



The
University
Of
Sheffield.

School of Mathematics and Statistics,
University of Sheffield

数学与统计学院，谢菲尔德大学

Financial Mathematics: Joint programme with
Nanjing Technology University

金融数学：谢菲尔德-南京工业大学联合培养计划

Handbook

学生手册

2018–2019

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1 Introduction 卷首语

Dear Student,

It is my pleasure to welcome you on behalf of the School of Mathematics and Statistics (SoMaS) at the University of Sheffield, and to congratulate you on being admitted to the Financial Mathematics programme.

You are joining an exciting programme, and we hope that you will enjoy it. It is a pleasure for us to be working with the Nanjing Technology University in providing this programme.

Although you are beginning this course now, it will not be until a few years later that we will properly be able to welcome you to Sheffield. I hope that you will find your time here both intellectually challenging and fun. University life has so much to offer, and we hope that you will take advantage of the opportunities to study in the United Kingdom.

Once again I congratulate you on being at the start of an exciting journey full of opportunities and challenges. Work hard and have fun! I wish you a stimulating, successful and enjoyable time on the course, and when you come to the University of Sheffield.

亲爱的同学们：

我非常高兴地代表谢菲尔德大学的数学与统计学院欢迎你，祝贺你成为金融数学专业的学生。

这是一个令人兴奋的专业，我们希望你会喜欢它。我们非常高兴能够和南京工业大学合作，给你们提供这个学习机会。

虽然你现在已经开始这个专业的学习，但几年之后我们才会真正地欢迎你们到谢菲尔德来。我希望你将会发现在谢菲尔德度过的时光既富有挑战性也充满乐趣。大学生活给你们提供了广阔的空间，我们希望你会充分利用在英国的学习机会。

我再一次祝贺你！你即将开始一个充满机会与挑战、令人激动的征途。努力学习、快乐学习！我祝愿你在南京工业大学和谢菲尔德度过一段令人振奋的、成功的、充满乐趣的时光。

Dr. Tobias Berger, NJTech Tutor (Tobias Berger 博士, NJTech 辅导员)

2 Disclaimer 免责声明

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

我们已尽所有努力以保证本文档提供信息的准确性。据我们所知，所有信息在文档制作时是正确的。如果谢菲尔德大学的管理条例有变化从而导致任何错误，数学与统计学院无法为此承担责任。

There have been a number of staff changes in the School in recent years with several new lecturers arriving and some older staff leaving. Further changes of this kind may well occur. Courses at Levels 3 and 4 are specialized and the School cannot guarantee to run a course for which the qualified lecturer leaves. On the other hand additional options may be offered when staff with new interests arrive. Also, there could be changes in the syllabus and timing.

因为老教员退休和新教员履职，学院在过去几年发生了若干人事变动。将来类似的变动同样可能发生。三、四年级课程专业程度较高；如果因为某种原因缺乏有资质的教员，学院无法保证继续开设受影响课程。反之，根据新教员的研究兴趣，我们也有可能开设额外的新课程。此外，教学大纲和时刻表也有可能发生变动。

In addition the School reserves the right to withdraw courses for which the number of students registered is very low.

最后，如果一门课程注册学生人数过少，数学与统计学院保留取消该课的权利。

3 Information on School of Mathematics and Statistics Courses 数学与统计学院专业简介

Mission 使命

The mission of the School of Mathematics and Statistics is

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

数学与统计学院的使命是

- 在数学和统计学科领域里从事高水平的研究活动；
- 为学生提供卓越的教育，激发学生潜能；
- 支撑、倡导并提高学科对社会的正面影响力；
- 以研究为主导，高标准实现学院各项任务。

Aims 目标

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

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

学院所有本科专业的共同目标是：

- 提供一个有利学习的学术环境
- 为学生进入需要使用数学和统计知识的工作职位做好准备；
- 以教工的研究成果和专业知识来指导教学；
- 对学生的数学与统计技能进行全面评估，发现和培养卓越人才。

There are also additional aims for particular programmes.

- In all its first degrees the School aims to provide programmes with internal choice to accommodate the diversity of students' interests and abilities.

- In its single honours degrees, the School aims to provide a programme in which students may choose either to specialise in one mathematical discipline (Pure Mathematics, Applied Mathematics, Probability and Statistics) or to follow a more balanced programme incorporating two or all three of these disciplines.

每一个具体专业方向还有具体的目标。

- 在它的所有本科专业中，学院都致力于提供多重选择以满足学生在兴趣和能力方面的多样性。
- 在它的单一学位专业中，学院学位设计的宗旨是，学生可以选择专注于某一个方向（纯数学，应用数学，或概率统计），也可以选择一个更平衡的课程组合，包括两个或者所有三个专业方向的课程。

Learning Outcomes 预期学习成果

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

根据 HEFCE 教学质量信息管理的要求，谢菲尔德大学制定了本科和研究生各专业的细则，提供明确信息，使得在读学生和未来学生对如何选择专业能够作出知情选择。除了上面所述专业目标，我们还制定了各专业的预期学习成果。如果学生成功完成专业学习，学生的考核成绩通常会证明他们已获得预期学习成果里所描述的技能或者知识。不同的专业方向的预期学习成果会有差异；学生可以在以下网站找到最新的版本<http://www.shef.ac.uk/calendar/progspec>。

4 Joint University of Sheffield - NJTech Financial Maths Degree 谢菲尔德大学-南工大金融数学联合学位

Normally, Sheffield BSc degrees last for three years. For this programme, however, the degree will take you four years.

Your fourth year, in Sheffield, will be the same as the final third year of the Sheffield BSc Financial Mathematics program. You will cover the material from the first two years of the Sheffield programme during your first three years, at NJTech. Some of this will be taught (in English!) by Sheffield lecturers, and some courses taught within NJTech. You will also take courses to enable you to get an Undergraduate Diploma and Bachelor of Science degree from NJTech, and will take additional courses in English.

谢菲尔德大学的理学学士学位通常三年即可完成，但是这个联合培养项目的学位却需要四年时间。

你在谢菲尔德的第四学年和谢菲尔德大学金融数学专业的第三年（也就是最后一年）相同。在南京工业大学的头三年，你将学习谢菲尔德大学金融数学专业前两年的课程。这里面的部分课程将由谢菲尔德的老师讲授（用英语！），其他课程由南京工业大学老师讲授。为了得到南京工业大学的本科毕业证书和理学学士学位，你还要学习其他一些的课程。此外，你还要额外上英语强化课。

In order to qualify for University of Sheffield degrees, you need to satisfy the regulations of the University. This means that you need to take a certain number of *credits* each year, and also satisfy certain requirements.

*Note that NJTech also use credits, and the credit systems at the two Universities are different! We will call them **Sheffield credits** and **NJTech credits** when we need to make clear which is which.*

为了取得谢菲尔德大学的学位，你的成绩要满足学校的学位管理条例。这意味着你每年要完成足够数量的学分，同时要满足其他一些要求。

注意：南京工业大学也有学分要求，但两个大学的学分系统有很大差别！在必要的时候，我们将用**谢菲尔德大学学分**和**南京工业大学学分**这两个名称进行区分。

We refer to the three years of study for a Sheffield BSc degree as “Level 1”, “Level 2” and “Level 3”. We also refer to individual courses as “modules”. Your first three years at NJTech count as Level 0, Level 1 and Level 2.

- The students in Sheffield need to register for, and take, **120** credits for each of Level 1, Level 2 and Level 3. Because you take Levels 1 and 2 over a 3-year period, you will need to take **240** credits in your three years at NJTech.
- To get a Sheffield degree, you need to obtain at least **180** UoS credits in the first three years in NJTech, and pass at least **200** UoS credits in the third year in NJTech and the final year in Sheffield, of which 90 credits need to be Level 3 or 4 modules.

我们把谢菲尔德大学本科学习的三个学年分别称为一年级，二年级和三年级。我们还把一门课称

为一个“模块”。你们在南京工业大学的三年相当于谢菲尔德大学的零年级，一年级，和二年级。

- 从一到三年级的每个学年，谢菲尔德的本科生都需要注册并且完成 **120** 个学分。因为你用三年来完成一年级和二年级，在南京工业大学的三年你要完成 **240** 个谢菲尔德学分。
- 为了取得谢菲尔德大学的学位，在南京工业大学的三年你需要至少取得 **180** 个谢菲尔德大学学分，同时，在南京工业大学的第三年和在谢菲尔德大学的最后一年里以不低于“及格”的成绩获得 **200** 个谢菲尔德大学学分，并且其中应至少包含 **90** 个三年级或者四年级的学分。

The first stage 第一阶段的学习

The first stage of the programme consists of three years at NJTech. During this time, you will be taught by both NJTech and Sheffield staff. At the start of the programme, you will be jointly registered by both NJTech and Sheffield.

第一阶段是指在南京工业大学的头三年。在这一阶段里，南京工业大学和谢菲尔德大学的老师将会共同给你们授课。在开始专业学习的时候，你会同时注册成为谢菲尔德大学和南京工业大学的学生。

The complete list of courses in the first stage, with the NJTech credits, is given in Section 9:

第一阶段的所有模块以及相应的南京工业大学学分的完整列表可以在第9节找到。

Level 0 零年级

In Level 0 (the first year), you will only have one course given by a lecturer from Sheffield. This course is “[MAS190](#) Introduction to Probability and Statistics I”. (MAS190 is the code given to the modules.)

在零年级（第一学年）里只有一门课程由谢菲尔德大学的教员讲授。这门课是“[MAS190](#) Introduction to Probability and Statistics I”。（MAS190 是谢菲尔德大学给这个模块所设代码。）

Level 1 一年级

The modules that Sheffield will lecture at NJTech are ¹

¹In the brackets are the codes for the corresponding modules in Sheffield. However, please note that some of these modules are no longer being run. 方括号里是谢菲尔德大学金融数学专业对应课程的代码，但是请注意其中的一些模块已经取消。

谢菲尔德大学教员将在南京工业大学讲授如下模块:

MAS191 [MAS113(2)]	Introduction to Probability and Statistics II	4
MAS192 [MAS103]	Differential and Difference Equations	4
MAS292 [MAS207]	Continuity and Integration	4
MAS290 [MAS271]	Methods for Differential Equations	4
MAS291 [MAS205]	Statistics Core	4

Level 2 二年级

The modules below will be lectured by Sheffield staff visiting NJTech during your Level 2 (the third year):

在二年级 (第三学年), 下面这些模块将会由谢菲尔德教员到南京工业大学讲授:

MAS3090 [MAS322]	Operations Research	4
MAS293 [MAS273]	Statistical Modelling	4
MAS294 [MAS274]	Statistical Reasoning	4
MAS295 [MAS277(1)]	Vector Spaces	2
MAS296 [MAS277(2)]	Fourier Theory	2
MAS3091 [MAS362]	Financial Mathematics	4

The second stage 第二阶段的学习

To qualify for the second stage, you must complete all coursework to a standard satisfactory to both universities, and also meeting the English language and other requirements. If you are qualified, you will spend one year in Sheffield in the second stage.

为了进入第二阶段学习, 你必须同时满足两个学校对课程成绩的要求, 同时还要在英语和其他方面达到一定条件。如果符合条件, 第二阶段你会在谢菲尔德进行为期一年的学习。

However, if you do not qualify for the fourth year in Sheffield, you can continue to enter the fourth year at NJTech, and can still obtain an Undergraduate Diploma and Bachelor of Science degree from NJTech.

如果你未能达到要求, 你可以继续在南京工业大学完成第四学年学业, 并仍然有可能获得南京工业大学的本科毕业证书和理学学士学位。

Progression requirements 晋级要求

In order to progress to the University of Sheffield for Level 3 (the fourth year), you must:

- Achieve a weighted mean grade of 65% or above at the end of Level 2 in the units provided by NJ Tech;
- Pass **all** exams set by the University of Sheffield with a minimum score of 40%, and achieve a weighted mean grade of 50% or above for all the modules taught by Sheffield staff;
- Achieve a score of 6.0 or more in the IELTS English language test, with at least 5.5 in all categories. Ideally you should do this by the end of Level 1, so that you can focus on Mathematics at Level 2.

为了能够晋级到谢菲尔德大学继续三年级（第四学年）的学习，你们必须满足以下条件：

- 在二年级（第三学年）的学习中，南工大设立的各科目的加权平均分达到 65 分或以上；
- 通过所有谢大出题考试的课程，也就是说每门课至少达到 40 分；同时谢大教师讲授的所有课程加权平均不能低于 50 分；
- 雅思分数必须达到 6.0 或以上，且单项成绩不可低于 5.5 分。理想情况下，在一年级（第二学年）学习结束时你的雅思就应达到这个水平，以便在二年级（第三学年）的时候你可以专注于数学专业的学习。

Level 3 in Sheffield 在谢菲尔德的三年级

If you meet the progression requirements, you will come to Sheffield three years later to finish your last year of study. The important dates for the year might not have been published. However, the Autumn semester usually starts from the third week of September. You will arrive in Sheffield and will take a compulsory 4–6 week English language course before the year in Sheffield begins, so this will probably start in the first half of August.

如果你满足以上晋级条件，你将会在三年后进入谢菲尔德大学进行最后一学年的学习。该学年度的日程安排目前可能还没有公布，但是秋季学期通常在九月份的第三星期开学。你要在谢菲尔德大学开学之前就到达谢菲尔德，然后必须上四到六周英语强化课，所以你的新学年很可能要从八月上旬开始。

Full details of the Degree Regulations are available on the web, as described in the section entitled ‘Official University Information for Students on the Web’ on p. 46. However, at the time of publication of this handbook, the Regulations on the web may be for 2017 - 2018 rather than 2018 - 2019. In particular, their lists of modules may reflect availability in 2017 - 2018 rather than in 2018 - 2019.

学位管理的详细规定在网上可以找到；第 44 页以 ‘Official University Information for Students on the Web 大学正式文件网页链接’ 为题的章节中提供了详细信息。然而，在这个手册制作的时候，网上的规定可能是 2017 - 2018 年度的信息，不适用于 2018 - 2019 学年度。特别需要注意的是，列表中的课程仅在 2017 - 2018 年度有效，不反映 2018 - 2019 的课程。

In what follows, the term ‘Level 3 module’ refers to the modules listed later in this booklet which have codes MAS3** and the term ‘Level 4 module’ refers to those which have codes MAS4**. Broadly speaking, you would expect to do Level 3 modules in your third year and Level 4 modules (if you are taking the MMath) in your fourth year; but exceptions are allowed, as detailed below. Remember that the pass mark for Level 3 modules is 40, and the pass mark for Level 4 modules is 50.

在本手册后文中，‘三年级模块’指的是以 MAS3** 为代码的课程，‘四年级模块’指的是以 MAS4** 为代码的课程。一般来说，你将会在第三学年学习三年级课程；在第四学年学习四年级课程（如果你攻读数学硕士学位的话）。但是，特殊情况下可以允许出现例外；这在下文将做详细解释。注意，三年级课程的及格分数是 40 分，四年级课程的及格分数是 50 分。

In the final year, you *must* take:

在最后一学年，你必须注册下面两门必修课：

MAS352	Stochastic Processes and Finance	20 credits	Both Semesters
MGT321	Corporate Finance	20 credits	Autumn Semester

and in the Autumn Semester modules to the value of *30 credits* from the list:

其次，在秋季学期你必须从下面这些课程中选修 *30* 个谢菲尔德学分：

MAS330	Topics in Number Theory	10 credits
MAS331	Metric Spaces	10 credits
MAS332	Complex Analysis	10 credits
MAS334	Combinatorics	10 credits
MAS336	Differential Geometry	10 credits
MAS348	Game Theory	10 credits
MAS361	Medical Statistics	10 credits
MAS364	Bayesian Statistics	10 credits
MAS367	Linear and Generalised Linear Models	10 credits
MAS369	Machine Learning	10 credits
MAS377	Mathematical Biology	10 credits

and in the Spring Semester you should take one of:

同时，在春季学期你必须从下面两门课选修一门：

ECN357	Modern Finance	20 credits
MGT375	Financial Derivatives	20 credits

and modules to the value of *30 credits* from the following list:

以及从下面课程中选修 30 学分：

MAS341	Graph Theory	10 credits
MAS343	History of Mathematics	10 credits
MAS344	Knots and surfaces	10 credits
MAS345	Codes and Cryptography	10 credits
MAS350	Measure and Probability	10 credits
MAS370	Sampling Theory and Design of Experiments	10 credits
MAS371	Applied Probability	10 credits
MAS372	Time Series	10 credits
MAS472	Computational Inference	10 credits.

Prerequisites 预修要求

Please note that if you want to take [MAS345](#), then you have to take [MAS330](#) in the Autumn Semester. If you want to take [MAS472](#), then you have to take [MAS364](#) in the Autumn Semester. It is also recommended that if you take [MAS370](#) then you take [MAS367](#) in the Autumn Semester.

请注意，如果你想选修[MAS345](#)，那么你必须在秋季学期选修[MAS330](#)。如果你想选修[MAS472](#)，那么你必须在秋季学期选修[MAS364](#)。如果你想选修[MAS370](#)，那么我们建议你在秋季学期选修[MAS367](#)。

5 Administrative Information 有用信息

Organisation of Modules 模块课程的组织方式

Most Level 3 and 4 Mathematics and Statistics modules are delivered at the rate of **2 hours of lectures per week**; project modules are among the exceptions to this. Your lecturers will make appropriate arrangements for times when you can consult them.

大部分数学学院讲授的三年级和四年级模块每星期两个小时授课时间。以做大作业为主的模块属于例外情况。授课老师会安排合适的答疑时间。

根据学位管理规定，你修习的课程必须达到 120 个学分。

Change of Choice of Modules 修改选修的课程

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

在谢菲尔德大学的最后一学年，学校允许你在每个学期的前三周修改你的选修课程。如果你要改变你的选择，你要保证所选课程的时刻表能够实际执行，同时保证你在下学期有足够的可选课程使得你可以顺利毕业（例如，保证你已经修习了必要的预修课程）。修改选修课程通常在网上进行。

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

这个系统可以通过 MUSE 访问。按照通常方式登陆，选择 My Services 标签页，点击 Module Add/Drop 链接进入网上系统，然后按照屏幕上的指令完成操作。屏幕上将会列出你的核心模块。你输入并提交你的添加/删除模块的请求之后，你所在院系将会检查，然后批准或者拒绝你的请求。你会收到一封系统自动发出的电子邮件，确认你的记录已经更新。如果你的请求遇到任

何问题，你所在院系将会给你发电子邮件，告知你下一步应该如何进行。

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

在线系统对远程教育学生不开放。选修终生学习研究所课程的学生也不能访问这个在线系统。他们需要使用纸质‘添加 - 删除’表。这个表格可以从学联里的学生信息服务台 (SSiD) 免费领取，也可以从 SSiD 的网站下载 (<https://www.sheffield.ac.uk/ssid/forms>)。填完表格之后，你需要学位负责人签字认可 – 参阅如下链接里的 ‘Making changes’ 部分: <https://sheffield.ac.uk/maths/current/admin>。然后你要把表格交至 Hicks 楼 F10 办公室。

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

你可以查阅你选修课程的记录。你必须在每个学期的第四周检查确认记录正确。如果发现任何错误，你需要利用在线系统或者纸质的添加/删除表做出适当修正。

Module Questionnaires 课程问卷调查

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

我们强烈建议学生填写所有的课程问卷调查。问卷调查通常采用电子化管理；每个学期我们都会向你们发布如何完成问卷调查的说明。

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

这些问卷调查对学院很重要。这是你表达你对课程意见的一个正式渠道 — 你也可以用其他方式提出非正式意见，例如通过教工学生论坛或者向授课老师直接提出，等等；我们同样感谢你们这样提供的反馈意见。

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

我们任何时候都乐于倾听改善教学、提高学习体验的意见。经过深入思考的反馈意见对学院的教学有极大帮助。

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

如果你的作业被批改之后上面只有一个分数，这对你的帮助不大；如果作业上有适当的点评告诉你如何改进，你会发现这更有帮助。同样的道理，我们希望你在问卷调查的回答里尽量具体、有建设性。有理有据的建设性意见不但对授课老师非常有帮助，对学院同样如此，因为这样我们可以推广好的教学技巧。

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

授课老师和学生一样，有普通人的感情。如果你觉得需要对一门课的某些方面提出批评意见，请尝试采用委婉、照顾阅读者情绪的方式。此外，批评意见固然好，我们同样乐意读到正面意见，所以如果你觉得某位老师在某一方面很出色，请也告诉他们！

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

问卷调查表和表中意见将交由教工 - 学生论坛和学院的教学委员会讨论。往年的意见已经使得我们修订了学院的一些程序，调整了课程内容和老师的教学方法。这些意见同样是我们对教工进行年度考核很有参考意义的一部分。

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

问卷调查的结果（以及老师的回应）会在教工 - 学生论坛的 MOLE 主页上公布。学院所有学生都可以看到这个结果。你的意见可以帮助低年级同学做选课决定。你审慎的反馈意见对提高我

们的教学质量非常有价值。

Avoiding Collusion and Plagiarism 如何避免串通合作和剽窃

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

这部分内容提取自谢菲尔德大学的 *Guidance for Students on the Use of Unfair Means*; 其内容可在以下链接找到: <http://www.shef.ac.uk/ssid/exams/plagiarism>。

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

谢菲尔德大学期望它的毕业生拥有特定的技能和品质, 其中很多和良好的学术行为有关。

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

在你的专业学习过程中, 你会学到怎么去发展这些技能和品质。计分作业是你证明自己已经获得并懂得如何应用它们的主要方式。在考核过程中使用不公平手段是不诚实的, 而且意味着你没能够证明你已经习得这些学术技能和品质。

What constitutes unfair means? 什么是不公平手段?

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

完成任何学术工作时, 一个基本原则是你提交的工作必须是属于自己的。**剽窃, 使用购买的或者雇人代笔的作品, 重复使用 (又叫自我剽窃), 串通合作, 和伪造结果**都是不允许的, 因为它们违反了原则。关于这些作弊手段的规定对所有计分和不记分作业都适用。

- (i) **Plagiarism (either intentional or unintentional)** is using the ideas or work of another person (including experts and fellow or former students) and submitting them as your own. It is considered dishonest and unprofessional. Plagiarism may take the form of cutting and

pasting, taking or closely paraphrasing ideas, passages, sections, sentences, paragraphs, drawings, graphs and other graphical material from books, articles, internet sites or any other source and submitting them for assessment without appropriate acknowledgement.

剽窃（有意或者无意的）指的是使用别人（包括专家、同学、或以前的学生）的想法或者作品，并以自己的名义提交。它被认为是不诚实和没有职业道德的行为。剽窃的可能方式包括剪切复制，使用或者以非常接近原文的方式复述其他资料的想法，句段，章节，句子，段落，绘图，图案或者其他图像材料，并在提交作业时不作适当声明。其中资料来源可以是书本，文章，网站等等。

- (ii) **Submitting bought or commissioned work** (for example from internet sites, essay “banks” or “mills”) is an extremely serious form of plagiarism. This may take the form of buying or commissioning either the whole piece of work or part of it and implies a clear intention to deceive the examiners. The University also takes an extremely serious view of any student who sells, offers to sell or passes on their own assessed work to other students.

提交购买所得或者雇人代笔的作业（例如，来自某些网站或者论文工场等的论文）是一种极为严重的剽窃行为。其可能形式包括购买或者雇人代笔整份或部分作业，带有明显欺骗老师的意图。同样，对出售，意图出售或赠送自己计分作业的学生，谢菲尔德大学也将极为认真对待。

- (iii) **Double submission (or self plagiarism)** is resubmitting previously submitted work on one or more occasions (without proper acknowledgement). This may take the form of copying either the whole piece of work or part of it. Normally credit will already have been given for this work.

重复使用（又叫自我剽窃）是指重新使用以前已经提交过的作业，并且不作适当说明。形式上包括复制整份或者部分已提交作业；通常这份作业已经得到过分数。

- (iv) **Collusion** is where two or more people work together to produce a piece of work, all or part of which is then submitted by each of them as their own individual work. This includes passing on work in any format to another student. Collusion does not occur where students involved in group work are encouraged to work together to produce a single piece of work as part of the assessment process.

串通合作指两个或更多人合作完成作业，之后每个人把部分或者全部作业作为独立完成的作业上交。这包括把自己的作业以任何形式分享给另外一个学生。下面的情况不属于串通合作：若干学生参与一个小组项目，授课老师鼓励共同合作，并且整个小组只需要提交一份作业作为考评的一部分。

- (v) **Fabrication** is submitting work (for example, practical or laboratory work) any part of which is untrue, made up, falsified or fabricated in any way. This is regarded as fraudulent and dishonest.

伪造是指提交的作业（例如实验或者实践作业）里包含有不真实的，捏造的，篡改的或者以任何方式编造的部分。这被认为是诈骗和不诚实。

How can I avoid the use of unfair means? 我应该如何避免使用不公平手段？

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

为了避免使用不公平手段，你提交的任何作业都必须是自己完成的；其他人的工作必须得到适当说明和引用。

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

你在学习过程中会学到怎样合适地引用参考资料以避免构成剽窃。这是一种核心技能；你在整个大学学习以及以后的职业生涯都需要用到。你要遵循布置作业的院系关于如何完成计分作业的说明。

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

你要**声明提交的作业全部是你的工作**。许多院系要求你随每份作业附上一份声明书（包括在网上提交的作业）。

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

如果你对什么是合适的学术行为有疑问，或者你的个人生活遇到困难，影响了学习，你应该征询你个人辅导员，导师，或者其他相关教员的意见。

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

下面的网站提供了关于如何引用参考资料和避免使用不公平手段的更多信息：

The **Library** provides online information literacy skills tutorials <http://www.shef.ac.uk/library/idlt>

图书馆 提供有信息读写技巧方面的线上教程：<http://www.shef.ac.uk/library/idlt>

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

图书馆 也有关于文献管理软件的信息: <http://www.shef.ac.uk/library/refmant/refmant.html>

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

英语语言教学中心 提供**写作咨询服务**。通过这个服务, 学生可以安排一对一的会面以讨论你写的文章。这个服务对所有学生都开放, 无论该学生的母语是不是英语。 <http://www.shef.ac.uk/eltc/languagesupport/writingadvisory/index>

What happens if I use unfair means? 如果我使用了不公平手段, 会发生什么?

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

任何形式的不公平手段都会被作为严重的学术违规来对待。学校可能会根据惩戒条例采取有关行动。对于就读于经过行业认证的专业的学生, 学校可能根据从业素质管理条例采取有关行动。如果确认有使用不公平手段行为, 大学将采取惩罚措施, 例如将该份作业判为零分, 或判罚博士答辩不及格, 或者, 在极端严重的情况下, 开除学籍。

Detection of Unfair Means 如何发现不公平手段

The University subscribes to a national plagiarism detection service which helps academic staff identify the original source of material submitted by students. This means that academic staff have access to specialist software that searches a database of reference material gathered from professional publications, student essay websites and other work submitted by students. Your work is likely to be submitted to this service.

谢菲尔德大学订购了一个国家剽窃检测服务, 这个服务帮助教员发现学生提交的材料原始出处。利用这个服务, 教员可以利用专业软件检索一个引文资料数据库; 该数据库涵盖专业出版物, 学生论文网站和其他学生提交的内容。你的作业很有可能需要提交到这个服务中心。

For further information, see <https://www.sheffield.ac.uk/ssid/complaint-and-appeals>.

更详尽的信息请查阅网页 <https://www.sheffield.ac.uk/ssid/complaint-and-appeals>。

Failure to Comply with Assessment Requirements 违反考试规定的处理

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

没有充分理由不参加考试会得到 0 分的成绩。如果由于不可控原因你不得不缺席考试，你需要填写一份困难情况减责表：<http://www.shef.ac.uk/ssid/forms/circs>。如果是由于生病，而且你注册了大学健康服务（UHS），注意表中所说如下要求：你需要填写该表格的电子版本（或者智能手机 app 版）并在线提交，使得 UHS 可以添加证明文件；同时，你生病的时候必须到医生处就诊。（更多内容参看解释性文件。）如果是由于其他原因，请在情况允许的条件下尽快将表格和证明文件提交至位于 F10 的 SoMaS 接待办公室。如果考试的时候身体不适，请马上告知监考老师。

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

看错时间或者睡过头了这样的借口不是可以缺席的理由。但是，任何由于这样原因错过考试的学生要尽快告知 F10 的 SoMaS 接待办公室。

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

所有未经许可的资料（复习笔记和书本等）必须留在考场外。这包括记有笔记的草稿纸。在进考场前，考生必须确认他们的口袋里没有这样的笔记。考生也必须确认他们的手上没有写有笔记；

在考试过程中考生也不能在手上书写任何内容。关于考试程序的更多内容，请查阅这个链接里的考试规定 http://calendar.dept.shef.ac.uk/calendar/06f_gen_regs_as_to_exams.pdf

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

我们建议有个人困难的同学每学期都提交一份困难情况减责表，以保证我们了解最新情况，避免出现疏漏。如果学校的残疾和阅读障碍支持服务处已经出具学习支持计划，有残疾或者慢性病的同学无需再填写困难情况减责表。实际上，残疾和慢性病通常不作为通常的特殊情况对待；我们的重点在于为这样的学生提供支持，让他们尽其所能。然而，如果这些慢性身体条件在考试前后出现恶化，提交困难情况减责表也是合适的做法。

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

根据学校的处罚政策，没有正当理由不按时提交计分作业会被以扣分的方式进行处罚。对于大作业（例如课程项目论文），如果迟交不超过 5 个工作日，每天扣除总成绩的 5%；如果迟交超过 5 天，该作业将只能得零分。对于占最后总分比例较少的小作业，理学院允许数学与统计学院采取‘零容忍’政策；按照这个政策，任何迟交的小作业都得零分。

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

对于由于医学原因或者严重的个人困难而导致作业不能及时提交的情况，授课老师有权决定免除处罚。豁免请求应该在发现问题的时候马上尽快书面提出，或者通过电子邮件告知授课老师。

提出豁免要求的学生需要同时填写一份困难情况减责表并交到 SoMaS 接待室 (F10)。

Statement on Assessment Criteria 关于考核的准则

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

SoMaS 典型的考试试卷会有若干道题目。考试试题通常包含如下几个方面中的某些内容：(i) 对课程理论内容的解释；(ii) 可以用课堂讲授方法求解的标准问题；(iii) 有一定难度，需要运用课堂知识进行独立思考求解的问题。学生的答卷会根据一个严格细致的评分方案进行批改。评分方案通常规定如何分配方法分和准确分。基本评分准则是准确性，包括计算、方法、或者解释的准确性。

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

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

批改后得到卷面分数，然后任课老师根据授课和考试情况对其进行调整。最后分数满分为 100 分；各个分数段根据下表分级：

70–100	: 一等
60–69	: 二等一类
50–59	: 二等二类
45–49	: 三等
40–44	: 及格;

If an examiner feels that a mark of 30% on the exam is deserving of a pass, then 30% will be scaled to 40 on the University's scale; there are similar points at each of the classification

boundaries. The scaling is subjected to a central School scrutiny process involving the past record of each student who is registered for the module and for whom there are no abnormal circumstances.

如果任课老师认为该次考试卷面分数为 30 分的试卷达到了通过的水平，那么 30 分会被换算成 40；在其他分界线上也会做类似考虑，对其他卷面分数做类似调整。这个调整过程会经过学院集中统一审查，审查过程将参考每个没有受困难情况影响的学生在这门课上面过去的考试成绩。

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

考试试卷会给出试题的每一部分所占分数比例，这包括学生可以提前看到的往年试卷。

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

课程的目标和预期学习成果都会提供给内部试卷检查人和合适的校外考试检查员，同时也会分发给所有学生。

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

学院组织老师对试卷的卷面分数进行检查以保证其正确性。此外，对二年级及以上年级的所有考试，部分评改过的试卷（通常是分数在分级边界区里的试卷）会被送至合适的校外考试检查员进行复查。在毕业班任课老师集体会议召开之前，校外考试检查员可以查看所有毕业班的考试答卷；他们通常会审查分数接近分界区的学生和其他需要特殊考虑的答卷。

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

评卷过程以及所有考试委员会的讨论都匿名进行，只使用注册号来区分学生。

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

学生有权要求查看自己被批改过的考试试卷；这通常安排在第一学期的第三周（查看上一个学期六月份的考试试卷）和第二学期的第六周（查看一月份的考试试卷）。

Award of Degrees 学位授予方法

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

为了取得学位，学生必须取得一定数目的学分。此外，这些学分是在哪一年级取得的也很重要。在本节以下内容中，‘三年级模块’指的是代号为 MAS3 ** 的课程；通常（但不是任何情况下）都在三年级学习。‘四年级模块’指的是代号为 MAS4 ** 的课程；通常（但不是任何情况下）都在四年级学习。三年级模块的及格成绩是 40 分，而四年级模块的及格成绩是 50 分。

In order to be awarded an **honours degree of BSc**, you must obtain at least *200 credits*, of which at least *90 must be of Level 3 or Level 4 modules*, out of the overall *240 credits* possible on the third and fourth years combined.

为了获得**理学学士荣誉学位**，你必须取得至少 200 个谢菲尔德学分；其中至少 90 个学分必须来自三年级和四年级课程。三年级和四年级总共可以选修 240 个学分的所有课程。

This is a minimum requirement below which you cannot obtain an honours BSc degree: the granting of a pass degree (that is, without honours) to a student with fewer than 200 credits (or with fewer than 90 credits of Level 3 or Level 4 modules) is always at the discretion of the examiners, and requires the specific concurrence of the External Examiners. A minimum of 180 credits is required for this.

这是取得荣誉学位的最低要求。如果一个学生取得学分数少于 200（或者少于 90 个学分来自三年级和四年级模块），他有可能获得及格学位（也就是没有荣誉），但这必须由学院酌情决定，并且需要得到校外考试检查员的明确附议。你最少需要获得 180 学分才适用这种情况。

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

如果一个理学学士学位候选人上完二年级和三年级各自 120 学分的课程，并以此作为考评的基础，但没有获得学位，他可以重考不及格的模块，每个模块有一次重考机会（但任何一个模块最多只有两次考试机会）。即便如此，他只有资格获得及格学位。

Classification of Honours Degrees 荣誉学位分类

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

根据目前的规定，每完成一个模块你都会得到按照百分制计算的一个成绩。这一小节解释这些成绩如何最终决定学位的级别。

The full details are available from the University's General Regulations for First Degrees at http://calendar.dept.shef.ac.uk/calendar/06d_gen_regs_for_first_degrees.pdf. Here are the main points.

完整的细节能够从大学关于学位的总规定里找到：http://calendar.dept.shef.ac.uk/calendar/06d_gen_regs_for_first_degrees.pdf。这里只列举若干要点。

Your degree class is based on the average of your module marks (including any for which the mark is a fail) at Level 2 (in Nanjing) and Level 3 (in Sheffield), but the Level 3 marks count twice as much as the Level 2 marks. At Level 2 you had some courses in Mathematics, Finance and Economics, taught by staff from Sheffield or from NJTech; all these will count towards your average. You will also have some courses on other subjects, taught by staff from NJTech; these will not count towards your average.

你的学位级别是基于二年级（在南京）和三年级（在谢菲尔德）部分课程的平均成绩（包括不及格的成绩），但是三年级成绩的权重是二年级成绩的两倍。二年级的时候你有数学，金融和经济等方面的课程，可能由谢菲尔德教师或者南京工业大学老师授课，这些会计入平均成绩；而某些由南京工业大学老师讲授的其他课程则不计入平均。

Then two calculations are made.

我们使用两种计算方法来确定学位等级。

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

计算方法一（根据加权平均分）依据如下原则：

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

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

如果候选人的加权平均分落入下表第一列的成绩范围，按照计算方法一得到的分级结果是第二列里对应等级：

69.5 或者更高	: 一等
59.5 或者更高	: 二等一类
49.5 或者更高	: 二等二类
44.5 或者更高	: 三等
39.5 或者更高	: 及格;

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

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

如果候选人的加权平均分属于下面表格第一列的某个分数区间，那么我们说计算方法一得到的结果是第二列里对应级别的‘边界区’。

68.0–69.4	: 一等
58.0–59.4	: 二等一类
48.0–49.4	: 二等二类
43.5–44.4	: 三等
38.0–39.4	: 及格

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

计算方法二（根据分数分布）是按照下面的原则：

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

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

如果候选人的所有加权单科成绩中最好的前一半里的最低成绩（也就是中位成绩）属于如下表格中第一列里的某个区间，那么计算方法二得到的初步分级是第二列里相应的级别。

69.5 或更高	: 一等
59.5 或更高	: 二等一类
49.5 或更高	: 二等二类
44.5 或更高	: 三等
39.5 或更高	: 及格;

- where the best five twelfths of a candidate's weighted grades are of a value indicated in the first column, the outcome of Calculation 2 shall be the borderline to the corresponding class indicated in the second column above. 如果候选人的加权单科成绩中最好的前 5/12 里的最低成绩属于上面的表格中第一列里的某个区间，那么计算方法二的结果是表中第二列对应级别的‘边界区’。

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

在对每个候选人的学位级别作出推荐意见时，考试委员会综合两个计算方法得到的结果，根据如下原则作出决定：

- where one Calculation places the candidate in one class and the other Calculation places the candidate in either the same class or the borderline to the same class, the candidate shall normally be recommended for the award of a degree of that class;
如果两个计算方法得到相同的级别，或者得到某个级别以及该级别的‘边界区’，该学生通常会被推荐授予该学位级别；
- where one Calculation places the candidate in one class, and the other Calculation places the candidate in the borderline to the class immediately above, the candidate shall normally be recommended for the award of a degree of the lower class;
如果一个计算方法得到某个级别，而另一个计算方法得到的级别是相邻高一级的‘边界区’，该学生通常会被推荐授予两个级别中较低级别；
- where one Calculation places the candidate in one class, and the other Calculation places the candidate in the class immediately below, the candidate shall be considered as being in the borderline to the higher class, and the class of the degree to be recommended by the Examiners shall normally correspond to the class indicated by the weighted mean of the grades at the final Level of study;

如果一个计算方法得到某个级别，而另一个方法得到的是相邻更低的级别，该候选人将被认为属于两者中较高级别的‘边界区’。这时，考试委员会通常推荐授予该学生根据最后一年成绩的加权平均计算得到的学位等级。

- where both Calculations place the candidate in the same borderline, the class of the degree to be recommended by the Examiners shall normally correspond to the class indicated by the weighted mean of the grades at the final Level of study;

如果两个计算方法得到同一个级别的‘边界区’，考试委员会通常推荐授予该学生根据最后一年成绩的加权平均分计算得到的学位等级。

- where one Calculation places the candidate in one class, or borderline to a class, and the other Calculation places the candidate in another class, or borderline to a class, neither immediately above nor below, the Examiners shall recommend the classification which, having regard to all the evidence before them, best reflects the overall performance of the candidate.

如果一个计算方法得到某个级别或者该级别的边界区，而另一个计算方法得到另一个级别或该级别的边界区，同时此两级别不相邻，考试委员会将考虑所有可能证据，作出最准确反映学生表现的学位级别推荐建议。

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

请注意，如有有力证据支持，考试委员会可以搁置上述书面规则，对某个学生作出特殊决定。在考量这些证据时，考试委员会将寻求校外考试检查员的指导意见。此外，如果一个学生被授予了分级学位（也就是一等，二等一类，二等二类，或者三等学位），那么这学位必定是一个**荣誉学位**，无论该学生是否有不及格的课程。

There is a University appeals procedure. Details may be found on the web at <https://www.shef.ac.uk/ssid/complaints-and-appeals>.

谢菲尔德大学允许学生对学院的决定进行上诉。详细信息可以在如下网页找到：<https://www.shef.ac.uk/ssid/complaints-and-appeals>.

Transcripts 成绩单

After graduation, you may wish to obtain a transcript of your detailed module results to show prospective employers. For details see <http://www.shef.ac.uk/ssid/transcript>. Note that there is a small charge, which increases more than 12 months after graduation.

毕业后你也许希望拿到一份详细的成绩单，以备未来雇主索要。关于成绩单的详细信息请见 <http://www.shef.ac.uk/ssid/transcript>。请注意，办理成绩单需要收取一小笔费用；毕业超过 12 个月之后费用数额会增加。

Prizes 奖学金

The following prizes may be awarded to Level 3 and Level 4 students.

下面的奖学金可以择优授予三、四年级学生。

David Burley Prize in Applied Mathematics (David Burley 应用数学奖)

This prize was established in 2000 and named in honour of Dr D M Burley, former Head of the Department of Applied Mathematics and a member of staff from 1960 to 1995.

1. Frequency of award: One annually.
2. Value of prize: £100.
3. Eligible candidates: Students taking a significant proportion of Level 3 or 4 units in Applied Mathematics.
4. Assessor: The Head of School.
5. Criteria for assessment: The best overall performance in Applied Mathematics (not necessarily the highest marks in any examination).

此奖学金设立于 2000 年，以纪念 D M Burley 博士。Burley 博士是前应用数学系主任，1960 年至 1995 年在数学学院任职。

1. 发奖周期：每年一人。
2. 奖金价值：100 英镑。
3. 符合资格候选人：三、四年级课程大部分选自应用数学方向的学生。
4. 评审人：系主任
5. 评审准则：应用数学课程平均分最高（单科成绩可以不是最高）。

Sir Edward Collingwood Prizes in Probability and Statistics (Edward Collingwood 爵士概率统计奖学金)

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

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

此奖学金由应用概率信托基金建立于 1970 年，以纪念 Edward Collingwood 爵士。Collingwood 爵士 1963 至 1970 年为该基金的首任主席，并于 1970 年任伦敦数学学会主席。

1. 发奖周期：每年两人。
2. 奖金价值：每人 50 英镑。
3. 符合资格候选人：(a) 已完成两年学习，同时系主任认为选修了相当数量概率或者统计课程的学生。(b) 数学与统计学院参加毕业考试的所有专业学生。
4. 评审人：系主任。
5. 评审准则：概率统计课程平均分最高 (单科成绩可以不是最高)。

T M Flett Prizes in Pure Mathematics (T M Flett 纯数学奖学金)

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

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

此奖学金建立于 1977 年，以纪念 T M Flett 教授。Flett 教授 1967 至 1976 年于纯数学系任职。

1. 发奖周期：每年两人。
2. 奖金价值：每人 75 英镑。
3. 符合资格候选人：数学与统计学院参加毕业考试的所有专业的学生，并且三年级纯数学科目超过所有当年选修科目的半数。

4. 评审人: 系主任。
5. 评审准则: 相关科目考试成绩和该学年课外作业成绩。

Wendy Wright Prize in Probability and Statistics (Wendy Wright 概率统计奖学金)

This prize was endowed by Miss Hilda Davies on her retirement from the Department of Probability and Statistics in 1979 and named at her request in memory of Mrs Wendy M Wright, a graduate of the University and former Research Assistant in Statistics.

1. Frequency of award: One annually.
2. Value of prize: £100.
3. Eligible candidates: Final year undergraduates on a programme of study involving a substantial number of Statistics courses.
4. Assessor: The Head of School.
5. Criteria for assessment: Performance in Level 3 or Level 4 practical and applied project work in Probability and Statistics.

此奖学金由 Hilda Davies 小姐 1979 年从概率与统计系退休时捐赠成立。按照她的意愿, 奖学金以 Wendy Wright 命名, 以纪念 Wright 夫人。Wright 夫人毕业于谢菲尔德大学, 曾任统计系研究助理。

1. 发奖周期: 每年一人。
2. 奖金价值: 100 英镑。
3. 符合资格候选人: 专业方向包含相当数目统计课程的毕业班学生。
4. 评审人: 系主任。
5. 评审准则: 在三四年级概率或者统计的应用方面的大作业上取得的成绩。

The Institute of Mathematics and its Applications Prize (数学与应用研究所奖学金)

This prize was established by the Institute of Mathematics and its Applications (IMA). The IMA is the UK's learned and professional society for mathematicians and its applications. It promotes mathematics research, education and careers, and the use of mathematics in business, industry and commerce.

1. Frequency of award: Two annually.
2. Value of prize: One year's membership of the Institute of Mathematics and its Applications.

3. Eligible candidates: Final year students in the School of Mathematics and Statistics.
4. Assessor: The Head of School.
5. Criteria for assessment: Outstanding performance in the final year.

此项奖学金由数学与应用研究所 (IMA) 设立。IMA 是英国一个以服务数学家和数学应用为宗旨的学会，它推广数学研究，教育和职业发展，以及数学在商业，工业和贸易中的应用。

1. 发奖周期：每年两人。
2. 奖金价值：一年 IMA 会员资格。
3. 符合资格候选人：数学学院毕业班学生。
4. 评审人：系主任。
5. 评审准则：在最后一取得突出的学习成绩。

6 Help, Guidance and Information 帮助，指导和信息

Calculators 计算器

You will need a calculator for certain examinations and for tests during the semester, and you will probably need one for Problems Classes too. Lecturers will inform classes when this is the case. However, certain calculators mainly those with a text retrieval facility (which includes many calculators with a graphical display) are not permitted for use in examinations or tests. During the first semester therefore you will need to get your calculator officially approved for examinations. Approval takes the form of a check of the calculator at the Student Services Information Desk (SSiD) in the Students Union, and the issue of an official sticker to signify approval. You will therefore need to take the calculator to SSiD during the Autumn semester. Calculators on smartphones are not permitted in exams. Mobile phones are NOT permitted in any examination venue. If you are thinking of buying a new calculator, it may be advisable to delay until you have had the chance to check the list of University approved models.

你将需要计算器来参加某些科目的考试、学期中的小测验、或者上习题课。如果某门课是这种情况，任课老师会通知整个班级。然而，某些计算器（以有文本回取功能的为主，包括许多有图形显示功能的计算器）是不能在考试和测验中使用的，所以你要在第一学期在学校里正式认证你的计算器。认证过程要求你将计算器带至学联，由 SSiD 的工作人员进行检查。你会获得一个贴纸来表示计算器已经得到认证。也就是说，你要在秋季学期将计算器拿去 SSiD。智能手机上的计算器在考试的时候是被禁止的。考场内一律禁止手机。如果你计划买一个新的计算器，最好找时间核对了已经通过大学认证的型号清单之后再购买。

Personal Tutors 个人辅导员

You will be assigned a member of the academic staff of SoMaS as your personal tutor. This person is there to help explain SoMaS and University procedures and for you to consult for general academic guidance and in times of trouble. More technical guidance on mathematical or statistical problems arising in a particular module is better obtained from problem class tutors or the lecturer taking the course.

你将会被分配一位 SoMaS 教员作为你的个人辅导员。这位教员帮助解释 SoMaS 和大学里的章程，在你咨询时对学业问题做一般性指导，并且在你生活上遇到难题的时候提供帮助。在某一门课里遇到的技术性数学或者统计问题最好咨询习题课上的答疑老师或者任课老师。

If at any time you become unhappy with your degree programme, or a particular module, or if you cannot cope, or if you have other problems, you should immediately discuss the matter with your personal tutor. Such problems are often easier to deal with if they are addressed immediately, and indeed talking about them with someone else can often go a long way to help. Your personal tutor will be able to direct you to an appropriate person for more specialist advice if that is necessary. If problems are likely to affect your examination performance, you should inform your tutor immediately rather than waiting until you receive your result.

如果在某一时刻你对你的专业或者某门课感到不满意，或者感觉难以应付学业，或者遇到其他难题，你要马上和个人辅导员讨论这些问题。如果处理及时，问题通常会更容易解决，而且通常仅仅和别人谈论一下本身就会有很大帮助。如有必要，你的个人辅导员可以向你介绍更专业的工作人员。如果你遇到的问题很可能影响考试成绩，你应该马上通知个人辅导员，而不是等到拿到考试成绩的时候。

Arrangements will be made for personal tutors to meet their students in the SoMaS induction week at the beginning of September and fairly regularly in the first semester. These meetings are intended to help the transition into life at University to be as smooth as possible. As well as dealing with any questions you may wish to raise, tutors will use the initial tutorials to explain the way in which relevant University systems work, and to inform you of support provided by the University, such as University Health Service, counselling Service, Students Union Rights and Advice Centre, Harassment Network, gender and ethnic minority advice, and where to find information. The tutor-tutee meeting just before Christmas will deal with preparation for examinations and what to do if problems such as illness occur over the examination period. Students are expected to keep these appointments.

我们将会在三月初 SoMaS 的接待周里安排个人辅导员和他们的学生见面。第一学期中也会有规律地安排见面。这些会面的目的是让你适应谢菲尔德大学生活这个转变过程进行得尽可能顺利。除了处理你可能提出的问题之外，个人辅导员会利用第一次见面的机会解释大学的基本工作方

式，介绍大学提供的一些支持性服务，例如大学健康服务、心理辅导服务、学联个人权利和建议中心、骚扰受害者网络、性别和少数族群建议中心等等，以及如何可以找到相关信息。圣诞节前的辅导员-学生会面将讨论如何准备考试，以及如果考试期间生病了该如何办等等。我们要求学生参加这些安排好的会议。

After the first semester, tutees are expected to see their personal tutor at least once per semester. Additional meetings may take place at the request of the personal tutor or of the tutee.

第一个学期之后，我们要求学生每个学期至少和辅导员见面一次。如有必要，辅导员和学生都可以要求安排额外的会面。

SoMaS also has a Womens Tutor whose role is to provide additional support, where required, for female students on personal or very confidential matters, and a corresponding Mens Tutor for male students. Students with a disability or specific learning difficulty are advised to contact the Disability and Dyslexia Support Service as soon as they have a confirmed student place, to ensure that any special support is in place as soon as possible. See <http://www.shef.ac.uk/disability/>.

SoMaS 还设有一个女生辅导员。女生辅导员的主要任务是在有需要的时候，在女生处理个人和非常隐私的问题的时候提供更多的帮助。相应地 SoMaS 也设有一个男生辅导员。有残障或者其他学习障碍的学生建议在取得入学资格之后尽快联系残障和阅读障碍支持服务，以保证专门的帮助措施可以尽快安排就位。请参看 <http://www.shef.ac.uk/disability/>.

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

如果你在联系个人辅导员时遇到困难，或者他/她没有办法解决你的问题或疑问，那么你可以联系资深辅导员或者其他指定的教员（参看此网页上的列表：<http://www.maths.dept.shef.ac.uk/math/contact.html>）。

Higher Education Achievement Report 高等教育成绩报告

The University has introduced a new kind of degree transcript for all new undergraduate students: the Higher Education Achievement Report or 'HEAR'. The HEAR provides a comprehensive record of your university achievements and it recognises your extra-curricular achievements as well as your academic learning. It can be used to help you identify your strengths, and to plan how to build on these to achieve your goals, and it provides employers and others with evidence of your university learning and experiences. Find out more by visiting the HEAR website <http://www.sheffield.ac.uk/ssid/hear>

谢菲尔德大学为所有新的本科生引进了一种新的学位成绩单：高等教育成绩报告，或者简称‘HEAR’。HEAR 是你在大学里所有成绩的一个全面的记录，包括学术成绩以及课外活动取得的成绩。它能帮助你认识自己的长处、从而安排计划发挥优势实现你的目标。你可以将它作为大学学习经历的证据向雇主或者其他相关机构展示。

Library 图书馆

The University Library provides 24-hour access to study space, a huge range of books and online information (including online journals and ebooks) as well as advice to help you find and use information effectively. You'll find all the information you need to get started on the library webpages.

大学图书馆提供 24 小时开放的学习空间、数量庞大的书籍、电子资讯（包括在线期刊和电子书）、以及帮助你有效搜索和使用信息的建议。你可以在图书馆网页上找到如何开始使用这些服务的信息。

Places to study 学习空间

There are four different library sites where you can go to study, find reading for your course, and get advice on finding, organising and referencing information. You will need to bring your Ucard with you to get into the library, borrow books and to use the printers and copiers. Remember to ask a member of staff if you need anything.

- The Information Commons (IC) is open 24 hours a day. You should find most of your recommended books here. Visit the Information Desk on level 1 for help using the library, finding materials for your course, or for help with your computer or laptop.
- The Diamond is open 24 hours a day, and has four floors of study space. Visit the top floor (Level 4) to speak to Library and CiCS staff at the Information Desk or to use the collection of reference books.
- Western Bank Library is a good place for quiet study or revision, with a large reading room overlooking Weston Park.
- The Health Sciences Library, based in the Medical School at the Royal Hallamshire Hospital has books and journals covering medicine, dentistry and health.

Visit the learning spaces page to check how busy each library is before you go and see the other study spaces available across campus.

谢菲尔德大学有四个图书馆；你可以在里面复习功课，寻找课外阅读材料，获取如何查找、组织和引用信息的帮助建议。你需要 Ucard 进入图书馆，借书，或者使用打印机和复印机。如果你需要任何东西，别忘记可以咨询工作人员。

- 信息共享空间 (IC) 24 小时开放。你应该可以在这里找到大部分推荐的参考书。你可以到一层的问询台找工作人员解决使用图书馆遇到的问题，查找对你课程有用的资源，甚至解决你手提电脑的问题。
- 钻石楼同样 24 小时开放。它拥有四个楼层的学习空间。顶层（四层）问询台的图书馆和 CiCS 工作人员可以回答你的问题。参考书馆藏也在四楼。
- Western Bank 图书馆是安静学习或者复习的好地方。它有一个宽阔的阅读室，俯视着美丽的 Weston 公园。
- 健康科学图书馆位于皇家海拉姆郡医院的医学院。它收藏关于医药，牙医学和健康方面的书籍和杂志。

StarPlus is the Library's online search tool. Use it to find books and ebooks, online journals, articles, and other information available through the Library. Log in to MUSE and open StarPlus from the link in the My Services menu. Use StarPlus to:

- find reading for your course or research for an assignment
- request something that is out on loan; the Library will let you know when it is ready to collect
- save the details of useful books, journals and articles so you can refer to them later (useful when referencing)

StarPlus 是图书馆的在线搜索工具。你可以用它搜索书本，电子书，网上期刊，文章，和图书馆收藏的其他信息。登陆 MUSE 即可从 My Services 菜单打开 StarPlus。你可以用 StarPlus 来

- 查找课程相关阅读材料或者为大作业做调研
- 请求外借资料；图书馆会通知你该资料的领取时间
- 保存有用书籍，期刊和文章的信息以便将来引用

Searching the scientific literature 查找科学文献

Web of Science and Scopus and arXiv.org can be used to search the journal literature and explore scientific research. To find other useful databases, visit the Maths and Statistics library guide, or contact your librarian.

Web of Science, Scopus 和 arXiv.org 可以用来搜索期刊文献和科学研究。如果想了解其他数据库，访问数学和统计图书馆指引，或者联系你的图书管理员。

Developing your skills 拓展你的技能

Visit the Library's study web pages for advice on:

- how to find information for your studies and assignments,
- how to cite/reference correctly, and avoid plagiarism

- details of optional workshops to support your learning

访问图书馆的学习网页来获取如下问题的相关信息：

- 如何获得关于你的学习和课外作业的有用信息
- 如何正确引用文献，避免作弊
- 有助你学习的各种工场的详细信息

Help and support 帮助和支持

- For general enquiries, contact Library Help or speak to a member of library staff.
- Oliver Allchin is the librarian for Science – you can contact him for advice on finding reading for your studies or with any other questions you have relating to library support for your course (o.allchin@sheffield.ac.uk, 01142227333, book an appointment)
- If you would like to borrow a book or read an article that the Library does not have, complete the InterLibrary Request form (available from the My Services menu in MUSE) and we will try to get it for you from the British Library. If you would like to suggest a book for the Library to buy use the book recommendation form.
- 如果你有一般性的问题，联系 Library Help，或者直接询问图书馆工作人员。
- Oliver Allchin 是理学院的图书管理员 – 你可以向他询问和你学习相关的阅读资料的问题，或者其他如何使用图书馆帮助你学习的问题(o.allchin@sheffield.ac.uk，,01142227333，安排一个面谈时间)。
- 如果你想借阅图书馆没有的书籍或者文章，你可以填写馆间互借请求表（MUSE 的 My Services 菜单里可以找到该表）。我们会尝试从大英图书馆里找到它。如果你想建议图书馆购买某本书，请使用书籍推荐表。

Student Advice Centre, SSiD, Counselling Service, University Health Service 学生建议中心, SSiD, 心理辅导服务, 大学健康服务

The Student Advice Centre (<http://www.sheffield.ac.uk/ssid/contacts/advice>) and Student Services Information Desk (SSiD, <http://www.sheffield.ac.uk/ssid>) provide assistance on a wide range of problems. Specifically, they provide advice on housing, finance, problems about harassment, and help to international students; they also help with academic matters. The Counselling Service (<http://www.sheffield.ac.uk/ssid/counselling>) and the University Health Service (<http://www.sheffield.ac.uk/ssid/health-service>) are also there to help you, and help with mental health problems can be found from <http://www.sheffield.ac.uk/ssid/health-service/conditions/mental-health>; strict confidence is always observed.

学生建议中心 (<http://www.sheffield.ac.uk/ssid/contacts/advice>) 和学生服务信息台 (SSiD, <http://www.sheffield.ac.uk/ssid>)

[//www.sheffield.ac.uk/ssid](http://www.sheffield.ac.uk/ssid))对各种各样问题提供协助。具体地说,他们提供的建议涵盖住房,理财,骚扰问题,和国际学生面对的特殊问题;他们也对学术问题提供帮助。心理辅导服务 (<http://www.sheffield.ac.uk/ssid/counselling>) 和大学健康服务 (<http://www.sheffield.ac.uk/ssid/health-service>) 也在这里为你服务,而精神健康方面的问题可以在如下链接找到帮助:<http://www.sheffield.ac.uk/ssid/health-service/conditions/mental-health>; 隐私条款会始终得到严格遵守。

iSheffield

Lots of information can be found from the iSheffield mobile app (see <http://www.sheffield.ac.uk/cics/isheffield>). In particular your timetable should be there, and near the start of semester it should have the correct tutorial times and rooms for you.

iSheffield 移动应用上面可以找到大量信息(参看<http://www.sheffield.ac.uk/cics/isheffield>)。尤其值得指出的是,你的课程时刻表会在里面,同时,在学期即将开始时它将会显示正确的习题课时间和教室。

301

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

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

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

301: 学生技能和发展中心为学生提供一系列服务:

- 数学和统计课外辅导
- 学术技能工场
- 学习方法辅导课
- 学习障碍专家辅导服务
- 语言课

- 写作咨询服务

301 同时发放一种学术技能证书；你可以将它加入你的高等教育成绩报告（HEAR）。更多信息参见 <http://www.sheffield.ac.uk/ssid/301/services>。

What to do if things are not going right 遇到困难怎么办

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

学院希望每个学生在谢菲尔德学习和生活期间都过得开心。但是我们知道，由于各种原因，你们中的一些同学可能会遇到问题，影响你的学习；有时有些比学习更重要的事情会发生。

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

在 SoMaS 你需要联系的人首先是你的个人辅导员和资深辅导员。我们可能没有能力提供你想要的帮助，但大学里有有资质的工作人员；你的个人辅导员可以帮你找到合适的帮助。学联的 SSiD 旁边有一个学生建议中心；那里有很多信息小册子，也可以给你提出有用建议。这个链接里有大学提供的各种服务：<http://www.sheffield.ac.uk/ssid/sos>。

For any issues that affect assessment, you need to complete an Extenuating Circumstances Form – see page 22.

出现任何影响考试结果的问题你都需要填写困难情况减责表向我们汇报 – 参看第 22 页。

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

如果问题迟迟无法得到解决，或者问题非常严重，你可能需要选择暂时休学，过一段时间之后

再继续学业。如果是这种情况，你需要填写休学申请表。相关问题在这个网页有讨论：<http://www.shef.ac.uk/ssid/change-of-status/leave>；例如，你很可能需要考虑经济上的一些问题，海外学生可能会遇到签证问题。如果休学请求是出于医疗的原因，在继续学业之前你需要向大学证明你的身体已经恢复得足够好。任何会改变你的‘学生身份’的表格都需要得到资深辅导员的签字；之后请把它们上交至 SoMaS 接待室 (F10)，使得我们可以保留一份备份，然后上交至讲授学位办公室。

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

所有表格都可以从这个链接下载：<http://www.sheffield.ac.uk/ssid/forms>；纸质表格可以向 SoMaS 接待室 (F10) 的工作人员索取。

Nightline 夜线

Nightline (see <https://www.sheffieldnightline.co.uk>) is the University of Sheffield's confidential listening and information telephone service. It is run by trained student volunteers, and operates from 8.00pm until 8.00am every night during term time. It offers students everything from the phone number of a twenty-four hour taxi company, to examination dates, times and locations, and information about many issues that can be encountered within student life. It provides a vital support network for all students, so whatever you need to say, Nightline is listening, and the service can be called free from phones in halls of residence. If you think you would like to volunteer for Nightline, contact sun1@shef.ac.uk for more information.

夜线是谢菲尔德大学的隐私的倾听和信息电话服务。它由经过训练的学生志愿者服务，开学期间每天晚上 8 点到早上 8 点开通。它提供各种各样信息，包括 24 小时的士公司的电话，考试日期、时间和地点，以及学生生活中可能碰到的各种问题的相关信息。它给所有学生提供一个至关重要的支持网络。所以，无论你有什么问题需要倾诉，夜线都在倾听。从学生公寓里的电话拨打夜线不需要支付通话费。如果你觉得你想要成为夜线志愿者的一员，请和sun1@shef.ac.uk联系索取更多信息。

The Careers Service 就业服务

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

就业服务 (网页地址：<http://www.shef.ac.uk/careers/>) 提供优秀的服务，具有丰富经验，可

以帮助学生选择职业方向，寻找毕业就业单位。你也可以和学院的就业联络人进行讨论；联络人的名称联系方式可以在如下网页找到：<http://www.maths.shef.ac.uk/math/contact.html>。

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

正确的就业决定依赖于你对自己特质和志趣的思考和认识。就业服务的资源可以对就业计划，书写简历，寻找工作，面试技巧等方面提供帮助。他们还组织大量的就业市场活动，提供和潜在雇主面谈的宝贵机会，了解雇主对技能的要求。大学的创业区 (<http://enterprise.shef.ac.uk/>) 也提供类似的技能培训。

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

我们专业的毕业生就业选择非常广泛。许多选择数学学位至关重要的工作，其他人选择需要本科教育的工作，但这工作不一定依赖于数学技能。数学毕业生拥有很强的可转移技能，例如突出的数学计算能力、分析和解决问题的能力。你的专业学习需要经常使用计算机软件；这些 IT 技能经常可以转化成雇主对 IT 技能的要求。向普通听众解释数学思路和方法的能力也得到用人单位的高度重视。

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

我们的一些毕业生对教育感兴趣；研究生教育证书 (PGCE) 是一个很普及的认证；谢菲尔德大学 (和很多其他大学) 都提供这样的学位。它由教育系运行；你应该和他们联系索取更多信息。其他一些毕业生选择更专业化的研究生学位，例如我们自己的统计硕士和数学硕士学位。

Students are strongly advised to make use of the wide range of resources that the Careers Service

has to offer. The Careers Service (<http://www.shef.ac.uk/careers/>) is located at 388 Glossop Road, on the corner of Glossop Road and Durham Road. There is also a Student Jobshop in the Student Union.

我们强烈建议学生充分利用就业服务提供的各种资源。就业服务 (<http://www.shef.ac.uk/careers/>) 的地址是 388 Glossop 路，在 Glossop 路和 Durham 路的交界处。学联里也有一个 Student Jobshop。

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

就业服务开设有一个 20 学分的课程：CAS201 (职业管理技巧)。数学与统计学院开设有 MAS279 (职业发展技巧)；这是一门专门针对数学学生的职业课程，对若干单一专业学生开放。

The Staff-Student Forum 教师学生论坛

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

秋季学期开学之后我们会邀请学生为教师学生论坛代表提名。如果有可能，请考虑竞选成为论坛代表。它给你一个机会去参与组织和管理影响数学和统计学院学生生活的各种决定。论坛通常每学期组织两次会议。若干学生成员同时作为学生代表参加学院教学委员会。

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

你可以随时向论坛成员提出需要注意的教学问题。你可以在下面网页上找到更多信息：<http://www.sheffield.ac.uk/maths/current/representation>；在那里你也可以找到一个问题反馈表。你反馈的内容会传达至 SoMaS 接待室，并最终转给教学主任。

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

此外，你还有机会成为理学院的学生代表。

Study room 课外学习专用教室

I19 Hicks, on the 5th floor, is a study room for undergraduates. It has plenty of space, tables and chairs and a whiteboard, and is intended for quiet study. It is somewhere you can go to make productive use of time in between lectures and tutorials, and might be especially useful if you are in the Hicks Building and you do not want to use time going to the Information Commons, Library, Student Union or wherever. There is a smaller room, the Barry Jackson Room, at the back of the ground floor of the building, just before Lecture Rooms 3 and 4. This is also somewhere you can go to sit down, but with maybe less of an expectation of peace and quiet, more a social space.

位于 Hicks 楼 6 楼的 I19 室用于本科生的课外学习。它有足够的空间和桌椅，还有一个白板；是专门为安静学习提供的。你可以到那里学习，充分利用课堂之间的时间；如果你正在 Hicks 楼，不想浪费时间走到信息共享空间，图书馆，学联或者任何其他地方，这个教室就显得更加的有用。另外一个稍小的房间，Barry Jackson 室，在 Hicks 楼一层靠里，教室 3 和 4 前面。这也是一个你可以休息的地方，但是这里更多地属于一个社交空间，所以不要祈求这里会很安静。

Voluntary work 义工

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

谢菲尔德大学鼓励它的学生考虑参与一些志愿者工作。下面这些文字来自学联里的 Sheffield Volunteering 的管理人：

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

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

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

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

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

SoMaS arranges a small number of school volunteering activities itself. There is a mailing

list (somas-schools-volunteers@sheffield.ac.uk) for interested students, with a very low level of traffic (maybe three emails per semester). An email will be sent around at the beginning of each academic year to find interested students, but students can be added to it at any time by emailing James Cranch (j.d.cranch@sheffield.ac.uk)

‘做义工是了解这个城市和它的居民非常好的一个方式。你可以获得和就业有关的体验，或者仅仅参与对你有吸引力的工作。

‘你可以仅仅抽一天的时间，或者每一个或者两个礼拜抽出几个小时的时间，弹性非常大。考试和放假期间我们也不会需要你工作。

‘你可以从 100 多个选项里选择，这些工作可能在学生公寓附近或者在市中心。或者，我们也可以帮助你设计你的义工项目，和其他学生合作，让社区变得更好。

‘我们的工作人员能帮助你找到适合你的工作。我们提供培训和自行垫付的费用。

‘让自己与众不同！访问<http://www.sheffieldvolunteering.info>或者来 Source (学联四楼) 来看我们。’

SoMaS 也组织少量的涉及中学的义工活动。感兴趣的学生可以参加这个邮件列表 (somas-schools-volunteers@sheffield.ac.uk)；这个邮件列表的邮件数量非常低（可能一个学期会有三封邮件）。每个学年度开始的时候我们会发一封群发邮件，招募感兴趣的学生，但是任何学生随时都可以要求加入邮件列表；请给 James Cranch (j.d.cranch@sheffield.ac.uk) 发邮件咨询。

Where else to find Information 哪里还可以找到更多信息

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

Hicks 楼 F10 室外面的信息板上也会公布有用信息。

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

紧急信息会在 Hicks 楼入口大厅里公示，或者通过电子邮件发送。请定期查阅信息板和电子邮件。

Office-holders in the School 学院负责人

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

你可以在以下网页找到目前数学与统计学院的负责人的名单和联系方式：<http://www.maths.dept.shef.ac.uk/math/contact.html>。

Official University Information for Students on the Web 大学正式文件网页链接

General regulations (including degree regulations) 总规定 (包括学位规定)

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

General Regulations relating to Academic Appeals 和学术申诉有关的总规定

http://calendar.dept.shef.ac.uk/calendar/06h_gen_regs_as_to_academic_appeals.pdf

Regulations and procedures for grievances and complaints, Appeals 关于不公平待遇, 投诉, 申诉的规定

<http://www.shef.ac.uk/ssid/complaints-and-appeals>

Specific SoMaS programme regulations 数学与统计学院学位规定

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

SSiD web pages (including exam information, fees, finance, etc.) SSiD 网页 (包括考试信息, 收费, 理财, 等等)

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

LeTS (Learning and Teaching Services) 学习与教学服务

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

CICS IT information for students 面向学生的 IT 服务

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

Student Rights and Responsibilities 学生的权利与义务

<https://www.sheffield.ac.uk/ssid/ourcommitment/rights>

Help and support for students 学生支持服务

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

Disability and dyslexia support 残障与阅读障碍服务

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

Essential guide for mature students 成熟学生指引

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

Information for international students 国际学生有关信息

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

7 Health and Safety 健康与安全

Smoking 吸烟

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

我们提醒您学校的任何建筑物里都禁止吸烟，这包括 Hicks 楼主入口的雨棚覆盖的区域。此外，我们要求您也尽量避免在紧挨出口处的台阶上吸烟。

First Aid 紧急医疗包

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

SoMaS 接待室 (F10) 和 Hicks 门外室 (Hicks 大厅 D 楼) 里都有紧急医疗包。在这两个地方的附近可以找到有资格实行紧急医疗救助的人员名单。

Fire Alarm 火警

If the fire alarm sounds in the Hicks Building, please proceed calmly to the nearest exit and assemble in the designated area (on the concourse, underneath the road bridge). **Do not** use lifts. **Do not** re-enter the building until you have been told that it is safe to do so by a fire officer. Note that the alarm is tested for about 30 seconds on Wednesdays at about 9.30.

如果 Hicks 楼发生火警，请冷静地从最近的出口离开大楼，到指定地点集合（路桥底下的会聚点）。**不要**使用电梯。除非消防员通知你已经可以安全返回，否则**不要**进入大楼。注意，每个星期三的 9 点 30 分，我们会对警报器进行测试；此过程大约持续 30 秒。

8 Cover sheet arrangements 关于大作业封面页的安排

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

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

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

如果记分大作业要上交至 SoMaS 接待室 (F10)，上交过程要遵循一些特殊的规定。

- (i) 所有递交到接待室的大作业都要有一个封面页。
- (ii) 学生可以通过如下链接获取封面页的电子版 <https://sciencecoversheet.group.shef>:
 - (a) 请用你的大学用户名和密码登录;
 - (b) 大作业的封面页在该作业截止日期前的一个礼拜内才可以下载，以避免过早提交的情况;
 - (c) 每个学生都有独一无二的封面页 – 为朋友打印封面页是行不通的!
- (iii) 你需要将打印出来的封面页订在作业的封面 (或者把封面页和作业装在同一个透明塑料文件套中)，然后投进接待室外面的投递口 (投递箱的设置是为了方便同学们在接待室上班时间以外提交作业)。

如果你在查阅或者下载封面页的时候碰到任何问题，请联系hickstudentsupport@sheffield.ac.uk，或者到接待室来设法解决你的问题。

9 List of Modules in the First Stage 第一阶段所有模块列表

Semester 1 第一学期

军事理论 Military Theory	0
军训 Military Training	0
入学教育 Entrance Education	0
大学体育-1 College Physical Education-1	1
英语强化 English Strengthening	4
普通英语-1 Comprehensive English I	3
信息技术训练 Information Technology training and testing	1
高等微积分-1 Advanced Calculus-1	5
线性代数与解析几何-1 Linear Algebra and Analytic Geometry-1	5

Semester 2 第二学期

大学体育-2 College Physical Education-2	1
英语口语 Spoken English	2
普通英语-2 Comprehensive English-2	5.5
VFP 程序设计 Visual FoxPro Programming	5
微观与宏观经济学原理 Microeconomic & Macroeconomic Principles	4
高等微积分-2 Advanced Calculus-2	5
线性代数与解析几何-2 Linear Algebra and Analytic Geometry-2	2
Introduction to Probability and Statistics I 概率统计导论-1	4

Semester 3 第三学期

英语写作 English Writing	3
大学体育 College Physical Education	1
经济学原理 Principles of Economics	3
Introduction to Probability and Statistics II 概率统计导论-2	4
金融学概论 Introduction to Finance	3
Differential and Difference Equations 微分与差分方程	4
高等微积分-3 Advanced Calculus 3	4

Semester 4 第四学期

毛泽东思想和中国特色社会主义理论体系概论 Introduction to Mao Zedong Thought and Chinese Socialism Theory	3
英语科技写作 Scientific English Writing	3
大学体育 College Physical Education	1
Methods for Differential Equations 微分方程方法	4
Statistics Core 统计基础	4
Continuity and Integration 连续性与积分	4
应用随机过程 Applied Stochastic Processes	3
财务会计导论 Introduction to Financial Accounting	4
多元统计分析 Multivariate Statistical Analysis	2
英语强化 English Strengthening	
社会实践 Social Practice	1

Semester 5 第五学期

马克思主义基本原理 Basic Principles of Marxism	3
科技英语写作 Scientific English Writing	3
Statistics Core 统计基础	4
Continuity and Integration 连续与积分	4
财务管理 Financial Management	4
Statistical Modelling 统计建模	4
信息检索与文献阅读 Information Retrieval and Literature Reading	1

Semester 6 第六学期

Operations Research 运筹学	4
Statistical Reasoning 统计推理	4
Financial Mathematics 金融数学	4
Vector Spaces 向量空间	2
Fourier Theory 傅立叶理论	2
公司金融和资产定价导论 Introduction to Corporate Finance and Asset Pricing	4
计量经济学 Econometrics	3
社会实践 Social Practice	1

10 Sheffield Module Descriptions 谢菲尔德大学模块简 要介绍

MAS190: Introduction to Probability and Statistics 1 (NJTech)

Semester 2 10 credits

Prerequisites:

Corequisites:

Cannot be taken with:

Prerequisite for:

Description

This module is the first of two providing an introduction to the fields of probability and statistics, which form the basis of much of applicable mathematics and operations research. The theory behind probability and statistics will be introduced, along with examples occurring in such diverse areas as medicine, finance, sport, the environment, law and so on. Some of the computational statistical work will make use of the statistics package R.

Aims

- Introduce students to the theory of probability, including applications to practical examples;

syllabus

1. Introduction

- Statistical and probabilistic modelling, and the need for a mathematical theory of chance.

2. Basic Probability

- Sets, unions, intersection, complement. Venn diagrams. Sample spaces and events.

- The idea of measure of a set. Counting measure. Properties of measures. Probability as measure.
- Calculating probabilities in practice - use of symmetry, relative frequencies, subjective probability.
- Joint and conditional probability, Bayes theorem, prior and posterior probabilities. Independence.

3. Discrete Random Variables

- Discrete random variables. Cumulative distributions and probability laws/ mass functions.
- Expectation and variance and their properties (e.g. $E(X+Y) = E(X)+E(Y)$, $E(aX+b) = aE(X) + b$, $Var(aX + b) = a^2Var(X)$.)
- Bernoulli, binomial, Poisson and geometric random variables. Calculations of laws, means and variances. The Poisson distribution as the limit of a binomial. The binomial and Poisson distribution in R.
- Multivariate discrete random variables. Covariance and correlation between two discrete random variables. The multinomial distribution.

4. Continuous Random Variables

- Area under a curve as a measure. Probability via integration. Continuous random variables and their pdfs.
- Examples. Uniform and exponential distributions.
- Mean and variance as integrals.
- The normal distribution. The normal distribution in R. The standard normal Z . Mean and variance in general case via $X = \sigma Z + \mu$.

Module Format

Lectures	32	Tutorials	32	Practicals	0
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Recommended books

- B** Applebaum “Probability and information : an integrated approach” (2nd ed) (ISBN 9780521899048)
- B** Dekking, Kraaikamp, Lopuhaa and Meester: “A modern introduction to probability and statistics: understanding why and how” (ISBN 9781852338961)

- B** Grimmett and Welsh “Probability: an introduction” (ISBN 0198532725)
- B** Ross “A first course in probability (8th ed)” (ISBN 9780136079095)
- B** Blastland and Dilnot “The tiger that isn’t: seeing through a world of numbers” (ISBN 9781861978394)
- B** Schoenberg “Introduction to probability with Texas holdém examples” (ISBN 9781439827680)
- B** Silver “The Signal and the Noise: The Art and Science of Prediction” (ISBN 9781846147524)

Assessment

One formal 2 hour written examination. All questions compulsory.

MAS191: Introduction to Probability and Statistics 2 (NJTech)

Semester 1 10 credits

Prerequisites:

Corequisites:

Cannot be taken with:

Prerequisite for:

Description

This is the second of two modules providing an introduction to the fields of probability and statistics, which form the basis of much of applicable mathematics and operations research. The theory behind probability and statistics will be introduced, along with examples occurring in such diverse areas as medicine, finance, sport, the environment, law and so on. Some of the computational statistical work will make use of the statistics package R.

Aims

- Introduce students to the theory of probability, including applications to practical examples;
- To develop the students' knowledge and understanding of statistics.

Syllabus

1. Introducing Statistics

2. Estimation and Uncertainty

- Estimation and the need to consider uncertainty in estimates, with examples from the media. Estimating a population mean from a sample: probabilistic modelling of random sampling from a population, and the difference between X_i and x_i .
- Independent random variables. Sums of i.i.d. random variables. Chebyshev's inequality and the law of large numbers.
- The central limit theorem.
- An estimator \bar{X} as a random variable.

- Bias, standard error and consistency; the expectation and variance of \bar{X} .
- Estimating a proportion and a variance. Mean and variance of estimators in both cases.
- Introduction to interval estimation, confidence interval for the mean with known variance, large samples and use of the CLT.
- The case of unknown variance, the t distribution, confidence intervals for the mean with unknown variance.
- Confidence intervals for population mean, with known and unknown population variance.
- Estimating variance, the chi-square distribution, confidence intervals for the variance.

3. Hypothesis tests

- The role of statistics in medical research. The principles of hypothesis testing. A hypothesis test using the binomial distribution (e.g. the lady tasting tea). The size of a test and p -values.
- Z -test and t test (one and two sample). Implementation using R.
- The power of a test, and choosing a sample size.

4. Inference for the multinomial distribution, and analysis of contingency tables

- Inference for the multinomial, goodness of fit tests, and why the χ^2 test works.
- Contingency tables, testing for independence and homogeneity, implementation in R

Module Format

Lectures	32	Tutorials	32	Practicals	0
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Recommended books

- B** Applebaum “Probability and information : an integrated approach (2nd ed)” (ISBN 9780521899048)
- B** Dekking, Kraaikamp, Lopuhaa and Meester “A modern introduction to probability and statistics: understanding why and how” (ISBN 9781852338961)
- B** Grimmett and Welsh “Probability : an introduction ” (ISBN 0198532725)
- B** Ross “A first course in probability (8th ed)” (ISBN 9780136079095)
- B** Trosset “An introduction to statistical inference and its applications with R” (ISBN 9781584889472)

- C Blastland and Dilnot “The tiger that isn’t: seeing through a world of numbers” (ISBN 9781861978394)
- C Pruij “Foundations and Applications of Statistics” (ISBN 0821852337)
- C Schoenberg “Introduction to probability with Texas hold’em examples” (ISBN 9781439827680)
- C Silver “The Signal and the Noise: The Art and Science of Prediction” (ISBN 9781846147524)

Assessment

One formal 2 hour written examination. All questions compulsory.

MAS192: Differential and Difference Equations (NJTech)

Semester 1 10 credits

Prerequisites:

Corequisites:

Cannot be taken with:

Prerequisite for:

Description

This unit introduces students to differential and difference equations, which are fundamental to many areas of applied mathematics. The course is based around techniques for solving elementary first and second order differential and difference equations, using both analytic and simple numerical methods. The use of the computer algebra package Maple to solve problems is an important part of the course. The course also explores one area in which the techniques learned can be applied, namely population dynamics.

Aims

- Introduce elementary techniques for solving first and second order differential and difference equations;
- Introduce some simple applications of differential and difference equations in population dynamics.

Outline syllabus

There is no recorded outline syllabus for this module.

Module Format

Lectures	32	Tutorials	32	Practicals	0
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Recommended books

- B** Boyce and DiPrima “Elementary Differential Equations and Boundary Value Problems” (ISBN 0471644544)
- B** Fulford, Forrester and Jones “Modelling with differential and difference equations” (ISBN 052144618X)
- B** Jones, Plank and Sleeman “Differential equations and Mathematical Biology” (ISBN 1420083570)
- B** Jordan and Smith “Mathematical Techniques” (ISBN 0199249725)
- B** Kelley and Peterson “Difference equations: an introduction with applications” (ISBN 012403330X)
- B** Kreyszig “Advanced Engineering Mathematics” (ISBN 0471728977)
- B** Swokowski “Calculus with analytic geometry” (ISBN 0871500078)

Assessment

One formal 2 hour written examination. All questions compulsory.

MAS290: Methods for Differential Equations (NJTech)

Semester 2 10 credits

Prerequisites:

Corequisites:

Cannot be taken with:

Prerequisite for:

Description

Differential equations arise in most models of real phenomena, including particle mechanics, biology and economics. The first half of this module covers first order differential equations in two variables, with emphasis on geometric features of the phase diagram, linearisation near equilibrium points, and stability analysis using Lyapunov functions. The second half of the course covers power series methods for solution of second order linear equations near ordinary points or regular singular points.

Aims

- To consolidate previous knowledge and develop level 1 work.
- To develop analytical techniques for solving systems of first order differential equations.
- To introduce phase portraits of two-dimensional systems.
- To extend the students' knowledge of linear and non-linear ordinary differential equations.

Outline syllabus

There is no recorded outline syllabus for this module.

Module Format

Lectures	32	Tutorials	32	Practicals	0
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Recommended books

B Teschl “Ordinary Differential Equations and Dynamical Systems” (ISBN 0821883283)

B Trench “Elementary Differential Equations” (ISBN 0534368417)

Assessment

One formal 2 hour written examination. All questions compulsory.

MAS291: Statistics Core (NJTech)

Semester 2 10 credits

Prerequisites: MAS191 (Introduction to Probability and Statistics 2 (NJTech))

Corequisites:

Cannot be taken with:

Prerequisite for:

Description

This unit develops tools and ideas underpinning probability and statistics at Level 2 and higher. It introduces some standard distributions beyond those met in MAS190-191, and uses the package R to study them. It proceeds to a systematic treatment of continuous multivariate distributions, with particular emphasis on the multivariate normal distribution. Transformations of univariate and multivariate continuous distributions are studied, with the derivation of sampling distributions of important summary statistics as applications. The idea of likelihood is developed, including the exploration and visualization of likelihood functions and surfaces using R, and the concept of maximum likelihood estimation.

Aims

- Extend students' familiarity with standard probability distributions.
- Give practice in handling discrete and continuous distributions, especially continuous multivariate ones.
- Instil an understanding of the rationale and techniques of likelihood exploration and maximisation.
- Extend students' experience of using R for numerical and graphical tasks.

Outline syllabus

- Univariate distribution theory
- Continuous multivariate distributions and the multivariate normal
- Likelihood

Module Format

Lectures	32	Tutorials	32	Practicals	0
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Recommended books

- B** Freund, Miller and Miller “John E. Freund’s Mathematical Statistics with Applications” (ISBN 0131246461)
- B** Mood, Graybill and Boes “Introduction to the Theory of Statistics” (ISBN 0070854653)

Assessment

One formal 2 hour written examination. All questions compulsory.

MAS292: Continuity and Integration (NJTech)

Semester 1 10 credits

Prerequisites:

Corequisites:

Cannot be taken with:

Prerequisite for:

Description

The calculus of A-level and first year courses is sufficient for many intermediate applications, but quite inadequate as a foundation for more advanced studies. The theory of Fourier series shows its shortcomings very well, and generalisations of the calculus to infinite-dimensional spaces (which are very valuable in clarifying more difficult problems) are impossible without a more accurate appreciation of how single variable calculus works. This course provides just such a rigorous analysis of single variable calculus and, in doing so, challenges the imagination with weird examples showing how strange functions can be, while still being amenable to study.

Aims

- To give students an understanding of and facility with rigorous real analysis, and an appreciation of the need for rigour.
- To give students an understanding of integration defined in terms of areas and its relation to integration as the inverse of differentiation.

Outline syllabus

- Introduction.
- Limits.
- Continuity.
- Differentiation.
- Integration.

Module Format

Lectures	32	Tutorials	32	Practicals	0
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Recommended books

- B Abbott “Understanding Analysis” (ISBN 978-0387950600)
- B Binmore “Mathematical Analysis: a Straightforward Approach” (ISBN 0521288827)
- B Bryant “Yet another Introduction to Analysis” (ISBN 052138835X)
- C Rudin “Principles of mathematical analysis” (ISBN 0070856133)

Assessment

One formal 2 hour written examination. All questions compulsory.

MAS293: Statistical Modelling (NJTech)

Semester 1 10 credits

Prerequisites:

Corequisites:

Cannot be taken with:

Prerequisite for:

Description

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

Aims

- To consider linear regression models in detail.
- To extend the comparison of means from two to several groups through ANOVA models.
- To give students experience in the use of R for fitting linear models.

Outline syllabus

There is no recorded outline syllabus for this module.

Module Format

Lectures	32	Tutorials	22	Practicals	10
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Recommended books

B Draper and Smith “Applied Regression Analysis” (ISBN 0471170828)

B Faraway “Linear models with R” (ISBN 1584884258)

B Kleinbaum, Kupper, Muller and Nizam “Applied Regression Analysis and Other Multi-variable Methods” (ISBN 0495384968)

Assessment

One formal 2 hour written examination. All questions compulsory.

MAS294: Statistical Reasoning (NJTech)

Semester 1 10 credits

Prerequisites:

Corequisites:

Cannot be taken with:

Prerequisite for:

Description

Statistics is about learning from data — often uncertain and variable — about underlying regularities of the real world. At first sight the methods for statistical analysis can appear particular to each application. This unit however shows that they can be founded on simple universal principles of statistical reasoning. There are two principal forms of statistical reasoning, known as frequentist and Bayesian inference. These principles simplify understanding and give powerful tools for analysing new problems. They form the basis for more specialist modules in Level 3/Level 4. The course will show how practical analyses follow from the principles, and will illustrate their power through a set of case studies of real-world problems from areas such as medicine, economics, technology and the environment.

Aims

- To formulate the process of inference in terms of parametric models.
- To introduce both frequentist and Bayesian inferential frameworks.
- To illustrate the scope of the principles with practical applications.

Outline syllabus

There is no recorded outline syllabus for this module.

Module Format

Lectures	32	Tutorials	32	Practicals	0
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Recommended books

- B** Kalbfleisch “Probability and Statistical Inference Vol 2: Statistical Inference” (ISBN 3540961836)
- B** Lee “Bayesian Statistics: An Introduction” (ISBN 0340814055)
- C** Azzalini “Statistical Inference: Based on the Likelihood” (ISBN 041260650X)

Assessment

One formal 2 hour written examination. All questions compulsory.

MAS295: Vector Spaces (NJTech)

Semester 2 10 credits

Prerequisites:

Corequisites:

Cannot be taken with:

Prerequisite for:

Description

This course introduces abstract vector spaces and linear transformations, building on the concrete approach with matrices in earlier courses. Many results that were merely stated, or proved by matrix methods, will be given conceptual proofs in this course. The abstract approach will allow us to give efficient proofs that simultaneously tell us interesting things about vectors, matrices, polynomials, sequences, differential equations, and many other objects. A central aim of the course is to help students become comfortable with the required level of abstraction.

Aims

- Introduce the abstract theory of vector spaces and linear maps between them.
- Introduce the abstract theory of inner product spaces.
- Familiarise students with abstract and axiomatic mathematics.

Outline syllabus

- Vector spaces, linear maps, subspaces.
- Independence and spanning sets.
- Linear maps out of \mathbf{R}^n ; matrices for linear maps.
- Theorems about bases.
- Eigenvalues and eigenvectors.

Module Format

Lectures	16	Tutorials	16	Practicals	0
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Recommended books

C Friedberg, Insel, Spence “Linear Algebra” (ISBN 1292026502)

C Halmos “Finite-dimensional vector spaces” (ISBN 1461263891)

Assessment

One formal 2 hour written examination. All questions compulsory.

MAS296: Fourier Theory (NJTech)

Semester 2 10 credits

Prerequisites:

Corequisites:

Cannot be taken with:

Prerequisite for:

Description

We introduce inner product spaces, including the space of continuous periodic functions. This allows us to define distances and angles between functions, by analogy with distances and angles between vectors in \mathbf{R}^3 . We then reinterpret the theory of Fourier series in these terms. We also discuss adjoints of operators. We show that any self-adjoint operator admits an orthonormal basis of eigenvectors, and that the eigenvalues are all real numbers.

Aims

- Introduce the abstract theory of inner product spaces.
- Reinterpret Fourier theory in terms of inner product spaces.
- Familiarise students with abstract and axiomatic mathematics.

Outline syllabus

- Inner products and the Cauchy-Schwartz inequality.
- Projections and the Gram-Schmidt procedure.
- Adjoints, and diagonalisation of self-adjoint operators.
- Fourier theory and the L^2 convergence theorem.

Module Format

Lectures	16	Tutorials	16	Practicals	0
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Recommended books

A Friedberg, Insel, Spence “Linear Algebra” (ISBN 1292026502)

Assessment

One formal 2 hour written examination. All questions compulsory.

MAS3090: Operations Research (NJTech)

Semester 1 10 credits

Prerequisites:

Corequisites:

Cannot be taken with:

Prerequisite for:

Description

Mathematical Programming is the title given to a collection of optimisation algorithms that deal with constrained optimisation problems. Here the problems considered will all involve constraints which are linear, and for which the objective function to be maximised or minimised is also linear. These problems are not continuously differentiable; special algorithms have to be developed. The module considers not only the solution of such problems but also the important area of post-optimality analysis; i.e. given the solution can one answer questions about the effect of small changes in the parameters of the problem (such as values of the cost coefficients)?

Aims

- To develop the mathematical skills that will provide you with the appropriate foundations for further mathematical studies in Operations Research.
- To enable you to analyse OR problems that may arise in your future employment.

Outline syllabus

- Graphical techniques
- The Simplex Method
- Artificial variables, the M-Method and the two-phase Method
- The dual simplex Method
- Integer Programming and piece-wise linear programming
- Duality
- Elementary post-optimality analysis

Module Format

Lectures	32	Tutorials	22	Practicals	10
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Recommended books

B Taha “Operations Research” (ISBN 0131889230)

B Thie and Keough “An Introduction to Linear Programming and Game Theory” (ISBN 978-0470232866)

C Bertsimas and Tsitsiklis “Introduction to Linear Optimization” (ISBN 1886529191)

C Winston “Introduction to Mathematical Programming” (ISBN 0534359647)

Assessment

One formal 2 hour written examination (75% of final marks). Format: 4 compulsory questions.

Computer project (25% final marks)

MAS3091: Financial Mathematics (NJTech)

Semester 2 5 credits

Prerequisites:

Corequisites:

Cannot be taken with:

Prerequisite for:

Description

The discovery of the Capital Asset Pricing Model by William Sharpe in the 1960's and the Black-Scholes option pricing formula a decade later mark the beginning of a very fruitful interaction between mathematics and finance. The latter obtained new powerful analytical tools while the former saw its knowledge applied in new and surprising ways. (A key result used in the derivation of the Black-Scholes formula, Ito's Lemma, was first applied to guide missiles to their targets; hence the title 'rocket science' applied to financial mathematics). This course describes the mathematical ideas behind these developments together with their applications in modern finance.

Aims

- To introduce students to the mathematical ideas and methods used in finance.
- To familiarise students with financial instruments such as shares, bonds, forward contracts, futures and options.
- To familiarise students with the notion of arbitrage and the notion of no-arbitrage pricing.
- To introduce the binomial tree and geometric Brownian motion models for stock prices.
- To familiarise students with the Black-Scholes option pricing method.
- To introduce the Capital Asset Pricing Model.

Outline syllabus

- Introduction, arbitrage, forward and futures contracts
- Options, binomial trees, risk-neutral valuation
- Brownian motion and share prices, the Black-Scholes analysis
- Portfolio theory, the Capital Asset Pricing Model.

Module Format

Lectures	32	Tutorials	32	Practicals	0
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Recommended books

- B** Capinski and Zastawniak “Mathematics for Finance: An Introduction to Financial Engineering” (ISBN 1852333308)
- B** Hull “Options, futures and other derivatives” (ISBN 0131499084)
- B** Sharpe “Portfolio theory and capital markets” (ISBN 0071353208)

Assessment

MAS330: Topics in Number Theory

Semester 1 10 credits

Prerequisites: MAS211 (Advanced Calculus and Linear Algebra)

Corequisites:

Cannot be taken with:

Prerequisite for: [MAS345](#) (Codes and Cryptography)

Description

The course covers topics in elementary Number Theory. This includes Modular Arithmetic, and properties of primes and integers. Most of the material (with the notable exception of the RSA cryptosystem) has been introduced by Fermat, Euler and Gauss in the 17th, 18th and 19th centuries.

Aims

- To introduce various topics in number theory

Outline syllabus

1. Modular Arithmetic
 - Linear Congruences
 - Fermat's Little Theorem and the RSA cryptosystem.
 - Arithmetic functions.
 - Euler's function and Euler's theorem.
 - Gauss' Quadratic Reciprocity Law.
2. Primes, Integers and Equations
 - Perfect numbers, Mersenne primes, Fermat primes.
 - Pythagorean triples and Fermat Last Theorem.
 - Generating functions and partitions.
 - Continued fractions.
 - Pell's equation.

Module Format

Lectures	20	Tutorials	0	Practicals	0
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Recommended books

- B** Burton "Elementary number theory" (Shelfmark 512.81 (B), ISBN 0071121749)
- B** Rose "A course in number theory"

Assessment

One formal 2.5 hour written examination. Format: 4 questions from 4.

MAS331: Metric Spaces

Semester 1 10 credits

Prerequisites:	MAS221 (Analysis)
Corequisites:	
Cannot be taken with:	
Prerequisite for:	MAS345 (Algebraic Topology); MAS436 (Functional Analysis)

Description

This unit explores ideas of convergence of iterative processes in the more general framework of metric spaces. A metric space is a set with a “distance function” which is governed by just three simple rules, from which the entire analysis follows. The course follows on from MAS221 ‘Analysis’, and adapts some of the ideas from that course to the more general setting. The course includes the Contraction Mapping Theorem, which guarantees the convergence of quite general processes; there are applications to many other areas of mathematics, such as to the solubility of differential equations.

Aims

- To point out that iterative processes and convergence of sequences occur in many areas of mathematics, and to develop a general context in which to study these processes
- To provide a basic course in analysis in this setting
- To reinforce ideas of proof
- To illustrate the power of abstraction and show why it is worthwhile
- To provide a foundation for later analysis courses

Outline syllabus

- Metric spaces: definition, properties and examples
- Convergence of sequences
- Open and closed subsets
- Continuity
- Cauchy sequences, completeness
- Iteration and the Contraction Mapping Theorem

- Compactness

Module Format

Lectures	20	Tutorials	0	Practicals	0
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Recommended books

- B** Bryant “Metric spaces: iteration and application” (Shelfmark 512.811 (B), ISBN 0521268575)
- B** Carothers “Real Analysis” (Shelfmark 517.51 (C), ISBN 0521497493)
- B** Haaser and Sullivan “Real Analysis” (Shelfmark 517.51(H), ISBN 0486665097)
- C** Kreyszic “Introductory Functional Analysis with applications” (Shelfmark 517.5 (S), ISBN 0471507318)

Assessment

One formal 2.5 hour written examination. Format: 4 compulsory questions.

MAS332: Complex Analysis

Semester 1 10 credits

Prerequisites:	MAS211 (Advanced Calculus and Linear Algebra)
Corequisites:	
Cannot be taken with:	
Prerequisite for:	MAS430 (Analytic Number Theory); MAS436 (Functional Analysis); Desirable but not essential for MAS342 (Applicable Analysis)

Description

It is natural to use complex numbers in algebra, since these are the numbers we need to provide the roots of all polynomials. In fact, it is equally natural to use complex numbers in analysis, and this course introduces the study of complex-valued functions of a complex variable. Complex analysis is a central area of mathematics. It is both widely applicable and very beautiful, with a strong geometrical flavour. This course will consider some of the key theorems in the subject, weaving together complex derivatives and complex line integrals. There will be a strong emphasis on applications.

Aims

- To introduce complex functions of a complex variable
- To demonstrate the critical importance of differentiability of complex functions of a complex variable, and its surprising relation with path-independence of line integrals
- To demonstrate the relevance of power series in complex analysis
- To develop the subject of complex analysis rigorously, highlighting its logical structure and proving several of the fundamental theorems
- To discuss some applications of the theory, including to the calculation of real integrals

Outline syllabus

- Revision of complex numbers
- Special functions
- Simple integrals of complex-valued functions
- Open sets, neighbourhoods and regions

- Differentiability; Cauchy-Riemann equations, harmonic functions
- Power series and special functions
- Complex line integrals
- Cauchy's Theorem
- Cauchy's integral formula and Cauchy's formula for derivatives
- Taylor's Theorem
- Laurent's Theorem and singularities
- Cauchy's Residue Theorem and applications

Module Format

Lectures	20	Tutorials	0	Practicals	0
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Recommended books

- B** Priestley “Introduction to complex analysis” (Shelfmark 517.53 (P), ISBN 0198534299)
- B** Stewart and Tall “Complex analysis” (Shelfmark 517.53 (S), ISBN 0521245133)
- B** Wunsch “Complex Variables with Applications” (ISBN 0201122995)
- C** Spiegel “Schaum” (Shelfmark 517.53 (S), ISBN 0070843821)

Assessment

One formal 2.5 hour written examination. Format: 4 questions from 5.

MAS334: Combinatorics

Semester 1 10 credits

Prerequisites: MAS211 (Advanced Calculus and Linear Algebra)

Corequisites:

Cannot be taken with:

Prerequisite for:

Description

Combinatorics is the mathematics of selections and combinations. For example, given a collection of sets, when is it possible to choose a different element from each of them? That simple question leads to Hall's Theorem, a far-reaching result with applications to counting and pairing problems throughout mathematics.

Aims

- To illustrate the wide range of selection problems in combinatorial mathematics
- To teach the basic techniques of selection and arrangement problems
- To show how to solve a wide range of natural counting problems using these techniques

Outline syllabus

- The binomial coefficients
- Three basic principles: parity, pigeon-holes and inclusion/exclusion
- Rook polynomials
- Hall's Marriage Theorem and its applications
- Latin squares
- Block designs and codes

Module Format

Lectures	20	Tutorials	0	Practicals	0
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Recommended books

B Anderson “A first course in combinatorial mathematics” (Shelfmark 519.21 (A), ISBN 0198596731)

B Bryant “Aspects of combinatorics” (Shelfmark 511.6 (B), ISBN 0521429978)

Assessment

One formal 2.5 hour examination. Format: answer all questions.

MAS336: Differential Geometry

Semester 1 10 credits

Prerequisites: MAS211 (Advanced Calculus and Linear Algebra)

Corequisites:

Cannot be taken with:

Prerequisite for:

Description

Differential geometry is the study of geometric objects using calculus, and it has plenty of applications in other sciences and engineering. In this introductory course, the geometric objects of our interest will be curves and surfaces. You will learn more about such familiar notions as arc lengths, angles and areas. You will also learn how to quantify the “shape” of an object, via various notions of *curvature*. There are rich interactions between curvature and other geometric quantities, as illustrated most notably by *Gauss’ Theorem* and the *Gauss-Bonnet Formula*. For example, we can make a map of the Earth that correctly represents either all angles or all areas; but by Gauss’ Theorem, the Earth’s curvature prevents us from ever making a map that correctly represents distances. The Gauss-Bonnet Formula has a “local version”, which computes the sum of angles in a triangle on a surface, as well as a “global version”, which reveals a far-reaching connection between some small- and large-scale geometric behaviours.

Aims

- Introduce differential geometry: its goals, techniques and applications;
- Convert intuitive ideas into mathematical concepts that allow quantitative studies and development of sophisticated results;
- Illustrate geometric concepts and results through many examples.

Outline syllabus

Curves in R^2

- basic notions and examples
- curvature

Surfaces in R^3

- basic notions and examples
- metric quantities
- curvature
- Gauss' Theorem and the Gauss-Bonnet Formula

Module Format

Lectures	20	Tutorials	0	Practicals	0
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Recommended books

B Pressley “Elementary differential geometry” (Shelfmark 513.73 (P), ISBN 1852331526)

Assessment

One formal 2.5 hour written exam. Format: 4 questions from 5.

MAS341: Graph Theory

Semester 2 10 credits

Prerequisites: MAS211 (Advanced Calculus and Linear Algebra)

Corequisites:

Cannot be taken with:

Prerequisite for:

Description

A “graph” is a simple mathematical structure consisting of a collection of points, some pairs of which are joined by lines. Their basic nature means that they can be used to illustrate a wide range of situations. The aim of this course is to investigate the mathematics of these structures and to use them in a wide range of applications. Topics covered include trees, Eulerian and Hamiltonian graphs, planar graphs, embedding of graphs in surfaces, and graph colouring.

Aims

- To expound the theory of graphs with brief consideration of some algorithms

Outline syllabus

- Definition and examples
- Trees
- Eulerian graphs
- Hamiltonian graphs
- The Travelling Salesman Problem
- The Shortest and Longest Path Algorithms
- Planar graphs
- Embedding graphs in surfaces
- Vertex colouring
- Edge colouring
- Face colouring

Module Format

Lectures	20	Tutorials	0	Practicals	0
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Recommended books

- B** Bryant “Aspects of combinatorics” (Shelfmark 519.21 (B), ISBN 0521429978)
- B** Wilson “Introduction to graph theory” (Shelfmark 513.83 (W), ISBN 0582249937)
- C** Wilson “Four colours suffice” (Shelfmark 513.83 (W), ISBN 014100908x)

Assessment

One formal 2.5 hour written examination. Format: 4 questions from 5.

MAS343: History of Mathematics

Semester 2 10 credits

Prerequisites:

Corequisites:

Cannot be taken with:

Prerequisite for:

Description

The course aims to introduce the student to the study of the history of mathematics. The main topics discussed are Egyptian and Babylonian mathematics, early Greek mathematics, Renaissance mathematics, and the early history of the calculus.

Aims

- To introduce the student to the history of mathematics
- To place mathematical developments into historical perspective
- To train the student to study from a set text
- To encourage independent study and use of the University's libraries
- To allow students to research a topic and then write up a formal report or produce a poster on their findings, which counts towards the continuous assessment part of the course
- To discuss developments in mathematics in various periods, including its beginnings in the Egyptian and Mesopotamian civilizations, its flowering under the ancient Greeks and its renaissance in sixteenth-century Europe.
- To trace the pre-history of the calculus from its beginnings in Greece to its rapid expansion in seventeenth-century Europe.

Outline syllabus

- Introduction
- Egypt and Mesopotamia
- Early Greek mathematics
- Renaissance mathematics
- The route to the calculus

Module Format

Lectures	20	Tutorials	0	Practicals	0
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Recommended books

- A** Boyer and Merzbach “A history of mathematics” (Shelfmark 510.9 (B), ISBN 0471543977)
- B** Katz “A history of mathematics” (Shelfmark 510.9 (K), ISBN 0321016181)
- C** Fauvel and Gray “The history of mathematics: a reader” (Shelfmark 510.9 (H), ISBN 0333427912)

Assessment

One formal 2.5 hour written examination [69%]. Format: 1 compulsory question plus 3 questions from 4. Coursework [31%].

MAS344: Knots and Surfaces

Semester 2 10 credits

Prerequisites: MAS114 (Numbers and Groups)

Corequisites:

Cannot be taken with:

Prerequisite for:

Description

The course studies knots, links and surfaces in an elementary way. The key mathematical idea is that of an algebraic invariant: the Jones polynomial for knots, and the Euler characteristic for surfaces. These invariants will be used to classify surfaces, and to give a practical way to place a surface in the classification. Various connections with other sciences will be described.

Aims

- To present a classification, that of compact surfaces, beginning from definitions and basic examples
- To instill an intuitive understanding of knots and compact surfaces
- To introduce and illustrate discrete invariants of geometric problems
- To show that adding extraneous structure may give information independent of that structure
- To develop the theory of the Euler characteristic
- To illustrate how a general mathematical theory can apply to quite different physical objects, and solve very specific problems about them

Outline syllabus

- Knots and links
- The Jones polynomial
- Surfaces
- The Euler characteristic

Module Format

Lectures	20	Tutorials	0	Practicals	0
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Recommended books

- B** Firby and Gardiner “Surface topology” (Shelfmark 513.83 (F), ISBN 1898563772)
- C** Adams “The knot book” (Shelfmark 513.83 (A), ISBN 0821836781)
- C** Cundy and Rollett “Mathematical models” (Shelfmark 510.84 (C), ISBN 0906212200)
- C** Gilbert and Porter “Knots and surfaces” (Shelfmark 513.83 (G), ISBN 0198514905)
- C** Kauffman “On knots” (Shelfmark 513.83 (K), ISBN 0691084351)

Assessment

One formal 2.5 hour written examination. Format: 4 compulsory questions.

MAS345: Codes and Cryptography

Semester 2 10 credits

Prerequisites: MAS211 (Advanced Calculus and Linear Algebra); MAS330 (Topics in Number Theory)

Corequisites:

Cannot be taken with:

Prerequisite for:

Description

The word ‘code’ is used in two different ways. The ISBN code of a book is designed in such a way that simple errors in recording it will not produce the ISBN of a different book. This is an example of an ‘error-correcting code’ (more accurately, an error-detecting code). On the other hand, we speak of codes which encrypt information — a topic of vital importance to the transmission of sensitive financial information across the internet. These two ideas, here labelled ‘Codes’ and ‘Cryptography’, each depend on elegant pure mathematical ideas: codes on linear algebra and cryptography on number theory. This course explores these topics, including the real-life applications and the mathematics behind them.

Aims

- To introduce the basic ideas connected with error detection and error correction, and various examples of useful codes
- To demonstrate the importance of the simple concepts of Hamming distance and the minimum distance of a code in the theory of error detection and error correction
- To illustrate how linear algebra can be used to good effect in the theory of linear codes
- To give an overview of cryptography from the most basic examples to modern public key systems
- To introduce the number-theoretic concepts used in public-key cryptosystems and to show how these are applied in practical examples

Outline syllabus

- Codes and linear codes

- Hamming distance
- Examples of error-correcting/error-detecting codes
- Classical methods of cryptography
- Results from number theory
- Public key methods of cryptography

Module Format

Lectures	20	Tutorials	0	Practicals	0
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Recommended books

- C Hill “A first course in coding theory” (Shelfmark 003.54 (H), ISBN 0198538030)
- C Koblitz “A course in number theory and cryptography” (Shelfmark 512.81 (K), ISBN 0387942939)
- C Singh “The code book” (ISBN 1857028899)
- C Welsh “Codes and cryptography” (Shelfmark 003.54 (W), ISBN 0198532873)
- C Young “Mathematical ciphers: from Caesar to RSA” (ISBN 0821837303)

Assessment

One formal 2.5 hour written examination. Format: 4 compulsory questions, two on Codes and two on Cryptography.

MAS348: Game Theory

Semester 1 10 credits

Prerequisites: MAS211 (Advanced Calculus and Linear Algebra)

Corequisites:

Cannot be taken with: ECN306 (Game Theory for Economists)

Prerequisite for:

Description

The module will give students an opportunity to apply previously acquired mathematical skills to the study of Game Theory and to some of its applications in Economics.

Aims

- To understand the mathematical concept of a game and to see its manifestations in various real-life settings.
- To understand the notion of Nash equilibrium.
- To understand the technique of backward induction and its applications in the context of sequential games.
- To understand the notion of subgame-perfect Nash equilibria in sequential games.
- To understand the complexities of repeated games.
- To understand the concept of a Bayesian Game and their Nash equilibria.

Outline syllabus

- The formal definition of games both in strategic form and in sequential form.
- Dominated strategies and the solution of games by iterative elimination of dominated strategies.
- Pure and mixed Nash equilibria of games.
- Sequential games: backward induction, Zermelo's Theorem, subgame-perfect Nash equilibria and imperfect information.
- Translation of games in normal form to sequential form and vice versa.
- Applications of game theoretical techniques to real-life problems, e.g., in Economics.
- The notion of equilibria of repeated games.

- Bayesian games and their equilibria.

Module Format

Lectures	20	Tutorials	0	Practicals	0
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Recommended books

B K. Binmore “Playing for Real: Game Theory” (Shelfmark 519.3 (B), ISBN 978-0195300574)

B M. J. Osborne “An introduction to game theory” (Shelfmark 519.3 (O) , ISBN 0195128958)

Assessment

One 2.5 hour exam.

MAS350: Measure and Probability

Semester 2 10 credits

Prerequisites:	MAS211 (Advanced Calculus and Linear Algebra); MAS221 (Analysis)
Corequisites:	
Cannot be taken with:	MAS451 (Measure and Probability)
Prerequisite for:	This or MAS451 (Measure and Probability) are recommended for MAS352 and MAS452 (Stochastic Processes and Finance)

Description

Measure theory is that branch of mathematics which evolves from the idea of “weighing” a set by attaching a non-negative number to it which signifies its worth. This generalises the usual physical ideas of length, area and mass as well as probability. It turns out (as we will see in the course) that these ideas are vital for developing the modern theory of integration.

The module will give students an additional opportunity to develop skills in modern analysis as well as providing a rigorous foundation for probability theory. In particular it would form a useful precursor or companion course to the Level 4 courses MAS436 (Functional Analysis) and MAS452 (Stochastic Processes and Finance), the latter of which is fundamentally dependent on measure theoretic ideas.

Aims

- Give a more rigorous introduction to the theory of measure.
- Develop the ideas of Lebesgue integration and its properties.
- Recall the concepts of probability theory and consider them from a measure theoretic point of view.
- Prove the Central Limit Theorem using these methods.

Outline syllabus

- The scope of measure theory,
- σ -algebras,
- Properties of measures,

- Measurable functions,
- The Lebesgue integral,
- Interchange of limit and integral,
- Probability from a measure theoretic viewpoint,
- Characteristic functions,
- The central limit theorem.

Module Format

Lectures	20	Tutorials	0	Practicals	0
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Recommended books

- C David Williams “Probability With Martingales” (Shelfmark 519.236 (W), ISBN 0 521 40605 6)
- C Donald L. Cohn “Measure Theory” (Shelfmark 3B 517.29 (C), ISBN 0-8176-3003-1)
- C Jeffery S. Rosenthal “A First Look at Rigorous Probability ” (Shelfmark 519.2 (R), ISBN 081-02-4303-0)

Assessment

One 2.5 hour written exam

MAS352: Stochastic Processes and Finance

Semester Year 20 credits

Prerequisites:	MAS113 (Introduction to Probability and Statistics); MAS221 (Analysis); MAS223 (Statistical Inference and Modelling) recommended; MAS275 (Probability Modelling)
Corequisites:	MAS350 or MAS451 (Measure and Probability) recommended
Cannot be taken with:	MAS452 (Stochastic Processes and Finance)
Prerequisite for:	

Description

Stochastic processes are models that reflect the wide variety of unpredictable ways in which reality behaves. In this course we study several examples of stochastic processes, and analyse their behaviour. We apply this knowledge to mathematical finance, in particular to arbitrage free pricing and the Black-Scholes model.

Aims

- Introduce probability spaces, σ -fields and conditional expectation.
- Introduce martingales and study their basic properties.
- Analyse the behaviour of different types of stochastic process, such as random walks, urn models and branching processes.
- Explain the role of arbitrage and arbitrage free pricing.
- Use finite market models to price and hedge a range of financial derivatives.
- Introduce Brownian motion and study its basic properties.
- Introduce stochastic calculus, Ito's formula and stochastic differential equations.
- Derive the Black-Scholes formula in continuous time and use it to price a range of financial derivatives.
- Study extensions of the Black-Scholes formula.

Outline syllabus

- **Stochastic Processes:** We introduce conditional expectation and martingales, which are used to study the behaviour of stochastic processes such as random walks, urn models,

branching processes, Brownian motion and diffusions. Stochastic integration with respect to Brownian motion is introduced.

- **Stochastic Finance:** We study the key concept of arbitrage and arbitrage free pricing, both in finite markets and in the continuous time Black-Scholes model.

Module Format

Lectures	40	Tutorials	0	Practicals	0
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Recommended books

- C A.Etheridge “A Course in Financial Calculus” (Shelfmark 332.0151922 (E), ISBN 0521890772)
- C Bjork, T “Arbitrage Theory in Continuous Time” (ISBN 9780199271269)
- C Williams, D. “Probability with Martingales” (Shelfmark 519.236 (W), ISBN 0521406056)
- C Wilmott, P., Howison, S., Dewynne, J. “The Mathematics of Financial Derivatives” (Shelfmark 332.64(W), ISBN 0521496993)

Assessment

One formal 3 hour written closed book examination.

MAS361: Medical Statistics

Semester 1 10 credits

Prerequisites: MAS223 (Statistical Inference and Modelling)

Corequisites:

Cannot be taken with: [MAS461](#) (Medical Statistics)

Prerequisite for:

Description

This course comprises sections on Clinical Trials and Survival Data Analysis. The special ethical and regulatory constraints involved in experimentation on human subjects mean that Clinical Trials have developed their own distinct methodology. Students will, however, recognise many fundamentals from mainstream statistical theory. The course aims to discuss the ethical issues involved and to introduce the specialist methods required. Prediction of survival times or comparisons of survival patterns between different treatments are examples of paramount importance in medical statistics. The aim of this course is to provide a flavour of the statistical methodology developed specifically for such problems, especially with regard to the handling of censored data (e.g., patients still alive at the close of the study). Demonstrating implementation of the statistical analyses in the R package is an important part of the course.

Aims

- To illustrate applications of statistics within the medical field.
- To introduce students to some of the distinctive statistical methodologies developed to tackle problems specifically related to clinical trials and the analysis of survival data.

Outline syllabus

- **Clinical Trials:**
 - **Basic concepts and designs:** controlled and uncontrolled clinical trials; historical controls; protocol; placebo; randomisation; blind and double blind trials; ethical issues; protocol deviations.
 - **Size of trials.**
 - **Multiplicity and meta-analysis:** interim analyses; multi-centre trials; combining

trials.

- **Cross-over trials.**
- **Binary response data:** logistic regression modelling; McNemar’s test, relative risks, odds ratios.
- **Survival Data Analysis:**
 - **Basic concepts:** survivor function; hazard function; censoring.
 - **Single sample methods:** lifetables; Kaplan-Meier survival curve; parametric models.
 - **Two sample methods:** log-rank test; parametric comparisons.
 - **Regression models:** inclusion of covariates; Cox’s proportional hazards model; parametric and accelerated failure time regression models.

Module Format

Lectures	18	Tutorials	2	Practicals	0
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Recommended books

- A** Everitt and Rabe-Heskith “Analyzing Medical Data Using S-Plus” (Shelfmark 610.285 (E), ISBN 0387988629)
- A** Matthews “An Introduction to Randomized Controlled Clinical Trials” (Shelfmark 615.50724 (M), ISBN 1584886242)
- B** Altman “Practical Statistics for Medical Research” (Shelfmark 519.023 (A), ISBN 1584880392)
- B** Campbell “Statistics at Square Two” (Shelfmark 519.023 (C), ISBN 1405134909)
- B** Collett “Modelling Survival Data in Medical Research” (Shelfmark 610.727 (C), ISBN 1584883251)

Assessment

One formal 2 hour written examination. Format: 3 questions from 4.

MAS364: Bayesian Statistics

Semester 1 10 credits

Prerequisites:	MAS223 (Statistical Inference and Modelling)
Corequisites:	
Cannot be taken with:	MAS464 (Bayesian Statistics)
Prerequisite for:	Either this module or MAS464 (Bayesian Statistics) is needed for MAS472 (Computational Inference)

Description

This unit develops the Bayesian approach to statistical inference. The Bayesian method is fundamentally different in philosophy from conventional frequentist/classical inference, and has been the subject of some controversy in the past. It is, however, becoming increasingly popular in many fields of applied statistics. This course will cover both the foundations of Bayesian statistics, including subjective probability, utility and decision theory, and modern computational tools for practical inference problems, specifically Markov Chain Monte Carlo methods and Gibbs sampling. Applied Bayesian methods will be demonstrated in a series of case studies using the software package R.

Aims

- To extend understanding of the practice of statistical inference.
- To familiarize the student with the Bayesian approach to inference.
- To describe computational implementation of Bayesian analyses.

Outline syllabus

- Subjective probability.
- Inference using Bayes Theorem. Prior distributions. Exponential families. Conjugacy. Exchangeability.
- Predictive inference.
- Utility and decisions. Tests and interval estimation from a decision-theoretic perspective.
- Hierarchical models.
- Computation. Gibbs sampling. Metropolis-Hastings. Case studies.

- Linear regression.

Module Format

Lectures	20	Tutorials	0	Practicals	3
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Recommended books

- B** Gelman, Carlin, Stern and Rubin “Bayesian Data Analysis” (Shelfmark 519.42 (W), ISBN 0412039915)
- B** Lee “Bayesian Statistics: An Introduction” (Shelfmark 519.542 (L), ISBN 0340814055)

Assessment

One formal 2 hour written examination [85%]. Format: 3 questions from 4. Continuous assessment [15%]; three assignments, each worth 5%.

MAS367: Linear and Generalised Linear Models

Semester 1 10 credits

Prerequisites:	MAS223 (Statistical Inference and Modelling)
Corequisites:	
Cannot be taken with:	MAS467 (Linear and Generalised Linear Models)
Prerequisite for:	Either this module or MAS467 (Linear and Generalised Linear Models) is needed for MAS474 (Extended Linear Models) Recommended for MAS360 (Practical and Applied Statistics) and for MAS370 (Sampling Theory and Design for Experiments)

Description

The module will further develop the general theory of linear models, building on theory taught in MAS223. Extensions from the L2 course will include methods for dealing with large numbers of independent variables. The module will also introduce generalised linear models, which can be used for modelling data such as binary data and count data, where a normal distribution would not be appropriate. These developments dramatically extend the range of problems that can be studied. The methods will be implemented using R.

Aims

- To review and extend the students knowledge of the standard linear model, building on concepts introduced at L2.
- To introduce the theory of generalised linear models.
- To show how these methods are applied to data, and what kinds of conclusions are possible.
- To demonstrate the fitting and interpretation of linear and generalised linear models to data using the statistical computing language R.

Outline syllabus

- Basics representation of linear models in matrix form including LS estimator of β and its covariance; estimator of σ^2 ; residuals and fitted values.
- General framework for testing linear null hypotheses of the form $C\beta = c$. Special case to include CI for components of β .

- Variance stabilizing transformation where relationship between $Var(y)$ and $E(y)$ is known.
- Box-Cox variance stabilizing transformation including detailed derivation of likelihood.
- Variable selection methods, F-tests, penalized likelihoods (AIC/BIC), nested vs non-nested comparisons, Mallows' C_p .
- Automated methods with small p : best subsets, stepwise approaches.
- Sparse linear regression approaches for big p focussed on the LASSO to include a geometric interpretation of the penalty, likelihood contours, bias - variance trade off.
- Implementation in `glmnet` including using cross validation to choose the tuning parameter and final model selection.
- Generalised linear models (GLMs): motivation and assumptions
- Fitting GLMs, common GLM distributions.
- Parameter estimation, use of deviance in GLMs to test model fit.
- Model building (analysis of deviance), types of residuals, quasi likelihood.
- Binary response: likelihood, links, odds, odds ratios and logistic regression.
- Poisson regression for count data, using offsets to adjust for exposure.
- Two-way contingency tables, response & controlled variables, association and homogeneity, probability distributions for two-way tables.
- Using log-linear models when analysing two-way tables, MLEs.

Module Format

Lectures	20	Tutorials	0	Practicals	0
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Recommended books

- C Atkinson “Plots, Transformations and Regression” (Shelfmark 519.51 (A))
- C Cook and Weisberg “Residuals and Influence in Regression” (Shelfmark 519.51 (C))
- C Draper and Smith “Applied Regression Analysis” (Shelfmark 519.536 (D))
- C Dobson “An Introduction to Generalized Linear Models” (Shelfmark 519.53 (D))
- C Faraway “Extending the Linear Model with R” (Shelfmark 519.5 (F))
- C Montgomery, Peck and Vining “Introduction to Linear Regression Analysis” (Shelfmark 519.51 (M))
- C Seber and Lee “Linear Regression Analysis” (Shelfmark 519.51 (S))

Assessment

One formal 2 hour written examination. Format: 3 questions from 3.

MAS369: Machine Learning

Semester 1 10 credits

Prerequisites: MAS223 (Statistical Inference and Modelling)

Corequisites:

Cannot be taken with:

Prerequisite for:

Description

Machine learning lies at the interface between computer science and statistics. The aims of machine learning are to develop a set of tools for modelling and understanding complex data sets. It is an area developed recently in parallel between statistics and computer science. With the explosion of “Big Data”, statistical machine learning has become important in many fields, such as marketing, finance and business, as well as in science. The module focuses on the problem of training models to learn from training data to classify new examples of data. Although other aspects of machine learning will be mentioned, the module focuses on the problem of classification; other topics in machine learning are covered by modules in Computer Science.

Aims

- Introduce students to the main problems in machine learning
- Introduce students to some of the techniques used for solving problems in data science
- Introduce students to neural networks and the main ideas behind “deep learning”
- Introduce students to the principal computer packages involved in machine learning

Outline syllabus

- The main problems of data science and machine learning
- Data sets and data visualisation
- Dimensionality reduction – principal components analysis and introduction to other methods
- Supervised learning: the classification problem and discriminant analysis
- Regression and classification trees
- Ensemble methods and random forests; boosting

- Support vector machines
- Neural networks and deep learning

Module Format

Lectures	20	Tutorials	0	Practicals	0
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Recommended books

- C Everitt “An R and S-PLUS Companion to Multivariate Analysis” (Shelfmark 519.535, ISBN 1852338822)
- C Hastie, Tibshirani and Friedman “The Elements of Statistical Learning” from <https://web.stanford.edu/~hastie/ElemStatLearn/>
- C James, Witten, Hastie and Tibshirani “An Introduction to Statistical Learning” from <http://www-bcf.usc.edu/~gareth/ISL/>

Assessment

Three projects of equal weight.

MAS370: Sampling Theory and Design of Experiments

Semester 2 10 credits

Prerequisites: MAS223 (Statistical Inference and Modelling); [MAS367](#) (Linear Models) recommended

Corequisites:

Cannot be taken with:

Prerequisite for:

Description

The results of sample surveys through opinion polls are commonplace in newspapers and on television. The objective of the Sampling Theory section of the module is to introduce several different methods for obtaining samples from finite populations. Experiments which aim to discover improved conditions are commonplace in industry, agriculture, etc. The purpose of experimental design is to maximise the information on what is of interest with the minimum use of resources. The aim of the Design section is to introduce some of the more important design concepts.

Aims

- To consolidate some previous mathematical and statistical knowledge.
- To introduce statistical ideas used in sample surveys and the design of experiments.

Outline syllabus

This course deals with two different areas where the important features are the planning before the data are collected, and the methods for maximising the information which will be obtained. The results of sample surveys through opinion polls, etc., are commonplace in newspapers and on television. The Sampling Theory component of the course introduces several different methods for obtaining samples from finite populations and considers which method is most appropriate for a given sampling problem. Experiments which aim to discover improved conditions are commonplace in industry, agriculture, etc. The purpose of experimental design is to maximise the information on what is of interest with the minimum use of resources. The Experimental Design component of the course introduces some of the more important design concepts.

Module Format

Lectures	20	Tutorials	0	Practicals	0
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Recommended books

- B** Barnett “Sample Survey; Principles and Methods” (Shelfmark 519.6 (B), ISBN 0340763981)
- B** Box, Hunter and Hunter “Statistics for experimenters: design, innovation, and discovery” (Shelfmark 519.5(B), ISBN 9780471718130)
- B** Morris “Design of experiments: an introduction based on linear models” (Shelfmark 001.434 (M), ISBN 9781584889236)
- C** Atkinson and Donev “Optimum Experimental Designs” (Shelfmark 519.52 (A), ISBN 019929660X)
- C** Box and Draper “Empirical model building and response surfaces” (Shelfmark 519.52 (B), ISBN 0471810339)
- C** Cornell “Experiments with mixtures” (Shelfmark 519.52 (C), ISBN 0471393673)
- C** Cox and Reid “The theory of the design of experiments” (Shelfmark 519.52 (C), ISBN 158488195X)
- C** Goos and Jones “Optimal design of experiments : a case study approach” (Shelfmark 670.285 (G), ISBN 9780470744611)

Assessment

Three assignments each contributing 5% to the module mark. One formal 2 hour written examination contributing 85% to the module mark. Exam format: all questions compulsory.

MAS371: Applied Probability

Semester 2 10 credits

Prerequisites: MAS223 (Statistical Inference and Modelling);
 MAS275 (Probability Modelling)

Corequisites:

Cannot be taken with:

Prerequisite for:

Description

This unit will link probability modelling to statistics. It will explore a range of models that can be constructed for random phenomena that vary in time or space - the evolution of an animal population, for example, or the number of cancer cases in different regions of the country. It will illustrate how models are built and how they might be applied: how likelihood functions for a model may be derived and used to fit the model to data, and how the result may be used to assess model adequacy. Models examined will build on those studied in MAS275.

Aims

- Illustrate the construction of probability models for random phenomena;
- Introduce some of the common classes of models for random phenomena;
- Illustrate how probability models may be fitted to data;
- Discuss applications of fitted models.

Outline syllabus

- **Basic techniques:** likelihood functions and their properties and use.
- **Continuous time Markov chains:** Introduction; generator matrices; informal coverage of stationary distributions and convergence.
- **Inference for stochastic processes:** deriving likelihood functions for stochastic processes; fitting models to data; model criticism.
- **Applications of Markov chains:** birth-death processes; queues.
- **Point processes:** homogeneous and inhomogeneous Poisson processes, spatial and marked point processes, inference for point processes.

Module Format

Lectures	20	Tutorials	0	Practicals	0
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Recommended books

- C Bailey “The Elements of Stochastic Processes with Applications to the Natural Sciences” (Shelfmark 519.31 (B))
- C Grimmett and Stirzaker “Probability and Random Processes” (Shelfmark 519.2 (G), ISBN 0198572239)
- C Guttorp “Stochastic Modeling of Scientific Data” (Shelfmark 519.23 (G), ISBN 0412992817)
- C Renshaw “Modelling Biological Populations in Space and Time” (Shelfmark 574.55 (R), ISBN 0521448557)
- C Taylor and Karlin “An Introduction to Stochastic Modelling” (Shelfmark 519.2 (T), ISBN 0126848874)

Assessment

One 2 hour written examination.

MAS372: Time Series

Semester 2 10 credits

Prerequisites: MAS223 (Statistical Inference and Modelling)

Corequisites:

Cannot be taken with:

Prerequisite for:

Description

Time series are observations made in time, for which the time aspect is potentially important for understanding and use. The course aims to give an introduction to modern methods of time series analysis and forecasting as applied in economics, engineering and the natural, medical and social sciences. The emphasis will be on practical techniques for data analysis, though appropriate stochastic models for time series will be introduced as necessary to give a firm basis for practical modelling. For the implementation of the methods the programming language R will be used.

Aims

- To introduce methods to uncover structure in series of observations made through time.
- To illustrate how models for time series may be constructed and studied.
- To develop methods to analyse and forecast time series.
- To show how these methods are applied to data, and what kinds of conclusion are possible.

Outline syllabus

- Examples of time series. Purposes of analysis. Components (trend, cycle, seasonal, irregular). Stationarity and autocorrelation.
- Approaches to time series analysis. Simple descriptive methods: smoothing, decomposition.
- Differencing. Autocorrelation. Probability models for stationary series. Autoregressive models.
- Moving average models. Partial autocorrelation. Invertibility. ARMA processes.
- ARIMA models for non-stationary series. Identification and fitting. Diagnostics. Ljung-

Box statistic, introduction to forecasting.

- State space models. Filtering (Kalman filter), smoothing and forecasting.
- Trend and seasonal state space models, time-varying regression. Estimation of hyperparameters, error analysis.

Module Format

Lectures	20	Tutorials	0	Practicals	0
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Recommended books

- A** Brockwell and Davies “Introduction to Time Series and Forecasting” (Shelfmark 519.36 (B), ISBN 0387953515)
- A** Shumway, R.H. and Stoffer, D.S “Time series analysis and its applications : with R examples” (Shelfmark 519.55 (S), ISBN 0387293175)
- B** Chatfield, C. “The analysis of time series : an introduction” (Shelfmark 519.55 (C), ISBN 1584883170)
- B** West and Harrison “Bayesian Forecasting and Dynamic Models” (Shelfmark 519.42 (W), ISBN 0387947256)

Assessment

One formal 2 hour written examination. Format: 3 questions from 4.

MAS377: Mathematical Biology

Semester 1 10 credits

Prerequisites: MAS110 (Mathematics Core I); MAS111 (Mathematics Core II);
 MAS222 (Differential Equations)

Corequisites:

Cannot be taken with:

Prerequisite for:

Description

The course provides an introduction to the mathematical modelling of the dynamics of biological populations. The emphasis will be on deterministic models based on systems of differential equations that encode population birth and death rates. Examples will be drawn from a range of different dynamic biological populations, from the species level down to the dynamics of molecular populations within cells. Central to the course will be the dynamic consequences of feedback interactions within the populations. In cases where explicit solutions are not readily obtainable, techniques that give a qualitative picture of the model dynamics (including numerical simulation) will be used.

Aims

To introduce students to the applications of mathematical techniques in deterministic models for the dynamics of biological populations.

Outline syllabus

- **Population models:** Deterministic models; birth and death processes; logistic growth; competition between populations.
- **Epidemic models:** Compartment models; the SIR model.
- **Biochemical and Genetic Networks:** Mass-action kinetics; simple genetic circuits; genetic switches and clocks.

Module Format

Lectures	20	Tutorials	0	Practicals	0
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Recommended books

B J.D.Murray “Mathematical Biology” (Shelfmark 570.15118 (M), ISBN 9780387952239)

B S.P.Ellner and J.Guckenheimer “Dynamic Models in Biology” (Shelfmark 570.15118 (E), ISBN 9780691125893)

C H.van den Berg “Mathematical Models of Biological Systems” (Shelfmark 570.15118 (B), ISBN 9780199582181)

Assessment

One formal 2 hour written examination. Format: 3 questions from 4.

MAS472: Computational Inference

Semester 2 10 credits

Prerequisites: [MAS364](#) (Bayesian Statistics) or [MAS464](#) (Bayesian Statistics)

Corequisites:

Cannot be taken with:

Prerequisite for:

Description

This unit aims to introduce the student to some of the powerful modern tools now available for statistical inference. The tools are largely based on the exploitation of modern computing power. They free the analyst from the distributional limitations of the past and they are widely applicable, both to traditional application areas of statistics and in new situations. The emphasis in the course will be on the practical utility of the methodology, though theoretical ideas will be introduced when necessary for understanding and use. Appropriate computer packages will be used to implement the methods.

Aims

- To extend understanding of the practice of statistical inference.
- To familiarize the student with ideas, techniques and some uses of statistical simulation.
- To describe computational implementation of likelihood-based analyses.
- To introduce examples of modern computer-intensive statistical techniques.

Outline syllabus

- Computational methods for likelihoods and likelihood theory.
- Simulation. Generating techniques. Monte Carlo integration and variance reduction.
- Bootstrapping.
- Simulation and Monte Carlo testing. Randomization tests.

Module Format

Lectures	16	Tutorials	0	Practicals	4
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Recommended books

- B** Garthwaite, Jolliffe and Jones “Statistical Inference” (Shelfmark 519.43 (G), ISBN 0198572263)
- B** Kalbfleisch “Probability and Statistical Inference, Volume 2: Statistical Inference” (Shelfmark 519.2 (K), ISBN 3540961836)
- B** Morgan “Elements of Simulation” (Shelfmark 519.39 (M), ISBN 0412245809)
- B** Robert and Casella “Introducing Monte Carlo Methods with R” (Shelfmark 518.282(R), ISBN 978-1-4419-1575-7)

Assessment

One formal 2 hour written examination [85%]. Format: 3 questions from 4. Coursework [15%]. Please note the pass mark for this level 4 module is 50 (out of 100).

MGT321: Corporate Finance

Semester 1 20 credits

Prerequisites:

Corequisites:

Cannot be taken with:

Prerequisite for:

Description

The course covers more advanced topics in corporate finance, such as financing and investment decisions under asymmetric information, valuation techniques for investment appraisal such as real option pricing. Equity financing, hybrid financing, and mergers and acquisitions are discussed. The efficient market hypothesis is challenged and an alternative approach to finance, behavioural finance, is reviewed.

MGT375: Financial Derivatives

Semester 2 20 credits

Prerequisites

The module is very applied and practical and will involve the students using the Bloomberg system. We teach real life market developments using real life data and events so students must be prepared to also read the Financial Times or another quality source on top of their core reading. The module is certainly numerical with about 80% of the assessment being based on students undertaking calculations or analysing numerical data. I would stress the module is not highly mathematical but students must have a good numerate ability and be able to manipulate data quickly.

Description

The use and complexity of derivatives has increased significantly over the last 20 years with market participants such as fund managers, traders, banks and treasurers using an increasingly diverse range of derivative instruments to hedge, speculate and undertake arbitrage. This module will start from first principles and will investigate how a wide range of derivatives are used, priced and regulated, with a core focus on quantitative methods. It will also cover key market developments and prepare students for working in a wide array of finance roles through a very practical teaching focus and the integrated use of Bloomberg.

Aims

- An in-depth understanding of the techniques and issues involved in the pricing and use of derivative securities.
- The ability to undertake complex computations to demonstrate the workings and pricing of a wide range of derivatives under changeable economic conditions.
- The ability to evaluate contemporary developments in derivatives markets and the risks associated with their use.
- A practical knowledge of analysing information on derivatives markets generated from a range of industry standard applications such as Bloomberg.

Outline syllabus

- Nature of derivatives and the size and scope of markets (latest BIS statistics)
- Concept of arbitrage, hedgers, speculators, arbitrageurs
- OTC and exchange traded derivatives, including the debate on OTC regulation
- Credit value adjustments and credit support annex
- The distinction between forwards, futures, swaps and options
- Theoretical principles relevant to analysis of forwards, futures, options and swaps
- Strategies for utilisation of forwards, futures, swaps and options in managing risk
- Strategies for utilisation of forwards, options futures and swaps as a speculation
- Pricing of derivatives
- Financial engineering with swaps and other derivatives
- Option premium/intrinsic value and time value & in and out of the money options
- Option pricing: Black Scholes model
- Non-standard derivatives – for example commodity and equity swaps, weather derivatives, credit derivatives

Module Format

Lectures	10	Tutorials	6	Practicals	0
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Module Format – Detail

The unit will be constructed via 10 two hour lectures and 6 one hour supervised tutorials held in the Management School trading room. Lectures will introduce key topics and concepts which will then be explored in greater detail during the tutorials using practical examples and real life scenarios / data. Students will be expected to have undertaken comprehensive preparation for the tutorials and this work will be outlined in advance. A range of financial market software will be used to support the tutorials including, Bloomberg, Excel, Futures and equity trading platforms and electronic data sources which provide financial news and data. Given the nature of the tutorials, it is expected students will maintain a good awareness of financial market developments, reading quality information sources such as the Financial Times, Bloomberg and Digital Look along with professional and academic journals.

Recommended books

- B** Chisholm, Andrew M. (2010) Derivatives Demystified: A Step by Step Guide to Forwards, Futures, Swaps & Options, 2nd edition, Wiley Finance
- B** Hull, J. C. (2011) Options Futures and Other Derivatives, 8th edition, Prentice-Hall International, Englewood Cliffs, new Jersey, USA
- B** Chance, Don M. (2012), An Introduction to Derivatives and Risk Management, 9th edition, South Western
- B** Students are encouraged to study journals such as: The Economist, The Treasurer, The Financial Times, Journal of Finance, Journal of Banking and Finance, Journal of Derivatives

Assessment

One formal 3 hour written examination [60%]. Coursework (Phase Test) [40%].

ECN357: Modern Finance

Semester 2 20 credits

Prerequisites

This module assumes that students are familiar with intermediate macroeconomic theory, for example, aggregate expenditure functions, expectations, inflation, economic growth and open-economy macroeconomics.

Description

The aim of this module is to introduce some of the main principles of modern finance. This is an analytical module which reflects the quantitative nature of the subject and each topic is developed from first principles. The topics covered include: the time value of money and its applications; risk return and diversification; introduction to portfolio selection; the capital asset pricing model (CAPM) and its use; and an introduction to the role of utility theory in finance and company capital structure. The coursework essay gives students the opportunity to investigate the issue of importance from either a theoretical or empirical standpoint.

Aims

On completion of this course, the student should have gained an understanding of some of the key principles of modern finance and how they are applied. They will also be able to carry out basic empirical work using these principles.

Outline syllabus

- Portfolio selection
- Risk return and diversification
- The Capital Asset Pricing Model (CAPM)
- Investment criteria
- Capital investment decisions
- Bond and equity evaluation.

Module Format

Lectures	10	Tutorials	0	Practicals	10
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Module Format – Detail

Ten two-hour lectures and 10 one-hour workshops

Recommended books

- B** Brealey, RA; Myers, SC; Allen, F (2008) Principles of Corporate Finance, 9th edition, McGraw-Hill
- B** Elton, EJ; Gruber, MJ; Brown, SJ; Goetzmann, WN (2003) Modern Portfolio Theory and Investment Analysis, 6th edition, John Wiley & Sons
- B** Hillier, D; Clacher, I (2011) Fundamentals of Corporate Finance, 1st European edition, McGraw Hill

Assessment

One formal 2 hour written examination [75%]. Class Test [25%].