The Department of Statistical Science Taught Postgraduate Student Handbook has been written for postgraduate students admitted by the Department of Statistical Science to study for one of the following degrees:

MSc Statistics  
MSc Statistics (Medical Statistics)

The contents also provide information that may be useful for postgraduate students studying Statistical Science as part of the following degree:

MSc Computational Statistics and Machine Learning (known as CSML)

However, students on the CSML programme should refer primarily to the corresponding information published by the Department of Computer Science at: http://www.cs.ucl.ac.uk/degrees/msc_csml/.

The Department of Statistical Science Taught Postgraduate Student Handbook is intended to provide particular information for students registered for the degrees listed above. General information about studying at UCL is given in the Academic Manual (http://www.ucl.ac.uk/academic-manual) and Current Students (http://www.ucl.ac.uk/current-students/) sections of the UCL website.

It is important that you are aware of the contents of these sections of the UCL website, which include information on:

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The information given in this handbook is as far as possible accurate at the date of publication, but the Department reserves the right to make amendments before the commencement of, or during, the courses to which it refers. Information concerning College regulations and procedures is given for guidance only and is not intended as a substitute for that contained in the UCL Academic Regulations and on the main UCL website (available from the web addresses above).

Department of Statistical Science, University College London, September 2015.
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CALENDAR OF EVENTS

The term dates for the current and upcoming academic sessions are advertised on the UCL website at http://www.ucl.ac.uk/staff/term-dates/. Terms for the 2015/16 session are based on the pattern of 12 weeks, 11 weeks and 7 weeks.

You should regularly check the DOSSSSH Moodle page (see “Computing Facilities” section on page 10) for current information about teaching matters, particularly during the first few weeks of each term when the timetable may have to be amended for unforeseen reasons.

Term 1

- **Week 0:** Enrolment: new students have to carry out College enrolment and course unit enrolment; returning students should only need do the latter.

  **College enrolment** for new students is organised by Student and Registry Services, who send you information about the procedure before the start of the term. (Returning students should be re-enrolled automatically.)

  **Course unit enrolment** is done using the online Portico system (see “Portico – The UCL Student Information Service” section on page 9). The procedure will be explained to you upon arrival. Tutorial groups are allocated automatically and your groups will appear in your online timetable (see “Timetable” section on page 9).

  **Foundation Course:** details are given to you on arrival at the Department.

- **Week 2:** Beginning of lectures for all courses in the Department of Statistical Science.

- **Week 7:** This is reading week. Classes in the Department of Statistical Science are replaced by self-study activities, including some set by the course lecturers.

- **Week 12:** End of all term 1 teaching in the Department of Statistical Science.

Term 2

- **Week 1:** Beginning of lectures in the Department of Statistical Science. Students should check their online timetable for the term 2 tutorial arrangements. Also check for any other timetable changes that may have occurred.

- **Week 2:** Student verification of assessments: Friday is the deadline for all students to review and verify their module selection details on Portico. Student and Registry Services will email you with instructions on how to do this.

  **Changing options:** Friday is the deadline for making module amendments.

- **Week 6:** This is reading week. Refer to the corresponding item in term 1 for details.

- **Week 11:** End of all teaching in the Department of Statistical Science.

Term 3

- **Week 1:** Some revision classes will be offered.

- **Week 2:** Examinations begin.

Start of June to start of September

- Students work on their project, culminating in an oral presentation and submission of the final version of the dissertation at the start of September.
DEPARTMENT OF STATISTICAL SCIENCE

The Department of Statistical Science is a constituent department of the Faculty of Mathematical and Physical Sciences (abbreviated to MAPS). Some information about the history of the Department is provided on the Departmental website at http://www.ucl.ac.uk/statistics.

The Department of Statistical Science is located on the first and second floors of 1-19 Torrington Place. The offices of the academic staff are all in this location. The Departmental Office can be found in room 120 on the first floor.

Staff

Academic staff

| Prof T Fearn (Head of Department) | Dr G Ambler | Dr G Baio |
| Dr JA Barber | Dr A Beskos | Prof RE Chandler |
| Dr C Cotar | Prof M De Iorio | Prof P Dellaportas |
| Dr SE Guillias | Dr CM Hennig | Prof VS Isham |
| Dr FJ Király | Dr IN Kosmidis | Dr I Manolopoulou |
| Dr G Marra | Dr JDB Nelson | Dr PJ Northrop |
| Dr AG O’Keeffe | Prof SC Olhede | Prof RZ Omar |
| Dr GW Peters | Dr Y Pokern | Dr GJ Ross |
| Dr AS Siddiqui | Dr RBA Silva | Dr ADL van den Hout |
| Dr HM Wilkinson-Herbots | Prof PJ Wolfe | Dr J Xue |
| Dr FJ Király | Dr CM Hennig | Prof VS Isham |

Teaching staff

| Dr SJ Harden | Dr J Herbert* | Dr EM Jones |
| Mrs K Krajniewska* | Dr MJ Rassias |

*members of staff indicated with an asterisk are based outside UCL

Support staff

| Mrs D Jayawardena Wilkinson | Dr RG Evans | Miss C Ghosh |
| Ms KA Leport | Mr C Visavakul |

Staff with particular responsibility for taught postgraduate students

MSc Tutor: Dr HM Wilkinson-Herbots (room 233)
Statistics Tutor to CSML students: Dr HM Wilkinson-Herbots (room 233)
Teaching Administrator: Ms KA Leport (room 120)
Careers Tutor: Dr HM Wilkinson-Herbots (room 233)
Chair of Staff-Student Committee: Prof RE Chandler (room 135)
Chair of Departmental Teaching Committee: Dr J Xue (room 141)
Personal Tutor: the MSc Tutor named above is also your Personal Tutor.
Whom to approach with problems

General queries
The MSc Tutor is responsible for the day-to-day running of the MSc Statistics programme (including the Medical Statistics pathway). This person is also your mentor and is there for you to consult about your academic progress and in times of trouble. The MSc Tutor may invite you to discuss your academic progress at appropriate times during the session.

The Teaching Administrator works closely with the MSc Tutor and is the first point of contact for many aspects of your studies. For example, you should contact the Teaching Administrator to notify absence from college, to submit medical documentation or to change a module registration.

If you become unhappy with your degree programme, or a particular course, or with your progress, or if you cannot cope, or if you have other problems, you should immediately discuss the matter with the Teaching Administrator or MSc Tutor. Such problems are often much simpler to deal with if they are addressed immediately. You will then be directed to an appropriate person for more specialist advice if that is necessary.

UCL Student Support and Wellbeing

The College provides a number of key welfare and support services directly to students (e.g. health & psychological services, financial support, discipline / complaints, accommodation, religious advice). Further information regarding these services can be found together on one webpage at: http://www.ucl.ac.uk/current-students/support. The Support to Study Policy document is also accessible via this webpage.

The Student Centre is located on the ground floor of the Chadwick Building on the Gower Street Campus. As you enter the main gate from Gower Street, the entrance is immediately on your right. The Student Centre opening hours are 10:00 to 16:00 Monday to Friday. Their staff can answer questions about graduation ceremonies, international student welfare issues and changes to your student record. If a Student Centre member of staff is unable to answer your question they will signpost you to the correct website / office / department / person to assist you.

The Student Support and Wellbeing team run daily appointment and drop-in sessions at 4 Taviton Street. If you would like to speak to a member of the team in person you can either make an appointment or attend the relevant drop-in session as shown on the following webpage: http://www.ucl.ac.uk/current-students/support/wellbeing/drop_in.

The team also operates a referral system by means of a “Student of Concern” form: http://www.ucl.ac.uk/current-students/support/wellbeing/student_of_concern. All UCL students and members of staff can use this form when a student's welfare presents you with cause for concern. This could include changes in behaviour, unexplained absence, unusual or serious problems, safety concerns, or where the student appears unable or unwilling to seek support themselves.

UCL Student Support Group

This is an online service that allows students to offer peer support to each other; students can log on and anonymously discuss any issues that may be troubling them. There is a discussion board and information pages containing helpful advice about common student problems including anxiety, loneliness, issues around sexuality, coping with exams, procrastination and many others. There is also a “sources of support” page with details of where to find further help if necessary. The web address for this support group is http://www.ucl.ac.uk/support-pages.
Queries about changing your registration status

If you are thinking about changing your degree programme or any of the individual course units, or if you are considering interrupting or withdrawing from your studies, you should first discuss your options with the Teaching Administrator or MSc Tutor.

Further information on changes to your registration status can be found at: http://www.ucl.ac.uk/current-students/services_2/registration_status.

Questions arising from lectures, problems sheets and assessments

For courses offered in Department of Statistical Science: discuss in tutorials or approach the course lecturer in a nominated office hour, as appropriate for the course.

Each member of the academic and teaching staff should nominate at least one weekly office hour during term time for general availability. If you need to consult a course lecturer, please do so in an office hour. In particular, in the period leading up to any assessment (see “In-Course Assessment” section on page 16) the course lecturer will set aside a fixed time or times at which (s)he will be available to answer questions about the assessment. (S)he will NOT answer queries about the course outside these times until the assessment is over.

For other courses: refer to the corresponding information published by the relevant teaching department.

Statement of student status

If you need a document that can be used to confirm your registration status at UCL, you can print out a Statement of Student Status letter or an Opening a Bank Account letter via Portico. Just log into Portico and click on the Statement of Student Status link on your Portico home page. It is recommended that you use the Firefox web browser to access Portico and print out your statement.

Alternatively you can send an email request to studentstatus@ucl.ac.uk with your name, student number, date of birth and desired delivery address.

Visa requirements for international students

General advice for international students, including UKBA requirements for visa renewal, is available from http://www.ucl.ac.uk/iss/immigration-visa. If you need a document for visa purposes, you should follow the instructions given there. ONLY Student and Registry Services is able to issue documents that comply with UKBA requirements.

Further advice on immigration matters can also be obtained from the UCL Union Rights and Advice Centre (http://uclu.org/services/advice-welfare).

Students’ common room and departmental student society

Room 117 is the common room for all taught students registered in the Department of Statistical Science. All such students are eligible for membership of the student-run Statistics Society, which organises social and other activities. Any mail arriving in the Department addressed to taught students will be placed in the pigeonholes in the Students’ Common Room.

Postgraduate students may also use the water cooler, microwave and kettle in the Staff Common Room (room 146), provided that they clean up after themselves. However, they may not store items in the fridge or use anything (e.g. milk) kept in it.
Study facilities

Masters students have their own study room (the Postgraduate Study Room, room 123). Students may also use the lecture room 102 for study when it is not being used for lectures or other classes and meetings. The College's safety regulations only permit students to be in the Department between 08:00 and 19:00 Monday to Friday.

There is substantial space for reading and studying in the College Library (see page 11).

Careers information

Within the Department, there is a careers noticeboard in the Postgraduate Study Room (123). Job advertisements and information about careers talks, fairs and courses are posted there. Some careers talks will be specifically arranged for Statistical Science students.

You may approach members of the academic and teaching staff for a job reference. However, please note that staff cannot supply a reference without your written permission (see “References” section on page 9). If you require a reference, therefore, you should fill in a form, available from the Departmental Office and the DOSSSH Moodle page (see “Computing Facilities” section on page 10). This form also contains space for you to provide other relevant information (for example, a description of the position / course you are applying for, and a brief CV). This kind of information will enable staff to write constructive references for you.

UCL Careers is located on the fourth floor of the Student Central Building in Malet Street. Information about its facilities can be found at http://www.ucl.ac.uk/careers/. You are advised to register with UCL Careers as soon as possible.

Notices

Notices about courses, examinations, and other useful information are posted on the noticeboards in the corridor near to room 120. Please check these noticeboards regularly. Also check the DOSSSH page on Moodle (see “Computing Facilities” section on page 10).

Email

E-mail is used for communication throughout the College and you will be allocated an e-mail address by UCL (see http://www.ucl.ac.uk/isd/services/email-calendar). Please check your UCL e-mail account regularly. There may be urgent messages left for you, e.g. from Student and Registry Services, the Departmental Office, the MSc Tutor, or from staff teaching courses that you attend.

Your tutors, lecturers and College administrative staff will use your College e-mail address and expect you to read and act promptly upon all messages sent to you at this address. If you wish to use only your own e-mail address from a provider external to the College, then it is your responsibility to arrange for e-mails to be forwarded from your College e-mail address. However, UCL cannot be held responsible for mail that is delayed or lost as a result of being forwarded to an external provider. Any consequences arising from not acting upon e-mails to your College address rest with YOU.

Processing of personal information

Whilst you are a student at UCL, the College will need to store and communicate information about you. The Data Protection Act, a law designed to protect the privacy of individuals, applies in any such situation. This section summarises departmental procedures with respect to such information.
Portico – the UCL Student Information Service

UCL operates a web-based student information service which is known as Portico. This is used to store personal information such as addresses and contact details, as well as to deal with module registration, examination entry and to provide students with a record of their academic results. Access to Portico is available to everyone across UCL – staff and students alike – via the web portal http://www.ucl.ac.uk/portico. Login requires your UCL userid and password, which are issued to you once you have enrolled.

Updating your personal information

Most communication within the College is carried out using the internal mail or via email. However, formal communications may also be sent to your registered correspondence address. For example, upon successful completion of your programme of study, a degree certificate and official transcript will be sent to this address.

It is your responsibility to ensure that your personal details held on the UCL central record are correct and up-to-date. This information can be viewed via Portico. Any consequences arising from the failure to correct or update your personal information rest with YOU.

Further information on updating your personal information can be found at: https://www.ucl.ac.uk/current-students/services_2/personal_information

Return of coursework

Marked coursework, bearing a grade, may be returned to you via your pigeonhole, in classes, or through the Departmental Office. These routes are not completely secure and may result in other students seeing your grade. If you are unhappy about this, you should discuss your concerns with the course tutor.

References

We need your explicit permission to give any reference for you. This applies to ALL references, (e.g. for a landlord, a prospective employer or a research degree programme). Thus, when you give either the Department’s or a tutor’s name as a referee, it is important that you complete and sign a “Reference Request” form confirming that you have done so. The form is available from the Departmental Office and the DOSSSH Moodle page (see “Computing Facilities” section on page 10).

Please note that the Department will NOT issue certificates of student status or attendance. You should obtain these from Portico, as explained on page 7.

TEACHING AND STUDYING ARRANGEMENTS

Course System

Taught postgraduate programmes are made up of component courses. Most courses consist of lectures supplemented by at least one of the following: tutorials, workshops, problem classes. The proportions of these activities vary over courses; details for courses offered by the Department of Statistical Science are provided later in this handbook.

Timetable

The timetable for lectures, workshops and problem classes can be found at http://www.ucl.ac.uk/timetable. After making your module selections on Portico, tutorial allocation will be arranged by the relevant Teaching Administrator before courses start and your tutorial group will automatically appear in your online timetable. However, it may take one or two days after registration has been approved before all of the classes appear on your personal
timetable, particularly for tutorials. Check your timetable frequently, in case alterations have
been made. Note also that, once allocated, your tutorial group will **NOT** be changed unless
you can demonstrate a timetable clash.

Although the timetable states that lectures (and other classes) begin and end on the hour,
there is a College-wide agreement that this refers to a starting time of *5 minutes past the
stated hour* and a finishing time of *5 minutes to the hour*. This should give you time to get to
your next lecture before it is due to start.

**Lectures**

These are formal, and can involve students from other degree programmes. Where
possible, Statistical Science lectures take place in lecture rooms 102 and 115 in 1-19
Torrington Place. These rooms are too small for many of the larger courses, however, and
therefore many Statistical Science lectures take place in other rooms around the College,
as do lectures for other UCL courses.

**Workshops**

Workshops, also referred to as "practical classes" within the Department, involve doing set
work under guidance from the course staff. Some workshops will take place in computer
cluster rooms. You should take a pocket calculator to all workshops (see page 11 for
guidelines regarding calculators).

**Problem classes**

These involve discussing coursework with the whole class.

**Tutorials**

Small group weekly tutorials are provided for some courses. These are less formal than
lectures and enable you to raise your own questions about course material, as and when
they arise from lectures or coursework.

**Computing facilities**

There are several PCs in the Postgraduate Study Room (room 123). This facility is
managed by the Systems Administrator, Mr C Visavakul (room 132).

Postgraduate students can also use the College computing facilities provided by the
Information Systems Division (ISD). Computer clusters, for teaching and for individual
study, are located throughout the College. Further information on these facilities, including
how to register to use them, is provided on the UCL website at [http://www.ucl.ac.uk/isd/](http://www.ucl.ac.uk/isd/).

There is an ISD Computer Cluster room near to the Department (room 113). Moreover,
students are able to access the College’s main facilities remotely via the internet. This
means that from home, students are able to use all of the software ([http://www.ucl.ac.uk/isd/
services/software-hardware](http://www.ucl.ac.uk/isd/services/software-hardware)) that is available in the computer clusters,¹ check and send
email ([http://www.ucl.ac.uk/isd/services/email-calendar](http://www.ucl.ac.uk/isd/services/email-calendar)) and access their filespace on the
UCL system. For more information on this service, see [http://www.ucl.ac.uk/isd-extra/services/desktops/wts-web/](http://www.ucl.ac.uk/isd-extra/services/desktops/wts-web/).

¹ There are some restrictions on the use of Microsoft Office products (Word, Excel, Powerpoint etc.) via this
remote system – see the web address above for details. However, students may use any of the other software
on the system without restriction. They may, of course, continue to use their own personal copies of Microsoft
Office products!
UCL has a “virtual learning environment” called Moodle (http://moodle.ucl.ac.uk/). All courses in the Department of Statistical Science have a presence on Moodle, and students registered for these courses can use the service to access online resources such as course information, lecture notes and assessment material. In addition, there is a Moodle space called the “Department of Statistical Science Student Home” (DOSSSH) to which all Statistical Science students have access: this contains useful information about the Department, as well as downloadable forms and links to resources that are described elsewhere in this handbook.

**Library facilities**

The Science Library (in the DMS Watson building, Malet Place) contains an exceptionally good collection of statistical science text and reference books. Copies of most books that are highly recommended for courses taught by the Department are included in the Short Loan Collection on the ground floor in the Science Library. The collection consists of all subjects of the Science Library and is arranged on open access shelves in one alphabetical sequence under authors. The period of loan for statistical science books is 2 days. Books cannot be taken out of the room without being issued. Other recommended books, for which there is less demand, are kept on the third floor of the Science Library. The loan period assigned to these is one week. There are longer loan periods for other books.

The UCL Library has developed a set of online training materials, called WISE, to help users find and use information effectively. WISE is designed to help you to discover the most valuable information for your topic, and to make the best use of it. Topics covered include finding materials in reading lists; search tips and techniques; accessing electronic resources; referencing; and copyright and plagiarism issues. The “WISE for Beginners” course, accessible from https://www.ucl.ac.uk/library/training/guides, is recommended to all new students. Students taking project courses may also benefit from the more advanced “WISE for Mathematical and Physical Sciences” course at the same address.

A new graduate Research Grid is due to open on the fourth floor of the Science Library in October 2015. This will accommodate up to 74 graduate students and will offer a variety of workstations and study spaces which will suit individual study as well as collaborative social learning. The new learning space features a group meeting room, a private Skype point, student lockers, 24 all-in-one Desktop PCs and a hot water point for tea and coffee.

Further information on the College libraries is available at http://www.ucl.ac.uk/library.

**Calculators**

There are eight calculator models that the College has approved for use in examinations. These are the Casio FX83ES, FX83GT+, FX83MS and FX83WA which are all battery powered, and Casio FX85ES, FX85GT+, FX85MS and FX85WA which are all solar powered. **Students on the degree programmes covered by this handbook may NOT use any other type of calculator in Statistical Science examinations.** Students are therefore strongly advised to purchase one of these calculators at the start of their degree programme. The use of a non-approved calculator constitutes an examination irregularity (i.e. cheating) and carries potentially severe penalties.

**Statistical tables**

Statistical tables are provided by the College for use in all examinations set by the Department. The currently provided tables are *New Cambridge Statistical Tables* by D.V.Lindley & W.F.Scott. These will be the statistical tables referenced in the Department's courses.
Feedback on student work

Students receive feedback on all items of assessed coursework (see “Components of Compulsory Assessment” section on page 16) and on selected items of non-assessed work. Feedback may be given in tutorials, problems classes or electronically. It may take the form of verbal or written comments, either personalised or in the form of general points that emerged from the class as a whole. These comments are intended to help you see what was done well and where there is room for improvement. For assessed work, the comments are also provided to help justify the grade awarded.

For assessed work, feedback will include a provisional letter grade. The correspondence between letter grades and percentage marks, along with guidance regarding the interpretation of each grade, is as follows:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Mark</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>≥ 80</td>
<td>The criteria for an A grade are all met. Additionally, exceptional quality has been demonstrated with respect to at least two of the following: understanding, insight, depth of analysis or clarity of discussion, with evidence (where appropriate) of relevant knowledge or reading.</td>
</tr>
<tr>
<td>A</td>
<td>70 to 79</td>
<td>The criteria for a B grade are all met, along with one or more of the following: high quality answers in a wide range of questions, evidence of a very sound understanding, thoroughness of discussion and clarity of expression, evidence of insight, wide knowledge or reading. There may be a small number of relatively minor errors or inconsistencies, but there should not be serious errors in knowledge or understanding.</td>
</tr>
<tr>
<td>B</td>
<td>60 to 69</td>
<td>Good understanding of the questions asked, good knowledge of the main aspects of the subject and good levels of appropriate skills (such as the ability to carry out calculations and manipulations, and to develop a logical argument), along with a level of understanding appropriate to a Masters qualification. At the higher end of the range, one would expect to see clear expression and presentation. A few mistakes are allowable, providing they are not serious.</td>
</tr>
<tr>
<td>C</td>
<td>50 to 59</td>
<td>Reasonable understanding of the subject (sufficient for a pass at Masters level) and a reasonable level of ability in the appropriate skills. At the lower end of this range, work may differ from scripts in the 46-49 range by showing a wider knowledge or having more convincing answers. At the higher end, work in this category may fail to reach Grade B either because it does not demonstrate a wide enough range of knowledge (e.g. some good answers, but too many questions or part questions either omitted or answered inappropriately), or because skill deficiencies lead to too many mistakes or badly presented answers.</td>
</tr>
<tr>
<td>D</td>
<td>40 to 49</td>
<td>Some limited understanding of the subject, but insufficient for a pass at Masters level. This grade might indicate, for example, a serious but largely unsuccessful attempt at a paper; or that some progress has been made but in an insufficient number of questions or at an insufficient level of analysis. It might also indicate answers that show some knowledge of the main concepts, definitions and terminology but are limited, for example, by errors or ambiguities in notation, or because their relevance to the question is not made clear.</td>
</tr>
<tr>
<td>Fail</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>Mark</td>
<td>Interpretation</td>
</tr>
<tr>
<td>-------</td>
<td>------</td>
<td>----------------</td>
</tr>
<tr>
<td>F</td>
<td>\leq 39</td>
<td>At the lower end of this scale, the answers will show little or no understanding of either the questions or the subject. At the higher end, a very limited understanding may be present, but answers will present little evidence of relevant knowledge and contain many mistakes, irrelevancies or misunderstandings. In practice, one might expect a mark at the lower end to indicate that a candidate has not made a serious attempt at answering the questions or who has practically no understanding of the subject; and a mark at the higher end to arise when questions have been attempted but the answers contain little of relevance.</td>
</tr>
</tbody>
</table>

**WHAT IS EXPECTED OF STUDENTS**

**Awareness**

- You are required to abide by the College's rules, regulations and procedures. These are provided in the Academic Manual and Current Students sections of the UCL website mentioned on page 1. You are expected to be familiar with the contents of these pages.

- You are expected to be familiar with the contents of this departmental handbook and to keep it throughout your time here.

- You should ensure that you know what is required of you for each course that you take. For courses given by the Department of Statistical Science, this information will be provided in the first lecture of each course.

**Attendance**

Detailed information on the procedures to follow if you are absent from College is contained in the Current Students section of the UCL website. Some general points to note are:

- You are expected to be in attendance during the UCL terms throughout your programme of study. This includes reading week (see page 4).

- If you wish to be absent from College for some special reason, then you should obtain permission beforehand from the MSc Tutor.

- UCL's *minimum* requirement is that you attend at least 70% of compulsory classes, unless you have good reason (e.g. medical) to be absent. If you fail to satisfy this requirement you may be barred from taking the examination for the course and this may mean that you cannot progress to your next year of study.

- If you have a good reason for needing to miss a compulsory class, you must inform the Teaching Administrator and lecturer or tutor concerned in order to be excused.

- If you have been absent for more than two consecutive days, you should immediately inform the Teaching Administrator of the reason for your absence.

- You should also provide a medical certificate if you are absent from an examination or cannot submit your in-course assessment because of illness (see “Extenuating Circumstances” section on page 20).

- The Department keeps records of coursework submission and attendance at tutorials and workshops. At the end of each term, the Teaching Administrator is required to report on your attendance to the Faculty. You will be required to explain an unsatisfactory attendance record to the Faculty Tutor. An inadequate explanation may lead to your studies being suspended.
• You may also be taking a course provided by another department, where arrangements are likely to be different from those in the Department of Statistical Science. It is important that you know what is expected of you in this course. You may be barred from taking examinations if you have not attended enough tutorials or submitted enough coursework, EVEN if it does not count towards the final examination mark.

The importance of attendance at lectures and other classes has been stressed above. Requests for special attention (e.g. for missed notes, handouts, problem sheets etc.) due to non-attendance without good reason (e.g. medical), do not create a good impression. The same applies to non-submission of coursework. Remember that when writing a job reference for you, we are usually asked to provide information about your attendance and punctuality, as well as your ability, etc. If you are absent from any lecture or other class, you should endeavour to copy up notes promptly.

**Studying**

*Tutorials*

Tutorials in the Department of Statistical Science are compulsory and provide the opportunity to get personal attention. It is important to prepare yourself by reading through the latest lecture material and trying the relevant exercises sheets before the tutorial. Think of questions relating to the course material to ask; make a note of points that you don't understand so that you can have them clarified in tutorials. Take your recent lecture notes and exercise sheets to each tutorial, in particular those relating to material that you know will be discussed.

*Lectures, workshops and problem classes*

Most new material is presented in lectures; some might be introduced by your trying ideas in workshops. The workshops give the opportunity to solve problems with guidance, a helpful alternative method of learning. In most courses learning is sequential; you need to have met and understood past material in order to follow the current material. You are therefore strongly advised to attend all classes. Teaching staff and demonstrators are able to give some personal attention in workshops; absences are likely to be noted.

Staff sometimes receive complaints from students about disruption and noise (caused by other students) in large classes. All students are respectfully asked to consider others when in the classroom: excessive noise and disruption can have a negative impact on the learning experience for everybody. Any student who is persistently disruptive will be asked to leave the classroom, and will receive an official warning from the MSc Tutor with an appropriate note placed on the student’s record.

**Coursework**

In the Department of Statistical Science regular, often weekly, coursework is set. Some of this is for in-course assessment, but much of it is to help you to learn the material being taught. You will normally receive feedback from coursework during problem classes, tutorials or workshops, as appropriate for the course. You will generally be expected to hand in your work so that we can monitor your progress. The detailed arrangements for coursework will vary between courses and you will be told about them at the start of each course. You should ensure that you know what is required for each course that you take.

Our teaching assumes that you have attempted the coursework, and we may refer to it in subsequent classes and coursework. **In-course assessment is compulsory: it contributes to your final examination mark for that course and non-submission may mean that you cannot pass the course** (see “Examinations” section on page 16). Furthermore, for courses with tutorial classes your tutor will record whether you have submitted each piece of non-
assessed coursework by the specified deadline and whether it is a reasonable attempt (i.e. an attempt of pass standard). The Department of Statistical Science expects a reasonable attempt for at least 70% of non-assessed coursework in each course. If you fail to satisfy this requirement you may be barred from taking the examination for the course.

Ensure that you leave yourself enough time to complete each exercise sheet. Weekly sets of exercises may well need about 5 hours work on them, including reading time. In some courses, more substantial sets of exercises are given out on a fortnightly basis: it is recommended that you start them in the first of the two weeks allowed. A prompt start to exercises set for in-course assessment is well advised.

It is good practice to aim for legibility, accuracy and clarity in your coursework, whether or not it is for in-course assessment (the same applies to examinations, of course!).

**Self study**

After a lecture, study your notes carefully. Work through the details slowly and annotate your notes in a different colour to that used in taking them; this can help with revision. It is important to keep on top of each course by reviewing the appropriate notes before the next class (lecture, tutorial, problem class or workshop). Read supporting material from textbooks as necessary. Start coursework well in advance of the submission date (see the above comments on coursework).

The following will help you understand and communicate your understanding of course material:

- continual practice at solving problems;
- thorough preparation for all classes;
- regular revision of course material as the course progresses;
- seeking help when you have difficulties.

The Department has prepared a self-assessment questionnaire to help you to evaluate what you are getting out of your studies and to take responsibility for your own progress. This questionnaire is available on the DOSSSH Moodle page (under the Student Feedback topic). Try completing it for each course during reading week.

**STUDENT FEEDBACK**

The Department is very interested in how students feel about studying Statistics at UCL and how well we are doing according to the students’ point of view. There are a number of ways in which students can give feedback to the Department, some of which are detailed below. Students are also encouraged to give feedback personally to the MSc Tutor (regarding general issues) and to the course lecturers (regarding specific courses). The Department will try its best to take students’ opinions into account wherever possible.

**Committees**

**Staff-Student Consultative Committee**

This usually meets once each term. Student membership normally consists of representatives from each year group. Participation is voluntary, but it is possible in principle for every interested student to attend the committee meetings (subject to space restrictions). These students meet with appropriate staff from the Department. This is an opportunity for students to discuss the results of the course questionnaires, and to air concerns about particular courses in the degree programmes as well as more general issues. The minutes of the meetings and summaries of the questionnaire results are available on the DOSSSH Moodle page for students to consult.
Departmental Teaching Committee

This committee oversees the organisation and structure of the degree programmes and courses offered by the Department. It also considers teaching matters arising from meetings of the Staff-Student Consultative Committee. Student representatives (including at least one from the MSc programme) are invited to Departmental Teaching Committee meetings.

Questionnaires

The Department regularly evaluates all its courses and relies on feedback from as many students as possible in order to get a clear picture of how well the courses are running and whether improvements can be made. You will be asked to complete a questionnaire for each course that you take. This is usually done during the last two weeks of a course. You are expected to take this exercise seriously. Anonymity is preserved and space is provided on the questionnaires for additional comments if you feel that is required (positive comments are also helpful; frivolous comments will be discounted).

EXAMINATIONS

Complete and non-complete courses

In order to qualify for the award of a Masters degree, students must have completed 180 UCL credits. Unless there are strong mitigating circumstances (e.g. medical), you will be non-complete for a particular course if:

- you are absent from the final examination, or make little or no attempt;
- you fail to submit a piece of coursework worth more than 20% of the overall mark.

You may also be declared non-complete in a course if your attendance is insufficient or you don't hand in enough non-assessed coursework (see page 14).

Components of compulsory assessment

Details of the methods of assessment, the amount of work involved and the proportion it normally contributes towards the final mark are given for each course in the “Course Information” section from page 29 onwards.

In-course assessment

At the beginning of each course, the lecturer will provide details of the method and dates of in-course assessment. The assessment dates will also be posted on the course Moodle page. Students should ensure that they have no other commitments on these dates. **In-course assessment is a form of examination, and should be treated as such.**

Each piece of in-course assessment set by the Department of Statistical Science has its own rubric and the instructions given must be followed. **In particular, do pay attention to the consequences of missing the deadline set, non-submission and plagiarism; any of these can result in your not passing the course.** Teaching staff will set aside extra office hours to discuss assessment-related matters (see page 7) students should respect the lecturers’ time by confining queries to these hours.

Some assessments will be in the form of a “take-home” assignment, to be handed in to the Departmental Office or the course lecturer by a set deadline. For such assessments, you will need to sign a cover sheet (provided by the course lecturer) containing a declaration that the submitted work is entirely your own (see “Plagiarism and collusion” section on page 18). You will also need to submit your work in a **single securely stapled bundle** including the cover sheet.
Students are given individual feedback after each piece of in-course assessment (see page 12), unless it constitutes the final piece of assessment for that particular course. The Department aims to provide feedback within four weeks of the submission deadline.

**Written examinations**

These normally take place during term 3. Student and Registry Services will contact you with details of your personal examination timetable, normally just before the end of term 2. Also included will be a copy of the UCL Examination Guide for Candidates: read it!

In most examinations set by the Department of Statistical Science, there are two sections and candidates are required to answer all questions. The questions in section A are intended to be straightforward and to focus on core material, whereas those in section B are more challenging. The rubric will indicate the proportion of the total mark allocated to each section. Statistical tables will be provided by the College in all examinations set by the Department (the currently provided tables are New Cambridge Elementary Statistical Tables by D.V.Lindley & W.F.Scott). You should take a pocket calculator to all of these examinations (see page 11 for details of permitted calculators).

Recent past examination papers are available for consultation on the UCL Library Services website: [http://digitool-b.lib.ucl.ac.uk:8881/R\&?local_base=EXAMPAPERS](http://digitool-b.lib.ucl.ac.uk:8881/R&?local_base=EXAMPAPERS).

**Final course mark**

To pass a course at Masters level, a final mark of at least 50% is required. For courses with more than one assessment component, a guideline is given later in this handbook to indicate the scheme used for combining the individual marks. This guideline will normally be adhered to, but is subject to change at the discretion of the Board of Examiners.

**Deadlines**

The Department aims to allow a reasonable period of time to complete any item of assessment if you manage your time effectively. Late submissions will incur a penalty unless there are extenuating circumstances supported by appropriate documentation. Penalties are as follows:

- For work submitted after the deadline but before the end of the next working day, the full allocated mark will be reduced by 5 percentage marks.
- For work submitted at any time during the following six days, the mark will be reduced by a further 10 percentage marks.
- For coursework submitted more than 7 days late but before the end of the second week in term 3, a mark of zero will be recorded. However, the assessment will be considered complete (see page 16). In the case of project dissertations submitted more than 7 days after the deadline, the mark will be recorded as zero but the assessment will be considered to be complete.

**Word counts**

Some assessments (usually involving the production of reports) carry a specified maximum word count. Assessed work (including dissertations) should not exceed the prescribed length. If submitted work is found to exceed the upper word limit by less than 10%, the mark will be reduced by ten percentage marks, subject to a minimum mark of 50%, providing the work is of pass standard. For work that exceeds the upper word limit by 10% or more, a mark of zero will be recorded. In the case of coursework that is submitted late and is also over length, the lateness penalty will have precedence.
The word count will be considered to include all text and formulae in the abstract and main body of the assessment (including figure and table captions), but to exclude the table of contents, reference lists and appendices. However, this should not be regarded as an invitation to transfer large amounts of surplus text into an appendix and the mark awarded will reflect the standard of judgement shown in the selection of material for inclusion.

Plagiarism and collusion

Plagiarism means attempting to pass off someone else's work as your own, while collusion means passing off joint work as your own unaided effort. Both are unacceptable, particularly in material submitted for examination purposes. Plagiarism and collusion are regarded by the College as examination irregularities (i.e. cheating) and are taken extremely seriously. UCL uses a sophisticated detection system (Turnitin®) to scan work for evidence of plagiarism and collusion, and the Department reserves the right to use this for assessed work. This system gives access to billions of sources worldwide, including websites and journals, as well as other work submitted to the Department, UCL and other universities. It is therefore able to detect similarities between scripts that indicate unacceptable levels of collusion, as well as material taken from other sources without attribution.

If plagiarism or collusion are suspected, on the basis either of the Turnitin® software or other evidence, it can be dealt with informally only in the case of first offences. All other cases must be dealt with formally, which involves adjudication by a departmental panel and/or College Examinations Irregularities panel. If the panel finds that an offence of plagiarism or collusion has been committed, a penalty will be imposed. Penalties depend on the severity of the offence, and range from being awarded zero marks for the work in question up to exclusion from all further examinations. They can also include a formal reprimand, which will be entered on the student's departmental and College records.

What isn't acceptable?

Students sometimes find it difficult to know what counts as plagiarism or collusion. The following list is not exhaustive, but gives some indication of what to avoid. It is based on guidelines developed by Nick Hayes of the UCL Pharmacology Department. You may NOT:

- Create a piece of work by cutting and pasting material from other sources (including websites, books, lecture notes and other students' work).
- Use someone else's work as your own. This includes, but is not limited to:
  - Making notes while discussing an assessment with a friend, and subsequently using these as the basis for all or part of your submission.
  - Telephoning another student to discuss how best to carry out a particular piece of analysis.
  - Employing a professional ghostwriting firm or anyone else to produce work for you.
- Use somebody else’s ideas in your work without citing them.
- Ask a lecturer in the department for help with assessed work, unless you make it clear to them that the work is assessed.
- Help another student with their assessed work. If you do this, you will be deemed to be guilty of an examination irregularity.

What is acceptable?

The following practices do not constitute plagiarism / collusion:

- Quoting from other people's work, with the source (e.g. book, lecture notes, website)
clearly identified and the quotation enclosed in quotation marks.

- Summarising or paraphrasing other people's work, providing they are acknowledged as the source of the ideas (again, usually this will be via a reference to the book, journal or website from which the information was obtained).

- Asking the course lecturer for help with difficult material, providing it is clear that the question is in connection with the assessment. The lecturer will be able to judge for him or herself what is an appropriate level of assistance.

**Some examples**

Unfortunately, each year there are some students in the Department of Statistical Science who submit work that contravenes the regulations. The consequences can be severe.

**Example 1:** Final-year student A had a lot of coursework deadlines in the same week as an important job interview. One of the coursework deadlines was for an extended piece of data analysis, set two weeks previously. Because of his other commitments, student A did not start this piece of coursework until shortly before the deadline, at which point he discovered that he did not have enough time to do it. He asked student B for help. The result was that both students submitted essentially identical work using exactly the same computer output. A departmental panel was convened to investigate the matter. The panel suggested that student B had passed electronic material (computer output and graphics files) to student A, who had pasted this material straight into his own submission. Although student A admitted asking student B for help, both students denied exchanging electronic material. They were, however, unable to explain how the same electronic files came to appear in both submissions. As a result, the allegation was upheld and both students were penalised. Student A was recorded as “non-complete” for the course in question (this meant that he had no possibility of passing it that year), and student B was given a mark of zero for the coursework component.

**Example 2:** Students C and D both had to submit some computer code for an assessment, which was worth one third of the total mark for a course. There was considerable flexibility in how to go about the assessment. Although the students submitted code that looked very different, closer inspection revealed that they were carrying out the same procedures in more or less the same order, and that the methods they used to carry out these procedures were essentially the same. Further, these procedures and methods were not used by other students in the class. On investigation, it transpired that the students had discussed the assessment over the phone while sitting in front of their computers. This is unacceptable, and as a result the marks of both students for this piece of assessment were halved.

**Example 3:** The in-course assessment for a particular module was organised as a multiple choice exam taken via Moodle outside of lessons. Each student could attempt the one-hour exam at any time of their choosing within a ten day window, but were clearly advised that they must work alone. After the exams had been graded, it was noticed that students E and F had given identical answers to every question (including incorrect answers). Inspection of the Moodle logs revealed that the students had started and finished their attempts at exactly the same time, using IP addresses that were traced to adjacent PCs in the same computer cluster. Students E and F admitted colluding on the in-course assessment and were both given a mark of zero.

**How to avoid plagiarism and collusion**

If you are found to have committed an offence of plagiarism or collusion, it makes no difference whether or not you intended to do so. Ignorance is no excuse. To avoid committing an offence, a useful rule of thumb is: if in doubt, don't do it. Make sure that any work you submit is your own unaided effort. More specific guidance is as follows:
• Plan your work schedule carefully, to allow enough time to complete each piece of assessment.

• If you have genuine problems in meeting a deadline, don’t take the easy way out and borrow a friend’s work. Discuss your difficulty with the course lecturer in the first instance.

• If you are stuck with an assessment, don’t ask another student for help. Discuss it with the course lecturer.

• If another student asks you for help with an assessment, or asks to see your work, suggest that they approach the course lecturer instead. Remember: if somebody else copies or uses your work, you will be penalised as well, even if you didn’t expect them to use your work in this way.

More information can be found at http://www.ucl.ac.uk/current-students/guidelines/plagiarism, and in the UCL Library Services WISE courses (see page 11).

**Special examination arrangements**

If you have a disability, medical condition or specific learning difficulty (including dyslexia), UCL recognises that the usual examination formats may not be suitable for you. In this case, you are advised to contact Student Disability Services (http://www.ucl.ac.uk/disability/) as early as possible in the academic year to discuss an application for special examination arrangements. All applications must be accompanied by evidence of disability or medical condition provided by a competent authority. Such an authority would usually be your consultant or GP.

If you wish to have special examination arrangements (e.g. extra time, use of a computer) on the grounds of a Specific Learning Difficulty you will need to have an assessment with one of UCL’s SpLD assessors. This is the case even if you come to UCL with an up-to-date diagnostic assessment report. To arrange an appointment contact SDS on 020 7679 0100. Application forms for students with disabilities other than dyslexia / specific learning difficulties can be obtained from Student Disability Services or the Examinations Office. A Disability Advisor will be happy to help you complete the form.

Student Disability Services will liaise with the Examinations Office regarding your exam arrangements. You will then receive a letter from the Exams Office to inform you of the arrangements that have been agreed for you. If you do not think that these arrangements are appropriate there is an appeals procedure.

Any special arrangements that are agreed for you will automatically be taken into account in all centrally-organized exams held during the main exam period in term 3. However, in order to have your requirements taken into account for any departmentally-organised assessments held outside the main exam period, you must provide the relevant department with a copy of your letter in advance of the test date.

To ensure that there is sufficient time to put in place any appropriate arrangements, applications should be submitted as early as possible and in any event **NO later than six weeks before the start of your examinations in term 3.**

**Extenuating circumstances**

Extenuating circumstances are defined by UCL as circumstances in a student’s life that are unexpected, significantly disruptive and beyond the student’s control and which may affect their performance at assessment. Wherever possible, UCL is responsible for ensuring that students are not unfairly disadvantaged by such circumstances.
The extenuating circumstances regulations provide short-term solutions for students experiencing sudden, unexpected difficulties. They are not designed to support students with longer-term or chronic conditions or disabilities. UCL seeks to ensure that such students are enabled to achieve their full potential at assessment by putting in place appropriate special examination arrangements (see the previous section).

Examples of extenuating circumstances that would commonly be regarded as having seriously affected a student's performance are:

- death of, or serious injury to, a close relative;
- a serious personal injury or medical condition;
- being the victim of a serious crime (e.g. assault, mugging);
- theft of work required for assessment.

Examples of circumstances that would not normally be considered are:

- minor illnesses or injuries (e.g. colds, headaches, hay fever);
- assessment / examination stress (e.g. because of tight exam timetabling);
- failure of IT equipment / printers;
- minor private or public transport failure.

However, these lists are by no means exhaustive and additional guidance on the types of claims that might be considered is available from the UCL Academic Manual (Section 7): [http://www.ucl.ac.uk/academic-manual](http://www.ucl.ac.uk/academic-manual). Furthermore, UCL recognises that each student's circumstances are different and that claims must be considered on a case-by-case basis.

You are responsible for making known any circumstances which may affect your performance in good time for them to be considered by the appropriate UCL body. You must complete an Extenuating Circumstances Claim Form (available from the DOSSSH Moodle page) and submit this, together with appropriate supporting evidence, to the Teaching Administrator as soon as possible and **NO later than one week after the circumstance has taken place**. Claims must clearly state the modules / components for which you are seeking mitigation; claims will not be considered for any modules not identified on the claim form.

Claims must be supported by written evidence from an appropriate, verifiable and independent authority such as a registered medical practitioner, solicitor, undertaker, registrar of births, marriages and deaths, police officer, fire officer, court or tribunal officer. Evidence must cover the full period for which you are claiming mitigation and must be provided in English or accompanied by a translation formally notarised by a solicitor. If you are unable to obtain evidence in order to submit your claim within the one week deadline, you should submit the claim on time, indicating on the form that the evidence is to follow.

Depending on the type of mitigation being requested, your claim will be reviewed by relevant members of staff from the Department and / or MAPS Faculty, who will make a decision either to accept or reject the claim, or to request additional evidence. You will be notified in writing within one week of the decision being made. Where a claim is accepted, the notification will include details of the mitigation to be applied. Where further evidence is required, you will be expected to provide this within a further two weeks.

Unless you follow the above procedure, **it will NOT be possible for the examiners to take any extenuating circumstances into account**. Details of the precise circumstances affecting individual students are not made available to all examiners.

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2 It is, however, recognised that a student with a chronic or long-term condition may nonetheless experience an acute episode or sudden worsening of their condition, or that the condition might be newly-diagnosed. Such students are encouraged to seek support through Student Disability Services, but may also need to submit an extenuating circumstances claim if, for example, there is insufficient time to put special examination arrangements in place.
Examination marks

Each examination script is marked by two examiners, one of whom is normally the course lecturer. The scripts are also scrutinised by an external examiner and the marks are finalised at meetings of examiners in the departments offering the courses. When finalising the marks, examiners in the Department of Statistical Science refer to the grade descriptors summarized in the “Feedback on student work” section on page 12.

Provisional results for the taught component and provisional award recommendations for postgraduate students registered in the Department of Statistical Science are released after the appropriate examiners’ meetings, normally in June and November respectively. These results are provisional until confirmed by the College Examination Board later in the year and will be published online via the DOSSSH Moodle page. To access the provisional results online you will need your candidate ID number, along with your UCL userid and password. Students will be advised of the release date in advance via UCL email and should not waste staff time by asking about results any earlier than this! Under the Data Protection Act (see page 8), we are unable to provide results by telephone.

Confirmed marks are accessible via Portico, once they are available. Students can then obtain an official paper transcript from the Examinations Section.

Appeals concerning examination results

Where informal resolution is not possible, candidates may appeal against their examination results under one or more of the following conditions (see http://www.ucl.ac.uk/academic-manual/part-5/student-complaints-procedure):

- Arithmetical or transcription error in the compilation of the marks and/or the result.
- The examiners could not reasonably be made aware, formally, of special circumstances notified by the candidate which significantly affected his/her performance. For a candidate to appeal on these grounds, it is necessary to demonstrate that they could not reasonably have submitted the appropriate claim for extenuating circumstances by the required deadline (see page 20).
- The examination and/or classification process was not conducted in accordance with the relevant regulations/procedures.
- There is substantive evidence that one or more of the examiners was biased or prejudiced against the candidate in one or more specific examinations.

Any such appeal should be addressed in the first instance to the Deputy Registrar. Note that appeals will NOT be considered except under one or more of the conditions above. The Department of Statistical Science would therefore like to reassure all students that all staff in the Department take the assessment process extremely seriously. The marking process described above is designed to ensure that papers are marked fairly and accurately, with all marks agreed by at least three examiners (two internal and one external) and any difficulties discussed by the entire Board of Examiners.

MSC PROJECT

Guidelines for preparation and submission

- Students should plan to take a short break after their written examinations, before starting work on their projects. All supervisors are likely to be away from time to time during the period June-September, attending conferences or on holiday. Students
should therefore see their supervisors as soon as their examinations are over, to make mutually convenient arrangements for starting work on their projects.

- During the project work, student and supervisor should arrange to meet regularly (about once a week, whenever possible) and should agree a suitable timetable for completing the project work and producing a written account. The supervisor should advise the student to start to write up the work, and to ask for the supervisor’s feedback on their writing, early in this period.

- Supervisors will provide feedback on an entire draft of the project dissertation on at least one occasion, providing it is available in at least three weeks before the deadline for submission. Any request for feedback after this deadline is at the discretion of the supervisor. Supervisors should provide feedback within two weeks.

- Final (word-processed) dissertations should be handed in to the Departmental Office by 16:00 on the advertised date (this is normally at the start of September). Late submissions will incur severe “lateness” penalties (see “Deadlines” section on page 17). Furthermore, a pdf version of the dissertation should be submitted via Moodle on the same day (the MSc Tutor will circulate more detailed instructions nearer to the date).

- The length of a project dissertation will depend on the topic of the project and may vary considerably. Lengths between 8,000 and 15,000 words (excluding computer programs, tables, graphs, formulae and other output) are generally acceptable. Typical projects are between 10,000 and 12,000 words long. The formal maximum length is 16,500 words; see the Guidelines for Assessment below.

- Each dissertation should include a table of contents, an introduction, a conclusion or discussion section, and a list of references. The reference list should include all references that have been used to support the work reported in the project; and these references should be cited in the text of the dissertation as appropriate to indicate where they have been used, following accepted conventions for citation. The pages should be clearly numbered and should have a left-hand margin of at least 2cm. Examiners attach considerable importance to accuracy, clarity and overall quality of presentation.

- In addition to the project dissertation, each student will be required to give a presentation on their research. The time normally allocated to each presentation is 15 minutes excluding questions. Students are expected to attend and actively participate in the oral presentations by other students. Presentations normally take place in early September; students therefore need to ensure that they are available in the Department at this time.

Specific dates for the arrangements referred to in the third and fourth bullet points above will be provided separately. Please ensure that you are aware of them.

**Guidelines for assessment**

- Project dissertations are read independently by two examiners, one of whom is normally the candidate’s project supervisor. Each examiner provides a brief written assessment. Dissertations are also read by a visiting examiner. The final mark is agreed by the whole exam board, which includes the visiting examiner. It is possible, but not usual, that a student may be required to take an oral examination before a final mark is assigned. The final mark should be interpreted in accordance with the guidance notes on page 12.

- Examiners will satisfy themselves that the dissertation is the work of the candidate, and will take into account the following points:
  - the difficulty and novelty of the project;
  - the amount of new methodology/application knowledge that the student was required to learn;
the degree of direction required from the project supervisor;
the student’s progress throughout the project.

Subject to these overall criteria, examiners will consider both the content of the dissertation and its presentation, with a higher priority being attached to content. Aspects considered will usually include the following:

- **Content**: amount of work done; extent to which understanding has been demonstrated; quality and accuracy of reasoning, validity of interpretation, relevance of conclusions; critical appraisal, discussion of limitations and suggestions for further work; clarity of objectives; quality of literature review; quality of data organisation and collection (if applicable); quality of programming or use of software (if applicable).

- **Presentation**: layout of dissertation and care in its presentation; structure of the dissertation; use of appropriate judgement in selecting material; clarity of expression, readability and coherence; correctness of grammar and spelling; adequacy of diagrams, graphs and tables (if applicable); quality of presentation of mathematical material (if applicable).

A mark less than 50 will be awarded if the material, though correct, is judged to be wholly reproduced in a purely technical manner.

For a mark over 85, it is expected that the student, in addition to having submitted a well-presented dissertation demonstrating a good understanding of the material and a comparatively high amount of work, will also have shown some initiative rather than simply following instructions. Marks of 90 or more may be appropriate where in addition the technical or conceptual difficulty of the material is very high, or where some of the work could be considered original research on the part of the student.

The length of project dissertation will depend on the topic of the project and may vary considerably. Lengths between 8,000 and 15,000 words (excluding computer programs, tables, graphs, formulae and other output) are generally acceptable. Typical projects are between 10,000 and 12,000 words long. Dissertations that exceed 16,500 words will be penalised (see page 17). It is generally required that the amount of work done and demonstrated is high enough, and that the material is presented in a way understandable to fellow students with a comparable background (so 8,000 words may only be an appropriate length for a very theoretical or densely presented dissertation). On the other hand, dissertations should not be too repetitive or contain unnecessary or irrelevant details, which may lead to downmarking even below 1,650 words. Although the word counts given above exclude appendices, tables and program listings, these items will also be penalised if they are excessive.

Each project presentation will be assessed by two examiners. Normally, neither of the examiners will be the candidate’s supervisor. The examiners make independent notes on the presentation prior to discussing and agreeing a mark. Aspects considered will usually include the following:

- **Content**: was the presentation interesting? Did it focus on the important aspects of the work and flow logically? Was there sufficient detail to be intelligible to statistically literate listeners who do not have an in-depth knowledge of the specific topic? Were there clear aims and conclusions?

- **Presentation skills**: was the verbal presentation confident and clearly audible with varied inflexion? Did the presentation engage with the audience? Were visual aids clear, well produced and well used? Were questions handled appropriately? Was the amount of material appropriate for the time allowed?
SCHEME FOR THE AWARD OF AN MSc

MSc Statistics

For the award of an MSc Statistics, students must be complete (see page 16) in eight taught courses (four core courses and four approved optional courses, excluding the Foundation Course, see “Programme Specifications” section on page 26) and a project. The final mark for the programme will be computed as a 2:1 weighted average of marks for the taught component and project, respectively, with the taught component mark calculated as a straight average of marks from the eight taught courses.

For the award of an MSc, a student must pass all modules including the project. The pass mark is 50. For students failing up to two taught courses with marks in the range 40-49, an MSc may be awarded at the discretion of the examiners, taking into account performance in other courses.

The award of an MSc with Merit will be made if the overall mark is at least 60, the mark for the project is at least 60 and there are no marks below 50, no condoned marks, and all marks are based on first attempts.

The award of an MSc with Distinction will be made if the overall mark is at least 70, the mark for the project is at least 70 and there are no marks below 50, no condoned marks, and all marks are based on first attempts.

If the criteria above are not met, no award is made. A student may then re-sit failed courses when the examinations take place in the next session. Students are advised not to take the condonement of marks in the range 40-49 for granted if they prepare for re-sit exams, and that they should attempt to re-sit all exams that were below 49. Further details on re-entry for examinations are contained on the UCL website: http://www.ucl.ac.uk/current-students/exams_and_awards. If a re-sit is also failed, the best available mark for that course will be used in the calculation of averages.

MSc Statistics (Medical Statistics)

The conditions for the award of an MSc Statistics (Medical Statistics) are the same as for the MSc Statistics as outlined above, except that, more taught courses are compulsory (see page 28) and the project must be on a topic related to medical statistics.

Prizes

The following sessional prizes may be awarded to students on the MSc Statistics programme (including the Medical Statistics pathway):

- **PSI Prize:** for outstanding overall performance.\(^3\)
- **Project Prize:** for the best MSc project.\(^4\)

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\(^3\) Awarded by PSI (“Statisticians in the Pharmaceutical Industry”) on the recommendation of the Board of Examiners in Statistics.

\(^4\) If the same recipient would otherwise be selected for both prizes, there will instead be two prizes for outstanding overall performance (and no Project Prize).
ROYAL STATISTICAL SOCIETY ACCREDITATION

The Royal Statistical Society (RSS) accredits university degree programmes at undergraduate and MSc level for a particular year on the basis of information supplied by the university. The MSc Statistics is currently accredited. This means that Graduate Statistician (GradStat) status will automatically be granted, on application to the RSS, to holders of the MSc who successfully completed the taught part of the degree programme during the accredited year. Applicants must already be Fellows of the RSS or become Fellows concurrently.

Accreditation is renewed annually subject to RSS approval of any amendments to the programmes of study and the syllabuses of constituent courses.

PROGRAMME SPECIFICATIONS

Course Codes

Each course offered in a programme has a code: this consists of a four character prefix which indicates the examination board responsible for that course, followed by another four characters indicating a course code within that board. Courses in Statistical Science have the prefix STAT (see the lists of courses that follow). However, you will often find that staff refer to course codes as simply G1 for STATG001 (for example).

MSc Statistics

Aim

To provide a one-year taught Masters degree in Statistics for more advanced training in statistical theory and applications, which enables graduates to enter specialist employment or academic research.

Objectives

A student on completion of the MSc programme should have acquired:

- a grounding in a selection of traditional branches of statistics;
- an introduction to modern ideas of statistics such as applied Bayesian methods, generalised linear modelling and object oriented statistical computing;
- an introduction to a selection of applications of statistics from medicine, industry and finance;
- experience of seeking out, interpreting and presenting statistical ideas or information, both orally and by written report.

Curriculum

Compulsory

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATG000</td>
<td>Foundation Course</td>
<td>1</td>
</tr>
<tr>
<td>STATG001</td>
<td>Statistical Models &amp; Data Analysis</td>
<td>1</td>
</tr>
<tr>
<td>STATG002</td>
<td>Statistical Design of Investigations</td>
<td>1</td>
</tr>
<tr>
<td>STATG003</td>
<td>Statistical Computing</td>
<td>1 &amp; 2</td>
</tr>
</tbody>
</table>

The Foundation Course begins one week before the start of term 1.
Optional: choose four courses, normally from the following list:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATG009</td>
<td>Decision &amp; Risk</td>
<td>2</td>
</tr>
<tr>
<td>STATG010</td>
<td>Stochastic Systems</td>
<td>1</td>
</tr>
<tr>
<td>STATG011</td>
<td>Forecasting</td>
<td>2</td>
</tr>
<tr>
<td>STATG012</td>
<td>Statistical Inference</td>
<td>1</td>
</tr>
<tr>
<td>STATG015</td>
<td>Medical Statistics I</td>
<td>1</td>
</tr>
<tr>
<td>STATG016</td>
<td>Medical Statistics II</td>
<td>2</td>
</tr>
<tr>
<td>STATG017</td>
<td>Stochastic Methods in Finance I</td>
<td>1</td>
</tr>
<tr>
<td>STATG018</td>
<td>Factorial Experimentation</td>
<td>2</td>
</tr>
<tr>
<td>STATG019</td>
<td>Selected Topics in Statistics</td>
<td>2</td>
</tr>
<tr>
<td>STATG020</td>
<td>Stochastic Methods in Finance II</td>
<td>2</td>
</tr>
<tr>
<td>STATG021</td>
<td>Bayesian Methods in Health Economics</td>
<td>2</td>
</tr>
<tr>
<td>STATG022</td>
<td>Quantitative Modelling of Operational Risk &amp; Insurance Analytics</td>
<td>2</td>
</tr>
</tbody>
</table>

In some circumstances, you may choose one option from other statistics-related courses offered in the College. Such options are sometimes referred to as electives. Examples of potential elective options include courses in mathematical biology (from the Mathematics Department), econometrics (from the Economics Department) and supervised and unsupervised learning (from the Computer Science Department).

The timetable will not be amended so that you may choose an elective option. However, students may usually take electives that are scheduled for Friday afternoons even though these clash with occasional workshops for statistics courses: in this case, it is the student's responsibility to catch up on any work missed as a result of the clash.

The following are recent examples of elective courses that previous students have taken:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPGI08</td>
<td>Graphical Models</td>
<td>1</td>
</tr>
<tr>
<td>ECONG020</td>
<td>Econometrics</td>
<td>1</td>
</tr>
<tr>
<td>MATHG501</td>
<td>Theory of Traffic Flow I</td>
<td>2</td>
</tr>
<tr>
<td>MATHGM03</td>
<td>Operational Research</td>
<td>1</td>
</tr>
</tbody>
</table>

To take an optional course, you must register for it on Portico. Instructions on how to do this can be found on the Portico website (log on to Portico and select the “Module registration documentation” option from within the “Module Selection” container). In choosing options, you are advised to try and balance the amount of work evenly between the two terms.

Please remember that your registration for any optional course is subject to approval both by the MSc Tutor and by the Department offering the option. Attempts to register for unsuitable options will be rejected. If you are in any doubt as to whether you will be allowed to take a particular option, you should discuss it with the MSc Tutor, BEFORE attempting to register for it on Portico.

Note also that provisional examination results for elective modules may not be released at the same time as those for Statistical Science courses (see page 22), as the former come under the responsibility of examination boards in other UCL departments that may operate to different schedules.

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6 Training sessions for the project are held throughout the year.
7 The course on Statistical Inference is compulsory for MSc students needing to reinforce this area.
MSc Statistics (Medical Statistics)

Medical Statistics is a pathway of the regular MSc Statistics, which means that the rules for the MSc Statistics also apply to the MSc Statistics (Medical Statistics), with some additional restrictions.

Aims and Objectives

Medical Statistics is a fundamental scientific component of health research. Medical Statisticians interact closely with biomedical researchers, epidemiologists and public health professionals and contribute to the effective translation of scientific research into patient benefits and clinical decision-making. As new and more complex biomedical problems emerge, medical statistics faces exciting challenges in the novel application of existing tools and the development of superior methods.

A priority for the National Institute for Health Research is to build research capacity in medical statistics, as there is currently a shortage of individuals with sufficient training and expertise in this area to support the current volume of health research. The Medical Statistics pathway provides students with a sound background in the theoretical statistics as well practical hands-on experience in designing, analysing and interpreting health studies. The aim is to equip students with the skills needed to work as medical statisticians in the pharmaceutical industry, universities, the NHS, and clinical trials and other medical research units.

Curriculum

Compulsory

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATG000</td>
<td>Foundation Course</td>
<td>1</td>
</tr>
<tr>
<td>STATG001</td>
<td>Statistical Models &amp; Data Analysis</td>
<td>1</td>
</tr>
<tr>
<td>STATG003</td>
<td>Statistical Computing</td>
<td>1 &amp; 2</td>
</tr>
<tr>
<td>STATG004</td>
<td>Applied Bayesian Methods</td>
<td>2</td>
</tr>
<tr>
<td>STATG012</td>
<td>Statistical Inference</td>
<td>1</td>
</tr>
<tr>
<td>STATG015</td>
<td>Medical Statistics I</td>
<td>1</td>
</tr>
<tr>
<td>STATG016</td>
<td>Medical Statistics II</td>
<td>2</td>
</tr>
<tr>
<td>STATG099</td>
<td>Project</td>
<td>Jun - Sep</td>
</tr>
</tbody>
</table>

Optional

Choose one course from the following list:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATG002</td>
<td>Statistical Design of Investigations</td>
<td>1</td>
</tr>
<tr>
<td>EPIDGS31</td>
<td>Epidemiology</td>
<td>1</td>
</tr>
</tbody>
</table>

and one course from the following list:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATG021</td>
<td>Bayesian Methods in Health Economics</td>
<td>2</td>
</tr>
<tr>
<td>GENEG005</td>
<td>Statistics for interpreting Genetic Data</td>
<td>2</td>
</tr>
</tbody>
</table>

8 The Foundation Course begins one week before the start of term 1.
9 The project topic is expected to be related to Medical Statistics.
10 Training sessions for the project are held throughout the year.
MSc Computational Statistics and Machine Learning

The specifications of this programme are available from the Department of Computer Science at: http://www.cs.ucl.ac.uk/degrees/msc_csml/course_information/.

Part time study

The MSc Statistics (including the Medical Statistics pathway) is available for part time study. The part time MSc is a two year programme. The rules are the same as for the full time programme, with the same compulsory and optional courses (special teaching times are not offered for part time students). Students are expected to take four courses in their first year and four courses in their second year from the eight taught courses have to be taken overall. In exceptional circumstances, it may be permitted to split the eight courses 3:5 or 5:3 over the two years instead of 4:4, but this has to be approved by the MSc Tutor.

The Foundation Course is taken at the beginning of the first year. It is recommended that students take STATG001 in the first year, and prerequisites of courses need to be fulfilled, but otherwise there are no restrictions on which courses are taken in which year. Part time students submit their project at the end of their second year. It is possible to arrange with the project supervisor to start to work on the project earlier than full time students, but part time students are not entitled to a higher overall amount of supervision.

COURSE INFORMATION

The following pages give more detail, including outline syllabuses, of the core and optional courses comprising the MSc Statistics programme (including the Medical Statistics pathway). For most courses, some indication is also given of areas where the course material may be applied in practice; this is to help students decide which options might be most suitable for them.

STATG000 FOUNDATION COURSE

Aims of course: To review the prerequisite undergraduate material assumed for the rest of the MSc degree programme.

Objectives of course: On completion of the course, a student should have reviewed and completed exercises on basic probability theory, statistical estimation and hypothesis testing, practical statistics and associated computing.

Prerequisites: Introduction to theory of probability and statistics, and the associated necessary mathematical theory.

Course content: Introduction to probability, conditional probability, random variables and distributions, expectation, special distributions, Poisson processes, Markov chains and "birth-death" processes. Introduction to estimation, sampling distributions of estimators, testing hypotheses, categorical data, non-parametric methods, linear statistical models, Minitab computing package.

Texts:

Assessment for examination grading: This course is not examined.

Set work:
Exercises are set with each topic. Many of these are from the book by Rice.

Timetabled workload:
About 45 hours, mainly during the week preceding and in the first week of term 1.
STATG001
STATISTICAL MODELS AND DATA ANALYSIS

Aims of course: To introduce the theory of linear and generalised linear / additive models and associated data analysis.

Objectives of course: On successful completion of the course, a student should have an understanding of the exponential family of distributions and their use in the formulation of generalised linear / additive models, and should be able to interpret the results of fitting such models in both a technical and non-technical manner.

Applications: The statistical methods introduced in STATG001 are very general, and they are used in almost all areas in which statistics is applied. In the course, we will analyse data sets from, among other areas, industrial quality control, astronomy, social sciences, and biology.

Prerequisites: STATG000. Simultaneous or previous attendance on STATG012 or its equivalent.


Course STATG003 gives students the computing skills to implement the methodology discussed in this course.

Texts:

Assessment for examination grading:
In-course assessment (see page 16), the exact method of which will be announced by the lecturer at the beginning of the course. 2 hour written examination in term 3. The final mark is a 9 to 1 weighted average of the written examination and in-course assessment marks.

Other set work:
Exercises will be set during the course, which will not count towards the examination grading.

Timetabled workload:
Lectures: 2 hours per week.
Tutorials: 1 hour per week.

STATG002
STATISTICAL DESIGN OF INVESTIGATIONS

Aims of course: To provide an introduction to the statistical aspects relating to the design of experimental and observational studies, and to introduce associated methods of statistical analysis.

Objectives of course: On completion of the course, a student should have an understanding of the basic ideas of experimental design and observational studies; should be able to analyse data from a variety of experimental designs by the analysis of variance; should be able to assess the appropriateness of various sampling schemes and perform appropriate analyses.

Applications: this course addresses the issues of what data are needed to answer a particular substantive question, and conversely what questions can reasonably be answered using data that may be available. These issues are fundamental to quantitative analyses in all application areas.

Prerequisites: STATG000.
**Course content:** Principles of experimental design; planning of experiments; comparative experiments; common designs: completely randomised, randomised blocks, Latin square; factorial experiments; nested and split-plot; fixed and random effects; associated analyses - analysis of variance. Observational studies v. experiments: problems of bias, confounding, difficulty of causal interpretation; planning observational studies; analysis: matching, adjusting for confounding variables; cohort studies; case-control studies. Sampling: target and sampled populations, finite populations, simple random sampling, stratification and cluster sampling, ratio and regression estimators, randomised response methods; introduction to questionnaire design.

**Texts:**

**Assessment for examination grading:**
In-course assessment: two compulsory assignments. One of these involves working in pairs to design, carry out and report the results of an experiment. There is no written examination. Any student who fails to submit any coursework will automatically be declared non-complete for the course.

**Other set work:**
Exercises will be set during the course which will not count towards the examination grading.

**Timetabled workload:**
Lectures and workshops: 2 hours per week. Tutorials: 1 hour per week.

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**STATG003**
**STATISTICAL COMPUTING**

**Aims of course:** To introduce the statistical package R with particular application to statistical modelling and a selection of computational techniques.

**Objectives of course:** On successful completion of the course, a student should be able to use the statistical package R to input, edit and manipulate data, produce appropriate graphics and implement statistical methods taught in courses STATG001 and STATG002.

**In addition,** the student should be familiar with some basic principles of programming, and should be able to carry out simple programming in R with application to a variety of computational and numerical techniques.

**Applications:** the generic programming skills acquired in this course are applicable across a wide variety of scientific disciplines as well as in the IT sector. More specifically, the R programming environment is gaining popularity among many research communities as well as in specialised areas of business and industry, such as finance and reinsurance, where non-routine statistical analyses are increasingly required.

**Prerequisites:** STATG000. Simultaneous or previous attendance on STATG001 and either STATG002 or EPIDGS31.


**Texts:**

**Assessment for examination grading:**
In-course assessment: by compulsory coursework. There is no written examination. Any student who fails to submit any coursework will automatically be declared non-complete for the course.

**Timetabled workload:**
About 10 two-hour workshops.

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**STATG004**
**APPLIED BAYESIAN METHODS**

**Aims of course:** To introduce the Bayesian approach to statistical inference, to develop relevant theory, methodology and computational techniques for its implementation and to develop basic skills in
use of the WinBUGS software for Bayesian modelling.

**Objectives of course:** On successful completion of this course, a student should be able to give an account of the underlying principles of Bayesian inference, and contrast these with those of other schools of inference; manipulate probability formulae to derive posterior and predictive distributions; perform conjugate prior-to-posterior analysis for simple Binomial, Poisson and Normal models; analyse these and more complex Normal models, using priors representing great prior uncertainty; use hierarchical and graphical modelling to represent and analyse complex systems; describe and implement Gibbs sampling methods for estimating posterior quantities; and use WinBUGS software to estimate complex Bayesian models.

**Applications:** Bayesian methods are currently gaining increasing popularity, largely because advances in computing facilities and in modern simulation-based Markov Chain Monte Carlo (MCMC) methods provide a means of analysing the complex data structures that arise in application areas as diverse as artificial intelligence, biology, genetics and environmental science. This course focuses on fundamental concepts and techniques, and introduces the computational tools needed to apply Bayesian methods in challenging research-level problems.

**Prerequisites:** STATG000.


**Texts:**

**Assessment for examination grading:**
In-course assessment (see page 16), the exact method of which will be announced by the lecturer at the beginning of the course. 2 hour written examination in term 3. The final mark is a 9 to 1 weighted average of the written examination and in-course assessment marks.

**Other set work:**
About 5 sets of exercises. These will not count towards the examination grading.

**Timetabled workload:**
Lectures: 2 hours per week. Some of these may be devoted to workshops or coursework feedback. Tutorials: 2 hours per fortnight.

**STATG009 DECISION AND RISK**

**Aims of course:** To provide an introduction to the ideas underlying the calculation of risk from a Bayesian standpoint, and the structure of rational, consistent decision making.

**Objectives of course:** On successful completion of the course, a student should be able to understand special measures of risk, understand the concepts of decision theory, find appropriate probability models for risky events and check the validity of the underlying assumptions, and be familiar with methodology for detecting changes in risk levels over time.

**Applications:** The ideas introduced in this course provide a generic framework for thinking about risk and decision-making in the presence of uncertainty. As such, they can be applied in many diverse areas. The course will use examples from natural hazards, environmental hazards, finance, and social policy.

**Prerequisites:** STATG000.

**Course content** Introduction to Bayesian inference, conditional probability, Bayes's formula, expectation and utility. Elicitation of subjective probabilities and utilities. Criteria for decision making. Comparison of decision rules. Probability models for the occurrence of extreme events. Time series approaches to detecting/ modelling change in risk over time.
**Texts**

**Assessment for examination grading**
In-course assessment (see page 16), the exact method of which will be announced by the lecturer at the beginning of the course.
2 hour written examination in term 3.
The final mark is a 9 to 1 weighted average of the written examination and in-course assessment marks.

**Other set work**
About 4 sets of exercises. These will not count towards the examination grading.

**Timetabled workload**
Lectures: 2 hours per week.
Workshops: two 2 hour sessions.
Office hours, during which the lecturer will be available to discuss students’ individual problems with the course, will also be provided.

**STATG010**
**STOCHASTIC SYSTEMS**

**Aims of course:**
The study of random processes, with the emphasis on Operational Research applications and including queueing theory, renewal and semi-Markov processes and reliability theory.

**Objectives of course:**
On successful completion of the course, a student should understand such concepts for stochastic processes as the Markov property, stationarity and reversibility and be able to determine whether such properties apply in straightforward examples; recognise and apply appropriately a range of models, as listed in the course contents, in a variety of applied situations so as to determine properties relevant to the particular application.

**Applications:**
Stochastic systems arise in many areas of application. They play a fundamental role in Operational Research which addresses real-world problems through the use of mathematics, probability and statistics; topics such as queueing theory and reliability are important examples. Stochastic processes are also vital to applications in finance and insurance, and have many applications in biology and medicine, and in the social sciences. Stochastic process theory underpins modern simulation methods like Markov-chain Monte-Carlo (MCMC).

**Prerequisites:**
STATG000, together with an undergraduate introductory course in applied probability.

**Course content:**

**Texts:**

**Assessment for examination grading:**
In-course assessment (see page 16), the exact method of which will be announced by the lecturer at the beginning of the course.
2 hour written examination in term 3.
The final mark is a 9 to 1 weighted average of the written examination and in-course assessment marks.

**Other set work:**
About 8 sets of exercises. These will not count towards the examination grading.

**Timetabled workload:**
Lectures: 2 hours per week.
Workshops: two 2 hour sessions.
Tutorials: 1 hour per week.
STATG011
FORECASTING

Aims of course: To introduce methods of finding and extrapolating patterns in time-ordered data.

Objectives of course: On successful completion of the course, a student should be familiar with the most commonly-used models for time series; be able to derive properties of time series models; be able to select, fit, check and use appropriate models for time-ordered data sequences; understand and be able to interpret the output from the time series module of a variety of standard software packages.

Applications: Time series data take the form of observations of one or more processes over time, where the structure of the temporal dependence between observations is the object of interest. Such data arise in many application areas including economics, engineering and the natural and social sciences. The use of historical information to estimate characteristics of observed processes, and to construct forecasts together with assessments of the associated uncertainty, is widespread in these application areas.

Prerequisites: STATG000.


Texts:

Assessment for examination grading: In-course assessment (see page 16), the exact method of which will be announced by the lecturer at the beginning of the course.

2 hour written examination in term 3. The final mark is a 4 to 1 weighted average of the written examination and in-course assessment marks.

Other set work: About 7 sets of exercises. These will not count towards the examination grading.

Timetabled workload:
Lectures: 2 hours per week.
Workshops: two 2 hour classes.
Office hours, during which the lecturer will be available to discuss students’ individual problems with the course, will also be provided.

STATG012
STATISTICAL INFERENCE

Aims of course: To provide a grounding in the theoretical foundations of statistical inference and, in particular, to introduce the theory underlying statistical estimation and hypothesis testing.

Objectives of course: On successful completion of the course, a student should be able to: describe the principal features of, and differences between, frequentist, likelihood and Bayesian inference; define and derive the likelihood function based on data from a parametric statistical model, and describe its role in various forms of inference; define a sufficient statistic; describe, calculate and apply methods of identifying a sufficient statistic; define, derive and apply frequentist criteria for evaluating and comparing estimators; describe, derive and apply lower bounds for the variance of an unbiased estimator; define and derive the maximum likelihood estimate, and the observed and expected information; describe, derive and apply the asymptotic distributions of the maximum likelihood estimator and related quantities; conduct Bayesian analyses of simple problems using conjugate prior distributions, and asymptotic Bayesian analyses of more general problems; define, derive and apply the error probabilities of a test between two simple hypotheses; define and conduct a likelihood ratio test; state and apply the Neyman-Pearson lemma;

Applications: The theory of statistical inference underpins statistical design, estimation and hypothesis testing. As such it has fundamental applications to all fields in
which statistical investigations are planned or data are analysed. Important areas include engineering, physical sciences and industry, medicine and biology, economics and finance, psychology and the social sciences.

Prerequisites: STATG000.


Texts:

Assessment for examination grading: In-course assessment (see page 16), the exact method of which will be announced by the lecturer at the beginning of the course. 2 hour written examination in term 3. The final mark is a 9 to 1 weighted average of the written examination and in-course assessment marks.

Other set work: About 8 sets of exercises. These will not count towards the examination grading.

Timetabled workload: Lectures: 2 hours per week. Workshops: 2 two-hour classes. Tutorials: 1 hour per week.

STATG015 MEDICAL STATISTICS I

Aims of course: To provide an introduction to the fields of clinical trials and epidemiology, with emphasis on the statistical ideas and methodology most widely used in these areas.

Objectives of course: On successful completion of the course, a student should have an understanding of types of observational studies and their design issues, the different measures of health outcome, and design features of randomised trials; be able to implement and interpret results from basic methods of analysis used in health studies as well as logistic regression and basic methods of survival analysis.

Applications: This course, together with STATG016, has applications in both medicine and epidemiology. Important areas include the design and analysis of medical research studies, including randomised controlled trials.

Prerequisites: STATG000. Simultaneous or previous attendance on STATG001 and STATG012 or its equivalent.


Texts:

Assessment for examination grading: In-course assessment (see page 16), the exact method of which will be announced by the lecturer at the beginning of the course. 2 hour written examination in term 3. The final mark is a 9 to 1 weighted average of the written examination and in-course assessment marks.

Other set work: Several sets of exercises. These will not count towards the examination grading.

Timetabled workload:
Lectures: 1 hour per week.
Workshops: 1 hour per week.
Office hours, during which the lecturer will be available to discuss students' individual problems with the course, will also be provided.

**STATG016**
**MEDICAL STATISTICS II**

Aims of course: To provide a continuation of the study of medical statistics started in STATG015, with emphasis on more advanced topics in epidemiological methods and the design and analysis of clinical trials.

Objectives of course: On successful completion of the course, a student should be able to: model survival data using regression models; develop and validate a risk prediction model; analyse clustered data using a regression model; design and analyse a cross-over trial, factorial trial, cluster randomised trial, equivalence trial and early phase trial; understand the issues concerning interim analyses and missing data; carry out a meta-analysis.

Applications: This course, together with STATG015, has applications in both medicine and epidemiology. Important areas include the design and analysis of medical research studies, including randomised controlled trials.

Prerequisites: STATG000 and STATG015 or its equivalent.

Texts:

Assessment for examination grading: In-course assessment (see page 16), the exact method of which will be announced by the lecturer at the beginning of the course. 2 hour written examination in term 3. The final mark is a 9 to 1 weighted average of the written examination and in-course assessment marks.
Other set work:
Several sets of exercises. These will not count towards the examination grading.

Timetabled workload:
Lectures and Workshops: 2 hours per week. Office hours, during which the lecturer will be available to discuss students’ individual problems with the course, will also be provided.

STATG017
STOCHASTIC METHODS IN FINANCE I

Aims of course: To introduce mathematical concepts and tools used in the finance industry, in particular stochastic models and techniques used for financial modelling and derivative pricing.

Objectives of course: On successful completion of the course, a student should have a good understanding of how financial markets work, be able to describe basic financial products, have a good knowledge of the basic mathematical and probabilistic tools used in modern finance, including stochastic calculus, and be able to apply the relevant techniques for the pricing of derivatives.

Applications: The techniques taught in this course are widely used throughout the modern finance industry, including the areas of trading, risk management and corporate finance. They also have applications in other areas where investment decisions are made under uncertainty, for example in the energy sector where decisions on whether or not to build (i.e. invest in) new power plants are subject to uncertainty regarding future energy demand and prices.

Prerequisites: STATG000.


Texts:

Assessment for examination grading:
In-course assessment (see page 16), the exact method of which will be announced by the lecturer at the beginning of the course. 2 hour written examination in term 3. The final mark is a 9 to 1 weighted average of the written examination and in-course assessment marks.

Timetabled workload:
Lectures: 2 hours per week. Workshops: four 2 hour classes. Office hours, during which the lecturer will be available to discuss students’ individual problems with the course, will also be provided.

STATG018
FACTORIAL EXPERIMENTATION

Aims of course: To introduce $2^k$ experiments, fractions and blocking. To introduce designs for response surface modelling. To discuss experimental designs to achieve quality control, including Taguchi ideas.

Objectives of course: On completion of the course, a student should have an understanding of the basic ideas relating to $2^k$ factorial experiments, including for fractional designs and with blocking; should be able to analyse data from these experiments by the analysis of variance and/or graphical techniques; be able to design experiments for response surface modelling; be able to design experiments for off-line quality control.

Applications: Factorial experiments are useful in any situation in which a complex system has to be investigated or optimised. The applications tend to be in the fields of science and technology, though that may be a result of a lack of imagination rather than a lack of wider applicability. Some examples are the optimisation of an industrial production process, the design of a new drug, the design of a human-computer interface, the optimisation of products and marketing campaigns, computer simulations to explore the effect of interventions on, e.g., economy or climate, or the quality of new statistical methodology.

Prerequisites: STATG000, STATG001 and STATG002.

Course content: Experiments: What is an experiment? Advantages over observational

**Texts:**

**Assessment for examination grading:**
In-course assessment (see page 16), the exact method of which will be announced by the lecturer at the beginning of the course. 2 hour written examination in term 3. The final mark is a 4 to 1 weighted average of the written examination and in-course assessment marks.

**Other set work:**
About 8 sets of exercises. These will not count towards the examination grading.

**Timetabled workload:**
Lectures: 2 hours per week.
Workshops: 2 two-hour classes.
Office hours, during which the lecturer will be available to discuss students’ individual problems with the course, will also be provided.

**STATG019 SELECTED TOPICS IN STATISTICS**

**Aims of course:** To provide an introduction to, and practical experience of, key ideas in selected specialized topics that are at the forefront of developments in modern statistical research and practice. The module is aimed specifically at students who may be considering going on to do research in statistics or related areas.

**Objectives of course:** On successful completion of the module, students should be able to: explain the motivation for, and key ideas involved, in the topics that have been studied; identify situations in which the studied techniques are potentially applicable, while recognizing their potential limitation; use software packages that are available in R to apply the techniques to real-world examples where appropriate; and understand the context of research papers in the areas that have been studied.

**Applications:** the availability of huge and often complex data sets, coupled with cheap computing power makes it possible to contemplate analyses that were inconceivable even two decades ago. The development of statistical methodology has made full use of these opportunities, so that modern statistics has made significant contributions in a wide range of application areas. The material covered in this course will vary from year to year so that the specific applications will vary; however, it will provide students with some insight into the state of the art. As such it would be suitable for students contemplating research in statistics or, indeed, in any other subject where complex problems require the use of advanced statistical methods.

**Prerequisites:** STATG001 and simultaneous or previous attendance on STATG003.

**Course content:** This course will provide an introduction to two or three advanced topics in modern statistics. The precise topics covered will vary from year to year, depending on teaching staff availability and research interests. Examples of topics might include: bootstrap and related methods; extreme value theory; multivariate analysis; nonparametric smoothing; robust methods; spatial statistics; applied probability; and estimating functions. Where appropriate, the methods will be illustrated using software available in the R package.

**Topic 1: Cluster Analysis (Dr CM Hennig)**
Cluster analysis is about finding groups of observations in data. It has a very wide range of applications such as delimitation of species in biology, data compression, classification of diseases or mental illnesses, market segmentation, detection of patterns of unusual
internet use, classification of regions or countries for administrative use, object identification in images etc. In the internet age, much data is routinely collected, and many such datasets are heterogeneous and chaotic. Cluster analysis is often used as a first exploratory tool to find better manageable subgroups, or more generally, to find unexpected patterns in datasets.

In the course, three basic approaches of cluster analysis will be introduced, namely defining clusters by optimal centroid objects, statistical mixture models, and hierarchical distance-based methods. A general idea of clustering is that objects in a cluster should be similar to each other, and distant from objects in other clusters. The course will therefore introduce some measurements of similarity and distance that can be applied to various data types (e.g., data with continuous, categorical or mixed variables). Furthermore, the tricky issue of estimating or deciding the number of clusters will be treated, along with techniques to check the validity and to visualise clusterings.

Data examples will be given and it will be explained how to use R for running the introduced analyses. Knowledge of R (STATG003) and of basic statistical modelling as introduced in STATG001 is required. The following texts are relevant to this part of the course:


**Topic 2: Spatial Statistics (Dr SE Guillas)**

The main aim of Spatial Statistics for continuous data (also called geostatistics) is to estimate the values of a quantity at some locations in space based on observations elsewhere. Observations can be spread out irregularly. For instance, the questions can be: where should we drill for oil? Or, what is the level of pollution over a specific region based on several monitoring stations? Or, where should we place monitoring stations in order to best estimate the trends in temperatures over a region, or over the globe?

To answer such questions, statistical models typically rely on a spatial covariance structure (or kernel). The covariance structure explains how data located close to one another are more similar than data that are located far apart. Recent computational improvements based on casting the problem as the solution of a Stochastic Partial Differential Equations (SPDE) will be also introduced.

Topics will include: Covariance and variogram models for Gaussian fields, estimation and prediction with kriging, Gaussian Markov random fields, INLA-SPDE, Bayesian approaches, implementation of these methods in R on data sets of interest. Experience with R and data analysis as provided by STATG003, and an understanding of statistics at the level of STATG001, will be expected. The following texts are relevant to this part of the course:


**Assessment for examination grading:**

In-course assessment: pieces of extended coursework (100%). There is no examination for this course. Any student who fails to submit any coursework will automatically be declared non-complete for the course.

**Other set work:**

About 8 sets of exercises. These will not count towards the examination grading.

**Timetabled workload:**

Lectures: 2 hours per week.
Workshops: two 2 hour classes.
Office hours, during which the lecturer will be available to discuss students’ individual problems with the course, will also be provided.

**STATG020 STOCHASTIC METHODS IN FINANCE II**

**Aims of course:** To explore advanced topics in finance via mathematical and statistical methods in order to gain a better understanding of optimal decision making, risk management and derivative pricing techniques. The course will be built on material covered in STAT3006.

**Objectives of course:** On successful completion of the course, a student should be
able to: Define the concepts of risk aversion and stochastic dominance, and apply them to manage risk in, and rank capital projects; Understand how dynamic programming can be used to make optimal decisions under uncertainty; Understand how to apply mathematical and statistical modelling techniques to credit risk modelling, value-at-risk measurements and capital adequacy assessments; Understand a range of modelling techniques used in derivative pricing, and the concepts and assumptions that underpin them; Criticise and understand the limitations of these techniques as they are used in the modern finance industry.

Applications: The techniques taught in this course are widely used throughout the modern finance industry, including the areas of: business investments decisions (for example in the energy sector where decisions on whether or not to invest in and build new power plants are subject to uncertainty regarding future energy demand and prices); in corporate finance; in trading activities in the financial markets; in financial and other forms of risk management; in valuing and accounting for assets; and in the prudential regulation of the banking industry.

Prerequisites: STATG000 and STATG017 or its equivalent.

Course content: Utility theory; Real options, including dynamic programming, optimal investment rules, and managerial flexibility; Risk management, including value-at-risk and credit risk modelling; More advanced techniques in derivative pricing.

Texts:

Assessment for examination grading:
In-course assessment (see page 16), the exact method of which will be announced by the lecturer at the beginning of the course. 2 hour written examination in term 3. The final mark is a 9 to 1 weighted average of the written examination and in-course assessment marks.

Other set work:
Several sets of exercises. These will not count towards the examination grading.

Timetabled workload:
Lectures: 2 hours per week.
Workshops: 2 two-hour classes.
Office hours, during which the lecturer will be available to discuss students’ individual problems with the course, will also be provided

STATG021
BAYESIAN METHODS IN HEALTH ECONOMICS (0.5 UNIT)

Aims of course: To provide an introduction to Bayesian analysis and Markov Chain Monte Carlo (MCMC) methods using R and MCMC sampling software (such as BUGS or JAGS), as applied to cost-effectiveness analysis and the typical models used in health economic evaluations. Emphasis will be placed on the practical side of Bayesian inference.

Objectives of course: The course is targeted at students interested in decision modelling and in the practice of Bayesian analysis in health economics. However, the topics and statistical content are fairly general and applicable to other areas (e.g. economics, biostatistics, epidemiology). On successful completion of the course, a student should be able to: i) understand the basic concepts of Bayesian analysis; and ii) design, build, run and interpret the results of a Bayesian model, with specific application to health economic problems. These skills are widely transferrable to a variety of fields and applications.

The course will be based on a mixture of lectures and computer practicals. Specific topics include an introduction to health economics, a review of a range of probability distributions, regression analysis, Markov models and random-effects meta-analysis.

Applications: This course has applications in medicine and studies on public health, epidemiology and health services research.

Prerequisites: STATG000. Simultaneous or previous attendance on STATG001 and STATG012 or its equivalent.

Course content: The course syllabus includes the following topics: Introduction to health economic evaluations; Introduction to Bayesian inference; Introduction to MCMC in
BUGS/JAGS; Analysis of cost and cost-utility data; Statistical cost-effectiveness analysis; Probabilistic Sensitivity Analysis (PSA); Evidence synthesis and hierarchical models; Decision-analytic and Markov models.

The practical sessions are based on a combination of R and BUGS and topics include: Monte Carlo estimation in BUGS; MCMC estimation in BUGS; Cost-effectiveness analysis with individual level data; Introduction to R and cost-effectiveness analysis using the R package BCEA; Health economic evaluation and PSA with R/BUGS/BCEA; Advanced topics in PSA in R using BCEA; Evidence synthesis (1): decision models; Evidence synthesis (2): network meta-analysis; Markov models in health economics.

**Texts:**

**Assessment for examination grading:**
In-course assessment (see page 16), the exact method of which will be announced by the lecturer at the beginning of the course. 2 hour written examination in term 3. The final mark is a 9 to 1 weighted average of the written examination and in-course assessment marks.

**Other set work:**
Several sets of practical exercises involving R and BUGS. These will not count towards the examination grading.

**Timetabled workload:**
Lectures: 1 hour per week.
Workshops: 1 hour per week.
Office hours, during which the lecturer will be available to discuss students’ individual problems with the course, will also be provided.

**STATG022 QUANTITATIVE MODELLING OF OPERATIONAL RISK AND INSURANCE ANALYTICS**

**Aims of course:** To develop a core mathematical and statistical understanding of an important new emerging area of risk modelling known as Operational Risk which arose from the development of the Basel II/III banking regulatory accords. This will equip students with the necessary tools to undertake core modelling activities required in risk management, capital management and quantitative modelling in modern financial institutions.

**Objectives of course:** On completion of the course, a student should be able to: describe the key quantitative requirements of the Basel II/III banking accord; describe the 56 risk cells (business units and risk types) required under the standard Basel II/III regulator frameworks; describe the basic indicator, standardized and advanced measurement approaches; describe the key components of a loss distributional approach model; develop frequency and heavy tailed severity models for Operational risk types including estimation or the model parameters and model selection; describe properties and asymptotic estimators for risk measures that are required for capital calculation; describe the coherent allocation of capital to business units from the institutional level; introduce and understand the influence of dependence modelling within an LDA model structure; obtain familiarity with particular classes of copula statistical models of basic relevance to practical Operational risk modelling; decide upon appropriate combining approaches for different sources of data required by regulation to be considered in OpRisk settings; develop loss aggregation methods to aggregate OpRisk loss processes.

**Applications:** An integral part of modern financial risk involves Operational Risk, the third key risk type that financial institutions must model and hold capital for according to the international banking regulations of Basel II/III. The key set of concepts and mathematical modelling tools developed in this course will equip the future risk modellers and quantitative analysts with the appropriate core mathematical and statistical background to undertake development of such risk models in industry.
**Prerequisites:** Familiarity with distribution theory and generating functions, for example as encountered in STATG000 or equivalent. Also some basic experience in either Matlab, Python or R is needed, as taught in STATG003 or equivalent.


**Texts:**

**Assessment for examination grading:**
In-course assessment (see page 16), the exact method of which will be announced by the lecturer at the beginning of the course. 2 hour written examination in term 3. The final mark is a 9 to 1 weighted average of the written examination and in-course assessment marks.

**Other set work:**
About 8 sets of exercises. These will not count towards the examination grading.

**Timetabled workload:**
Lectures: 2 hours per week. Workshops: two 2 hour classes. Office hours, during which the lecturer will be available to discuss students’ individual problems with the course, will also be provided.

**STATG099 PROJECT**

**Aims of course:** To enable students to apply Statistical Science to real world problems and to present their findings in a written report.

**Objectives of course:** On successful completion of the course, a student should be able to plan a suitable schedule for completing an extended project; obtain or access relevant background information and data; select and apply appropriate formal and informal statistical methods, using computer software as appropriate; assess what has been achieved and point to further research; use appropriate word processing skills to write up a project dissertation efficiently; and communicate findings both technically and non-technically, in a word processed dissertation and an oral presentation.

**Prerequisites:** Relevant material from other courses in the MSc programme.

**Assessment for examination grading:**
*Dissertation* (normally between 10000-12000 words, i.e. about 30 pages, A4 size, double-spaced typing, excluding graphs, tables, computer programmes and other output), to be submitted by the start of September.
Dissertations that exceed 16,500 words will be penalised (see page 17).
*Oral presentation* (15 minutes excluding questions) at the start of September.
The final mark is a 4 to 1 weighted average of the dissertation and presentation marks.

**Timetabled workload**
Skills development: Preparation for the project starts with several practical exercises, presented and discussed in workshop sessions during terms 1 and 2. Topics include preparing and presenting short talks, presenting information in tabular and graphical form, reading and digesting other people’s research, and the use of the document preparing system LaTeX. Participation in these activities is mandatory although it does not count towards the assessment for the course: any student whose participation is inadequate will be declared non-complete for the course.
Tutorials: about once a week, starting in June.
Individual study: full-time, starting in June.

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**EPIDGS31 EPIDEMIOLOGY**

Information on this course is provided in the programme handbook for the MSc Infection & Immunity, available from the following webpage: [http://www.ucl.ac.uk/infection-immunity/study/Infection_immunity/](http://www.ucl.ac.uk/infection-immunity/study/Infection_immunity/).

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**GENEG005 STATISTICS FOR INTERPRETING GENETIC DATA**

Information on this course is available from the following webpage: [http://www.ucl.ac.uk/lifesciences-faculty-php/courses/viewcourse.php?coursecode=GENEG005](http://www.ucl.ac.uk/lifesciences-faculty-php/courses/viewcourse.php?coursecode=GENEG005).

The information given in this document is as far as possible accurate at the date of publication but the Department reserves the right to amend it.

Department of Statistical Science, UCL, September 2015.