DEPARTMENT OF STATISTICAL SCIENCE
UNDERGRADUATE STUDENT HANDBOOK

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

**BSc Statistics** (UCAS code G300)
**BSc Statistics, Economics and Finance** (known as SEF, UCAS code GLN0)
**BSc Statistics, Economics and a Language** (known as SEL, UCAS code GLR0)
**BSc Statistics and Management for Business** (known as SAMB, UCAS code GN32)
**BSc (Econ) Economics and Statistics** (known as Econ/Stats, UCAS code LG13)
**MSci Statistical Science (International Programme)** (UCAS code G305)

The contents also provide information for undergraduate students studying Statistical Science as part of the following degrees:

**BSc Mathematics and Statistical Science** (known as MASS, UCAS code GG13)
**MSci Mathematics and Statistical Science** (known as MASS, UCAS code GGC3)

Students on the Econ/Stats, SAMB and MASS degree programmes will also need to refer to the corresponding information published respectively by the Departments of Economics, Management Science & Innovation and Mathematics.

The Department of Statistical Science Undergraduate 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 Regulations (http://www.ucl.ac.uk/srs/academic-regulations) 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:

- Academic Regulations
- Enrolment
- Rights and Advice
- Accommodation
- Examinations
- Safety and Security
- Alumni Relations
- Health Services
- Student & Registry Services
- Careers Services
- Learning Support
- Student Records
- College Facilities and Amenities
- Library Services
- Student Wellbeing
- College Premises and Maps
- Money
- Students Unions
- Computer Services
- New Students
- Term Dates

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 2014.
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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 2014/15 session are based on the pattern of 12 weeks, 11 weeks and 7 weeks.

You should regularly check the DOSSSH Moodle page (see “Computing Facilities” section on page 12) 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 1:** *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 (see also “Selection of Options” section on page 19). Tutorial groups are allocated automatically and your groups will appear in your online timetable (see “Timetable” section on page 11).

  *Induction week for new students*: 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. *Not all departments observe reading week and you MUST attend classes given in other departments if they continue during this time.*

- **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.

*Courses not organised by the Department of Statistical Science may not follow the above schedule. For further information you should check with the relevant teaching department.*
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**

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
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<tbody>
<tr>
<td>Prof T Fearn (Head of Department)</td>
<td>Dr G Ambler</td>
</tr>
<tr>
<td>Dr J A Barber</td>
<td>Dr A Beskos</td>
</tr>
<tr>
<td>Dr C Cotar</td>
<td>Dr M De Iorio</td>
</tr>
<tr>
<td>Dr C M Hennig</td>
<td>Prof V S Isham</td>
</tr>
<tr>
<td>Dr I N Kosmidis</td>
<td>Dr I Manolopoulou</td>
</tr>
<tr>
<td>Dr J D B Nelson</td>
<td>Dr P J Northrop</td>
</tr>
<tr>
<td>Prof S C Olhede</td>
<td>Prof R Z Omar</td>
</tr>
<tr>
<td>Dr Y Pokern</td>
<td>Dr G J Ross</td>
</tr>
<tr>
<td>Dr R B A Silva</td>
<td>Dr A D L van den Hout</td>
</tr>
<tr>
<td>Prof P J Wolfe</td>
<td>Dr J Xue</td>
</tr>
<tr>
<td>Dr G Baio</td>
<td>Prof R E Chandler</td>
</tr>
<tr>
<td>Dr S E Guillas</td>
<td>Dr F J Király</td>
</tr>
<tr>
<td>Dr G Marra</td>
<td>Dr A G O’Keeffe</td>
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<tr>
<td>Dr A S Siddiqui</td>
<td>Dr G W Peters</td>
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<td>Dr H M Wilkinson-Herbots</td>
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**Teaching staff**

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<thead>
<tr>
<th>Name</th>
<th>Position</th>
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<tbody>
<tr>
<td>Dr S J Harden</td>
<td>Dr J Herbert*</td>
</tr>
<tr>
<td>Mrs K Krajniewska</td>
<td>Dr M J Rassias</td>
</tr>
<tr>
<td>Mrs D Jayawardena Wilkinson</td>
<td></td>
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<tr>
<td>Ms K A Leport</td>
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<tr>
<td>Dr R B A Silva</td>
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<tr>
<td>Dr S E Guillas</td>
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<tr>
<td>Dr J Xue</td>
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<tr>
<td>Dr E M Jones</td>
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<tr>
<td>Dr M J Rassias</td>
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*members of staff indicated with an asterisk are based outside UCL

**Support staff**

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
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</thead>
<tbody>
<tr>
<td>Mrs D Jayawardena Wilkinson</td>
<td>Mr S K Cadman</td>
</tr>
<tr>
<td>Ms K A Leport</td>
<td>Miss Y Thornhill</td>
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<tr>
<td>Dr R G Evans</td>
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</table>

**Staff with particular responsibility for undergraduate students**

- **Departmental Tutor:**
  - Statistics Tutor to MASS students: Dr R B A Silva (room 139)
  - Teaching Administrator:
  - Ms K A Leport (room 120)
  - Study Abroad Tutor:
  - Tutor to Affiliate students: Dr S E Guillas (room 133)
  - Chair of Staff-Student Committee: Prof R E Chandler (room 135)
  - Chair of Departmental Teaching Committee: Dr C M Hennig (room 129)
  - Personal Tutor: your Personal Tutor’s name is shown on your Portico record (see “Portico – The UCL Student Information Service” section on page 9) and it is expected that it will be the same person throughout the whole of your degree programme.
Whom to approach with problems

**Departmental Tutor**

The Departmental Tutor is responsible for the day-to-day running of the five Statistical Science BSc degree programmes (i.e. Statistics, SAMB, SEF, SEL and Econ/Stats), as well as the MSci International Programme.

The equivalent responsibility for the MASS degree programmes is held by the Departmental Tutor in the Mathematics Department.

**Teaching Administrator**

The Teaching Administrator works closely with the Departmental 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.

**Personal Tutor**

This person is your mentor and is there for you to consult about your academic progress and in times of trouble. Your personal tutor may invite you to discuss your academic progress at appropriate times during the session.

*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 your personal 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](http://www.ucl.ac.uk/current-students/support). The Support to Study Policy document is also accessible via this webpage.

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](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](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](http://www.ucl.ac.uk/support-pages).
**UCL Transition Programme**

UCL runs a “Transition Programme” that aims to support all new UCL students in adapting to university life, assisting first years in dealing with the social, academic and personal issues that are specific to UCL (see [http://www.ucl.ac.uk/transition/](http://www.ucl.ac.uk/transition/)). Under this programme, all first year students are allocated a student mentor from the second or third year. Mentors are able to provide advice on academic and non-academic matters from a student’s perspective. Subject to availability, transition programme mentors may also provide “Peer Assisted Learning” sessions, which are informal group sessions that are intended to help first year students with course material.

**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 member of staff named below.

**Statistics, SAMB, SEF, SEL and Econ/Stats students:** please consult the Departmental Tutor (this applies for courses in any subject). For Econ/Stats students, there is also a tutor available in the Department of Economics whom you may consult about the Economics courses in the degree programme.

**International Programme students:** please consult the Departmental Tutor (this applies for courses in any subject). For organisation of the year abroad, please consult the Study Abroad Tutor.

**MASS students:** please consult the Departmental Tutor in the Department of Mathematics (this applies for courses in any subject). You may also consult the Statistics Tutor to MASS Students about the Statistics courses in the degree programme.

Further information on changes to your registration status can be found at: [http://www.ucl.ac.uk/current-students/services_2/registration_status](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 20) 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, the quickest way to obtain it is to visit the Student Centre in person with your student ID card. 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.

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](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](http://uclu.org/services/advice-welfare)).

**Students’ common room and departmental student society**

Room 117 is the common room for students registered for any of the degree programmes listed on page 1. Students registered for these programmes are eligible for membership of the student-run Statistics Society, which organises social and other activities.

**Study facilities**

Within the Department some study space is provided in room 116 (the Pearson Reading Room) when it is not being used for meetings. **This is NOT a common room! The students’ common room is room 117. Please do not eat or drink in the Pearson Reading Room.**

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 13).

**Careers information**

Within the Department, there is a careers noticeboard in the Students' Common Room. Job advertisements and information about careers talks, fairs and courses are posted there. There are special careers talks arranged by the Careers Tutor for students from each year, including first years.

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 12). 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 ULU Building in Malet Street. Information about its facilities can be found at [http://www.ucl.ac.uk/careers/](http://www.ucl.ac.uk/careers/). You are advised **NOT** to wait until your final year to find and register with the careers service. UCL Careers also has information about appropriate summer vacation jobs.

**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 12).
Mail and email

Please check regularly:

- the pigeonholes in the Students' Common Room (117);
- your UCL e-mail account.

There may be urgent messages left for you, e.g. from Student and Registry Services, the Departmental Office, your Personal Tutor, or from staff teaching courses that you attend.

You will be allocated an e-mail address by UCL (see http://www.ucl.ac.uk/isd/students/mail). E-mail is used for communication throughout the College. 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 (see “Selection of Options” section on page 19), 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 Masters 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 12).

Please note that the Department will NOT issue certificates of student status or attendance. You should obtain these from the Student Centre, as explained on page 8.

TEACHING AND STUDYING ARRANGEMENTS

Course units

Teaching is organised on a course unit system. A student normally takes courses equivalent to 4.0 units in each year of full-time study; most individual courses are worth either 0.5 or 1.0 units. 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 in this handbook. A few courses are projects. Outline details of courses offered by other departments to students on the Statistics, SEF and SEL programmes are also provided in this handbook. Econ/Stats, SAMB and MASS students should refer to the course information provided by the Economics, Management Science & Innovation and Mathematics Departments, respectively, for details of the full range of Economics, Management and Mathematics courses that are potentially available.

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 large groups. Some lecture courses include students from other departments and those of you on joint degrees will be taking courses in other departments alongside their own and other students. Where possible, Statistical Science lectures take place in lecture rooms 102 and 115 in 1-19 Torrington Place. These rooms are too small for 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.

Problem classes

These involve discussing coursework with the whole class.
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 the Computer Cluster Rooms. You should take a pocket calculator to all workshops (see page 13 for guidelines regarding calculators).

Tutorials

Weekly academic tutorials are provided for first and second year students. 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. You normally have different academic tutors in terms 1 and 2.

For third year students, tutorials for courses STAT3001 and STAT3002 are provided. For all other third year Statistical Science courses, the staff involved should nominate office hours during which they will be available to discuss any queries about the course material.

Projects

These normally involve a small amount of class training. Most of the work is done under individual supervision from a staff member whom you meet once a week to discuss your progress.

Computing facilities

Undergraduate students 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/.

Although there are no computer facilities for undergraduates within the Department of Statistical Science, 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/common/software) that is available in the computer clusters,¹ check and send email (http://www.ucl.ac.uk/isd/students/mail) and access their filespace on the UCL system. For more information on this service, see http://www.ucl.ac.uk/isd-extra/common/windows/wts-web/.

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. Students are given additional printing credits, to allow them to print copies of the lecture notes for each of their statistics courses. 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.

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!
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 [http://www.ucl.ac.uk/Library/infoskill.shtml](http://www.ucl.ac.uk/Library/infoskill.shtml), 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.

Further information on the College libraries is available at [http://www.ucl.ac.uk/library](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. New students are strongly advised to purchase a copy of these statistical tables at the start of their degree programme. 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 20) 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). 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, and a reasonable level of ability in the appropriate skills. 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>Basic but limited understanding of the subject, together with some basic ability in the appropriate skills. There may be many mistakes, but there will be clear evidence of some relevant knowledge.</td>
</tr>
<tr>
<td>F</td>
<td>≤ 39²</td>
<td>Not of pass standard. At the higher end of the scale a very limited understanding may be present, but answers will present little evidence of relevant knowledge and contain many mistakes, irrelevancies or misunderstandings. At the lower end, answers will show little or no understanding of either the questions or the subject.</td>
</tr>
</tbody>
</table>

Model answers

Many Statistical Science courses have regular sets of exercises. These are designed to help students learn and, in most courses, it is essential that students do the exercises in order to understand the subject. Course lecturers are often asked to provide model answers to the exercise sheets. There is a similar demand for model answers to past exam papers. Lecturers do provide model or outline answers to some exercises and to some exam questions, but it is Departmental policy not to do so in general, for a number of reasons:

² Marks for assessed coursework in the range 35-39, whilst still not being of pass standard, are indicative of a level of performance which may have slightly better implications if repeated in the final exam (see “Referred Assessment” section on page 24). Such marks are sometimes informally denoted using the letter grade “E”.
• We do not want to encourage students to “learn answers” but rather to create a culture in which they know that they must work out the answer for themselves. Often it is not the answer, but the process of working it out that is the main learning experience.

• We are trying to encourage independent thought and understanding, so that students can answer (more or less well) different questions, similar questions in different forms, and to solve related problems. Understanding in statistical science, and in mathematics, comes much more from doing than from reading.

• It is important for students to learn how to persevere with a problem when they are “stuck”. In the past, we have found that model answers handed out in one year are often passed on to students in a subsequent year, to the detriment of the learning process.

A common argument put forward by students is “Yes, we want to do the exercises, but we would like model answers in order to check that we have the right method and answer”. Of course it can sometimes be helpful to look at answers, but it is also important to learn how to verify answers when they are not otherwise available, and to gain the confidence to know when you are right. One function of tutorials is to discuss problems or work through them with the teacher, and this is one way in which answers may be obtained. Part of the skill of the teacher is to help the student to progress without “spoon feeding” the answer.

Having said all of this, the Department recognises that while preparing for examinations in particular, it can be useful for students to have the final answers (rather than complete solutions) to past exam questions: this provides some confidence that the answers obtained while attempting past papers are correct. All teaching staff should provide such “final” answers routinely, for selected exam papers from 2012 onwards, via their course Moodle pages (see page 12).

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 Regulations 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 will be informed of any changes as necessary.

• 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 5).

• If you wish to be absent from College for some special reason, then you should obtain permission beforehand from the Departmental Tutor (see page 7).

• 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. If this extends to more than five working days, then on your return you must give the Departmental Tutor a medical certificate if appropriate.

- 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 24).

- 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 or, in the case of International Programme students, you might not be allowed to go abroad.

- You will also be taking some courses provided by other departments, 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 each of these courses. 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 Departmental 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 19). 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 and this may mean that you cannot progress to your next year of study.

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.
**Total workload**

For a typical 0.5 unit course, you should expect a workload of about **9 or 10 hours per week** – this includes lectures, workshop, problems class, tutorial, reading and coursework, as appropriate for each course. For example, if you are studying the equivalent of four half-unit courses per term, your total weekly workload is expected to be around **40 hours**.

As part of monitoring your own progress, you may find it helpful, in some weeks, to keep a diary of the time you spend actively working.

**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 individual feedback to their Personal 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.

**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).

At the end of your degree programme you will be asked to participate in the National Student Survey (http://www.thestudentsurvey.com/), which is your opportunity to give public feedback on all aspects of university life – from the learning resources available, to course teaching and academic support. A strong participation from students is very important in order for the Department to obtain reliable information about how well we are performing and identify aspects that could benefit from improvement.
MODULE SELECTION

Each degree programme has some compulsory courses that cover core material from each of the subjects in the degree title. These are then supplemented through the choice of appropriate options to make up a total of 4.0 course units in any particular year.

Levels of courses

All UCL courses have a level associated with them. These levels are as follows:

- Level 0 (Basic/introductory – a level below that of a normal first year course)
- Level 1 (First – the level of most first year courses)
- Level 2 (Intermediate – the level of most second year courses)
- Level 3 (Advanced – the level of most third year courses)
- Level M (Masters – a level associated with some fourth year MSci courses)

Students must take courses at an appropriate level for the degree programme for which they are registered (see “Schemes for the Award of Honours” section on page 28). The levels of all courses offered by the Department of Statistical Science are given in the “Course Information” section from page 53 onwards.

Options

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. There is normally a specified list of options but, subject to approval, you may choose a limited number (normally no more than 0.5 course units per year) of options from other courses offered by the College, provided that there is no timetable clash. These courses are sometimes referred to as electives. The timetable will not be amended so that you may choose an elective option. However, third and fourth year 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.

During term 3 the Department holds meetings for current first and second year students to discuss the options available for the next year. You will be reminded of the options available to you and the rules of your degree programme. Although you will not select your modules (using Portico) until later in the summer, it is helpful for you to think seriously about your options at this point.

Second year students taking a project in their third year will also be asked to choose a topic from a list suggested by staff. You must discuss a proposed topic with the supervisor named on the list before registering for it. These topics are allocated on a first taker basis so you must not delay making your choice and getting a supervisor’s agreement. You may suggest a topic of your own but you must see the Departmental Tutor to discuss whether it will make a suitable project and to find out who might supervise it.

Please remember that your registration for any optional course is subject to approval both by the Departmental Tutor and by the Department offering the option. Moreover, any final year student who has failed more than half a unit of courses MUST discuss their options with the Departmental Tutor, since failed courses may affect your eligibility for the award of a particular degree. 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 both the Departmental Tutor and with the Department offering the option, BEFORE attempting to register for it on Portico.

EXAMINATIONS

Complete and non-complete courses
In order to qualify for an award, you need to be complete in all your courses (4.0 units per year), **EVEN in those that you have failed.** 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 15).

Components of compulsory assessment
For most courses, you are examined by in-course assessment and written examinations (there are exceptions, however, notably if the course is a project).

**In-course assessment**
At the beginning of each course, the lecturer will provide details of the method and dates of in-course assessment and the amount of work involved. 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.** The proportion it normally contributes towards the final mark is given for each course in the “Course Information” section from page 53 onwards.

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 21). You will also need to submit your work in a **single securely stapled bundle** including the cover sheet.

**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 assessments 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 above).

**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 40% (50% for fourth year courses) 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.

Students are given feedback after each piece of in-course assessment (see page 13), 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 13 for details of permitted calculators).


**Final course mark**

For courses in Statistical Science which are assessed by both in-course assessment and written examination, the final mark is obtained by combining the in-course assessment mark and the written examination mark. To pass a course at any level below Masters, a final mark of at least 40% is required. To pass a Masters-level course, a final mark of at least 50% is required. For each course described later in this handbook, a guideline is given to indicate the scheme used for combining marks. This guideline will normally be adhered to, but is subject to change at the discretion of the Board of Examiners.

**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 including exercises done in your own time for in-course assessment. 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 coursework. 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 committed by first year students. 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](http://www.ucl.ac.uk/current-students/guidelines/plagiarism), and in the UCL Library Services WISE courses (see page 12).

**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/](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**

If you are prevented from taking an examination or a piece of assessment as a result of medical or personal problems, or with other good reason, or if there are factors affecting your studies over an extended period of time, it is usually possible for examiners to take this into account. UCL has a procedure for dealing with such extenuating circumstances. In the Statistical Science department, this procedure is implemented as follows:

- A student claiming extenuating circumstances should complete a form (available from the DOSSSH Moodle page) and submit this, along with appropriate documentation, to the Teaching Administrator. This should be done as soon as possible in general, but the deadline for receipt of any such applications in a given academic session is one week after the end of the main examination period in term 3. **NO claims for extenuating circumstances will be considered after this date.**
• After discussion with the relevant member(s) of staff, an acknowledgement will be sent
to the student concerned. This acknowledgement will either confirm that the
circumstances will be taken into account in due course, or request additional
documentation in support of the application. In the latter case, the application will not be
considered further unless the requested documentation is received by the due date.

Where a student claims extenuating circumstances for a missed examination, the
Department will require evidence that the student was unable or unfit to take an
examination on the specific date in question. If necessary, students may obtain a certificate
to this effect from the College Health Centre at 3 Gower Place.

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.

Late assessment

A non-final year student who is prevented from attending any examination due to
extenuating circumstances may apply, through his / her Departmental Tutor, for late
assessment. This requires the student to provide appropriate documentation to support the
application (e.g. a medical certificate). Approval for late assessment will not be granted in
any circumstances where prior planning could have made it unnecessary.

A student may have late assessment in 3.0 units at most in any one year. Students on 3-
year programmes may have late assessment in a maximum of 4.0 units over the length of
the programme; students on 4-year programmes may have late assessment in a maximum
of 6.0 units over the length of the programme.

The late assessment is normally in the same format as the one missed. In the Department
of Statistical Science, late assessments for written examinations missed in term 3 are
usually scheduled at the end of August or beginning of September.

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 13. Recommended degree
classifications for final year students registered on the Statistics, SEF, SEL and
International programmes are made at the Departmental Examiners’ Meeting at the end of
term 3. Recommended degree classifications for the Econ/Stats, SAMB and MASS degrees
are made by the Examination Boards for these programmes.

Provisional degree classifications for final year students and provisional marks for
continuing students registered in the Department of Statistical Science are released after
the appropriate examiners’ meetings, normally shortly after the end of term 3. These results
are provisional until confirmed by the College Examination Board later in the summer 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 user id 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 10), we are unable to provide results by telephone.
Confirmed marks are accessible via Portico, once they are available. Students will also receive an online Higher Education Achievement Report (HEAR). The HEAR not only shows the annual record of academic results but also non-degree related achievements that have been verified by UCL. The HEAR will continue to be maintained by UCL until a student graduates or leaves UCL. Access to the HEAR is via the Gradintel website https://gradintel.com/index.php. Student access to Gradintel is free of charge.

Students will be given two opportunities a year to review any verified non-degree achievements and they will have the opportunity to publish or suppress them as required until they leave UCL when a final version is published. Students will not be able to edit any academic results, prizes or scholarships received for merit and for merit and need. Further information is available at http://www.ucl.ac.uk/hear/.

**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 24).
- 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.

**Referred assessment**

If your final mark for any course is between 35-39%, then the option of referred assessment in that course is available if the following conditions are satisfied:

- You are not in the final year of your degree programme.
- If you are in the first year of your degree programme, you have passed at least 2.5 units altogether AND the course is examined by one of the departments in the MAPS faculty.
- If you are in the second year of your degree programme, you have passed at least 6.0 units altogether.
- If you complete the referral successfully, there is nothing to prevent you from progressing to the next year of your degree programme.

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3 For some courses in other departments (for example Mathematics), the referral range is 30-39%.
Referred assessment provides you with the opportunity to pass the course before the next normal re-sit opportunity (or a final opportunity to pass the course, if this was already your second attempt). In the Department of Statistical Science, the procedure used for referred assessment for a course is normally the following:

- You are given a choice of dates, normally at the end of August or beginning of September, on which to come into the Department and repeat the paper you took in May, under examination conditions. You should use the intervening period to study the course material in your own time so that you understand how to solve the questions.

- If you obtain a mark of at least 60% on your repeat attempt, you will be awarded a bare pass (40%) for the course. Otherwise, your original mark will remain unchanged.

- For certain courses that cover material of fundamental importance to the remainder of the programme, the referral may involve an additional, unseen assessment component.

If you are offered the opportunity of referred assessment, you do not have to accept it. Other options are:

- To re-sit the examination at the next available opportunity, in the hope of obtaining a mark higher than 40% (not applicable if this was already your second attempt).

- To retain the failed mark.

However, students are normally advised to take up the offer of a referral, even if they can progress without it. (Whilst it is true that a re-sit gives you the opportunity to obtain a mark higher than 40%, most students find it difficult to prepare for a re-sit at the same time as the following year's examinations.) Note also that students on 3-year programmes must pass at least 11.0 course units to be eligible for the award of an honours degree, so can retain at most 1.0 unit of failed marks in this way. Students on the 4-year MSci International Programme must pass at least 14.5 units to be eligible for the award of an honours degree, so can retain at most 1.5 units of failed marks.

Arrangements for referred assessment in other departments may differ from those in Statistical Science. Further advice about the referral procedure and its consequences will be available to eligible students from the Departmental Tutor.

Re-sits

A student who is non-complete for a course or fails a course, and either (i) is ineligible for referred assessment, (ii) has declined the offer of referred assessment, or (iii) fails the referred assessment in that course, can re-sit the failed component(s) of assessment for that course at the next available opportunity. This is normally the following year. Only one re-sit attempt is normally allowed for each course.

Progression to next year of study

As a guideline you are normally allowed to proceed automatically to the second year if you have passed in at least 3.5 units including STAT1005, and to the third year if you have passed in at least 7.0 units and are complete in 4.0 first year units (see page 21).

To progress automatically from year 2 to 3 of the MSci International Programme, a student must additionally achieve at least 60% weighted average from all year 2 courses and an overall weighted mark of at least 60% for years 1 and 2. To progress automatically from year 3 to 4, a student must normally pass at least 11.0 units altogether, achieve at least 60% weighted average from all year 3 courses and achieve an overall weighted mark of at least 60% for years 1, 2 and 3. The relative weightings used in the calculation of these
yearly and overall averages are those specified in the scheme of award for the MSci International Programme (see page 32). A student who fails to meet the rules for progression from year 3 to 4 may opt to transfer to the BSc programme followed in the first two years, or to re-sit their failed third year courses (at the overseas institution). A student who fails to progress from year 2 to 3 cannot go abroad and must transfer to the BSc programme.

The following options are normally available to first and second year students who are not able to proceed to the next year of their degree programme, and to final year students who are not eligible for the award of a degree:

- Take a year out and re-sit any failed examinations at the next available opportunity.
- Register as a part-time student and re-attend up to 2.0 units of failed courses. A student choosing this option is responsible for paying the appropriate fees. A part-time student failing to attend sufficient teaching or complete adequate coursework may be barred from the re-sit examination and have no further opportunity to progress.

**Prizes and medals**

*Departmental*

The following sessional prizes may be awarded to students on the Statistics, SEF, SEL, SAMB, Econ/Stats or MSci International programmes:

- Two *Egon Pearson Prizes*: for outstanding performance in the first year;
- Two *Karl Pearson Prizes*: for outstanding performance in the second year;
- *R A Fisher Prize*: for outstanding performance in the final year;
- *Project Prize*: for the best undergraduate project.\(^4\)

*Faculty*

The Department may nominate outstanding students for consideration by the MAPS Faculty for the following awards:

- *Faculty Medal*: a final year student
- *Dean’s Commendation*: final year students
- *Jackson Lewis Scholarship*: a continuing student in any year
- *UCL Scholarships for Excellence*: one first year and one second year student.

*Other*

- *Royal Statistical Society Prize*: a final year student on an RSS accredited programme.

**SCHEMES FOR THE AWARD OF HONOURS**

A scheme for the award of honours provides the formula for determining your degree class at the end of your final year. The following pages describe the current schemes for the award of honours.

**Award of honours for Statistics, SEF, SEL, SAMB and Econ/Stats**

Degree classification takes place after the examinations in term 3 of your final year. Provided you:

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\(^4\) If the same recipient would otherwise be selected for both the R A Fisher and Project Prizes, there will instead be two R A Fisher Prizes for outstanding performance in the final year (and no Project Prize).
• are complete in 12.0 units (see page 21);
• have taken no more than 1.0 unit of courses at Introductory level (see page 19);
• have passed at least 11.0 units in total;
• have passed at least 3.0 units at Advanced level;

You will be considered for honours. An initial classification is obtained as follows:

• Marks are calculated for each year of your degree programme. The precise details of these calculations vary between programmes and are given below.
• Your final mark is calculated as a weighted average, rounded to the nearest whole number, of the marks for each year of your degree programme. The relative weights attached to the first, second and third year marks are 1, 3 and 5 respectively.
• The resulting final mark is referred to the following table:

<table>
<thead>
<tr>
<th>Final mark</th>
<th>Initial Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>70 or over</td>
<td>First</td>
</tr>
<tr>
<td>60 to 69</td>
<td>Upper Second</td>
</tr>
<tr>
<td>50 to 59</td>
<td>Lower Second</td>
</tr>
<tr>
<td>40 to 49</td>
<td>Third</td>
</tr>
</tbody>
</table>

In cases where a candidate re-sits a course, the highest available mark is used in the calculation. The resulting mark is credited to the year in which the course was first taken.

Candidates whose overall degree mark falls within 1% of a class boundary may be considered for promotion to the higher class. Examiners will consider the following criteria in such cases, before making the final recommendation of honours class:

• The overall distribution of marks: does the candidate have a majority of marks in any particular class, for example.
• The final-year performance compared with that in earlier years, and whether this is reflected adequately in the weight attached to the third year mark.
• The performance in modules of more advanced level or those with a significant research element.
• Marks that have a particular significance for the overall classification (for example, marks for modules with a high course unit value, or marks that were affected by extenuating circumstances for which the appropriate documentation has been received).

Candidates who do not meet the requirements for an honours classification, but who:

• are complete in at least 11.0 units;
• have passed at least 10.0 units in total;
• have passed at least 2.0 units at Advanced level,

will be offered an ordinary degree. If such a candidate has exhausted all re-sit attempts available to them, they must accept this offer. Otherwise, they may either (i) decline the offer and re-sit any failed examinations at the next available opportunity, with a view to improving their degree classification, or (ii) accept the offer (in which case they have no further right to re-sit any failed examinations).

**Calculation of yearly marks**

In the schemes of award for every degree programme covered by this handbook, the marks from all 4.0 course units are used in the calculation of each yearly mark. A 1.0 unit course is counted as two 0.5 unit courses.
**BSc Statistics**

- The first year mark is a weighted average of all first year course marks; full weight is attached to courses STAT1004 and STAT1005 and to the best unit from your remaining courses, and half weight to the other two units.

- The second year mark is a weighted average of all second year course marks; full weight is attached to STAT2001, STAT2003 and to the best two units of your remaining courses, and half weight to the other unit.

- The third year mark is a weighted average of all third year course marks; full weight is attached to STAT3001, half a unit of STAT3901 and the best two units of remaining courses, and half weight to the other unit.

**BSc Statistics, Economics and Finance**

- The first year mark is a weighted average of all first year course marks; full weight is attached to courses STAT1004 and STAT1005 and to the best unit from your remaining courses, and half weight to the other two units.

- The second year mark is a weighted average of all second year course marks; full weight is attached to STAT2001, STAT2003 and to the best two units of your remaining courses, and half weight to the other unit.

- The third year mark is a weighted average of all third year course marks; full weight is attached to STAT3001, STAT3006 and the best two units of remaining courses, and half weight to the other unit.

**BSc Statistics, Economics and a Language**

- The first year mark is a weighted average of all first year course marks; full weight is attached to courses STAT1004 and STAT1005 and to the best unit from your remaining courses, and half weight to the other two units.

- The second year mark is a weighted average of all second year course marks; full weight is attached to STAT2001, STAT2003 and to the best two units of your remaining courses, and half weight to the other unit.

- The third year mark is a weighted average of all third year course marks; full weight is attached to STAT3001 and the best 2.5 units of remaining courses, and half weight to the other unit.

**BSc Statistics and Management for Business**

- The first year mark is a weighted average of all first year course marks; full weight is attached to courses STAT1004, STAT1005 and to the best unit of remaining courses, and half weight to the other two units.

- The second year mark is a weighted average of all second year course marks; full weight is attached to STAT2001, MSIN7002 and to the best two units of your remaining courses, and half weight to the other unit.

- The third year mark is a weighted average of all third year course marks; full weight is attached to the best three units of courses, and half weight to the other unit.

**BSc (Econ) Economics and Statistics**

- The first year mark is a weighted average of all first year course marks; full weight is attached to courses STAT1004, STAT1005 and ECON1604 (which counts as two half-unit courses), and half weight to the other two units.
The second year mark is a weighted average of all second year course marks; full weight is attached to STAT2001, half a unit of ECON2601 and to the best two units of your remaining courses, and half weight to the other unit.

The third year mark is a weighted average of all third year course marks; full weight is attached to the best three units of courses, and half weight to the other unit.

*Illustrative calculations*

When attempting to determine your yearly average or final mark using the above rules, the calculation may be easier to perform if you begin by separating any 1.0 unit courses into two 0.5 unit courses (and attributing the same mark to both), such that you are then dealing with a set of eight marks for each year of your degree programme. Below are two examples to show how the preliminary assessment of honours is calculated.

**Example 1:** a student on the SEF programme obtains marks as follows:

*First year:* STAT1004 63%; STAT1005 53%; ECON1604 32%; marks for all other half-unit courses 72%, 64%, 58%, 46%. The student has only passed 3.0 course units, and the mark for ECON1604 is not high enough for a referral to be offered (see page 26). The student therefore takes a year out, resits ECON1604 at the next available opportunity and obtains a mark of 45%.

*Second year.* STAT2001 38%; STAT2003 64%; marks for all other half-unit courses 68%, 64%, 59%, 53%, 50%, 46%. A referral is offered in STAT2001. The student passes this referral, and is therefore credited with a mark of 40% for this course.

*Third year.* STAT3001 52%, STAT3006 64%, marks for all other half-unit courses 73%, 67%, 63%, 57%, 54%, 48%.

The student meets all the criteria for the award of an honours degree. The marks for each year of the degree programme are calculated as follows:

*First year.* Since ECON1604 is a 1.0 unit course, for the purpose of the calculation it is treated as two 0.5 unit courses, both with a mark of 45%. Full weight is attached to STAT1004, STAT1005 and to the best unit of remaining courses (i.e. to the marks of 72% and 64%); half weight to the remainder. The first year mark is therefore

\[
\frac{(1 \times 63) + (1 \times 53) + (1 \times 72) + (1 \times 64) + (0.5 \times 58) + (0.5 \times 46) + (0.5 \times 45) + (0.5 \times 45)}{1 + 1 + 1 + 1 + 0.5 + 0.5 + 0.5 + 0.5} = 58.17
\]

*Second year.* Full weight is attached to STAT2001, STAT2003 and to the best two units of remaining courses (i.e. to the marks of 68%, 64%, 59% and 53%); half weight to the remainder. The second year mark is therefore

\[
\frac{(1 \times 64) + (1 \times 40) + (1 \times 68) + (1 \times 64) + (1 \times 59) + (1 \times 53) + (0.5 \times 50) + (0.5 \times 46)}{1 + 1 + 1 + 1 + 1 + 1 + 0.5 + 0.5} = 56.57
\]

*Third year.* Full weight is attached to STAT3001, STAT3006 and to the best two units of remaining courses (i.e. to the marks of 73%, 67%, 63% and 57%); half weight to the remainder. The third year mark is therefore

\[
\frac{(1 \times 52) + (1 \times 64) + (1 \times 73) + (1 \times 67) + (1 \times 64) + (1 \times 57) + (0.5 \times 54) + (0.5 \times 48)}{1 + 1 + 1 + 1 + 1 + 1 + 0.5 + 0.5} = 61.00
\]

The final mark for this student is obtained by rounding the weighted average

\[
\frac{(1 \times 58.17) + (3 \times 56.57) + (5 \times 61.00)}{1 + 3 + 5} = 59.21
\]

to the nearest whole number. The resulting final mark is 59%. The preliminary classification for this student would therefore be a lower second class degree. However, since the final mark is within 1% of a class boundary, the Board of Examiners has the discretion to award
an upper second degree if appropriate (on the basis on the criteria set out on page 29).

**Example 2:** a student on the Econ/Stats programme obtains marks as follows:

*First year:* STAT1004 61%; STAT1005 37%; ECON1604 55%; marks for all other half-unit courses 73%, 66%, 62%, 48%. The student has passed 3.5 course units, but cannot progress to year 2 automatically as these do not include STAT1005. The failed mark is high enough for a referral to be offered. The student passes this referral, is credited with a mark of 40% for STAT1005 and is therefore able to progress.

*Second year.* STAT2001 33%; ECON2007 52%; ECON2601 58%; marks for all other half-unit courses 71%, 63%, 49%. The student re-sits STAT2001 at the next available opportunity (alongside the third year exams) and obtains a mark of 48%.

*Third year.* Marks for all half-unit courses 71%, 63%, 59%, 56%, 52%, 49%, 49%, 47%.

The student meets all the criteria for the award of an honours degree. The marks for each year of the degree programme are calculated as follows:

*First year.* Since ECON1604 is a 1.0 unit course, for the purpose of the calculation it is treated as two 0.5 unit courses (both with a mark of 55%). Full weight is attached to STAT1004, STAT1005 and ECON1604 (twice); half weight to the remainder. The first year mark is therefore

\[
\frac{1 \times 61 + 1 \times 40 + 1 \times 55 + 1 \times 55 + (0.5 \times 73) + (0.5 \times 66) + (0.5 \times 62) + (0.5 \times 48)}{1 + 1 + 1 + 1 + 0.5 + 0.5 + 0.5} = 55.92
\]

*Second year.* Since ECON2007 and ECON2601 are both 1.0 unit courses, for the purpose of the calculation they are each treated as two 0.5 unit courses. Full weight is attached to STAT2001, half a unit of ECON2601 and to the best four half units of remaining courses (i.e. to the marks of 71%, 63%, 58% and 52%); half weight to the remainder. The second year mark is therefore

\[
\frac{1 \times 48 + 1 \times 58 + 1 \times 71 + 1 \times 63 + 1 \times 58 + 1 \times 52 + (0.5 \times 52) + (0.5 \times 49)}{1 + 1 + 1 + 1 + 1 + 1 + 0.5 + 0.5} = 57.21
\]

*Third year.* Full weight is attached to the best 3.0 units (i.e. to the marks of 71%, 63%, 59%, 56%, 52% and 49%); half weight to the remainder. The third year mark is therefore

\[
\frac{1 \times 71 + 1 \times 63 + 1 \times 59 + 1 \times 56 + 1 \times 52 + (1 \times 49) + (0.5 \times 49) + (0.5 \times 47)}{1 + 1 + 1 + 1 + 1 + 0.5 + 0.5} = 56.86
\]

The final mark for this student is obtained by rounding the weighted average

\[
\frac{(1 \times 55.92) + (3 \times 57.21) + (5 \times 56.86)}{1 + 3 + 5} = 56.87
\]

to the nearest whole number. The resulting final mark is 57%. The preliminary classification for this student would therefore be a lower second class degree. As the final mark does not lie within 1% of a class boundary, the Board of Examiners would not normally give any consideration to adjusting the classification unless there were extenuating circumstances for which appropriate documentation had been received by the required deadline.

**Award of honours for the MSci International Programme**

Degree classification takes place after the examinations in term 3 of your final year. Provided you:

5 In general, the degree awarded according to the scheme of awards of honours is an *MSci in Statistical Science (International Programme).* The title might be modified to take the specific course choice into account, i.e. the examiners will determine the degree title with reference to the subjects taken and, where appropriate, the UCL rules for combined degrees.
• are complete in 16.0 units (see page 21);
• have taken no more than 1.0 unit of courses at Introductory level (see page 19);
• have passed at least 14.5 units in total;
• have passed at least 3.0 units at Masters level;
• have passed in statistical project work amounting to the equivalent of at least 1.0 unit undertaken in the third and/or fourth year,

you will be considered for honours. An initial classification is obtained as follows:

• Marks are calculated for each year of your degree programme. For the calculation of each yearly mark, a 1.0 unit course is counted as two 0.5-unit courses. The first and second year marks are calculated in the same way as for the corresponding BSc programme (see above). The third year mark is a weighted average of all third year courses, with full weight attached to the best three units and half weight attached to the remainder. The fourth year mark is an average of all fourth year courses, in which all units are given equal weight.

• Your final mark is calculated as a weighted average, rounded to the nearest whole number, of the marks for each year of your degree programme. The relative weights attached to the first, second, third and fourth year marks are 1, 3, 2.5 and 5 respectively.

• The resulting final mark is referred to the following table:

<table>
<thead>
<tr>
<th>Final mark</th>
<th>Initial Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>70 or over</td>
<td>First</td>
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<td>60 to 69</td>
<td>Upper Second</td>
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</tr>
<tr>
<td>40 to 49</td>
<td>Third</td>
</tr>
</tbody>
</table>

In cases where a candidate re-sits a course, the highest available mark is used in the calculation. The resulting mark is credited to the year in which the course was first taken.

Candidates whose overall degree mark falls within 1% of a class boundary may be considered for promotion to the higher class. Examiners will consider the following criteria in such cases, before making the final recommendation of honours class:

• The overall distribution of marks: does the candidate have a majority of marks in any particular class, for example.
• The final-year performance compared with that in earlier years, and whether this is reflected adequately in the weight attached to the third year mark.
• The performance in modules of more advanced level or those with a significant research element.
• Marks that have a particular significance for the overall classification (for example, marks for modules with a high course unit value, or marks that were affected by extenuating circumstances for which the appropriate documentation has been received).

Students registered on the MSci programme, who have failed to meet the criteria for a MSci Degree, will be offered a BSc Degree provided that they:

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6 The description given here is standard for MSci programmes within the UCL Faculty of Mathematical and Physical Sciences. In practice however, students on the International Programme spend their third year abroad and, since other universities do not operate the same course unit system as does UCL, it is necessary to translate their marks to a “UCL equivalent” for the purposes of degree classification. The translation is done on a case-by-case basis, taking into account the known correspondence between marking scales at different institutions as well as any relevant individual circumstances. No attempt is made to translate marks for individual courses: rather, a single mark for the year abroad is recorded and this is treated as a 4.0 unit course for the purpose of applying the formula described above.
• are complete in at least 12.0 units;
• have passed at least 11.0 units in total;
• have passed at least 3.0 units at Advanced / Masters level.

If such a candidate has exhausted all re-sit attempts available to them, they must accept this offer. Otherwise, they may either (i) decline the offer and re-sit any failed examinations at the next available opportunity, with a view to improving their degree classification, or (ii) accept the offer (in which case they have no further right to re-sit any failed examinations).

Award of honours for the MASS programmes
Schemes of award are available from the Mathematics Department.

ACCREDITATION BY PROFESSIONAL BODIES

Royal Statistical Society (RSS)
The Royal Statistical Society (https://www.rss.org.uk/) accredits university degree programmes at undergraduate and MSc level for a particular year on the basis of information supplied by the university. For undergraduate degrees, accreditation means that graduates for that year will automatically be granted Graduate Statistician (GradStat) status on application to the RSS, provided that at least second class honours has been achieved. Applicants must already be Fellows of the RSS or become Fellows concurrently.

Five undergraduate programmes offered by the Department of Statistical Science (Statistics, SEF, SEL, SAMB and the MSci International programme) have been accredited for the year 2013/14, as have the MASS BSc and MSci programmes. In some of these cases, qualification for GradStat status requires that at least 50% of the optional courses selected in the second and third years are chosen from amongst those offered in the Department of Statistical Science. The Econ/Stats programme has not been accredited. Graduates with this degree may apply individually for GradStat status; they will need to provide a transcript of courses taken.

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

Management courses
The Chartered Institute of Marketing (http://www.cim.co.uk/) has accredited some Management courses taken by SAMB students: MSIN7009 Introduction to Marketing, MSIN3002 Marketing Communications, and MSIN3006 Digital Marketing. The Department of Management Science & Innovation has also been awarded “Partner in Learning” status with Institute of Chartered Accountants in England and Wales (ICAEW, http://www.icaew.com/).

ACTUARIAL PLACEMENT SCHEME
The Department participates in an undergraduate placement scheme run by Alpha Consulting Ltd., which involves a 12-month paid work placement with an actuarial employer (see http://www.alphaconsulting.co.uk/placements). This is normally taken at the end of the second year of a degree programme. Following the placement, undergraduate students return to complete the final year of their studies. This scheme can give students some excellent experience of the actuarial profession. However, competition for places is intense and there is no guarantee that students will be successful in gaining a placement.
The scheme is open to all students in principle, although those from outside the European Union will need to check that their visa allows them to participate and subsequently to complete their studies, since for visa purposes a work placement is likely to be regarded by the UKBA as “full-time employment” rather than “full-time education”. Details of the arrangements for the current year will be emailed to all students when available. Any student who is potentially interested in this scheme should discuss it further with the Departmental Tutor.

AIMS AND OBJECTIVES OF THE DEGREE PROGRAMMES

BSc Statistics

Aims
To provide an intellectually challenging undergraduate degree programme in the theory and practice of Statistical Science. This training should enable students to proceed directly to posts as Statisticians in industry, commerce or the civil service, or by profiting from the general numeracy and reasoning skills acquired during the programme, to take up trainee positions in accountancy, insurance or management. The programme should also provide a preparation for a Master's programme in Statistics, which in turn is a normal requirement for postgraduate research in Statistics.

Objectives
On completion of the programme, a student is expected to be able to do the following:

- Explain the concepts and properties of discrete and continuous random variables, common probability distributions (both univariate and multivariate), and carry out basic calculations associated with these.

- Summarise the main features of a set of data, and explain and use basic methods of statistical estimation and significance testing in a variety of standard situations; explain and use basic concepts in the theory of statistical inference.

- Explain, and apply to simple situations, basic ideas in applied probability such as Markov Chains and Markov processes (discrete states only).

- Undertake a research project involving data analysis under supervision and present the findings by oral presentation and written report.

- Use a modern computer operating system, use at least one major statistical package, use a word processor, spreadsheet, database and graphics software.

In addition, a student should be introduced to most of the following:

- The problems associated with planning a survey, and the use of simple methods of analysing survey data.

- The problems associated with planning a clinical trial, and the use of simple methods for analysis of data from clinical trials and epidemiological studies.

- Forecasting procedures.

- Criteria for decision making, utility theory, decision trees.
BSc Statistics, Economics and Finance (SEF)

**Aims**

To provide an intellectually challenging undergraduate degree programme in quantitative methods together with a basic knowledge of Economics and Finance. This training should enable students to profit from the general numeracy and reasoning skills acquired during the programme in order to take up trainee positions in accountancy, finance, insurance or management, or to proceed to positions as statisticians in industry, commerce or public organisations. The programme should also provide a preparation for a Master's programme in Statistics, Economics or Finance, which in turn is a normal requirement for postgraduate research in any of these areas. Via appropriate choice of options, the programme may also provide a foundation for a career, or for further study, in Operational Research.

**Objectives**

On completion of the programme, a student is expected to be able to do the following:

- Explain the concepts and properties of discrete and continuous random variables, common probability distributions (both univariate and multivariate), and carry out basic calculations associated with these;
- Summarise the main features of a set of data, and explain and use basic methods of statistical estimation and significance testing in a variety of standard situations; explain and use basic concepts in the theory of statistical inference;
- Carry out a critical evaluation of an analytical method, recognising both its strengths and its limitations;
- Explain the ideas of Markov Chains, Markov processes (discrete states only) and renewal processes, and use them in simple applications, including queues and reliability;
- Use a major statistical computer package, and interpret the output;
- Have a basic knowledge of central principles of microeconomics including supply and demand, consumer choice, firm behaviour, product markets, labour markets and international trade;
- Have a basic knowledge of central principles of macroeconomics including national accounts, relations between private sector and government, consider the problems of inflation, unemployment, balance-of-payments and growth, aggregate demand and supply;
- Formulate economic arguments and understand the role of argument and evidence in the policy-making process;
- Interpret company financial reports and appreciate the use of basic financial products;
- Use the basic mathematical and probabilistic tools of modern finance, and apply the relevant techniques for the pricing of derivatives;

In addition, a student should be introduced to most of the following:

- The problems associated with planning a survey, and the use of simple methods of analysing survey data.
- Forecasting procedures.
- Concepts and principles of risk, assessment and management of risk; criteria for decision making, utility theory, decision trees.
- Practical experience of techniques in Statistics through project work or case studies.
• Methods of linear and dynamic programming, and simple problems in game theory and Markov sequential processes.

BSc Statistics, Economics and a Language (SEL)

Aims
To provide an intellectually challenging undergraduate degree programme in quantitative methods, together with a basic knowledge of Economics and a reasonable ability to communicate in a second language in addition to English. This training should enable students to profit from the general numeracy, reasoning and linguistic skills acquired during the programme in order to take up trainee positions in accountancy, finance, insurance or management, or to proceed to positions as Statisticians in industry, commerce or public organisations. The study of a second language recognises that increasingly these careers have an international dimension. Students should be able to converse reasonably fluently (according to the level) with native speakers and discuss personal, social, current and professional issues using appropriate structures. The programme should also provide a preparation for a Master's programme in Statistics or Economics, which in turn is a normal requirement for postgraduate research in either of these areas. Via appropriate choice of options, the programme may also provide a foundation for a career, or for further study, in Operational Research.

Objectives
On completion of the programme, a student is expected to be able to do the following:

• Explain the concepts and properties of discrete and continuous random variables, common probability distributions (both univariate and multivariate), and carry out basic calculations associated with these.

• Summarise the main features of a set of data, and explain and use basic methods of statistical estimation and significance testing in a variety of standard situations; explain and use basic concepts in the theory of statistical inference.

• Explain the ideas of Markov Chains, Markov processes (discrete states only) and renewal processes, and use them in simple applications, including queues and reliability.

• Have a basic knowledge of central principles of microeconomics including supply and demand, consumer choice, firm behaviour, product markets, labour markets and international trade.

• Have a basic knowledge of central principles of macroeconomics including national accounts, relations between private sector and government, consider the problems of inflation, unemployment, balance-of-payments and growth, aggregate demand and supply.

• Formulate economic arguments and understand the role of argument and evidence in the policy-making process;

• Speak, write and comprehend a language other than English, to a level of fluency which is sufficient for future professional activities.

In addition, a student should be introduced to most of the following:

• The problems associated with planning a survey, and the use of simple methods of analysing survey data.

• Forecasting procedures.
• Concepts and principles of risk, assessment and management of risk; criteria for decision making, utility theory, decision trees.
• Practical experience of techniques in Statistics through project work or case studies.
• Use of a major statistical computer package, and interpretation of the output.
• Methods of linear and dynamic programming, and simple problems in game theory and Markov sequential processes.

BSc Statistics and Management for Business (SAMB)

Aims
To provide an intellectually challenging undergraduate degree programme in the theory and practice of Statistical Science, and equip those students who wish to enter industry or commerce with sufficient management skills for the first few years at work. This training should enable students to proceed directly to posts as Statisticians in industry, commerce or public organisations, or by profiting from the general numeracy and reasoning skills acquired during the programme, to take up trainee positions in accountancy, insurance or management. The programme should also provide a preparation for a Master’s programme in Statistics, which in turn is a normal requirement for postgraduate research in this area.

Objectives
On completion of the programme, a student is expected to be able to do the following:

• Explain the concepts and properties of discrete and continuous random variables, common probability distributions (both univariate and multivariate), and carry out basic calculations associated with these.
• Summarise the main features of a set of data, and explain and use basic methods of statistical estimation and significance testing in a variety of standard situations; explain and use basic concepts in the theory of statistical inference.
• Carry out a critical evaluation of an analytical method, recognising both its strengths and its limitations.
• Explain the ideas of Markov Chains, Markov processes (discrete states only) and renewal processes, and use them in simple applications, including queues and reliability.
• Understand the practical aspects of applying theories of management and present arguments and views that demonstrate understanding of the realities of organisation life.
• Identify and discuss the impact of cultural, political, social, economic and technological issues on organisations.
• Define, analyse and present recommendations for the solution of given management problems.

In addition, a student should be introduced to most of the following:

• One or more specialised areas of management science as applied to business, including e-Business, ethics, international business, business law, managing organisational change and marketing.
• The problems associated with planning a survey, and the use of simple methods of analysing survey data.
• Forecasting procedures.
• Concepts and principles of risk, assessment and management of risk; criteria for decision making, utility theory, decision trees.

• Practical experience of techniques in Statistics through project work or case studies.

• Apply the methods of linear and dynamic programming, and solve simple problems in game theory and Markov sequential processes.

• Use of a modern computer operating system including spreadsheet, database and graphics software and the use of a computer package for data analysis.

**BSc (Econ) Economics and Statistics (Econ/Stats)**

**Aims**

To provide an intellectually challenging undergraduate degree programme that provides training in all major aspects of Economics, and in the theory and practice of Statistical Science. This training should prepare students for a career as an economist or statistician or, by profiting from the general numeracy and transferable skills acquired during the programme, to take up trainee positions in accountancy, insurance or management. The programme also aims to provide a foundation for graduate study in Economics, Statistics and related fields.

**Objectives**

On completion of the programme, a student is expected to be able to do the following:

• Understand the central ideas, concepts and methods of modern economics, including core elements of macroeconomics, microeconomics and quantitative empirical economics.

• Apply these core concepts to one or more specialised areas of economics.

• Explain the concepts and properties of discrete and continuous random variables and common probability distributions (both univariate and multivariate), and carry out basic calculations associated with these.

• Summarise the main features of a set of data, and explain and use basic methods of statistical estimation and significance testing in a variety of standard situations.

• Approach economic and more general quantitative problems in a methodical and structured manner, bringing to bear skills of conceptualisation, problem solving, analysis and communication.

In addition, a student should be introduced to most of the following:

• One or more specialised areas of economics, including financial economics, industrial relations, international trade and economic applications of game theory.

• Use of a modern computer operating system, and use of a computer package for data analysis.

• Methods of linear and dynamic programming and their application to simple problems.

• The problems associated with planning a survey, and the use of simple methods of analysing survey data.

• Forecasting procedures.

• Criteria for decision making, utility theory, decision trees.
MSci Statistical Science (International Programme)

Aims
As for the corresponding BSc degree (see previous pages). In addition, the International Programme aims at continuing advanced education in Statistics, as well as providing experience of education in a different cultural and/or linguistic setting which will broaden the horizon of students and increase chances to find positions with special emphasis on international expertise.

Objectives
As for corresponding BSc degree plus:

- Deepened / advanced understanding of statistical theory and its applications in a variety of areas.
- Mastering a foreign language (for those not already following a language degree programme).

STRUCTURES OF THE DEGREE PROGRAMMES

The tables on the following pages show the degree programme structures by subject material for each year and term.

You will see that each degree programme has compulsory courses to fulfil the aims and objectives of the degree. In these tables, some course titles have been abbreviated; full course titles are given in the list of courses in the section following these tables. You will normally have the required prerequisites for each compulsory course. You should check on the prerequisites for an optional course by reference to the course descriptions later in the handbook.

General Information for the following tables:

- Students study 4.0 units per year.
- All courses are 0.5 units except where otherwise stated.
- Courses marked • are compulsory.
- Courses in capital letters have full weight in the scheme for the award of honours.
- Courses in square brackets are third year options if not taken in the second year.

A limited number of options may be chosen from other courses offered in the College, subject to approval by the Departmental Tutor and the department offering the option and the constraints of the timetable.
## Structure of the Statistics degree programme

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## Structure of the Statistics, Economics and Finance degree programme

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7 At least one of these courses must be selected during the degree programme.
8 Only available to students who take Economics II in the second year.

42
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9 Only available to students who take Economics II in the second year.
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\(^{10}\) Only one of these two options may be taken during the degree programme.

\(^{11}\) A total of at least 1.5 units must be taken during the second and third years.
## Structure of the Economics and Statistics degree programme

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**Mathematics**
- Maths I •
- Maths II •
- Maths III •

**Core Economics**
- ECONOMICS I (T1 & T2), 1 unit •
- ECONOMICS II (T1 & T2), 1 unit •
- Quant Econ & Econometrics (T1 & T2), 1 unit •

**Economics Options**
- **One from**
  - World Economy
  - Applied Economics

**Core Probability & Statistics**
- INTRO PROB & STATS •
- FURTHER PROB & STATS •
- Intro to Practical Statistics (T1 & T2) •
- PROB & INERENCE •
- Linear Models & ANOVA •

**Statistics Options**
- **At least one from**
  - Intro Applied Prob
  - Social Statistics

**Core Probability & Statistics**
- **At least two from**
  - Statistical Inference
  - Stochastic Systems
  - Stochastic Methods in Fin I
  - Medical Statistics I
  - Opt Algorithms in OR

**Statistics Options**
- **At least three from**
  - Microeconometrics
  - Game Theory
  - International Trade
  - Issues in Economic Dev
  - Economics of Labour
  - Economics of Finance
  - Economics of Science
  - Economics of Tax Policy
  - Economet for Macroecon & Fin
  - Economics of Information
  - Experimental Economics
  - Economics of Fin Markets
  - Environmental Economics
  - Money & Banking

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12 At least one ECON3### module must be selected.
13 A limited number of options may be chosen from other course units offered by the Departments of Economics and Statistical Science, or up to 1.5 units may be chosen from other course units offered in the College, subject to approval by the Departmental Tutor and the department offering the option and the constraints of the timetable.
Structure of the MSci International Programme

Students may be accepted onto the International Programme from year 1 with the intention of following the first two years of either the Stats, SEF or SEL BSc programmes (but not Econ/Stats or SAMB). Alternatively, students starting on one of these programmes may be allowed to transfer to the International Programme after their first year. The Department will only support a limited number of students on the International Programme. Where more students seek to follow the programme than there are opportunities available, the candidates will be selected by the Study Abroad Tutor in conjunction with the Departmental Tutor, based on overall profile of academic performance, enthusiasm and contribution to the Department. Students who wish to study in a language other than English must be able to demonstrate linguistic competence through qualifications and / or following UCL language courses. The Department may ask the UCL Centre for Languages & International Education to assess students seeking to study abroad.

Years 1 and 2 are the same as for the corresponding BSc programme selected at the start of year 1 except that, if required, a student should take up to 1.0 unit of additional language courses in the first two years. These language courses should be taken instead of options named in the programme structure of the selected programme; students will be required to take all of the compulsory first and second year courses of the selected programme.

Year 3 will be the year abroad. Students studying abroad must follow a programme that is to the fullest extent possible agreed in advance with the Study Abroad Tutor. The programme must

- be of equivalent depth and quality to the third year of one of our BSc programmes;
- be substantially composed of courses in Statistics or closely related allied disciplines such as Mathematics, Econometrics, Operations Research, Computer Science;
- be of equal workload to that of the UCL third year of one of our BSc courses, that is, using accepted equivalence measures, be of 4.0 units;
- be formally assessed by the host institution and the results of the assessment independently reported to the Study Abroad Tutor;
- include taught courses / units, i.e. not consist solely of project work;
- be formally documented by the student in an up to date written study plan, signed by the Study Abroad Tutor and kept by the Departmental Tutor.

Due to the variety of international marking systems, year 3 examination and assessment results will be converted into UCL marks on a case-by-case basis based on the grade definitions given in the “Feedback on Student's Work” section on page 13.

In year 4, the choice of courses should complement the ones taken in the year abroad according to the selected BSc programme. At most 1.0 unit of Advanced level courses can be taken in year 4; the remaining 3.0 units must be at Masters level. A student must also undertake in year 3 and / or 4, statistical project work amounting to the equivalent of at least 1.0 unit. If taken in year 4, the project will be at Masters level. For some of the BSc programmes, a compulsory 1.0 unit statistical project is already included in the final year. For the other programmes, a student may opt to undertake the project work by registering for at least a 0.5 unit project course in each of years 3 and 4 instead of undertaking the work in one year only. Options courses must be agreed by the Study Abroad and Departmental Tutors, in order to avoid overlap caused by attending an overseas institution.

Structure of the MASS degree programmes

The structures of these degrees are available from the Department of Mathematics at http://www.ucl.ac.uk/maths/courses/undergraduates/maths-stats.
COURSES AVAILABLE IN THE DEGREE PROGRAMMES

Course codes

Each course has a code: this consists of a four character prefix which indicates the examination board that is responsible for that course, followed by another four characters indicating a course code within that board. Courses in statistical science have the prefix STAT. However, you will often find that staff refer to course codes as simply 1005 for STAT1005, and 1604 for ECON1604 (for example).

Codes of courses on offer

In the list below, the courses are listed by subject area. All courses listed are 0.5 units unless stated otherwise. Please refer to the programme structures shown on the previous pages for the appropriate courses for your degree.

Statistics, SEF and SEL degree programmes

- *Statistical Science*

<table>
<thead>
<tr>
<th>Year</th>
<th>Course Code14</th>
<th>Course Title</th>
<th>Level</th>
<th>Term</th>
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<tbody>
<tr>
<td>1</td>
<td>STAT1004</td>
<td>Introduction to Probability &amp; Statistics</td>
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<td></td>
<td>STAT1005</td>
<td>Further Probability &amp; Statistics</td>
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<td></td>
<td>STAT1006</td>
<td>Introduction to Practical Statistics</td>
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<td>1 &amp; 2</td>
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<td>STAT2001</td>
<td>Probability &amp; Inference</td>
<td>Intermediate</td>
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<td>STAT2002</td>
<td>Linear Models &amp; the Analysis of Variance</td>
<td>Intermediate</td>
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<td>2/3</td>
<td>STAT2003</td>
<td>Introduction to Applied Probability</td>
<td>Intermediate</td>
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<td>STAT7001</td>
<td>Computing for Practical Statistics</td>
<td>Intermediate</td>
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<td>STAT7002</td>
<td>Social Statistics</td>
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<tr>
<td></td>
<td>STAT7003</td>
<td>Optimisation Algorithms in Operational Research</td>
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<tr>
<td>3</td>
<td>STAT3001</td>
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<td>STAT3002</td>
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<td>STAT3003</td>
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<td>STAT3004</td>
<td>Decision &amp; Risk</td>
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<td>STAT3005</td>
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<td>STAT3006</td>
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<td>STAT3009</td>
<td>Medical Statistics II</td>
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<td>STAT3019</td>
<td>Selected Topics in Statistics</td>
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<td>STAT3020</td>
<td>Stochastic Methods in Finance II</td>
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<td>STAT3021</td>
<td>Further Modelling with Applications in Health Research</td>
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<td>STAT3022</td>
<td>Quantitative Modelling of Operational Risk &amp; Insurance Analytics</td>
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14 Most Statistical Science courses have additional entries in the Portico module directory to those given here, representing versions of the courses offered to other groups of students at UCL e.g. postgraduate students (STATG###), fourth year MSci students (STATM###) and autumn term only affiliate students (STAT####A). Input your choices carefully, therefore, as the selection of any Statistical Science course codes not listed here will most likely result in the module registration being rejected.
### Mathematics

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<td>MATH6402</td>
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### Economics and Finance

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<td>MSIN1004</td>
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<td>MSIN6004</td>
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### Languages - see page 51.

Students may also choose options from outside the above lists, subject to the constraints and approval procedure described on page 19. The following are examples of courses that previous students have taken:

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<td>Entrepreneurship: Theory and Practice</td>
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\(^\d\) Students may not take both PSYC6001 and MSIN1002
### Year 3 Courses

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<td>Economics of Industrial Relations</td>
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<td>ECON7005</td>
<td>Economics of the Public Sector</td>
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<tr>
<td>MSIN7004</td>
<td>E-Business Environment &amp; Management</td>
<td>Intermediate</td>
<td>2</td>
</tr>
<tr>
<td>MSIN7014</td>
<td>Strategic Human Resource Management</td>
<td>Intermediate</td>
<td>2</td>
</tr>
</tbody>
</table>

Students may not take courses in years other than those indicated above. Third year students may not take a First level Mathematics course or MATH6502 (Mathematics for Engineers II). Students may not take both MATH3508 (Financial Mathematics) and STAT3006.

### SAMB degree programme

- **Mathematics** - the courses are those listed on page 47.
- **Statistical Science** - the courses are included in the list on page 47.
- **Management and Business Studies**

<table>
<thead>
<tr>
<th>Year</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Level</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MSIN6001</td>
<td>Understanding Management</td>
<td>First</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>MSIN1002</td>
<td>Communication &amp; Behaviour in Organisations</td>
<td>First</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>MSIN1003</td>
<td>Information World</td>
<td>First</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>MSIN1004</td>
<td>Accounting for Business</td>
<td>First</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>MSIN7002</td>
<td>Business in a Competitive Environment</td>
<td>Intermediate</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>ECON6002</td>
<td>An Introduction to Applied Economic Analysis</td>
<td>First</td>
<td>1</td>
</tr>
<tr>
<td>2/3</td>
<td>MSIN7003</td>
<td>Organisational Change</td>
<td>Intermediate</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>MSIN7004</td>
<td>E-Business Environment &amp; Management</td>
<td>Intermediate</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>MSIN7005</td>
<td>Law for Managers</td>
<td>Intermediate</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>MSIN7007</td>
<td>Mastering Entrepreneurship</td>
<td>Advanced</td>
<td>1 or 2</td>
</tr>
<tr>
<td></td>
<td>MSIN7008</td>
<td>Entrepreneurship: Theory and Practice</td>
<td>Advanced</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>MSIN7009</td>
<td>Introduction to Marketing</td>
<td>Intermediate</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>MSIN7011</td>
<td>International Business</td>
<td>Advanced</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>MSIN7013</td>
<td>Innovation Management</td>
<td>Advanced</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>MSIN7016</td>
<td>Managerial Accounting for Decision Making</td>
<td>Intermediate</td>
<td>1 or 2</td>
</tr>
<tr>
<td>3</td>
<td>MSIN7014</td>
<td>Strategic Human Resource Management</td>
<td>Intermediate</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>MSIN3101</td>
<td>Project, Programme &amp; Portfolio Management</td>
<td>Advanced</td>
<td>1 or 2</td>
</tr>
<tr>
<td></td>
<td>MSIN3002</td>
<td>Marketing Communications</td>
<td>Advanced</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>MSIN3004</td>
<td>Mergers &amp; Valuations</td>
<td>Advanced</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>MSIN3006</td>
<td>Digital Marketing</td>
<td>Advanced</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>MSIN3017</td>
<td>Corporate Financial Strategy</td>
<td>Advanced</td>
<td>1 or 2</td>
</tr>
<tr>
<td></td>
<td>MSIN9001</td>
<td>Dissertation (1 unit)</td>
<td>Advanced</td>
<td>1 &amp; 2</td>
</tr>
<tr>
<td></td>
<td>ECON3014</td>
<td>Game Theory</td>
<td>Advanced</td>
<td>1</td>
</tr>
</tbody>
</table>

49
Second year students may choose a 0.5 unit elective course and third year students may substitute other courses from the Department of Management Science & Innovation or choose up to 1.5 units of courses from other departments, subject to the degree programme structure (see page 44) and the constraints and approval procedure described on page 19. Third year students who wish to opt for either the 0.5 or 1.0 unit statistical project are still required to choose at least two other courses from the list of statistical science options.

Students may not take courses in years other than those indicated above. Students may not take both PSYC6001 (Introduction to Social and Business Psychology) and MSIN1002 or both MATH3508 (Financial Mathematics) and STAT3006. Third year students may not take a First level Mathematics course or MATH6502 (Mathematics for Engineers II).

**Econ/Stats degree programme**

- **Mathematics** - the courses are those listed on page 47.
- **Statistical Science** - the courses are included in the list on page 47.
- **Economics**

<table>
<thead>
<tr>
<th>Year</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Level</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ECON1002</td>
<td>Applied Economics</td>
<td>First</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>ECON1005</td>
<td>The World Economy</td>
<td>First</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>ECON1604</td>
<td>Economics I (Combined Studies) (1 unit)</td>
<td>First</td>
<td>1 &amp; 2</td>
</tr>
<tr>
<td>2</td>
<td>ECON2601</td>
<td>Economics II (Combined Studies) (1 unit)</td>
<td>Intermediate</td>
<td>1 &amp; 2</td>
</tr>
<tr>
<td></td>
<td>ECON2007</td>
<td>Quantitative Economics &amp; Econometrics (1 unit)</td>
<td>Intermediate</td>
<td>1 &amp; 2</td>
</tr>
<tr>
<td>3</td>
<td>ECON6003</td>
<td>Money &amp; Banking</td>
<td>Advanced</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>ECON7001</td>
<td>Economics of Labour</td>
<td>Advanced</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>ECON7002</td>
<td>Economics of Finance</td>
<td>Advanced</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>ECON7007</td>
<td>Environmental Economics</td>
<td>Advanced</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>ECON7008</td>
<td>Economics of Tax Policy</td>
<td>Advanced</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>ECON7011</td>
<td>Economics of Science</td>
<td>Advanced</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>ECON3002</td>
<td>Microeconometrics</td>
<td>Advanced</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>ECON3003</td>
<td>Econometrics for Macroeconomics &amp; Finance</td>
<td>Advanced</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>ECON3004</td>
<td>International Trade</td>
<td>Advanced</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>ECON3014</td>
<td>Game Theory</td>
<td>Advanced</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>ECON3016</td>
<td>Economics of Information</td>
<td>Advanced</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>ECON3019</td>
<td>Issues in Economic Development</td>
<td>Advanced</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>ECON3020</td>
<td>Experimental Economics</td>
<td>Advanced</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>ECON3023</td>
<td>Economics of Financial Markets</td>
<td>Advanced</td>
<td>2</td>
</tr>
</tbody>
</table>

Third year students must take at least 0.5 units of courses with ECON3### codes, but may substitute other courses from the Department of Economics or choose up to 1.5 units of courses from other departments, subject to the degree programme structure (see page 45) and the constraints and approval procedure described on page 19. Third year students who wish to opt for either the 0.5 or 1.0 unit statistical project are still required to choose at least two other courses from the list of statistical science options.

Students may not take courses in years other than those indicated above. Students may not take both PSYC6001 (Introduction to Social and Business Psychology) and MSIN1002 (Communication & Behaviour in Organisations) or both MATH3508 (Financial Mathematics) and STAT3006. Third year students may not take a First level Mathematics course, MATH6502 (Mathematics for Engineers II), MSIN1002 (Communication & Behaviour in Organisations), MSIN1004 (Accounting for Business), MSIN6001 (Understanding
Management) or MSIN7002 (Business in a Competitive Environment) or more than 0.5 units of MSIN courses below Advanced level.

**MASS degree programmes**

The courses available in these degrees can be found on the Department of Mathematics website at [http://www.ucl.ac.uk/maths/courses/undergraduates/math-stats](http://www.ucl.ac.uk/maths/courses/undergraduates/math-stats).

**Language Courses**

Language courses for Statistical Science students are available at the UCL Centre for Languages & International Education (CLIE). The following languages are available from CLIE:

- Arabic, Dutch, French, German, Italian, Japanese, Mandarin, Spanish

All languages are offered as 0.5 unit courses at 7 levels. Two levels may be combined in the same year to form a 1.0 unit course. The correspondence between language levels and those described on page 19 is indicated below. A full course listing is available on the CLIE website at [https://www.ucl.ac.uk/clie](https://www.ucl.ac.uk/clie).

**Selecting a level**

The CLIE tutors will assist students in selecting the right level when they come for interview as part of the course enrolment procedure in September. You can only register for language courses following an interview; if you try and register on Portico for a language course without the prior agreement of the Centre, your registration will not be permitted.

The Language Centre levels are as follows:

- **Level A** (corresponding level for degree classification: First) This is for complete beginners or for students who have had only very little contact with the language.
- **Level B** (corresponding level for degree classification: Intermediate) This is for students who have passed level A, or have a low GCSE grade or equivalent.
- **Level C** (corresponding level for degree classification: Advanced) This is for students who have passed level B, or have a high GCSE grade or equivalent.
- **Level D** (corresponding level for degree classification: Advanced) This is for students who have passed level C, or are reasonably fluent in the language and are able to discuss a range of issues (low A-Level grade or equivalent).
- **Business and Current Affairs** (corresponding level for degree classification: Advanced) This is for students who have passed level D, or have a high A-level grade or equivalent. The course covers a variety of issues within the scope of Business and Current Affairs such as Europe, society and politics.
- **Current Affairs and Culture (Social, Historical and Political)** (corresponding level for degree classification: Advanced) This is for students who have taken the Business and Current Affairs course. The course provides knowledge and understanding both of the structure of the language and of the business, social, historical and political contexts in which it is currently used.
- **Professional Purposes II** (corresponding level for degree classification: Advanced)

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16 In some cases students may be able to attend courses organised by other departments such as UCL French, German, Italian or Spanish departments or the Modern European Studies Department.
**Statistics degree**

In each year, a 0.5 unit language course at any level is allowed as an option, subject to an overall maximum of 1.0 unit of language courses and to the requirements of the scheme for the award of honours. However, a 1.0 unit course in any one year is not normally allowed.

**SEF degree**

In each of years 2 and 3, a 0.5 unit language course at any level is allowed as an option, subject to the requirements of the scheme for the award of honours. A 1.0 unit course in any one year is not normally allowed.

**SEL degree**

You can study at most two languages throughout your degree programme. However, you can only enrol for one level A course throughout the three years. The rules are as follows:

- **Year 1**: A compulsory 0.5 unit language course. A 1.0 unit course is not allowed.
- **Year 2**: A compulsory 0.5 unit language course and an optional 0.5 unit language course. You may combine both to select a 1.0 unit course in one language.
- **Year 3**: A compulsory 0.5 unit language course and an optional 0.5 unit language course. You may combine both to select a 1.0 unit course in one language. If you enrol for a level A course, it must be 1.0 unit.

In addition to the restrictions outlined here, the number of language courses taken at levels A to D may be limited by the requirements of the scheme for the award of honours (see page 28).

**COURSE INFORMATION**

The following pages give more details, including outline syllabuses, of the courses offered by the Department of Statistical Science that are included in the Statistics, SEF, SEL, SAMB, Econ/Stats and MASS degree programmes. 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.

- Details of all undergraduate courses offered by the Department of Computer Science are available at: [http://www.cs.ucl.ac.uk/students/syllabus/ug/](http://www.cs.ucl.ac.uk/students/syllabus/ug/).
- Details of all undergraduate courses offered by the Department of Economics are available at: [http://www.ucl.ac.uk/economics/undergraduate/module-list](http://www.ucl.ac.uk/economics/undergraduate/module-list).
- Details of all undergraduate courses offered by the UCL Centre for Languages and International Education are available at: [http://www.ucl.ac.uk/clie/CourseUnits](http://www.ucl.ac.uk/clie/CourseUnits).
- Details of all undergraduate courses offered by the Department of Management Science & Innovation are available at: [https://www.msi.ucl.ac.uk/study](https://www.msi.ucl.ac.uk/study).
- Details of all undergraduate courses offered by the Department of Mathematics are available at: [http://www.ucl.ac.uk/maths/courses/undergraduates/](http://www.ucl.ac.uk/maths/courses/undergraduates/).
- Details of all undergraduate courses offered by the Department of Science & Technology Studies are available at: [http://www.ucl.ac.uk/sts/study](http://www.ucl.ac.uk/sts/study).

Some of the information provided in the following pages is based on the courses as taught on the previous occasion and so may be out-of-date. The most likely changes are in the booklists and numbers of exercises.
Courses offered by the Department of Statistical Science

First Year

STAT1004
INTRODUCTION TO PROBABILITY AND STATISTICS (0.5 UNIT)

Level: First

Aims of course: To provide an accessible and application-oriented introduction to basic ideas in probability and statistics. Together with STAT1005 and STAT1006, this provides the foundation for further study of statistics in the degree programmes offered by the Department of Statistical Science or jointly with other Departments. It may also serve as a foundation course for students taking a Statistics stream as part of a Natural Sciences degree.

Objectives of course: On successful completion of the course, a student should understand, at an intuitive level, the basic concepts in probability theory; be able to use fundamental laws of probability to solve simple problems; recognise simple situations in which standard univariate probability distributions may be useful, and apply results for these distributions as appropriate in these situations; be able to choose and apply appropriate simple techniques for the presentation and description of data; understand the concepts of a probability model and sampling variability; and be aware of the need to check assumptions made when using a given probability model.

Applications: This course motivates the use of probability and statistics in a wide range of application areas. Recent high-profile statistical applications in areas such as politics, road safety, space travel, public health and criminal justice are discussed. Smaller teaching examples come from astronomy, medicine, meteorology, education, genetics, finance and physics.

Prerequisites: Grade A in GCE A Level Mathematics, or equivalent.


Texts:

Assessment for examination grading:
In-course assessment (see page 20), the exact method of which will be announced by the lecturer at the beginning of the course. 2 ½ 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: Weekly sets of exercises. These will not count towards the examination grading.

Timetabled workload:
Lectures: 3 hours per week.
Tutorials: 1 hour per week.
STAT1005
FURTHER PROBABILITY AND
STATISTICS (0.5 UNIT)

Level: First

Aims of course: To introduce a formal framework for the study of probability and statistics, building on the intuitive concepts introduced in STAT1004. Together with STAT1004 and STAT1006, this provides the foundation for further study of statistics in the degree programmes offered by the Department of Statistical Science or jointly with other Departments. It may also serve as a core course for students taking a statistics stream as part of a Natural Sciences degree.

Objectives of course: On successful completion of the course, a student should be able to derive simple results in probability using an axiomatic approach; know how to derive properties of discrete and continuous univariate probability distributions; be able to give an informal statement of the Central Limit Theorem for independent identically distributed random variables; and be able to calculate confidence intervals and carry out hypothesis tests in simple situations, and interpret the results.

Applications: Probability and statistics have applications in almost every field of quantitative investigation; this course introduces techniques that are applicable in a variety of simplified real-life situations, and provides the foundations for the advanced methods required in more complex problems.

Prerequisites: Grade A in GCE A Level Mathematics, or equivalent, and prior or simultaneous attendance on STAT1004.

Course content: Axioms of probability, conditional probability, combinatorics. Discrete and continuous random variables: probability mass functions, probability density functions, distribution functions, expectation and variance, revision of necessary integration techniques, moment generating functions. Further distributions (negative binomial, hypergeometric, gamma). Transformations of random variables, idea of Central Limit Theorem, approximation of moments. Sampling distributions, standard errors, confidence intervals and significance tests (including common nonparametric tests). Methods applicable to binomial, Poisson and normally distributed data for one and two sample problems. Definitions, properties and use of chi-squared, t and F distributions. Tests for association in contingency tables. Inference in the simple linear regression model.

Texts:

Assessment for examination grading:
In-course assessment (see page 20), the exact method of which will be announced by the lecturer at the beginning of the course. 2½ 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: Weekly exercises and/or practical assignments. These will not count towards the examination grading.

Timetabled workload:
Lectures: 3 hours per week.
Tutorials: 1 hour per week.

STAT1006
INTRODUCTION TO PRACTICAL
STATISTICS (0.5 UNIT)

Level: First

Aims of course: To provide training in the basic skills of practical statistics using a statistical software package. Together with STAT1004 and STAT1005, this provides the foundation for further study of statistics in the degree programmes offered by the Department of Statistical Science or jointly with other Departments.

Objectives of course: On successful completion of the course, a student should be able to use the MINITAB statistical software package for data analysis and simulation; be able to identify and carry out an appropriate
statistical analysis of a simple data set using a computer; and be able to interpret the output from a statistical software package when used for simple statistical analyses.

**Applications:** Modern statistical analysis in practice is almost entirely computer-based, and statistical software packages are widely used in all areas of quantitative investigation. The MINITAB package used in this course has a similar 'look and feel' to many commercial packages, thereby providing students with a solid basis for using other packages in a wide variety of application areas.

**Prerequisites:** Grade A in GCE A Level Mathematics, or equivalent, and simultaneous or previous attendance on both STAT1004 and STAT1005.

**Course content:** Practical application of the methods taught in STAT1004 and STAT1005, in workshops. Use of the MINITAB statistical computing package for data analysis and simulation.

**Texts:**

**Assessment for examination grading:**
In-course assessment (see page 20), the exact method of which will be announced by the lecturer at the beginning of the course. 3 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:** Regular exercises and/or practical assignments. These will not count towards the examination grading.

**Timetabled workload:**
Workshops: 2 hours per fortnight.

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**ECON1604**

**ECONOMICS I (COMBINED STUDIES) (1 UNIT)**

**Aims of course:** To provide an analytical introduction to the core concepts of microeconomics and macroeconomics for students on combined-studies programmes with a high quantitative content. To provide the foundations for the second year course ECON2601.

**Objectives of course:** On successfully completing the course, students should: be familiar with many of the core concepts in modern economics and be able to use these concepts in thinking about a range of issues and problems in the real economy; be able to apply these concepts, along with quantitative techniques acquired elsewhere in their degree programme, to solve stylised numerical or algebraic economic problems; be able to move without undue difficulty to the more advanced economic analysis encountered in the second year of the programme.

**Course content:**
- **Microeconomics:** Purpose and structure of economic models; supply-and-demand models; consumers and demand analysis; production and cost; business decisions and market structure; market failures and possible policy responses.
- **Macroeconomics:** Introduction to macroeconomics, equilibrium in the goods and financial markets, the IS-LM model, the effects of monetary and fiscal policy, the labour market, frictional unemployment, the AS-AD model, the Phillips curve, disinflationary policies, openness in goods and financial markets, depreciation and the trade balance, exchange-rate regimes, the Mundell-Fleming model.

**Key texts:**

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17 This course comes under the Economics Department’s examination board, but is taught by staff based in the Departments of Statistical Science and Mathematics.
STAT2001
PROBABILITY AND INference (0.5 UNIT)

Level: Intermediate

Aims of course: To continue the study of probability and statistics beyond the basic concepts introduced in STAT1004 and STAT1005. To provide further study of probability theory, in particular as it relates to multivariate random variables, and to introduce formal concepts and methods in statistical estimation.

Objectives of course: on successful completion of the course, a student should have an understanding of the properties of joint distributions of random variables and be able to derive these properties and manipulate them in straightforward situations; recognise the $\chi^2$, $t$ and $F$ distributions of statistics defined in terms of normal variables; be able to apply the ideas of statistical theory to determine estimators and their properties satisfying a range of estimation criteria.

Applications: As with other core modules in probability and statistics, the material in this course has applications in almost every field of quantitative investigation; the course introduces general-purpose techniques that are applicable in principle to a wide range of real-life situations.

Prerequisites: STAT1004 and STAT1005 or their equivalents. MATH6401 and MATH6402 or their equivalents.

Course content: Simple examples will be used throughout to motivate and illustrate the topics discussed. Joint probability distributions: joint and conditional distributions and moments; serial expectation; multinomial and multivariate normal distributions. Transformation of random variables: distributions; approximation of moments; order statistics. Moment and probability generating functions: properties; sums of independent random variables; Central Limit Theorem. Relations between standard distributions: $\chi^2$, $t$ and $F$ distributions; orthogonal transformation of multivariate normal distribution; Poisson-multinomial connections. Statistical estimation: bias, mean square error, consistency, best linear unbiased estimators; method of moments, least squares, maximum likelihood, Cramér–Rao lower bound.

Texts:

Assessment for examination grading:
In-course assessment (see page 20), the exact method of which will be announced by the lecturer at the beginning of the course. 2½ 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 2 sets of exercises. These will not count towards the examination grading.

Timetabled workload:
Lectures: 3 hours per week.
Tutorials: 1 hour per week.

STAT2002
LINEAR MODELS AND THE ANALYSIS OF VARIANCE (0.5 UNIT)

Level: Intermediate

Aims of course: To provide an introduction to linear statistical modelling and to the analysis of variance with emphasis on ideas, methods, applications and interpretation of results.

Objectives of course: On successful completion of the course, a student should have an understanding of the basic ideas...
underlying multiple regression and the analysis of variance; be able to analyse, using a statistical package, data from some common experimental layouts and carry out and interpret simple and multiple regression analyses; understand the assumptions underlying these analyses and know how to check their validity.

Applications: Linear models and the analysis of variance (ANOVA) are two basic and powerful statistical tools to model and analyse the relationship between random variables, and thus are widely used in almost all of classical and modern statistical practice. Their use exemplifies the modern, model-based approach to statistical investigations, and provides the foundations for more advanced techniques that may be required for the study of complex systems arising in areas such as economics, natural and social sciences and engineering as well as in business and industry.

Prerequisites: STAT1004 and STAT1005, or their equivalents.

Course content: Analysis of variance for a variety of experimental designs. Multiple regression: model fitting by least squares, model assessment and selection. Heteroscedastic and autocorrelated errors. Emphasis will be placed on ideas, methods, practical applications, interpretation of results and computer output, rather than on detailed theory.

Texts:

Assessment for examination grading:
In-course assessment (see page 20), the exact method of which will be announced by the lecturer at the beginning of the course. 2½ 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 practical exercises. These will not count towards the examination grading.

Timetabled workload:
Lectures: 3 hours per week, 1 hour of which to be used as necessary as a problems class.

STAT2003
INTRODUCTION TO APPLIED PROBABILITY (0.5 UNIT)

Level: Intermediate

Aims of course: To provide an introduction to the study of systems which change state stochastically with time and to facilitate the development of skills in the application of probabilistic ideas.

Objectives of course: On successful completion of the course a student should understand the Markov property in discrete and continuous time; for discrete-time Markov chains, be able to find and classify the irreducible classes of intercommunicating states, calculate absorption or first passage times and probabilities, assess the equilibrium behaviour; for simple examples of continuous-time Markov chains, be able to write down the forward equations, find and interpret the equilibrium distribution.

Applications: Stochastic processes are vital to applications in finance and insurance, and have many applications in biology and medicine, and in the social sciences. They also play a fundamental role in areas such as queueing theory and the study of system reliability. The material in this course can be applied to simplified real-world situations, and provides the foundations for further study of more complex systems.

Prerequisites: STAT2001 or its equivalent.

Course content: Revision of conditional probability. Markov Chains (discrete time and states): transient and equilibrium behaviour, first passage times, classification of states, applications. Markov processes (continuous time, discrete states): general theory, forward and backward equations, equilibrium distributions; Poisson process, interval and counting properties; birth and death processes and other simple examples.

Texts:
Assessment for examination grading:
In-course assessment (see page 20), the exact method of which will be announced by the lecturer at the beginning of the course. 2½ 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: 3 hours per week, 1 hour of which to be used as necessary as a problem class. Tutorials: 1 hour per week.

STAT7001
COMPUTING FOR PRACTICAL STATISTICS (0.5 UNIT)

Level: Intermediate

Aims of course: To extend students’ practical experience of statistical software environments. To extend students’ abilities in applying ideas and methods already taught in a practical context. To enable students to perform computer-assisted statistical analyses.

Objectives of Course: On successful completion, a student should be able to independently perform a systematic analysis with the statistical software suites R and SAS to answer data-based or methodological questions, and report on it according to the scientific state-of-the-art.

Applications: This course provides training in performing statistical analyses with the R and SAS statistical software suites. R is one of the most used non-commercial statistical software packages, predominant in research and specialised areas in industry, which can easily be used for non-routine statistical analyses. SAS is the commercial statistical analytics suite with the largest worldwide market-share, widely-used in business and industry. The course provides, amongst others, basic programming skills, an introduction to R and SAS, and practice in basic statistical analysis workflows.

Prerequisites: STAT1004, STAT1005 and STAT1006. Simultaneous or previous attendance on STAT2001 and STAT2002.

Course content: Introduction to SAS commands, SAS/ASSIST and the R environment. Use of these packages for descriptive statistics, graphics, and for fitting regression and ANOVA Models. Non-linear regression and generalised linear model fitting, simulation, programming and numerical maximisation/minimisation.

Texts:
R. Wicklin: Simulating Data with SAS. SAS Institute, 2013.

Assessment for Examination Grading:
In-course assessment: two pieces of extended coursework (100%). There is no examination for this course. Students submitting neither assessment 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: 1 hour per week. Workshops: 3 hours per week.

STAT7002
SOCIAL STATISTICS (0.5 UNIT)

Level: Intermediate

Aims of course: To provide an introduction to the basic mathematical aspects of sample survey design and statistical analysis, to the practical aspects involved in carrying out a survey and to some key concepts in measurement theory.
Objectives of course: On successful completion of the course, a student should have an understanding of the basic principles and methods underlying sample surveys, be able to assess the appropriateness of various sampling schemes and to calculate precisions and sample sizes required to achieve specific precisions or costs, to have a basic understanding of the ideas underlying the scale type classification and the concepts of validity and reliability, to construct and evaluate a Likert scale and to have a general knowledge of practical survey methods and statistics in society.

Applications: Areas of application of the methods taught in this course include governmental statistics, public health research, opinion polls, market research, and customer relationship management. Sampling techniques are also used, for example, in industrial quality control.

Prerequisites: STAT2001 or its equivalent.

Course content: Introduction to sampling, simple random sampling. Sources of error, practical survey methods. Planning a survey, questionnaire construction (with some philosophical background) and data collection techniques. Scale types, Likert scales, validity and reliability. Basic ideas of stratified, cluster and systematic sampling and ratio estimation. Analysis of Social Statistics.

Texts:
Central Statistical Office: Social Trends.

Assessment for examination grading: In-course assessment (see page 20), the exact method of which will be announced by the lecturer at the beginning of the course. 2½ 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. Problem classes: arranged as necessary.

STAT7003
OPTIMISATION ALGORITHMS IN OPERATIONAL RESEARCH (0.5 UNIT)

Level: Advanced

Aims of course: To provide an introduction to the ideas underlying the optimal choice of component variables, possibly subject to constraints, that maximise (or minimise) an objective function. The algorithms described are both mathematically interesting and applicable to a wide variety of complex real life situations.

Objectives of course: On successful completion of the course, a student should be able to understand the theoretical concepts of linear programming, dynamic programming and finite Markov programming, set up correct models of real life problems, interpret results correctly and check the validity of assumptions.

Applications: Optimisation methods provide the means for successful business strategies, scientific planning and statistical estimation under constraints. They are a critical component of any area where decision making under limited resources is necessary.

Prerequisites: STAT1004 or its equivalent.


Texts:


**Assessment for examination grading:**
In-course assessment (see page 20), the exact method of which will be announced by the lecturer at the beginning of the course. 2½ 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 6 sets of exercises. These will not count towards the examination grading.

**Timetabled workload:**
Lectures and problems classes: 3 hours per week.

**ECON2601**

**ECONOMICS II (COMBINED STUDIES) (1 UNIT)**

**Aims of course:** To provide a thorough understanding of core concepts and methods of microeconomics and macroeconomics to second year students on combined-studies programmes with a high quantitative content, and to prepare these students for optional courses in economics taken in the third year.

**Objectives of course:** On successfully completing the course, students should:
understand the main elements of microeconomic and macroeconomic theory, at a level appropriate for an economics graduate; understand economic models and problems expressed in standard mathematical terms, and be able to solve and interpret problems based on such models at a level of difficulty appropriate for an economics graduate; be able to use economic concepts and methods to analyse and interpret real-world economic phenomena, and to assess issues of economic policy.

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**Course content:**

**Microeconomics (consumers and producers):**
Consumer choice (budget constraints, preferences and utility, revealed preference, Slutsky equation, indirect-utility and expenditure functions, consumer surplus and price indices); choice under uncertainty; firm behaviour (technology and production functions, profit maximisation and factor demands, cost functions, conditional factor demands, cost curves).

**Microeconomics (markets and equilibrium):**
Market demand; exchange equilibrium; competitive markets (short and long run behaviour); monopoly; price discrimination; oligopoly models; game theory.

**Macroeconomics (growth and fluctuations):**
Economic growth (Solow-Swan model, technological progress, introduction to endogenous growth).

**Key texts:**

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**Third Year**

**STAT3001**

**STATISTICAL INFERENCE (0.5 UNIT)**

**Level:** Advanced

**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, and to provide theory underlying the methods taught in the first and second years of degree courses offered by the Department of Statistical Science or jointly with other Departments.

**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

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18 This course comes under the Economics Department’s examination board, but is taught by staff based in the departments of Statistical Science and Mathematics.
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: STAT2001 and STAT2002, or their equivalents.


Texts:

Assessment for examination grading:
In-course assessment (see page 20), the exact method of which will be announced by the lecturer at the beginning of the course.

2½ 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.
Tutorials: 1 hour per week.

STAT3002
STOCHASTIC SYSTEMS (0.5 UNIT)

Level: Advanced

Aims of course: To provide a continuation of the study of random processes started in Introduction to Applied Probability (STAT2003), but with the emphasis now 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: STAT2003 or its equivalent.

Course content: Markov processes: revision of general concepts, reversibility and

**Texts:**

**Assessment for examination grading:**
In-course assessment (see page 20), the exact method of which will be announced by the lecturer at the beginning of the course. 2½ 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.
Tutorials: 1 hour per week.

**STAT3003**
**FORECASTING (0.5 UNIT)**

**Level:** Advanced

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

**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:** STAT2001 and STAT2002, or their equivalents.


**Texts**

**Assessment for examination grading:**
In-course assessment (see page 20), the exact method of which will be announced by the lecturer at the beginning of the course. 2½ 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 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.

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**STAT3004**
**DECISION AND RISK (0.5 UNIT)**

**Level:** Advanced

**Aims of course:** To provide an introduction to the ideas underlying the calculation of risk 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, find appropriate probability models for risky events and check the validity of the underlying assumptions, understand the concepts of utility theory, understand Bayesian risk together with its theoretical assumptions, draw complex decision trees and evaluate optimal strategies, understand methods of eliciting subjective probabilities.

**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 areas as diverse as business, finance, government policy, management, health service provision and environmental hazard assessment.

**Prerequisites:** STAT1004 and STAT1005, or their equivalents.

**Course content**

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**Texts**

**Assessment for examination grading**
In-course assessment (see page 20), the exact method of which will be announced by the lecturer at the beginning of the course. 2½ 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.

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**STAT3005**
**FACTORIAL EXPERIMENTATION (0.5 UNIT)**

**Level:** Advanced

**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, and the conservation of works of art.

Prerequisites: STAT2002 or its equivalent.


Texts:

Assessment for examination grading:
In-course assessment (see page 20), the exact method of which will be announced by the lecturer at the beginning of the course. 2½ 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: 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.

STAT3006
STOCHASTIC METHODS IN FINANCE I
(0.5 UNIT)

Level: Advanced

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: STAT2001 or its equivalent.


Texts:

Assessment for examination grading:
In-course assessment (see page 20), the exact method of which will be announced by
the lecturer at the beginning of the course.  
2½ 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: 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.

STAT3008  
MEDICAL STATISTICS I (0.5 UNIT)  

Level: Advanced

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 
STAT3009, has applications in both medicine 
and epidemiology. Important areas include the 
design and analysis of medical research 
studies, including randomised controlled trials.

Prerequisites: STAT2002 or its equivalent. 
Simultaneous or previous attendance on 
STAT3001.

Course content: Introduction to 
Epidemiology and trials. Measures of health 
outcome used in observational studies and 
trials: risk, rate, odds, relative and absolute 
measures. Basics of study design for health 
studies. Types of observational studies: case-
control, cohort, cross-sectional. Design 
features of randomised trials: randomisation, 
blocking, stratification and minimisation

blinding and use of placebos. Confounding 
and interaction: stratification, Mantel Haenzel 
and Woolf’s tests. Key issues in statistical 
analysis of parallel group trials: basic analysis, 
treatment to treat and per protocol analysis, 
missing data and interpretation of results. 
Logistic regression: variable selection, MLE, 
LR and Wald tests, dealing with categorical 
covariates, interaction terms, checking 
assumptions of linearity for continuous 
covariates, interpretation. Basics of survival 
analysis: features of survival data, hazard and 
survivor function, Censoring, Kaplan Meier 
Curve, Log rank Test. Calculation of sample 
size for trials and observational studies. 
Critical appraisal of published papers in health 
research. Introduction to statistical software 
STATA.  
There will be computer or paper based 
practical sessions on study design, measures 
of health outcome, confounding and 
interaction, logistic regression, analysis of 
trials and sample size calculation, survival 
analysis and critical appraisal.

Texts:  
B.R. Kirkwood & J.A.C. Sterne: Essential 
Medical Statistics (2nd edition). Blackwell, 
2003.  
S.J. Pocock: Clinical Trials. A Practical 
K.J. Rothman & S. Greenland: Modern 
Epidemiology (3rd edition). Lipincott, 
Williams & Wilkins, 2008.  
S. Senn: Statistical Issues in Drug 
D. Collett: Modelling Survival Data in Medical 
Research (2nd edition). Chapman and Hall, 
2003.  
D. Clayton & M. Hills: Statistical Models in 
N.E. Breslow & N.E. Day: The Analysis of 
Case Control Studies. Statistical Methods in 
N.E. Breslow & N.E. Day: The Design and 
Analysis of Cohort Studies. Statistical 
Methods in Cancer Research, Volume 1 
(1987, IARC).

Assessment for examination grading:  
In-course assessment (see page 20), the 
extact method of which will be announced by 
the lecturer at the beginning of the course.  
2½ 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.

STAT3009
MEDICAL STATISTICS II (0.5 UNIT)

Level: Advanced

Aims of course: To provide a continuation of the study of medical statistics started in STAT3008, 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; develop and validate a risk prediction model; be able to analyse clustered data and carry out a meta analysis; be able to analyse matched data; have an understanding of cross-over trials, factorial trials, cluster randomised trials, equivalence trials and early phase trials; understand the issues concerning interim analysis and missing data.

Applications: This course, together with STAT3008, has applications in both medicine and epidemiology. Important areas include the design and analysis of medical research studies, including randomised controlled trials.

Prerequisites: STAT3008 or its equivalent.

Course content: Modelling survival data using the Cox proportional hazards model. Further Survival analysis including parametric models and time varying covariates. Risk prediction models. Introduction to clustered data including cluster randomised trials and repeated measures. Systematic reviews and meta analysis. Analysis of matched or paired data including McNemar’s test and conditional logistic regression. Cross over trials and factorial trials. Early phase trials. Interim analyses in trials. Missing data. Equivalence trials. In addition, there will be weekly practical sessions on many of the topics listed above.

Texts:

Assessment for examination grading:
In-course assessment (see page 20), the exact method of which will be announced by the lecturer at the beginning of the course. 2½ 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.

STAT3019
SELECTED TOPICS IN STATISTICS (0.5 UNIT)

Level: Advanced

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:** STAT7001 and STAT3001, or their equivalents.

**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: Spatial Point Processes (Dr S J Harden)** In many applications, data arise in the form of patterns of points in space. Examples include locations of trees in a forest, human settlements in a region, galaxies in the universe, cells in an organism, earthquake epicentres, crimes, outbreaks of diseases, insect colonies and so on. In some situations the points are associated with additional information such as the magnitude of an earthquake; these are called “marked point processes”. The analysis of point process data typically focuses on questions such as: do the points tend to cluster (e.g. crime “hot spots”), is there inhibition between them (e.g. locations of insect colonies, where colonies tend not to be too close together)? Are there variations in the intensity of points that can be associated with covariates (e.g. effect of varying soil fertility on plant density)? This part of the course will introduce modern statistical methods for addressing these kinds of questions. Topics covered will include motivating examples which will run throughout the course, spatial randomness, models for interaction between points, inclusion of covariates, intensity estimation, parameter estimation, marked point processes and summary statistics. The use of R to implement the methods, mostly using the spatstat library, will also be covered. Students will be expected to be familiar with the use of R as taught in STAT7001, as well as with principles of statistical inference as taught in STAT3001. The following texts are relevant to this part of the course:


**Topic 2: Kernel Methods (Dr F J Király)** Two major challenges in modern data analytics are the large size of data sets and non-linear structure. Kernel methods provide a way to achieve both scalability and non-linearity through "kernelization" by the "kernel trick", an algorithmical and mathematical idea which allows one to convert a wide range of scalable linear algorithms into non-linear ones. The course will cover the necessary theoretical foundations, and present applications to statistical analysis and machine learning tasks such as: non-linear classification with the kernel support vector machine, feature extraction with kernel principal component analysis, kernel correlation analysis, kernel clustering, non-linear kernel regression, and kernel on-line methods. Specific emphasis will be given to the close theoretical and algorithmic connections of kernels to Gaussian and point process methods which are covered in topic 1. Some common practical data analysis
scenarios arising for example in pattern recognition, geostatistics, bio-/chemoinformatics or text mining will be presented, with hands-on experience being provided through exercises on implementation and analysis tasks with the kernlab package in R. Experience with R and data analysis as provided by STAT7001, and an understanding of statistics, linear algebra and calculus on the level of STAT3001, will be expected. The following texts (available as e-books) 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.

STAT3020
STOCHASTIC METHODS IN FINANCE II
(0.5 UNIT)

Level: Advanced

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: STAT2001, STAT2003, STAT3006 or MATH3508.

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 20), the exact method of which will be announced by the lecturer at the beginning of the course. 2½ 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: 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.

**STAT3021**
**FURTHER MODELLING WITH APPLICATIONS IN HEALTH RESEARCH (0.5 UNIT)**

**Level:** Advanced

**Aims of course:** To introduce advanced statistical models commonly employed in current health research.

**Objectives of course:** On successful completion of the course, a student should be able to apply statistical models appropriately and have developed the necessary practical skills to fit these models and interpret the results. In particular the student will be able to: choose and apply models to address different research questions and clinical aims; handle different types of outcome (continuous, binary, survival and categorical); handle different data structures (independent or correlated); check model assumptions; interpret the results.

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

**Prerequisites:** STAT2002 or its equivalent. Simultaneous or previous attendance on STAT3001.

**Course content:** The course will provide an overview of advanced statistical modeling applied to health research. The topics include: review of standard statistical models; regression for categorical outcomes; nonlinear models; risk prediction modeling; hierarchical models for continuous, binary and survival outcomes; marginal models based on Generalized Estimation Equations; health economic modeling. In addition, there will be weekly practical sessions on the topics listed above.

**Texts:**


**Assessment for examination grading:**
In-course assessment (see page 20), the exact method of which will be announced by the lecturer at the beginning of the course. 2½ 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.

**STAT3022**
**QUANTITATIVE MODELLING OF OPERATIONAL RISK AND INSURANCE ANALYTICS (0.5 UNIT)**

**Level:** Advanced

**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: STAT1005 or its equivalent.


Texts:

Assessment for examination grading: In-course assessment (see page 20), the exact method of which will be announced by the lecturer at the beginning of the course. 2½ 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.
STAT3901 PROJECT (1.0 UNIT)

Level: Advanced

Aims of course: To enable students, under supervision, to apply statistical science to real world problems and learn how to communicate technical ideas both by oral and written presentations.

Objectives of course: On successful completion of the course, a student should be able to obtain or access relevant background information and data; select and apply appropriate formal and informal statistical methods, using appropriate computer software; assess what has been achieved and point to further research; use appropriate word processing skills to write up the project report efficiently; communicate and defend the main points in a short verbal presentation; communicate the whole project in a word processed report.

Prerequisites: First and second year of degree courses offered by the Department of Statistical Science or jointly with other Departments.

Assessment for examination grading: Written report (about 12000-15000 words, i.e. about 40 pages, A4 size, double-spaced typing, excluding graphs, tables and computer output), to be submitted by the start of term 3 (80%). Over-length reports will be penalised (see page 21).

Oral presentation (15 minutes excluding questions) at the start of term 3 (20%).

Project reports are read independently by two examiners, one of whom is normally the candidate’s project supervisor. Each examiner provides a brief written assessment. Reports are also read by a visiting examiner. The final mark is agreed by the whole exam board, which includes the visiting examiner.

Examiners will satisfy themselves that the report 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 report 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 report and care in its presentation; structure of the report; 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).

Each project presentation will be assessed by two examiners. 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?

For a mark over 85, it is expected that the student, in addition to having submitted a well-presented report 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.

Timetabled workload:
Workshops: about 3 hours.
Oral presentations: about 6 hours.
Tutorials with the project supervisor(s): about 30 hours.
Individual study:
Project work (including reading) and preparation of the oral and written presentation are expected to take about 260 hours. Students are expected to attend and actively participate in the oral presentations by other students.

STAT3902
PROJECT (0.5 UNIT)

Level: Advanced

Aims of course: To enable students, under supervision, to apply Statistical Science to real world problems and learn how to communicate technical ideas both by oral and written presentations.

Prerequisites: First and second year of degree courses offered by the Department of Statistical Science or jointly with other Departments.

Objectives of course: On successful completion of the course, a student should be able to obtain or access relevant background information and data; select and apply appropriate formal and informal statistical methods, using appropriate computer software; assess what has been achieved and point to further research; use appropriate word processing skills to write up the project report efficiently; communicate and defend the main points in a short verbal presentation; communicate the whole project in a word processed report.

Assessment for examination grading:
Written report (about 7000-10000 words, i.e. about 20-25 pages, A4 size, double-spaced typing, excluding graphs, tables and computer output), to be submitted by the start of term 3 (80%). Over-length reports will be penalised (see page 21).
Oral presentation (15 minutes excluding questions) at the start of term 3 (20%).

See STAT3901 for more details on project marking.

Timetabled workload:
Workshops: about 3 hours.
Oral presentations: about 6 hours.
Tutorials with the project supervisor(s): about 15 hours.

Individual study:
Project work (including reading) and preparation of the oral and written presentation are expected to take about 130 hours. Students are expected to attend and actively participate in the oral presentations by other students.

Fourth Year

STATM001
STATISTICAL MODELS AND DATA ANALYSIS (0.5 UNIT)

Level: Masters

Aims of course: To introduce the theory of linear and generalised linear 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 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 STATM001 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: STAT2001 and STAT2002. Simultaneous or previous attendance on STATM012 or its equivalent.

Course content: Multiple Linear Regression: inference techniques for the General Linear Model, applications, variable selection. Generalised Linear Models: structure incorporating an introduction to the exponential family of distributions, inference procedures. Categorical data: special cases of generalised linear models leading to logistic regression and log-linear models, use in data analysis. Introduction to non-linear modelling, mixed modelling, generalised estimating equations. (Students are expected to obtain the computing skills to implement the methodology discussed in this course in the course STATM003.)
Assessment for examination grading:
In-course assessment (see page 20), 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: 3 hours per week.
Tutorials: 1 hour per week.

STATM002
STATISTICAL DESIGN OF INVESTIGATIONS (0.5 UNIT)

Level: Masters

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: STAT2001 and STAT2002.

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.

STATM003
STATISTICAL COMPUTING (0.5 UNIT)

Level: Masters

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 STATM001 and STATM002. 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: STAT2001 and STAT2002. Simultaneous attendance on STATM001 and STATM002.


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.

STATM004
APPLIED BAYESIAN METHODS (0.5 UNIT)

Level: Masters

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: STAT2001, STAT2002. Simultaneous or previous attendance on STATM012 or its equivalent.

Texts:

Assessment for examination grading:
In-course assessment (see page 20), 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.

STATM901 PROJECT (1.0 UNIT)

Level: Masters

The arrangements and details for this course are the same as those for course STAT3901.

STATM902 PROJECT (0.5 UNIT)

Level: Masters

The arrangements and details for this course are the same as those for course STAT3902.

Other options

For details of the remaining Masters-level courses (except for method of assessment), refer to the corresponding third year options. The Masters-level courses are listed below with the corresponding third year course code given in parentheses.

STATM009 DECISION AND RISK (STAT3004)

STATM010 STOCHASTIC SYSTEMS (STAT3002)

STATM011 FORECASTING (STAT3003)

STATM012 STATISTICAL INFERENCE (STAT3001)

STATM015 MEDICAL STATISTICS I (STAT3008)

Prerequisites: STAT3001 or its equivalent, or simultaneous attendance on STATM012.

STATM016 MEDICAL STATISTICS II (STAT3009)

Prerequisites: STATM015.

STATM017 STOCHASTIC METHODS IN FINANCE I (STAT3006)

STATM018 FACTORIAL EXPERIMENTATION (STAT3005)

STATM019 SELECTED TOPICS IN STATISTICS (STAT3019)

STATM020 STOCHASTIC METHODS IN FINANCE II (STAT3020)

Prerequisites: STATM017.

STATM021 FURTHER MODELLING WITH APPLICATIONS IN HEALTH RESEARCH (STAT3021)

Prerequisites: STAT3001 or its equivalent, or simultaneous attendance on STATM012.

STATM022 QUANTITATIVE MODELLING OF OPERATIONAL RISK AND INSURANCE ANALYTICS (STAT3022)
Assessment for examination grading:
For each of the courses listed above, assessment is as follows:

In-course assessment (see page 20), 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.

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 2014.