need help

It is not unusual for students to experience a difficulty of one kind or another. There are a number of ways to handle such situations.

Establish good work habits. You are recommended to read Charles Batty's notes *How do Undergraduates do Mathematics?* and Tom Körner's advice on *How to listen to a Maths lecture*. Both are available on the web.

`http://www.maths.ox.ac.uk/current-students/undergraduates/study-guide/`

`http://www.dpmms.cam.ac.uk/~twk`

Go and talk to somebody. There are a number of people that are ready and willing to help you. Often the best advice is to go and talk to your College Tutor.

Colleges have the lead responsibility for student welfare and can provide details of arrangements made to support their students. The University, in addition, provides for all students who require such support:

a counselling service,

childcare advice,

disability assessment and advice, and

a harassment advisory service.

Further details of these are included in the Proctors' and Assessor's handbook *Essential Information for Students*, which is updated annually.

6 Contact points

You could, of course, contact any member of the Statistics Department for information about the course. The following is a list of more official points of contact.

6.1 Department of Statistics

Head of Department
Professor Colin McDiarmid – `cmcd@stats.ox.ac.uk`

Academic Administrator
Mrs Jan Boylan – `boylan@stats.ox.ac.uk`

6.2 Statistics Academic Committee

Chairman
Dr Matthias Winkel – `winkel@stats.ox.ac.uk`

6.3 Statistics Faculty

Chairman
Professor Gesine Reinert – reinert@stats.ox.ac.uk

6.4 Mathematical Institute

Director of Undergraduate Studies
Dr Audrey Curnock – curnock@maths.ox.ac.uk

Academic Administrator
Ms Margaret Sloper– m.sloper@maths.ox.ac.uk

6.5 MURC

General
http://www.maths.ox.ac.uk/~murc

Appendices

A Syllabus and Synopses

A.1 Moderations

The syllabus and synopses for Moderations are part of the Mathematics handbook, and are also available at:

`http://www.maths.ox.ac.uk/current-students/undergraduates/handbooks-synopses/`

A.2 Part A

The syllabus and synopses for Mathematics and Statistics Part A are part of this handbook, as a supplementary document, and are also available at:

`http://www.stats.ox.ac.uk/current_students/bammath/course_handbooks`

A.3 Part B

The syllabus and synopses for Mathematics and Statistics Part B are part of this handbook, as a supplementary document, and are also available at:

`http://www.stats.ox.ac.uk/current_students/bammath/course_handbooks`

A.4 Part C

The syllabus and synopses for Mathematics and Statistics Part C are part of this handbook, as a supplementary document, and are also available at:

`http://www.stats.ox.ac.uk/current_students/bammath/course_handbooks`

B Examination Regulations

You should receive a copy of the *Examination Decrees and Regulations*, the 'Grey Book', through your college at the beginning of your first term. You should always check with a current copy of the regulations, which can be consulted in University and College libraries.

C Examination Conventions

C.1 Moderations

Mathematics and Statistics students take *Honour Moderations in Mathematics* and the examination conventions for that examination are given in the Mathematics handbook.

C.2 Finals

For those taking the BA in Mathematics and Statistics, 'Finals' examinations consist of Part A (second year examinations) and Part B (third year examinations). For those taking the MMath in Mathematics and Statistics, 'Finals' consists of Part A, Part B, and Part C (fourth year examinations).

Some examination conventions are given in the syllabus and synopses documents for Parts A, B and C. You will also receive advice from the Examiners before each part of your Finals examination, giving more information.