



UK Quality Assured



**School of Mathematical and Computer Sciences  
Actuarial Mathematics and Statistics  
Undergraduate Students' Guide  
Heriot-Watt University Edinburgh Campus  
2018/2019**

**PART A: PROGRAMME INFORMATION**

|   |   |    |
|---|---|----|
| 1 | WELCOME & INTRODUCTION                  | 2  |
| 2 | SUMMARY OF KEY INFORMATION              | 4  |
| 3 | PROGRAMME STRUCTURES                    | 15 |
| 4 | ACTUARIAL EXEMPTIONS                    | 24 |
| 5 | COURSE DESCRIPTIONS                     | 28 |
|   | APPENDIX A: AMS CODE OF PRACTICE        | 52 |
|   | APPENDIX B: STUDENT GUIDE TO PLAGIARISM | 54 |

**PART B: UNIVERSITY INFORMATION**

|   |   |    |
|---|---|----|
| 1 | OUR VALUES  | 59 |
| 2 | STUDENT LEARNING CODE OF PRACTICE                   | 59 |
| 3 | UNIVERSITY POLICIES AND SUPPORT                     | 59 |
| 4 | YOUR STUDENT PORTAL                                 | 60 |
| 5 | QUICK FINDER GUIDE TO ACADEMIC AND SUPPORT SERVICES | 60 |

# **PART A: PROGRAMME INFORMATION**

## **1 WELCOME AND INTRODUCTION**

### **Welcome Welcome from the Principal of Heriot-Watt University**

I am very pleased to welcome you to Heriot-Watt University!

I am delighted you have chosen to study at our innovative and distinctive University. You are now part of an unparalleled global community that connects students, staff and alumni.

At Heriot-Watt University you will have the opportunity to thrive, both personally and academically, during your time with us. As a student I invite you to contribute to our future together as we continue to develop the learning and teaching experience we deliver across the world – transforming people, society and the world we live in.

Our learning environment seeks to offer the very best in terms of study programmes which apply knowledge to real world challenges, together with the latest learning technologies, and outstanding support and facilities.

The University wants to encourage our students to see the world, then change it. We have developed opportunities for student mobility through our Go Global inter campus exchange, encouraging all our students to benefit from working and socialising in an international institution, whether at a single campus location or abroad.

Our graduates are sought by global professions and industries. The very nature of a Heriot-Watt research-informed education, underpinned by our values, ensures you will have the opportunity to develop the leadership skills and confidence, to be global citizens of the world who are specialists in their chosen field and experts in their professions.

I hope you thoroughly enjoy the experience of being a Heriot-Watt student and on behalf of all of the staff, we look forward to you commencing your studies with us.

Professor Richard A Williams OBE  
Principal and Vice-Chancellor

### **Welcome from Head of Department Actuarial Mathematics and Statistics**

I am delighted to welcome you as students on behalf of all staff in the Department of Actuarial Mathematics and Statistics at Heriot-Watt University.

The Department of Actuarial Mathematics and Statistics is internationally renowned for teaching and research in these areas, and it was among the first universities in the UK to offer degree programmes in Actuarial Science. I would like to encourage you to explore the opportunities we offer. There are opportunities to spend a year abroad in Canada or Australia

or on our campus in Malaysia. There are also opportunities to spend a year on an industrial placement. On your home campus, there are ample opportunities to attend talks and seminars including the annual conference and other events organised by the Students' Actuarial Society.

Once again we are delighted to welcome you as our students, and I very much hope the academic year ahead will be successful, inspiring, and enjoyable for you.

Dr Anke Wiese  
*Head of Department*

## **1.1 Introduction**

This guide provides a reference to degree programme structures and other departmental information for students on Actuarial Mathematics and Statistics (AMS) degrees. This guide is intended as a summary of AMS Programme Structures, but note that the University Regulations and Programme Structures take precedence in case of any discrepancy between them and the guide.

Information concerning examination timetables, University regulations and other general information can be found on the Academic Registry website at [www.hw.ac.uk/registry](http://www.hw.ac.uk/registry). Further sources of information are the MACS web site at [www.macs.hw.ac.uk/students](http://www.macs.hw.ac.uk/students) and the MACS Organisation section on VISION (see Section 2.5.5).

## **1.2 Programmes Offered**

The following undergraduate programmes are offered:

- F723 BSc in Actuarial Science
- F712 BSc in Actuarial Science and Diploma in Industrial Training 1
- F706 BSc in Actuarial Science and Diploma in Industrial Training 2 (F706 is no longer open to enrolment)
- F771 BSc in Financial Mathematics
- F713 BSc in Statistical Data Science

The degrees may be awarded at honours or ordinary level. Study for an honours degree usually takes four years, and for an ordinary degree, three years. For the programmes that include industrial training, study lasts an additional year because of the year-long work placement.

All the degrees are designed to make it easy in most cases to transfer from one to another during the first two years. In addition, the Heriot-Watt course scheme is compliant with the Scottish Credit and Qualifications Framework (SCQF). This makes credit transfers between Scottish universities easier.

## 2 KEY INFORMATION

### 2.1 Key Contacts

Professor Beatrice Pelloni is the Head of the School of Mathematical and Computer Sciences, and Dr Anke Wiese is the Head of the Department of Actuarial and Mathematical Statistics. They are supported by year level Year Co-ordinators and an experienced team of academic staff.

#### Year Co-ordinator 2018/19

First Year Dr James Cruise [R.Cruise@hw.ac.uk](mailto:R.Cruise@hw.ac.uk)

Second Year Mrs Andrea Sneddon [A.E.Sneddon@hw.ac.uk](mailto:A.E.Sneddon@hw.ac.uk)

Third Year Dr Torsten Kleinow [T.Kleinow@hw.ac.uk](mailto:T.Kleinow@hw.ac.uk)

Fourth Year Mr John Phillips [J.Phillips@hw.ac.uk](mailto:J.Phillips@hw.ac.uk)

### 2.2 Academic Staff

Students are encouraged to contact directly any member of staff whose lectures they have attended if further help or advice is needed. Staff can also be contacted through the MACS School Office (EM 1.25).

The AMS academic staff for 2017-18 are listed below, together with their offices and telephone extensions (prefix by 451 if calling from outside). E-mail addresses for staff consist of the initials and surname followed by @hw.ac.uk (e.g. [A.J.G.Cairns@hw.ac.uk](mailto:A.J.G.Cairns@hw.ac.uk)).

Email and telephone contact details for all other Heriot-Watt University staff (and students as well) can be found by using the 'People Finder' option on the menu bar of the University's homepage <http://www.hw.ac.uk/>.

| <b>Name</b>   | <b>Room</b> | <b>Extension</b> |
|---|-------------|------------------|
| Professor A.J.G. Cairns                             | CM S.08     | 3245             |
| Professor D. Clancy                                 | CM S.02     | 3208             |
| Dr R. Cruise (1 <sup>st</sup> Year Co-ordinator)    | CM T.27     | 3741             |
| Dr F. Daly  | CM G.06     | 3212             |
| Dr C. Donnelly                                      | CM G.04     | 3251             |
| Dr M. Fahrenwaldt                                   | CM F.13     | 3664             |
| Professor S. Foss                                   | CM G.07     | 3238             |
| Professor G. J. Gibson                              | CM G.18     | 3205             |
| Professor J. Hansen                                 | CM S.05     | 3213             |
| Dr T.C. Johnson                                     | CM G.05     | 8343             |
| Dr T. Kleinow (3 <sup>rd</sup> Year Co-ordinator)   | CM F.11     | 3252             |
| Professor A.S. Macdonald                            | CM T.04     | 3209             |
| Dr. M. Pereyra                                      | CM T.17     | 3211             |
| Mr J. Phillips (4 <sup>th</sup> Year Co-ordinator)  | CM S.06     | 4376             |
| Mr G.G. Reid  | CM F.09     | 3075             |
| Mr P. Ridges (Exemptions Officer)                   | CM F.16     | 3906             |
| Dr V. Shneer  | CM S.07     | 3902             |
| Ms A.E. Sneddon (2 <sup>nd</sup> Year Co-ordinator) | CM S.10     | 3226             |
| Mr A.D. Stott                                       | CM T.12     | 3937             |
| Dr G. Streftaris                                    | CM S.15     | 3679             |
| Dr A. Wiese (Head of Department)                    | CM T.13     | 3717             |

### **2.3 Administrative Staff**

The Programmes are supported through the School Office. Staff in the office can help with administrative information and procedures such as registration issues, changes of address and many other issues.

Location: EM1.25  
 Phone: 0131 451 3324  
 Email: [macs-schooloffice@hw.ac.uk](mailto:macs-schooloffice@hw.ac.uk)

Updating personal information, such as a change of address, is done through the Student Self Service portal: (<http://www.hw.ac.uk/selfservice>).

## 2.4 Significant Dates in the Academic Year

HWU Edinburgh Campus session dates for 2018/2019

| Dates                                | Activity         |
|--------------------------------------|------------------|
| 10 September 2018 – 30 November 2018 | Semester 1       |
| 3 December 2018 – 14 December 2018   | Semester 1 exams |
| 17 December 2018 – 4 January 2019    | Semester 1 break |
| 7 January 2019 – 29 March 2019       | Semester 2       |
| 1 April 2019– 22 April 2019          | Semester 2 break |
| 23 April 2019 – 17 May 2019          | Semester 2 exams |
| 20 May 2019 – 9 September 2019       | Summer break     |
| 1 August 2019 – 10 August 2019       | Resits           |

Please refer to the University's websites at <http://www.hw.ac.uk/> and <http://www.hw.ac.uk/edinburgh.htm> which contain detailed information about Heriot-Watt University and the Edinburgh Campus.

## 2.5. Communications

### 2.5.1 Contact Details

It is essential that the School and the University are kept informed of any changes to students' contact details, particularly term-time and home addresses. It is the responsibility of the student to ensure that the University has the most up to date contact information.

Please inform the University of any changes to personal details to ensure that we hold up-to-date records.

If you wish to change your address, please login to Student Self Service (<http://www.hw.ac.uk/selfservice>).

If you require your name to be changed, please inform the Student Service Centre and provide the appropriate paperwork.

Please note that letters from the University are automatically sent to students' term addresses as recorded on the student record system, so it is particularly important to ensure address details are kept up to date.

### **2.5.2 Mail & Notices**

Mail (internal and external) for students is delivered to pigeon-holes inside the MACS office (EM1.25). Check yours regularly. Various announcements and notices are posted on VISION (see Section 2.5.5).

### **2.5.3 Lockers**

Lockers are allocated for the duration of each academic year on a first-come, first-served basis. Keys for lockers in the EM Building are available from Mr A. Houston (EM1.31) for a deposit of £10.

### **2.5.4 E-mail**

New students will be issued with instructions on how to set up their e-mail account during enrolment.

Returning students will have continued access to their e-mail.

Please note that students' Heriot-Watt e-mail addresses are used by academic and administrative staff to send important information throughout the year.

Staff will only use official Heriot Watt e-mail addresses when writing to their students.

Students are expected to check your e-mail regularly (at least once a day) and to ensure that your in-box is regularly cleared.

More information regarding Heriot-Watt's I.T. facilities and regulations can be found at: <http://www.hw.ac.uk/is/>.

### **2.5.5 VISION**

Heriot Watt University has a Virtual Learning Environment (VLE) called VISION. Each of your courses will have a space on the VLE and your lecturers will use this space to post class materials, such as reading lists, details of assignments or announcements of revision sessions. You may also be required to use VISION to upload your work through Turnitin, a plagiarism detection programme which is in regular use by the Schools. Many courses will also include online assessment which is accessed and submitted through VISION.

Other important information, such as the AMS Code of Practice, can be found in the MACS Organisation section of VISION.

Once you have registered and have your username and password, you can access VISION here: <http://vision.hw.ac.uk/>.

### **2.5.6 Computing Facilities**

All AMS students are issued with accounts on the University Desktop Service. For details of computer labs and availability see [www.hw.ac.uk/schools/mathematical-computer-sciences/about/facilities.htm](http://www.hw.ac.uk/schools/mathematical-computer-sciences/about/facilities.htm). Students are expected to use the computer facilities in an appropriate and considerate way. Abuse of the facilities is subject to various disciplinary measures, ranging from a ban on access to the facilities to, in extreme and flagrant cases, expulsion from the University. Examples of abuse include monopolising a terminal for non-academic related purposes, running excessively long or inappropriate print jobs, and displaying, circulating or printing offensive material on or from the Internet. Computer games and relay chat are specifically forbidden. Further information on policy regarding the abuse of computer facilities is available from Information Technology (IT) <https://www.hw.ac.uk/documents/it-communications-facilities-acceptable-use.pdf>.

### **2.5.7 Changes to Registration**

Students should make any changes to course or degree registration through the relevant Year Co-ordinators (see Section 2.1). Any changes must be made before the end of week 3 of semester, or a fee will be incurred. Forms can be obtained from the MACS Office (EM1.25) or <http://www.macs.hw.ac.uk/macshome/forms.htm>.

### **2.5.8 Staff-Student Committee**

The Staff-Student Committee provides an additional channel of communication between staff and students within the AMS department. It consists of the School Officer, the Year Co-ordinators, the President of the Students' Actuarial Society and two student representatives from each of the four undergraduate years. Student representatives are elected annually.

The committee meets once or twice each semester. One of its major functions is to consider any concerns about current lecture courses, including teaching quality, and to take appropriate action for their resolution. Other matters of interest, such as the provision of computing facilities or the timing of lectures, may be discussed. Minutes of the meetings are available on VISION.

### **2.5.9 Course Evaluation**

At the end of each course you take you will be asked to complete a course evaluation questionnaire, normally through VISION. Your views are important to us and the information gathered from these evaluations is analysed by the University and the resulting information is then fed into an annual review of the programme.



### **2.5.10 Feedback**

Feedback is a two-way process. Feedback is provided to students in a variety of ways in order to help you to reflect on and to evaluate your progress and to assist you to take steps to improve before the next relevant assessment. For most courses, students can expect feedback on assessed coursework within three teaching weeks of the coursework due date. Feedback is sought from students via Student-Staff Liaison Committees and various surveys so that the School can continue to enhance the student learning experience. Your feedback is valued by the School, so please be sure to provide feedback whenever it is sought.

## **2.6 Personal Tutors**

Each student studying an Undergraduate Programme will be assigned to a member of the academic staff (the personal tutor) who can be consulted on all aspects of the University.

You will normally retain the same personal tutor as long as you are registered on an AMS degree. The personal tutor is your main academic link with the University. Under certain circumstances, with the permission of the Head of AMS, it may be possible to change your personal tutor.

### **2.6.1 Regular Meetings**

It is important that you see your personal tutor regularly. These meetings are particularly important for monitoring academic progress in the first and second years. All students must see their personal tutor at the start of Semester 1 and early in Semester 2. In addition, first and second year students must see their personal tutor in week 7 of Semester 1 and week 8 of Semester 2 and third year direct entrants must see their personal tutor in week 7 of Semester 1. Staff often arrange meetings via e-mail, or post notices on their office doors. It is your responsibility to find out what arrangements have been made. Remember to check your e-mail regularly.

### **2.6.2 Help and Advice**

Every year a few students run into serious personal difficulties (e.g. family illness, accommodation, financial, etc.). As well as being generally supportive, your personal tutor can help in a number of practical ways. For example, if you are prevented from completing project work or sitting exams, your personal tutor can sometimes help with re-scheduling or making alternative arrangements for assessment. However, you must notify your personal tutor as soon as possible, or there is very little that can be done. This is particularly important if the difficulty affects your sitting Level 9 or 10 honours papers, as once taken there are no resits allowed for honours papers. Also, it is essential to submit a Mitigating Circumstances Form (see Section 2.7.2 **Notification of Mitigating Circumstances**).

With other problems, your personal tutor can put you in touch with the appropriate University support service (Chaplaincy, Medical Centre, Student Welfare Services or

Student Union). Personal tutors are there to help; do not hesitate to contact yours if you need help.

### **2.6.3 Temporary Suspension of Studies**

In certain situations it may be in your best interests to suspend your studies temporarily. It sometimes helps to take time out to deal with issues that are stopping you studying effectively – this might be a health or personal issue – and return to University at an agreed date. A Temporary Suspension of Studies (TSS) is when a student stops studying at the university for an extended period of time (usually no longer than one academic year), and then returns to resume their studies.

For further information see

<https://www.hw.ac.uk/students/studies/leaving/temporary-suspension-studies.htm>.

If you are considering applying for a suspension of studies you should contact your personal tutor or Year Co-ordinator to discuss this with them.

## **2.7 Attendance**

### **2.7.1 Requirements**

In order to achieve course and programme learning outcomes, students are expected to attend all scheduled course learning sessions (e.g. timetabled lectures, tutorials, lab sessions, etc).

Students who fail to satisfy course attendance requirements may, after due warning, be disallowed from presenting themselves for examination in the course (see <https://www.hw.ac.uk/students/doc/compulsorywithdrawal.pdf>)

### **2.7.2 Mitigating Circumstances**

Should you have to miss a timetabled session due to ill health or other legitimate reasons, or there are any circumstances which could adversely affect your examination performance, it is very important that you notify your personal tutor as soon as possible.

You should also submit an application for consideration of Mitigating Circumstances (see <https://www.hw.ac.uk/students/studies/examinations/mitigating-circumstances.htm>), together with any supporting documents (e.g. medical certificates) to the MACS School Office (EM1.25).

The Examiners will always take such circumstances into account where appropriate, but the later the notification, the less scope there is to do so. In particular, notification should be as soon as possible after the mitigating circumstances have arisen, and certainly no later than the Examiners Meeting (usually at the end of the assessment period, or mid-August in the case of re-sits). Late notification will mean that either no account can be taken, or that formal procedures have to be invoked. In the latter case, final year

students will not be permitted to graduate until these procedures have been completed. For further details, see the MACS Handbook and the University Regulations.

### 2.7.3 Examinations

It is the student's responsibility to check all relevant examination timetables (including resits) on the Registry webpage [www.hw.ac.uk/registry](http://www.hw.ac.uk/registry). Should you be required to resit any exams, you **must** be available to take them. Therefore **do not book holidays or take on any other commitments during the resit diet**. Note that students must take all examinations at the campus at which they are studying. Resits can only be taken at an overseas location in exceptional circumstances.

Any basic scientific calculator other than graphics calculators, programmable calculators, or those with text storage or retrievable facilities may be used in examinations. (Calculators are not provided.). Unless there are special circumstances, students are **not** allowed to use translation dictionaries in examinations.

Students are not allowed to have mobile phones or other communication devices on or about their persons during examinations. Phones may be left at the front of the examination room but they must be switched off.

**Cheating in an exam or other assessed work is considered to be a very serious offence.**

Students should be aware that reading exam papers or communicating with other candidates prior to the start of an exam, or taking unauthorised material into an exam (even if you don't use it), is considered to be an attempt to cheat. **Do not take any material into the exam hall with you – put it in your bag or in the bin.**

If a student is found cheating in an exam the Student Discipline policy will apply – see <https://www.hw.ac.uk/students/doc/discguidelines.pdf>.

### 2.7.4 Coursework and continuous assessment

As well as end of semester examinations, most courses on the AMS degree programmes involve some element of coursework or continuous assessment such as midterm tests. Students will be informed by the course lecturer of the important dates for tests and project submission and must ensure that they attend / submit at these times. These dates are fixed and cannot be altered for individual students. If you are unexpectedly unable to attend or submit due to circumstances beyond your control you should contact the course lecturer and your personal tutor as soon as possible, as well as submit an application for consideration of Mitigating Circumstances to the School Office (see Section 2.7.2 for more detail).

### 2.7.5 Submission of Coursework Policy

The University recognises that, on occasion, students may be unable to submit coursework and dissertations by the submission date. As such, the University has agreed a new policy from 2018/19 which states:

- No individual extensions are permitted under any circumstances (unless course coordinators decide to give an extension to an entire class);
- Standard 30% deduction from the mark awarded (maximum of five working days);

Alternative options if students cannot submit coursework or their dissertation on time

In the case where you submit coursework up to five working days late and you have valid mitigating circumstances, the mitigating circumstances policy will apply and appropriate mitigation will be applied.

Formative feedback will be provided on all coursework submitted up to five working days late. Any coursework submitted after five calendar days of the set submission date shall be automatically awarded a no grade with no formative feedback provided.

There will be no extensions granted to coursework (this includes undergraduate and postgraduate taught dissertations).

A link to the policy can be found here:

<https://www.hw.ac.uk/services/docs/CourseworkPolicyFinal.pdf>.

## **2.8 PLAGIARISM, COLLUSION and CHEATING**

Cheating in examinations and coursework, and plagiarism, that is, the presentation of another person's ideas or work as one's own, are very serious offences and are dealt with severely. They carry a range of penalties up to and including expulsion from the University. Students are responsible for familiarising themselves with the University policy on these matters.

The University website contains detailed explanation of what is meant by plagiarism with examples and consequences- see <https://www.hw.ac.uk/students/studies/examinations/plagiarism.htm> as well as Appendix B of this Guide, and Regulations 9 and 50 on the Registry's website <http://www1.hw.ac.uk/ordinances>.

Your lecturer will always be very clear about the extent to which you can collaborate and share ideas with your classmates. It is never acceptable to share your electronic files with others.

## **2.9 Graduate Attributes**

As a student of Heriot Watt you are part of a global community. You will meet new people, discover new interests, develop your life skills and enhance your employability and career prospects. The University will provide you with the opportunity to develop skills, qualities and academic abilities during your time as a student. These are known as the Four Heriot Watt Graduate Attributes: Specialist, Creative, Global and Professional,

These Graduate Attributes can help you shape your experiences while studying and to present your skills and qualities effectively to employers. For more information see <https://www.hw.ac.uk/services/docs/gradattributes-visual.pdf>.

## **2.10 Professional Development & Careers Advice**

Professional development planning (PDP) is incorporated in all four years of the AMS degrees. This is a structured process designed to help students reflect upon their own learning, performance and achievements. One of its main purposes is to support students in the planning of their professional, education and career development, keeping the University's Graduate Attributes in mind.

In addition to taking a PDP course in 1<sup>st</sup> year, students will periodically attend seminars on developing these skills, given by, for example, prospective employers. In later years there will be opportunities to develop presentation and group working skills. Students are encouraged to take every opportunity to help develop their own skills.

Career guidance is available through the University's Careers Advisory Service, which gives a number of presentations on topics related to careers. Students are encouraged to contact Alan Smith there for advice.

## **2.11 Exchange opportunities**

There are two exchange agreements which give AMS students the opportunity to study abroad, at either the University of Melbourne (Australia) or the University of Waterloo (Canada). To be eligible, students will have to be consistently in the top 20% of the class. For further information, see the link in VISION, under the AMS Undergraduate Degree Programme section within the MACS Organisation section. Note that the Institute and Faculty of Actuaries accreditation policy does not apply to exchange programmes: exemptions will be determined on a subject-by-subject basis (see Section 4.1.2).

Students on the Actuarial Science degree also have the opportunity to transfer to the University's Malaysian campus. Short term transfers are available, for one or two semesters in Years 2 or 3 (and then return to Edinburgh), or students can permanently transfer to Malaysia in any of Years 2, 3 or 4. Further information about Inter-Campus Transfers is available on the Go Global site: <https://www.hw.ac.uk/student-life/campus-life/go-global.htm>.

## **2.12 Diploma in Industrial Training / Industrial Placements**

The Department encourages all students to undertake a year-long actuarial or financial services-based paid work placement during their studies. This can be done through the Diploma in Industrial Training (for eligible BSc (Hons) Actuarial Science students only) or by temporarily suspending your studies. More information about the Diploma in Industrial Training can be found on the School VISION website, within the AMS Undergraduate Degree Programmes section.

In all cases the student is responsible for securing a work placement. The University's Careers Advisory Service can advise anyone interested on how to go about researching and applying for a placement. You are strongly advised to contact the Careers Advisory Service for help on writing CVs, online tests and assessment centres.

### **2.13 University Prizes and Bursaries**

A number of prizes, for overall performance in each year, are available to AMS Students.

- |               |   |
|---------------|---|
| <b>Year 1</b> | University Prize<br>Standard Life Prize (may be shared)   |
| <b>Year 2</b> | University Prize<br>Worshipful Company of Actuaries Prize (may be shared)                         |
| <b>Year 3</b> | University Prize<br>Scottish Widows Prize (may be shared)<br>Longevitas Prize for Survival Models |
| <b>Year 4</b> | Watt Club Medal for the Best Student<br>IMA Prize<br>Roger Gray Memorial Prize in Statistics      |

The Worshipful Company of Actuaries Charitable Trust offers a number of bursaries each year to final year honours students in Actuarial Science. Applicants are required to demonstrate need and reasonable progress on their degree, and should be seriously considering a career in the actuarial profession. Third year students who wish to apply should contact Peter Ridges at the beginning of second semester.

### 3 PROGRAMME STRUCTURES

The academic year is divided into two semesters. Each semester consists of 12 weeks teaching followed by an assessment period (2 weeks in Semester 1, and 4 weeks in Semester 2). Students must register for four courses each semester. These courses are listed in the relevant tables overleaf.

Each course has a five-character code; the first two characters indicate the department, the third is the level (0, 1 indicate Levels 10, 11 respectively). Usually, but not always, Level 7 courses are taken in the 1st year, Level 8 in the 2nd year and Level 9 and 10/11 courses in the 3rd and 4th years respectively.

A course is regarded as requiring 150 hours of student effort, and is worth 15 SCQF credits.

#### 3.1 Assessment

Each course is awarded a grade in the range A-F: grade E is the minimum required for the award of credits, but at least a grade D is needed for progression to subsequent courses. Other grades are interpreted as follows:

A - excellent, B - very good, C – good, F - inadequate. (See University Regulations for further details).

The minimum mark needed to gain a grade D is usually 40%. The correspondence between marks and other grades varies from course to course, but is approximately as follows: grade A, 70% or over; grade B, 60-69%; grade C, 50-59%; grade D, 40-49%.

#### 3.2 Level 7 and 8 Courses

Course assessment is generally based on either coursework, an exam at the end of the semester, or a combination of both. Details for individual courses can be found in the relevant course description. If you do not obtain a grade D (or higher) in a Level 7 or 8 course at the first attempt, you are entitled to one further attempt.

#### 3.3 Level 9, 10 and 11 Courses

Assessment of Level 9, 10 and 11 courses is generally as for Level 7 and 8. However, in some cases, the exam for a first semester course may take place at the end of the second semester. Also, note that some pairs of courses are **synoptically linked**; that is, both courses are assigned the same grade, based on the average mark for the individual courses. Details are in the relevant course description. All Level 9, 10 and 11 course marks count towards the **final degree classification** (see also Section 3.8.4 Final Degree Assessment).



### 3.4 Results and Progress Decisions

The University operates a Heriot-Watt Assessment and Progression System (HAPS) which specifies minimum progression requirements. Schools have the option to apply progression requirements above the minimum University requirement, which are approved by the Studies Committees. Students should refer to the programme specific information on progression requirements. This information is detailed below.

The Progression Board meets at the end of the academic year to decide which students will be allowed to proceed to the next year of their degree programme. The Year Co-ordinators will write to inform you of the Board's decision, and whether you must resit any exams. The Registry also makes the results available online. To avoid any delay in receiving notification of your results, you should inform the School office of your summer address should it not be the same as your permanent home address.

### 3.5 First Year

#### 3.5.1 First Year Courses

| 1st Semester Courses |   | Required   | Optional |
|----------------------|---|------------|----------|
| F77SA                | Introduction to Statistical Science A     | AS, FM, SD |          |
| F17CA                | Calculus A                                | AS, FM, SD |          |
| F17CC                | An introduction to university mathematics | AS, FM, SD |          |
| C27OA                | Introductory Economics                    | FM         | AS, SD   |

| 2nd Semester Courses |                                       | Required   | Optional |
|----------------------|---------------------------------------|------------|----------|
| F77SB                | Introduction to Statistical Science B | AS, FM, SD |          |
| F17CB                | Calculus B                            | AS, FM, SD |          |
| F77PD                | Professional Development Planning     | AS, FM, SD |          |
| C37FF                | Finance & Financial Reporting         | FM         | AS, SD   |

AS-Actuarial Science    FM-Financial Mathematics    SD- Statistical Data Science

### **3.5.2 Degree Requirements**

#### **Actuarial Science**

Three mandatory and one optional course each semester. Any level 7 course may be chosen as an option, subject to timetable constraints and the approval of the Year Coordinator.

Students should note that the options C37FF and C27OA can lead to exemptions from the CT2 and CT7 examinations of the Institute and Faculty of Actuaries (see Section 4 -Actuarial Exemptions).

#### **Financial Mathematics**

Eight mandatory courses.

#### **Statistical Data Science**

Three mandatory and one optional course each semester. Any level 7 course may be chosen as an option, subject to timetable constraints and the approval of the Year Coordinator.

### **3.5.3 Proceeding to 2nd Year**

If you obtain a grade D or better in all eight courses at the first attempt, you may proceed to the 2nd year of any AMS degree for which you have fulfilled the prerequisites. Otherwise, progress is determined by the progression board on a case-by-case basis, and you may be required to resit some exams in August.

If you do not obtain D's at this second attempt, you may be required to transfer to another degree programme for which you have enough credit points (e.g. Combined Studies, Mathematics), or withdraw from the University. You will be advised of your options.

### 3.6 Second Year

#### 3.6.1 Second Year Courses

| 1st Semester Courses                           | Required   | Optional |
|--|------------|----------|
| F78PA Probability & Statistics A               | AS, FM, SD |          |
| F78AA Actuarial & Financial Mathematics A      | AS, FM, SD |          |
| F18CD Multivariable Calculus & Real Analysis A | AS, FM, SD |          |
| F18CF Linear Algebra                           | AS, FM, SD |          |

| 2nd Semester Courses                           | Required   | Optional   |
|--|------------|------------|
| F78PB Probability & Statistics B               | AS, FM, SD |            |
| F78AB Actuarial & Financial Mathematics B      | AS, FM, SD |            |
| F18CE Multivariable Calculus & Real Analysis B | AS, FM, SD |            |
| F18NA Numerical Analysis A                     |            | AS, FM, SD |
| C37FF Finance & Financial Reporting            |            | AS, FM, SD |

AS-Actuarial Science    FM-Financial Mathematics    SD- Statistical Data Science

#### 3.6.2 Degree Requirements

##### **Actuarial Science, Financial Mathematics and Statistical Data Science**

Seven mandatory courses, plus one optional course in Semester 2.

Direct entrant AS students should note that C37FF can lead to exemption from the CT2 examination of the Institute and Faculty of Actuaries (see Section 4 - Actuarial Exemptions).

Direct entrant FM students must take C37FF to fulfil degree requirements.

SM students may choose any Level 7 or 8 course as an option, subject to timetable constraints and the approval of the Year Co-ordinator.

### **3.6.3 Proceeding to 3rd Year**

If you obtain a grade D or better in all eight courses at the first you will be allowed to proceed to the 3rd year of any AMS degree for which you have fulfilled the prerequisites.

Otherwise, you will be required to resit some exams in August. If you do not obtain D or better at this second attempt, you may be required to transfer to another degree programme for which you have enough credit points (e.g. Combined Studies, Mathematics), or withdraw from the University. You will be advised of your options.

### 3.7 Third Year

#### 3.7.1 Third Year Courses

| 1st Semester Courses |                                 | Required   | Optional |
|----------------------|---------------------------------|------------|----------|
| F79MA                | Statistical Models A            | AS, FM, SD |          |
| F79SP                | Stochastic Processes            | AS, FM, SD |          |
| F79PS                | Statistics for Social Science   | SD         |          |
| F70LA                | Life Insurance Mathematics A    | AS         |          |
| F79PA                | Portfolio Theory & Asset Models | AS, FM     | SD       |
| C27OA                | Introductory Economics          |            | FM       |
| F19MV                | Vector Analysis                 |            | FM, SD   |

| 2nd Semester Courses |  | Required   | Optional |
|----------------------|--|------------|----------|
| F79MB                | Statistical Models B                       | AS, FM, SD |          |
| F79BI                | Bayesian Inference & Computational Methods | SD         | FM       |
| F79SU                | Survival Models                            | AS, SD     |          |
| F70LB                | Life Insurance Mathematics B               | AS         |          |
| F79DF                | Derivative Markets & Discrete-time Finance | AS, FM     | SD       |
| F19MO                | Ordinary Differential Equations            | FM         | SD       |
| F19NB                | Numerical Analysis B                       |            | FM       |

AS-Actuarial Science    FM-Financial Mathematics    SD- Statistical Data Science

### **3.7.2 Degree Requirements**

#### **Actuarial Science**

Eight mandatory courses.

#### **Financial Mathematics**

Three mandatory and one optional course each semester. Direct entrant FM students must take C27OA to fulfil degree requirements.

#### **Statistical Data Science**

Three mandatory and one optional course each semester. SM students may choose any Level 7, 8 or 9 course as an option, subject to timetable constraints and the approval of the Year Co-ordinator. However, note that only Level 9 and 10 courses count towards the final degree assessment (see Section 3.8.4 - Final Degree Assessment).

### **3.7.3 Synoptic Links (see Section 3.3)**

The following pairs of courses are synoptically linked:

F79MA and F79MB,

F79SP and F79SU (not FM degree),

F79PA and F79DF (not SD degree),

F70LA and F70LB.

### **3.7.4 Proceeding to 4th Year**

Students who obtain a grade D or better in all eight courses, may be allowed to proceed to the 4th year.

If you obtain a grade D or better in at least six courses and have an average mark of at least 40%, you may be permitted, at the discretion of the examiners, to proceed to the 4th year of an AMS degree. In these cases you will be advised by the examiners of your options, and may be required to resit some papers in August, to satisfy the prerequisites for the 4th year courses.

However, note that otherwise, no resit is allowed for an Honours paper, and in all cases, it is the marks obtained at the first attempt that form part of the Final Degree Assessment (see Section 3.8.4). For further information, consult your personal tutor.

### **3.7.5 Ordinary Degrees**

A candidate who obtains a grade D or better in at least four Level 9 courses and a total of at least 360 credits may be awarded the ordinary degree of B.Sc.

### 3.8 Fourth Year

#### 3.8.1. Fourth Year Courses

| 1st Semester Courses |   | Req'd | Opt.   | Elect. |
|----------------------|---|-------|--------|--------|
| F70DA                | Statistics Dissertation A               | SD    |        |        |
| F79PS                | Statistics for Social Science           |       | AS, FM |        |
| F70CF                | Continuous-time Finance                 | FM    | AS, SD |        |
| F70PE                | Pensions                                |       | AS     |        |
| F10MF                | Functional Analysis                     |       | FM     |        |
| F10MM                | Optimisation                            | SD    | AS, FM |        |
| F10AM                | Mathematical Biology A                  |       | SD     |        |
| F10NC                | Numerical Analysis C                    |       | FM, SD |        |
| F20ML                | Statistical Machine Learning            | SD    | AS,FM  |        |
| C39SM                | International Bond and Currency Markets |       | FM     | AS     |

| 2nd Semester Courses |  | Req'd | Opt.       | Elect. |
|----------------------|--|-------|------------|--------|
| F70DB                | Statistics Dissertation B                  | SD    |            |        |
| F70TS                | Time Series                                | SD    | AS, FM     |        |
| F79BI                | Bayesian Inference & Computational Methods |       | AS, FM     |        |
| F70DP                | Advanced Derivative Pricing                | FM    |            |        |
| F70RT                | Risk Theory                                |       | AS, FM, SD |        |
| F70LP                | Life Office Practice                       |       | AS         |        |
| F71CM                | Credit Risk Modelling                      |       | FM         |        |
| F71TT                | Risk Management: Techniques & Tools        |       | AS         |        |
| F19MO                | Ordinary Differential Equations            |       |            | AS     |
| F10AN                | Mathematical Biology B                     |       | SD         |        |
| F10ND                | Numerical Analysis D                       |       | FM, SD     |        |
| C39TA                | Taxation (Tax Law)                         |       |            | AS     |

AS-Actuarial Science      FM-Financial Mathematics      SD- Statistical Data Science

#### 3.8.2 Degree Requirements

##### Actuarial Science

At least three optional courses plus at most one elective course each semester. Students must take both F70PE and F70LP, or neither.

Direct entrants to AS may take C27OA and/or C37FF to obtain exemption from the CT7 and/or CT2 examinations of the Institute and Faculty of Actuaries

Direct entrants to 3rd year AS may take F71AB to obtain exemption from the CT1 examination of the Institute and Faculty of Actuaries.

### **Financial Mathematics**

One mandatory course and three optional courses each semester. At least four option courses must be at Level 10 or above.

### **Statistical Modelling**

Two mandatory courses plus at least one optional course and at most one elective each semester.

Students transferring to the SM degree from one of the other AMS degrees must take F79PS and F79BI (if not already taken).

### **3.8.3 Synoptic Links (see Section 3.3)**

The following pairs of courses are synoptically linked:

F70DA and F70DB,

F70PE and F70LP.

### **3.8.4 Final Degree Assessment**

The Examiners take into account all course marks at Level 9 and above in deciding the class of Honours: the final mark is the average of those marks (note that Level 7 and 8 course marks are not included). In broad terms, an average mark of over 70% for first class honours, 60% - 70% for upper second class honours, 50% - 60% for lower second class honours, and 40% - 50% for third class honours, would be required, subject to the agreement of the Examiners.

Note that 480 credits are required for the award of an honours degree.

In borderline cases, a positive view may be taken of an improving performance from third to fourth year.



## 4 ACTUARIAL EXEMPTIONS

### 4.1 Introduction

The Actuarial Science degree has been accredited by the Institute and Faculty of Actuaries (IFoA), which means that students can obtain exemption from some of the subjects in the IFoA's examination system. There are two routes to gaining exemptions.

#### 4.1.1 Accreditation

Students graduating with a good upper second class degree (normally an overall average of at least 65%) will be eligible for exemption from all Core Technical subjects covered in their degree from in which they have obtained the University pass mark in the relevant courses (normally 40%).

#### 4.1.2 Individual Exemptions

Students who do not attain the accreditation threshold as above will be considered for exemption from individual subjects as described below. The exemption standard for each subject will be reviewed each year by the profession's Independent Examiners and may vary from year to year.

Note that the accreditation policy does not cover exchange arrangements; in this case, all exemptions will be recommended on a subject-by-subject basis, taking into account performance at Heriot-Watt and the exchange university.

### 4.2 Core Technical Stage

Exemptions are based on performance in the relevant subjects as listed below.

#### **Subject CT1 Financial Mathematics**

Actuarial & Financial Mathematics F78AA & F78AB

#### **Subject CT2 Finance & Financial Reporting**

Finance & Financial Reporting C37FF.

#### **Subject CT3 Probability & Mathematical Statistics**

Probability & Statistics F78PA & F78PB.

#### **Subject CT4 Models**

Survival Models F79SU, Stochastic Processes F79SP.

#### **Subject CT5 Contingencies**

Life Insurance Mathematics F70LA & F70LB.

#### **Subject CT6 Statistical Methods**

Risk Theory F70RT, Time Series F70TS.

#### **Subject CT7 Business Economics**

Introductory Economics C27OA/C27IE.

#### **Subject CT8 Financial Economics**

Portfolio Theory F79PA, Derivative Markets F79DF, Continuous-time Finance F70CF.

### **Subject CT9 Business Awareness:**

The IFoA assesses this through a two-day residential course and does not grant exemption from this subject on the basis of university studies.

### **4.3 Impact of IFoA Curriculum 2019 on Core Technical Subjects**

The IFoA is currently in the process of implementing a new exam system as of 2019. Core Technical Subjects will be replaced by 'Core Principles' subjects in the new syllabus, and exemptions under the current system will be able to be mapped over to exemptions under the 2019 system. However, please note:

- in order to be granted exemption from new subject 'Actuarial Mathematics CM1', you must gain exemption from both CT1 **and** CT5;
- in order to be granted exemption from new subject 'Core Statistics CS2', you must gain exemption from both CT4 **and** CT6.

Gaining only one of each pair of CT exemptions will not allow you to claim the relevant exemption under the new system.

### **4.4 Later Stages of the Professional Syllabus**

The later parts of the professional syllabus are divided into three stages: Core Applications, Specialist Technical, and Specialist Applications. In addition, the profession intends to develop a series of UK Practice Modules, which will not be required to qualify as a Fellow, but will be required in order to practise in the UK. Students on the MSc. in Actuarial Management can obtain exemptions from CA1, CA3 and three ST subjects. Otherwise, no exemptions are available, although some courses are relevant, as indicated in the brackets.

#### **4.4.1 Core Applications Stage**

**Subject CA1** Actuarial Risk Management

**Subject CA2** Model Documentation, Analysis and Reporting

**Subject CA3** Communications

#### **4.4.2 Specialist Technical Stage**

Students choose two subjects. Note Subject ST3 no longer exists.

**Subject ST1** Health and Care

**Subject ST2** Life Insurance (F70LP)

**Subject ST4** Pensions and Other Benefits (F70PE)

**Subject ST5** Finance and Investment A

**Subject ST6** Finance and Investment B (F70CF, F79DF)

**Subject ST7** General Insurance: Reserving and Capital Modelling (F70RT)

**Subject ST8** General Insurance: Pricing (F70RT)

**Subject ST9** Enterprise Risk Management (F71RM)

#### **4.4.3 Specialist Applications Stage**

Students choose one subject.

**Subject SA1** Health and Care

**Subject SA2** Life Insurance (F70LP)

**Subject SA3** General Insurance

**Subject SA4** Pensions and Other Benefits (F70PE)

**Subject SA5** Finance

**Subject SA6** Investment

It is also possible to pass the Specialist Applications stage by writing a research dissertation (Subject SA0).

#### **4.4.3 Impact of IFoA Curriculum 2019 on Later Stages**

While there are some minor changes to these later parts of the professional syllabus, there are no significant changes.

#### **4.5 General Information**

Some general points to note about the exemption system are:

- 4.5.1.** The University cannot grant exemptions, the Independent Examiner appointed by the IFoA makes recommendations to the IFoA. Usually the recommendations are accepted.
- 4.5.2** Decisions regarding recommendations for exemptions are generally made on the basis of the student's performance at the first sitting of the relevant University exam. (Resits granted as a first attempt because of medical or other mitigating circumstances are usually counted as a first attempt for exemption purposes also.) The IFoA will only allow a student to resit a course for exemption purposes (in the absence of mitigating circumstances) if it is necessary to resit it for the purposes of progression or graduation, in which case the resit must be taken at the next reassessment opportunity, and the maximum mark that can be used for exemption purposes is the pass mark (40%). These resits are for subject-by-subject exemptions only, and will not alter your degree average, or your entitlement to exemptions from other courses under the accreditation agreement.
- 4.5.3.** Decisions on a particular exemption are made at a meeting of staff and an independent examiner held at the end of the academic year in which the relevant information becomes available, following which students are informed of these decisions. However, the recommendations are not sent to the IFoA until the end of the academic year in which the student graduates. Graduating students will be issued with a letter confirming the recommendations, and advising on how to claim them upon joining the IFoA as a student member.

- 4.5.4.** The IFoA will not grant any exemptions (or confirm that any will be granted) until a student has joined the profession, at which time you should complete an Exemptions Application Form, available from the IFoA. State clearly on the form that you are a graduate of the AMS Department at Heriot-Watt University; there will then be no need to supply details of syllabi or exam papers. Note there is a fee payable for each exemption granted.
- 4.5.5.** There are frequent discussions between the AMS department and the IFoA about the rules and practices concerning exemptions. The above notes reflect the current position but it is possible that changes may occur without prior notice.

#### **4.6 Further Information**

Further information about the IFoA's Education strategy can be found on their website ([www.actuaries.org.uk](http://www.actuaries.org.uk)).

## 5 COURSE DESCRIPTIONS

The aims and summary of the courses are provided in this section.

### 5.1 Level 7 Courses

**F77SA**

**INTRODUCTION TO  
STATISTICAL SCIENCE A**

**Lecturer: G. Streftaris**

**Aims:** To provide an introduction to the statistical issues associated with the collection, description, and interpretation of data, and in addition, to introduce computer-based methods for graphically describing and summarising data.

**Summary:** The aim of statistical analysis is to provide insight by means of numbers. This process usually involves three stages:

1. collecting data,
2. describing and presenting data,
3. drawing conclusions from the data (inference).

In this course, we will (primarily) consider the statistical principles and techniques used in the first two stages in an analysis. There will be some discussion of inference at the end of the course.

**Book:**

D.S. Moore and W. Notz, *Statistics: Concepts and Controversies* 6th ed. (W.H. Free-man & Co.).

**Assessment:** 2-hour final exam (70%), continuous assessment consisting of a class test (up to 20%) and a project (minimum 10%).

**F77SB**

**INTRODUCTION TO  
STATISTICAL SCIENCE B**

**Lecturer: J.Hansen**

**Aims:** To develop simple probability models for data and understand important features of these models.

**Summary:** This course provides an introduction to the probability models for inference. The main topics covered are:

1. models for statistical inference: introduction to discrete probability models including sample spaces, probability functions, axioms of probability and consequences of the axioms;
2. conditional probability, Partition Theorem, Bayes' Theorem and independence;
3. special probability models for random experiments;
4. discrete random variables, expectation and variance.

**Book:** (useful, but not essential)

S. M. Ross, A First Course in Probability, 7th ed. (Pearson, 2006).

**Assessment:** 2-hour final exam (80%), two marked assignments (10% each).

**F77PD**

**PROFESSIONAL DEVELOPMENT  
PLANNING**

**Lecturer: J. Phillips**

**Aims:** To introduce students to the actuarial, statistical and financial mathematics professions and to improve their career planning. To help students build up a range of skills that will prepare them to cope well at the job interview stage and beyond.

**Summary:**

1. An analysis of the opportunities available to Actuarial Science, Financial Mathematics and Statistical Modelling graduates;
2. Case studies of career paths taken by graduates in these subject areas;
3. Professional Development Planning and the graduate selection process;
4. Using computer methods to solve problems of the type found in industry;
5. Taking part in games that simulate the business environment.

**Assessment:** Continuous assessment: group project analysing a particular company, presentation, written assignments and two computer projects.

**F17CC**

**AN INTRODUCTION TO  
UNIVERSITY MATHEMATICS**

**Lecturer: M. Lawson**

**Aims:** To provide a bridge between school and university mathematics, with a particular emphasis on the central role of proofs in mathematics.

**Summary:** The conceptual aspects of mathematics – what is mathematics? What is an argument? Abstraction and Rules, Problem-solving and the need for checking covering:

1. Combinatorics
2. Complex numbers and polynomials
3. Matrices
4. Vectors

**Assessment:** 2-hour final exam (at least 70%), continuous assessment such as class tests or project work (up to 30%).

**F17CA**

**CALCULUS A**

**Lecturer: R. Szabo**

**Aims:**

A course on differential calculus with applications of differentiation and an introduction to integral calculus. It is designed for students who will specialize in mathematics, actuarial mathematics or statistics. The module builds on what the students learned at school but provides a greater depth of study and introduces new material and concepts.

**Syllabus**

Functions  
Limits of functions.  
Introduction to Differentiation.  
Inverse Functions.  
Advanced Differentiation: Parametric differentiation, implicit differentiation.  
Derivatives of inverse functions, Inverse Trig functions. Hyperbolic functions and hyperbolic equations, Derivatives for hyperbolic functions and inverse hyperbolic functions.  
Introduction to Integration.  
Sequences and Series.

**Contact Hours:** 3 lectures and 1 tutorial per week.

**Assessment:** up to 20% by class tests or other continuous assessment at least 80% by end of semester 2-hour exam.

**F17CB**

**CALCULUS B**

**Lecturer: J. Sherratt**

**Aims:** This course builds on the differential and integral calculus introduced in Calculus A, before moving on to introduce the basics of mathematical modelling techniques using first and second order ordinary differential equations. The course develops integration methods such as integration by parts and reduction formulae and describes some applications of integration. Solution methods for first and second order differential equations are introduced and used to investigate various physical problems.

**Syllabus:**

- Applications of differentiation
- Advanced Integration
- Differential Equations
- Modelling through first order equations
- Modelling through second order equations
- Recurrence relations

**Contact Hours:** 3 lectures and 1 tutorial per week.

**Assessment:** up to 20% by class tests or other continuous assessment. 80% by end of course 2-hour exam

**C27IE**

**INTRODUCTORY ECONOMICS**

**Lecturer: TBA**

**Aims:** To equip students with knowledge and understanding of the fundamental principles and concepts of microeconomics and macroeconomics. By the end of the course students should be able to apply their knowledge and understanding in the analysis of a range of economic problems. Students who perform well in this course may be recommended for exemption from subject CT7.

**Assessment:** Continuous assessment and a 2-hour exam .

**C37FF**

**FINANCE AND FINANCIAL REPORTING**

**Lecturer: TBA**

**Aims:** To provide a basic understanding of issues in corporate finance and cover the syllabus of subject CT2.

**Summary:**

1. Instruments used by companies to raise finance
2. Management of financial risk
3. Personal and corporate taxation
4. Interpretation of financial statements of companies and financial institutions

**Assessment:** Continuous assessment (30%) and a 2-hour exam (70%).



## 5.2 Level 8 Courses

**F78PA**

**PROBABILITY & STATISTICS A**

**Lecturer: R.Cruise**

**Summary:** The main topics covered in this course are:

1. Probability models: sample spaces, events, probability measures, axioms of probability and related results.
2. Random variables and their distributions.
3. Expectation, variance, and standard deviation of random variables.
4. Important random variables including Binomial, Geometric, Hypergeometric, Poisson, Uniform, Normal, Exponential, Gamma variables.
5. Conditional probability and independence including the chain rule, the partition rule and Bayes' Theorem.
6. Joint probability distributions, marginal and conditional distributions.
7. Independent random variables and sums of independent random variables, generating functions, the weak law of large numbers and the Central Limit Theorem.
8. Expectation of a function of random variables, covariance and correlation.
9. Computer simulation of random variables and its applications in probability and statistics

**Prerequisites:** F77SA and F77SB (or equivalent).

**Books:** Some helpful reference books include:

- R.P. Dobrow, Probability with Applications and R (Wiley, 2014);
- S. Ross, A First Course in Probability (details are already in the guide)
- T. Cacoullos, Exercises in Probability (Springer-Verlag, 1989);
- Grimmett & Welsh, Probability: An Introduction (Clarendon Press, 1988)
- Verzani, Using R for Introductory Statistics (Chapman and Hall, 2005);

**Assessment:** 2-hour end-of-semester examination (85%), continuous assessment(15%).

**F78PB**                      **PROBABILITY & STATISTICS B**                      **Lecturer: J. Phillips**

**Aims:** To reinforce basic ideas related to the description and analysis of data, and provide the basis for the application of statistical modelling, estimation, hypothesis testing and regression.

**Summary:** This course follows on from Probability and Statistics A. It develops the basic ideas used in statistical analysis and inference, with an emphasis on how we learn from data using both graphical techniques and statistical methodology based on probability theory. Topics presented include: analysis of simple data; construction of statistical models; sampling distributions and properties of estimators; method of moments and introduction to maximum likelihood estimation; inference for data from one population; comparisons of data from two populations; confidence intervals with samples from one or two populations; hypothesis testing; issues related to association between two variables; linear regression; statistical computing.

**Prerequisites:** F77SA and F77SB (or equivalent).

**Books:**

I. Miller & M. Miller, J.E. Freund's Mathematical Statistics with Applications, 7th ed. (Prentice Hall, 2004).

**Assessment:** 2-hour end-of-semester examination (80%), continuous assessment (20%).

**F78AA**                      **ACTUARIAL & FINANCIAL**                      **Lecturer: A. Cairns**  
**MATHEMATICS A**                      **& M. Fahrenwaldt**

**Aims:** The aim of this course, along with F78AB, is to give students a thorough understanding of basic actuarial techniques. Exemptions from Subject CT1 may be recommended for candidates who score sufficiently well in F78AA and F78AB.

**Summary:** In this course, you will learn how to deal with questions involving cashflows at discrete time points, and the accumulation and discounting of payments over discrete time intervals. Topics include:

1. interest rates and some actuarial notation,
2. loan schedules,
3. yields,
4. fixed interest securities,
5. discounted cash flows.

There are three lectures per week. Students attend weekly tutorials and three computer labs during the semester.

**Books:** Useful reference:

S.J. Garrett, An Introduction to the Mathematics of Finance: A Deterministic Approach. (Butterworth-Heinemann, 2013).

Alternative reference with additional exercises:

Schaum's Outlines of Mathematics of Finance (McGraw-Hill, 1996).

**Assessment:** 2-hour end-of-semester examination (80%), continuous assessment (10%), Excel-based assignment (10%).

**F78AB**

**ACTUARIAL & FINANCIAL  
MATHEMATICS B**

**Lecturer: B. Moretta**

**Aims:**

1. To introduce the continuous-time concept of cash flows and interest,
2. develop skills in applying continuous-time models to financial contracts and transactions,
3. model interest rates as random variables and apply those models,
4. introduce the principle of no-arbitrage and how to price financial contracts and construct the term-structure of interest rates assuming no-arbitrage,
5. value inflation-indexed cashflows.

**Summary:** This course builds on and extends the ideas contained in the related course F78AA. The concepts of a continuously-payable cashflow and the force of interest are considered. We incorporate inflationary increases into cashflows and value index-linked bonds. We see how interest-rate risk can be managed through the use of Redington's immunisation theory. As rates of return can be random, we see how to model them using random variables. Using the no-arbitrage principle, we price forward contracts. This leads on to a wider discussion of the term-structure of interest rates and the yield curve.

**Books:**

S.J. Garrett, An Introduction to the Mathematics of Finance: A Deterministic Approach. (Butterworth-Heinemann, 2013).

**Assessment:** 2-hour end-of-semester examination (85%) and continuous assessment (15%).

**F18CF**

**LINEAR ALGEBRA**

**Lecturer: A. Martin**

**Aims:** This is a Level 8 course in Linear Algebra aimed at students specializing in Mathematics, Statistics, or Actuarial Mathematics. The course aims to provide sufficient knowledge of matrix theory and of the solution of systems of linear equations for use in later courses in mathematics and statistics; to give an understanding of the basic concepts of linear algebra; and to develop the ability to solve problems and prove theorems involving these concepts.

**Summary:**

Euclidean space: Vector spaces  $\mathbb{R}^2$ ,  $\mathbb{R}^3$  and  $\mathbb{R}^n$ , Matrices, Basic matrix operations, Determinants.

Systems of linear equations: Gaussian elimination, Results on homogeneous and inhomogeneous systems, Matrix inversion.

Vector spaces: Definition and examples of vector spaces, Subspaces, Span, Linear independence, Bases and dimension.

Inner product spaces: Scalar or Inner products, Cauchy-Schwartz inequality, Orthogonality, Orthogonal projection, Orthonormal bases, Gram - Schmidt process, Vector products.

Linear transformations: Row and Column rank of a matrix, Applications to systems of equations, Range, Kernel, Rank and Nullity, Invertibility of linear transformations, Linear transformations and matrices.

Eigenvalues and eigenvectors: Calculation of Eigenvalues and Eigenvectors, Symmetric matrices, Diagonalisation of a matrix, Cayley Hamilton theorem, Iterates of matrices, applications to quadratic forms.

**Assessment:** 30% by class tests or other continuous assessment. 70% by end of course 2-hour exam.

**F18CD** **MULTIVARIABLE CALCULUS & REAL ANALYSIS A** **Lecturer: A. Konechny**

**Aims:** The course aims to provide an introduction to the calculus for functions of several variables, which will provide sufficient expertise for use in various later courses. The students will also develop their general skills in differentiation, integration and algebraic manipulation.

**Summary:**

Partial differentiation: Functions of several variables, partial derivatives and higher order partial derivatives. Matrix 'total' derivatives. The chain rule, implicit differentiation.

Applications of partial differentiation: Taylor expansions, tangent planes, maxima and minima, Lagrange multipliers. The inverse function theorem (in 1 and 2-dimensions).

Integration: Double integrals interchange of order of integration. Change of variables. Polar coordinates. Triple integrals.

Applications of integration: Areas, volumes.

Integrals over infinite regions: The definition of the convergence of integrals of functions on unbounded intervals. Comparison tests and absolute convergence tests of integrals.

Sequences: Define a sequence of real numbers. Define bounded and convergent sequences, and the limit of a convergent sequence.

**Assessment:** Up to 30% by class tests or other continuous assessment. At least 70% by end of course 2-hour exam.

**Aims:**

The course aims to introduce students to the idea of rigorous mathematical arguments and, in particular, to discuss the rigorous foundations of calculus. An important feature of the course is the use of careful, rigorous proofs of the theorems used and one of the aims of the course is to improve student's ability to understand such arguments and to develop such proofs for themselves. A central concept in analysis is the idea of convergence, either of sequences, series or of functions, and this course aims to introduce this concept and provide the basic results which will be used in later courses. In addition, it will give methods of obtaining inequalities and approximations (with precise estimates of how good the approximations are), tests for convergence of series and power series and ways of identifying functions defined by power series and characterisations of functions (over bounded and unbounded intervals) for which the concept of area under the graph of a function makes sense.

**Summary:**

Sequences: Briefly recall the idea of a sequence of real numbers, and of bounded and convergent sequences.

Suprema and infima: Sup and inf of sets of real numbers. The completeness axiom for real numbers.

Monotone sequences: Monotone sequences and the monotone convergence theorem. Use of the monotone convergence theorem to prove convergence of sequences without knowing the limit.

Subsequences: Subsequences and the Bolzano-Weierstrass theorem.

Continuous functions: Limits of functions, manipulation of limits. Continuity, combinations of continuous functions. Boundedness of continuous functions on closed intervals. The intermediate value theorem.

Differentiability: Differentiability. Continuity of differentiable functions. Rolle's theorem. Local maxima and minima.

First mean value theorem: Statement and proof of the first mean value theorem, applications to inequalities.

$n$ th mean value theorem: Statement and proof of the  $n$ th mean value theorem, applications to approximations.

Series and power series: Convergence of series, the comparison, ratio zero, absolute convergence and alternating series tests for series, radius of convergence of a power series properties of functions defined by power series, convergence of standard power series.

Riemann integration and convergence of integrals: Partitions, upper and lower sums, Riemann integrable functions.

**Assessment:** 15% by class tests or other continuous assessment. 85% by end of course 2-hour exam.

**Aims:**

When solving problems in science, engineering or economics, a real-life situation is first converted into a mathematical model. This is often called the formulation of the problem and it is given in terms of mathematical equations. Only a handful of model equations can be solved in a neat analytical form. Hence we need numerical analysis, comprising a set of techniques for finding approximate solutions of these equations. This course provides an introduction to very basic methods in numerical analysis both from a theoretical and a practical perspective. It also provides an introduction to programming the scientific computing package Matlab.

**Syllabus:**

- Solving general non-linear scalar equations
- Solving smooth non-linear scalar equations
- Analysis of orders of convergence for fixed point iteration
- Interpolation
- Numerical Integration
- Convergence of the numerical integration methods
- Numerical differentiation
- Computer arithmetics
- Basics of Matlab Programming
- Iteration techniques in Matlab
- Integration and differentiation in Matlab

3 lectures + 1 tutorial or lab session per week

**Assessment:** 30% by class tests or other continuous assessment  
70% by end of module 2-hour exam

### 5.3 Level 9 Courses

#### **F79MA                      STATISTICAL MODELS A                      Lecturer: M. Pereyra**

**Aims:** To describe and compare the main approaches to statistical inference, including classical and Bayesian, and to develop students' skills in practical, computer-based estimation and inference. This course also aims to develop students' independent research skills, and their report writing skills.

**Summary:** This course will consist of a mixture of lectures, tutorials, and project work. First and second year courses have discussed how to draw conclusions from data, and introduced some basic methods in an informal way. In this course we take a more fundamental approach to estimation and quantifying the accuracy of estimates.

In lectures we introduce the principles of classical and Bayesian inference discussing their different philosophical bases, and comparing the different solutions that each method gives to various problems of inference. The properties and fundamental importance of the likelihood are described, along with some important results on the sampling properties of estimators. The course will emphasise worked examples and there will be project work based on the computer implementation of the theory taught in lectures and tutorials. The statistical computer package R will be used for the project work.

**Prerequisites:** F78PA and F78PB (or equivalent).

**Books:**

P.H. Garthwaite et al, Statistical Inference, 2nd ed. (Oxford Science Publ., 2002); G. Casella & R.L. Berger, Statistical Inference, 2nd ed. (Thomson Learning, 2002); V. Barnett, Comparative Statistical Inference, 3rd ed. (Wiley, 1999).

**Assessment:** 2-hour exam on the lecture material in December (60%) and project work (40%). This course is synoptically linked with F79MB.

#### **F79MB                      STATISTICAL MODELS B                      Lecturer: D. Clancy**

**Aims:** To develop students abilities in understanding and solving statistical problems, and to teach them how to choose appropriate techniques, analyse data and present results, especially in applications related to linear and generalised linear models.

**Summary:** The course will consist of a mixture of lectures and practical work. The first part of the course will focus on statistical modelling, including the selection of appropriate models, the analysis and interpretation of results, and diagnostics. Exploratory and graphical techniques will be considered, as well as more formal statistical procedures. Both parametric and nonparametric methods will be discussed, as will modern robust techniques. There will be considerable emphasis on examples, applications and case studies, especially for continuous response variables. Some theory of multiple linear regression in matrix notation will be presented. The course will go on to consider the theory and techniques for the analysis of categorical data,

including the use of generalised linear models (log-linear and logistic regression models). Practical applications will be emphasised throughout and computing facilities, especially R, will be used extensively.

**Prerequisites:** F78PA and F78PB (or equivalent).

**Books:** The following textbooks are recommended:

A.J. Dobson, *An Introduction to Generalized Linear Models*, 2nd ed. (Chapman & Hall, 2002);

J. Faraway, *Linear models with R* (Chapman & Hall, 2005);

J. Faraway, *Extending the Linear Model with R: Generalized Linear, Mixed Effects and Nonparametric Regression Models* (Chapman & Hall/CRC, 2006);

P.H. Garthwaite, I.T. Jolliffe & B. Jones, *Statistical Inference*, 2nd ed. (Prentice Hall, 2002);

J. Verzani, *Using R for Introductory Statistics* (Chapman & Hall/CRC, 2005) (back-ground);

S. Weisberg, *Applied linear regression*, 3rd ed. (Wiley/Interscience, 2005).

**Assessment:** Two practical assignments, to be handed in at specified times during the semester. This course is synoptically linked with F79MA.

## **F79PS                      STATISTICS FOR SOCIAL SCIENCE.                      Lecturer: J. Phillips**

**Aims:** To introduce students to the main classical statistical methods that are commonly applied in psychology and other social sciences and to give hands-on experience of using more advanced techniques for exploring multivariate data.

**Summary:** In social sciences, such as psychology, experiments and surveys typically yield large quantities of high-dimensional data (e.g. in the form of questionnaire responses) from which we wish to extract simpler underlying relationships, or evidence of differences in subgroups in a population. The course will give students a grounding in the most common classical statistical methods used in analysing psychological data, the correct interpretation of results, and the application of methods to real data sets using the computer package SPSS. Topics covered will include: confidence intervals, hypotheses testing, parametric and non-parametric statistical methods, analysis of variance (incorporating one-way designs, planned and unplanned comparisons, factorial designs and interactions), principal components analysis and the interpretation and use of factor analysis.

**Prerequisites:** F78PA and F78PB, or F78SC (or equivalent).

**Books:**

Brace, Kemp & Snelgar, *SPSS for Psychologists*, 3rd ed. (Palgrave Macmillan, 2006); H. Coolican, *Research Methods and Statistics in Psychology* (Hodder & Stoughton, 1999);

D.C. Howell, *Statistical Methods for Psychology*, 5th ed. (Duxbury, 2002).

**Assessment:** 2-hour exam in December (70%) and project work 30%).



**F79SP**

**STOCHASTIC PROCESSES**

**Lecturer: S. Foss**

**Aims:** To introduce fundamental stochastic processes which are useful in insurance, investment and stochastic modelling, and to develop techniques and methods for simulation and the analysis of the long term behaviour of these processes.

**Summary:** In this course, we develop methods for modelling systems or quantities which change randomly with time. Specifically, the evolution of a system is described by a collection  $\{X_t\}$  of random variables, where  $X_t$  denotes the state of the system at time  $t$ .

Discrete-time processes studied include Markov chains. In particular, we consider branching processes, random walk processes, and more general countable state-space chains. Continuous-time processes studied include point processes, Poisson and compound Poisson processes; continuous time Markov processes; population, queueing and risk models.

**Prerequisites:** F78PA and F78PB (or equivalent).

**Books:** Useful reference books are

P. Bremaud, An Introduction to Probabilistic Modeling, (Springer, 1997);  
Grimmett & Stirzaker, Probability and Random Processes, 3rd ed. (OUP, 2001);  
Grinstead & Snell, Introduction to Probability, (Amer. Math. Soc., 1997);

W. Feller, An Introduction to Probability Theory and Its Applications, Vol. 1, 3rd ed. (Wiley, 1968);

S.M. Ross, Stochastic Processes, 2nd ed. (Wiley, 1996).

**Assessment:** 2-hour exam (80%) at the end of the 1st semester, project work (20%). This course is synoptically linked to F79SU on all degrees except FM.

**F79BI**

**BAYESIAN INFERENCE &  
COMPUTATIONAL METHODS**

**Lecturer: G.J. Gibson,  
G.Streftaris**

**Aims:** To provide students with a knowledge of modern Bayesian statistical inference, an understanding of the theory and application of stochastic simulation methods including MCMC, and experience of implementing the Bayesian approach in practical situations.

**Summary:** The course will review subjective and frequentist probability, the role of likelihood as a basis for inference, and give a comparative treatment of Bayesian and frequentist approaches. The key concepts in practical Bayesian statistics will be covered including: likelihood formulation; the incorporation of prior knowledge or ignorance in the prior; the interpretation of the posterior distribution as the totality of knowledge and its use in prediction. Methods for assessing the goodness-of-fit of models in the Bayesian context will be considered. A range of stochastic simulation methods for investigating posterior distributions will be considered. Methods will include rejection sampling, and Markov chain methods such as the Metropolis-Hastings algorithm and the Gibbs sampler. The use of stochastic methods for inference for

partially observed processes will be discussed and students will gain experience of implementing methods in computer laboratory sessions.

**Prerequisites:** F78PA and F78PB (or equivalent).

**Books:**

(useful) P.H. Garthwaite et al, Statistical Inference, 2nd ed. (Oxford Sc. Publ., 2002);

W. M. Bolstad, Introduction to Bayesian statistics (John Wiley, 2007)

A. Gelman, J. B. Carlin, H. S. Stern, D. B. Dunson, A. Vehtari, & D. B. Rubin, Bayesian Data Analysis (3rd Edition) (Chapman & Hall, 2014)

G.Cassella&R.L.Berger,StatisticalInference (2nd Edition) (Duxbury2002)

S.M. Ross, A course in simulation (Macmillan, 1990)

**Assessment:** 2-hour exam (70%) and practical assignments (15% each).

**F79PA** **PORTFOLIO THEORY & ASSET MODELS** **Lecturer: G. Peters**

**Aims:** To introduce asset pricing and portfolio selection models. This course covers the first half of the material in Subject CT8 of the Institute and Faculty of Actuaries examinations. Summary: This course covers the following topics:

Utility theory,  
Stochastic dominance  
Measures of investment risk,  
Mean-variance portfolio theory,  
Models of asset returns,  
Behavioural economics, and  
Efficient markets hypothesis.

Students are expected to understand the basic mathematical skills of decision theory and apply them to various stochastic problems.

**Prerequisites:** F78PA and F78AB (or equivalent).

**Books:**

(Main reference) Joshi & Paterson, Introduction to Mathematical Portfolio Theory, 1st ed. (CUP);

Brown, Elton, Goetzman & Gruber, Modern Portfolio Theory and Investment Analysis, 9th ed. (Wiley, older editions are adequate).

**Assessment:** 2-hour exam (80%) at the end of the 1st semester, a midterm test (10%) and two assignments (10%). This course is synoptically linked to F79DF on all degrees except SM.

**F79DF**

**DERIVATIVE MARKETS &  
DISCRETE-TIME FINANCE**

**Lecturer: T.C. Johnson**

**Aims:** This course introduces students to derivatives, their use in financial markets and how they are priced and hedged in discrete time. It introduces the relationship between financial markets and stochastic analysis.

**Summary:** The course introduces the idea of derivative securities and why they exist, explaining the role of forward and option contracts in risk management, and discusses various investment strategies involving derivatives. The concept of arbitrage-free pricing (cash-and-carry pricing) is explained and developed into the fundamental theorem of asset pricing in discrete time. Pricing on the binomial tree (the CRR model) is explained, for both European- and American-style derivatives, in the context of the fundamental theorem, and the relationship between the CRR model and the continuous-time Black-Scholes-Merton formula is discussed. The fundamental properties of option prices are given.

This course covers some of the material in Subject CT8 of the Institute and Faculty of Actuaries examinations.

**Prerequisites:** F78PA and F78AB (or equivalent).

**Books:** Recommended texts are:

A. Chatterjea & R.A. Jarrow, *An Introduction to Derivative Securities, Financial Markets and Risk Management* (W.W. Norton, 2013);

M. Baxter & A. Rennie, *Financial Calculus* (Cambridge University Press, 1996); J.C. Hull, *Options, Futures and Other Derivatives*, 8th ed. (Prentice Hall, 2011).

**Assessment:** 2-hour end-of-semester exam (80%), continuous assessment (20%). This course is synoptically linked to F79PA on all degrees except SM.

**Aims:**

1. To understand the use of mathematical models of mortality, illness and other life-history events in the study of processes of actuarial interest.
2. To be able to estimate the parameters in these models, mainly by maximum likelihood.
3. To describe and apply methods of smoothing rates of mortality and other actuarial statistics based on observed data.

**Summary:**

1. Estimation procedures for lifetime distributions: Kaplan-Meier estimate of the survival function, the Nelson-Aalen estimate of the cumulative hazard function and estimation for the Cox model for proportional hazards.
2. Statistical models for transfers between multiple states (e.g., alive, ill, dead), relationships between probabilities of transfer and transition intensities, and estimation for the parameters in these models.
3. Methods of projecting future mortality rates to allow for improving longevity.
4. Tests of consistency of crude estimates of rates of mortality and rates in a standard table. Methods of graduation: parametric, standard table, graphical.
5. Computing facilities, especially R, will be used extensively and this work will be assessed by practical assignments.

**Prerequisites:** F78AB and F78PB (or equivalent).

**Book:**

I.D. Currie, Survival Models (Heriot-Watt University notes, supplied by the department).

The recommended textbook, supplementing these notes, is *Modelling Mortality with Actuarial Applications*, by A.S. Macdonald, S.J. Richards and I.D. Currie, Cambridge University Press, 2018.

**Assessment:** 2 hour exam (80%-90%), project work (10%-20%). The exact split between exam and project work will be announced at the start of the course. This course is synoptically linked to F79SP (except on the FM degree).

## 5.4 Level 10 and 11 Courses

**F70TS**

**TIME SERIES**

**Lecturer: F. Daly**

**Aims:** To introduce many of the fundamental concepts required for modelling and forecasting time series data.

**Summary:** A time series is a set of data consisting of observations made one after another in time. The analysis of time series data is an area of practical importance in finance, business, economics, industry, medicine, life and physical sciences and many other fields.

The course begins with real data, and some descriptive methods for identifying, and removing if appropriate, trend and seasonal effects. We consider moving averages and exponential smoothing, along with other approaches. This leads into the important concepts of stationarity and autocorrelation.

The main body of the course consists of modelling the stochastic mechanism which gives rise to an observed series, and then using model-based forecasting procedures to predict future values of the series.

The models we consider are autoregressive moving average (ARMA) processes, and autoregressive integrated moving average (ARIMA) processes. Various methods of parameter estimation are considered, including the method of moments, least-squares, conditional least-squares, and maximum likelihood. We then perform residual analysis, and consider over-fitting and the principle of parsimony. The course ends with consideration of various forecasting methods.

Although the approach is mainly orientated to utilising time-dependence, we also consider the frequency aspects of series and study the periodogram and the spectral density. We relate the two approaches.

**Prerequisites:** F78PA and F78PB (or equivalent).

**Books:** Useful references are

C. Chatfield, *The Analysis of Time Series* (Chapman Hall); P. Diggle, *Time Series* (OUP);

P. Cowpertwait and A. Metcalfe, *Introductory Time Series with R* (Springer).

**Assessment:** 2-hour exam (85%) and a project (15%).

**F70LA                      LIFE INSURANCE MATHEMATICS A                      Lecturer: P. Ridges**

**Aims:** To extend the coverage of life assurance mathematics in F78AB to include some of the material for Subject CT5 of the Institute and Faculty of Actuaries examinations.

**Summary:** By combining the mathematics of finance and the mortality table, we can develop the functions necessary to value a wide range of benefits which may be payable on death or survival. Some of the functions will be clear extensions of those previously encountered, while others will be new. Such benefits are often provided by insurance policies. The course will study some of the essential calculations made by insurance companies in valuing their contracts and calculating premiums. You will learn how to deal with questions involving:

- selection and select life tables,
- actuarial functions using select life tables,
- with profits policies,
- net premiums and gross premiums,
- expenses and bonuses,
- net and gross premium policy values.

There will be three lectures, one tutorial per week. Also one computer lab (Microsoft Excel) in some weeks.

**Prerequisites:** F78AA and F78AB (or equivalent).

**Books:**

Formulae and Tables for Actuarial Examinations – ESSENTIAL  
Dickson, Hardy & Waters, Actuarial Mathematics for Life Contingent Risks (CUP, 2009). An electronic version of this book is available in PDF format online. (F70LA covers material in the first seven chapters.)

**Assessment:** 2-hour exam (80%) at the end of the 1st semester and an Excel-based assignment (20%). This course is synoptically linked with F70LB.

**F70LB                    LIFE INSURANCE MATHEMATICS B    Lecturer: A.E. Sneddon**

**Aims:** To extend the coverage of life assurance mathematics in F70LA to include further material for Subject CT5 of the Institute and Faculty of Actuaries examinations.  
**Summary:** In this course, you will learn how to deal with questions involving:

Thiele's differential equation,  
Markov multiple-state models,  
risk reserves,  
insurances written on multiple lives,  
the features of disability and long-term care insurance contracts,  
heterogeneity and selection,  
single-figure indices,  
profit testing conventional and unit-linked insurance contracts.

There will be three lectures and one tutorial per week. Also one computer lab (Microsoft Excel) in some weeks.

**Prerequisites & books:** See F70LA.

**Assessment:** 2-hour exam (80%) at the end of the 2nd semester and an Excel-based assignment (20%). This course is synoptically linked with F70LA.

**F70CF                    CONTINUOUS-TIME FINANCE                    Lecturer: T. Chan**

**Aims:** This course develops the theory and practice of financial derivatives pricing in continuous time, following on from the course F79DF Derivatives Markets and Discrete-Time Finance.

**Summary:**

1. Theory of martingales in continuous time, Brownian motion, and its properties, stochastic integration, stochastic differential equations and Ito's formula, Girsanov's theorem and the Martingale Representation Theorem.
2. The Black-Scholes model, derivatives pricing using the martingale and PDE approaches, extensions to foreign currencies and dividend-paying stocks.
3. Portfolio risk management.
4. Interest rate models, and credit risk models.
5. Other models of security prices.

There will be weekly tutorial sessions, starting in the second week of term.

**Prerequisites:** F79SP and F79DF (or equivalent).

**Books:**

M. Baxter & A. Rennie, Financial Calculus (CUP, 1996); R. Durrett, Stochastic Calculus (CRC Press);  
J. Hull, Options, Futures and Other Derivative Securities, 3rd/4th ed. (Prentice Hall, 1996);  
B. Oksendal, Stochastic Differential Equations (Springer, 1998); D. Williams, Probability with Martingales (CUP, 1997).

**Assessment:** 2-hour exam end of the 1st semester (90%) and coursework (10%) .

**Aims:** To introduce fundamental practical and technical issues in the actuarial management of UK occupational pension schemes.

**Summary:** The foundations of actuarial mathematics have been covered in 2nd and 3rd year courses. This course takes some of that work and places it in a practical context.

A pension scheme is an arrangement whereby an employer invests money for the benefit of its employees and their dependents after they retire or on death before retirement. Some obvious questions arising are:

What level of benefit is reasonable?

How should the cost of the benefits to the employer be spread out? How should the fund be invested?

How can the actuary be certain that the scheme will not run out of money, even if the employer does?

The course will discuss benefit design - that is, exactly what benefits could be offered. We will discuss how the actuary can assess the cost of the benefits, including how she/he might choose the interest, inflation, salary and service table assumptions necessary. We will discuss investment principles and practice for pension schemes, and we will cover briefly the tax and legislation issues relevant to UK pension schemes.

While some of the work will be technical in nature, we will also consider some more general issues surrounding pension schemes, including monitoring pensions issues currently in the news. Students will be expected to read the financial press regularly and will be required to give a short presentation to the class on a particular current issue. Most technical actuarial work involves computers and this course will include regular computer laboratory sessions.

**Prerequisites:** F70LA and F70LB (or equivalent).

**Assessment:** This course and F70LP will be examined together in a 3-hour exam (80%) at the end of the 2nd semester. Both courses will have an assessed project (10% each).



**F70LP**

**LIFE OFFICE PRACTICE**

**Lecturer: C. Donnelly**

**Aims:** The aim of this course is to introduce students to the practical issues arising in life insurance and the management of a life insurance company.

**Summary:** The course covers modern life office practice, e.g. types of policy and the risks to which an office is exposed in writing them (conventional and unitised with-profits, non-profit, unit-linked), premiums, actuarial bases (for premiums, experience and valuation), bonus systems for distributing profits, solvency, nature and valuation of assets and liabilities, and asset shares. More advanced topics are also covered, including stochastic modelling, hedging/matching, reserving requirements, capital requirements, orphan assets, financial strength, and guarantees. The course will involve practical work, tutorial and project work. Most technical actuarial work involves computers and this course will include regular computer laboratory sessions.

**Prerequisites:** F70LA and F70LB (or equivalent).

**Assessment:** This course and F70PE will be examined together in a 3-hour exam (80%) at the end of the 2nd semester. Both courses will have an assessed project (10% each).

**F70DP**

**ADVANCED DERIVATIVE PRICING**

**Lecturer: T.C. Johnson**

**Aims:** The aim of this course is to introduce students to advanced and practical topics in derivative markets, which are essential preparation for a career in the financial industry. This course is available only to students on the BSc in Financial Mathematics.

**Summary:** The material develops ideas from F70CF and F79DF. The course begins with a review of some of the key concepts in stochastic calculus. It then moves on to applying these to the question of stochastic volatility, in pricing exotic options and in the interest rate markets. Numerical techniques for practical application of the theory are also covered. The course finishes with a discussion of structured products and synthetic securities and associated risk management issues.

**Prerequisites:** F79SP and F79DF (or equivalent).

**Books:**

M. Joshi, *The Concepts and Practice of Mathematical Finance* (CUP, 2003); J.C. Hull, *Options, Futures and Other Derivatives*, 8th ed. (Prentice Hall, 2011);

A. Chatterjea & R.A. Jarrow, *An Introduction to Derivative Securities, Financial Markets and Risk Management* (W.W. Norton, 2013).

**Assessment:** 2-hour exam (75%) and project work (25%).

**F70RT**

**RISK THEORY**

**Lecturer: V. Shneer**

**Aims:** To introduce and apply the statistical techniques used in the analysis of insurance processes, in particular for the assessment of premiums for short term insurance contracts, for reserving, and for assessing and managing solvency risk.

**Summary:** We look at some mathematical/statistical models and techniques which are useful in insurance, particularly short term insurance (for example motor, household, employers' liability).

We look at how to find the compound distribution of aggregate claims by combining the frequency of claims with the distribution of the amounts paid out on individual claims; we will consider how this might be used to set a premium, and how the insurers insure themselves through reinsurance.

We then study aspects of experience rating, which is a method of setting a premium for a policy which is affected by the claims history of that policy. We look at No Claims Discount systems.

The final four topics covered are:

1. ruin theory (we consider a stochastic model for the reserves of a general insurer and examine the probability that the reserves fall below zero);
2. run-off triangles (we study methods used to determine appropriate reserves for general insurance);
3. the use of copulas and extreme value theory;
4. simulation.

**Prerequisites:** F79MA(or equivalent).

**Assessment:** 2-hour exam at the end of the 2nd semester (85%), project work (15%).

**F10MM**

**OPTIMISATION**

**Lecturer: D. Breit**

**Aims:**

To present different methods of solving optimisation problems in the areas of linear and nonlinear programming, and classical calculus of variations. In addition, there will be an introduction to numerical methods.

**Summary:** The syllabus is as follows:

1. Introduction: simplified examples of common real world situations leading to optimisation problems.
2. Linear programming (optimisation of linear functions subject to linear constraints): basic theory, simplex method, duality, practical techniques.
3. Nonlinear programming (optimisation of nonlinear functions subject to constraints): Lagrange multipliers, Karush-Kuhn-Tucker optimality conditions, convexity, duality.
4. Approximation methods for nonlinear programming: line search methods, gradient methods, conjugate gradient methods.
5. Variational problems: Euler-Lagrange equation, boundary conditions constraints.

**Prerequisites:** F18CD and F18CF.

**Books:** The course is based on the following book:  
Pedregal, Introduction to Optimization (Springer, 2004).

**Assessment:** 2-hour exam at the end of the 1st semester.

## **F71CM                      CREDIT RISK MODELLING                      Lecturer: M. Fahrenwaldt**

**Aims:** To introduce students to quantitative models for measuring and managing credit risk; to provide students with an understanding of the credit risk methodology used in the financial industry and the regulatory framework in which the credit risk models operate.

**Summary:** Topics covered include:

1. Introduction to credit risk: credit-risky instruments, defaults, ratings.
2. Merton's model of the default of a firm.
3. Common industry models (KMV, CreditMetrics, CreditRisk+).
4. Modelling dependence between defaults with factor models.
5. Mixture models of default.
6. The Basel II regulatory capital formula.
7. Calculating the portfolio credit loss distribution.
8. Calibration and statistical inference for credit risk models.

**Books:**

- A.J. McNeil, R. Frey, & P. Embrechts, Quantitative Risk Management: Concepts, Techniques and Tools, 2nd ed. (Princeton University Press, 2015),
- B. Blum, L. Overbeck & C. Wagner, An Introduction to Credit Risk Modelling (Chapman and Hall, 2003).

**Assessment:** 2-hour exam

## **F20ML                      STATISTICAL MACHINE LEARNING                      Lecturer: TBC**

**Aims:** To provide students with an in-depth introduction to data mining and machine learning and to the mathematics underpinning these techniques. Topics will include generative and discriminative approaches, classification, clustering, regression, and supervised and unsupervised learning. Students will develop practical experience by using the WEKA software to apply a range of machine learning algorithms to benchmark datasets.

**Summary:**

Basic Concepts: classification, clustering, regression, supervised and unsupervised learning.

Generative Models: probabilistic graphical models; cluster analysis (k-means, expectation-maximisation, mixture models, hierarchical models); regression analysis.

Discriminative Learning: Instance-based learning and decision tree learning; artificial neural networks (perceptron, MLPs, back propagation, introduction to deep learning architectures); maximum entropy models; support vector machines; ensemble learning (bagging, boosting, stacking, random forests).

**Assessment:** : 2-hour exam at the end of the 2nd semester (60%), project work (40%).

**F71TT**

**Risk Management:  
Techniques and Tools**

**Lecturer: A. Cairns**

**Aims:** The aims of this course are:

- To equip students with a variety of tools to tackle problems involving univariate financial time series
- To provide a good grounding in the best practice of risk management within an organisation
- To understand economic measures of capital and capital allocation
- To have a thorough understanding of operational risk in its various forms
- To identify and measure risks and then to take actions to mitigate risks and exploit risky opportunities through good risk management strategies.

**Summary:** Topics covered include:

- Operational risk management
- Banking and insurance regulatory systems
- Risk management governance and culture
- ERM frameworks and assessment
- Risk appetite and risk tolerance
- Economic capital and capital allocation
- Credit risk management
- Modelling and assessment of market risk
- Market risk management
- Interest rate risk management
- How risks and risky opportunities affect the selection of strategy
- Advantages and disadvantages of different approaches to risk reduction; e.g. costs and benefits; information asymmetry; transparency; liquidity; basis risk; moral hazard
- Optimising risks and opportunities relative to the Board's declared risk appetite and risk tolerances
- Case studies: examples of past disasters and examples of good practice

**Prerequisites:** None.

**Assessment:** 2-hour exam (80%) and coursework (20%).



## Actuarial Mathematics and Statistics: Code of Practice

### What you can expect from AMS Staff

Teaching is one of the most important duties for AMS staff. Although academic staff have research and administrative duties which also need our attention, we aim to provide:

- Commitment to helping you learn
- Politeness and respect
- Availability for face-to-face meetings, either during scheduled office hours or at pre-arranged times
- Timely feedback and marks for coursework
- A prompt response from your mentor
- A timely reply to general email questions
- An opportunity to see your exam script to see where you went wrong, either at scheduled feedback sessions or by applying at the School Office to see your script. You can also make an appointment with the lecturer to get further advice on how to improve your work.

Sometimes staff members are away on University business and won't be able to respond as quickly as normal. If this happens, they will tell you about it (e.g. on an "out-of-office" message) and will advise you who to contact instead.

*If you have a problem...*

For personal problems or any other problem that is interfering with your studying, please discuss it with your personal tutor. We are here to help. You can also discuss any personal problems with the staff in the Student Support Office.

For problems about a course, talk to the lecturer first. If that doesn't help, you can raise the matter with your Class Rep. or the Year Co-ordinator.

### What staff can expect from AMS students

Most importantly, we expect you to take charge of your own learning. This is your degree - to get the most of your time at the University you need to be independent and proactive. We understand that you may have other demands on your time, but as full-time students, your studies should come first. In addition, we expect:

- Commitment to your learning
- Politeness and respect, including switching off phones and other social media during classes.
- Attendance at classes. During the semester it is your responsibility to be available on campus to attend classes and in particular class tests.
- Preparation for classes as specified by your lecturers, such as studying lecture notes, working on tutorial questions and participating in online activities. For every hour of timetabled class, we expect you to spend 2-3 hours in private study.
- Persistence. Some topics and problems in mathematics are challenging and we expect you to make a sustained effort to master difficult topics. We are there to help you if you get stuck.
- Basic organisational skills, including coming to classes with pen and paper ready to take notes or with equipment for electronic note-taking, and using a calendar so that you don't forget deadlines and appointments.
- Attendance at any scheduled meeting with a staff member. If you can't make a scheduled meeting with a staff member, please notify them in advance rather than just not turning up.
- Checking your email and logging into VISION at least every other day.
- A timely reply to email from staff.
- Willingness to learn from feedback on tutorial work, projects and exams, and an attempt to improve your work based on that feedback.
- Finally, we encourage you to keep yourself informed about new and interesting developments in your discipline (beyond what you learn in your courses). The department is full of experts in a wide range of areas who are happy to chat with you about topics of current interest. Seek them out!



## STUDENT GUIDE TO PLAGIARISM <sup>1</sup>

**Plagiarism is intellectual theft and is a major offence which the University takes seriously in all cases. Students must therefore avoid committing acts of plagiarism by following these guidelines and speaking to academic staff if they are uncertain about what plagiarism means. Those who are found to have plagiarised will be subject to the University's disciplinary procedures, which may result in penalties ranging from the deduction of credits and modules already achieved by students to compulsory termination of studies. Students are advised to refer to Regulation 50 at <http://www.hw.ac.uk/ordinances/regulations.pdf> and to the Guidelines for Staff and Students on Discipline at <http://www.hw.ac.uk/students/studies/examinations/plagiarism.htm> for further details of how the University deals with all acts of plagiarism.**

### Introduction

- 1.1. This guide is intended to provide students at Heriot-Watt University with a clear definition of plagiarism and examples of how to avoid it.
- 1.2. The guide may also be of use to members of staff who seek to advise students on the various issues outlined below.

### Definition

- 1.3. Plagiarism involves the act of taking the ideas, writings or inventions of another person and using these as if they were one's own, whether intentionally or not. Plagiarism occurs where there is no acknowledgement that the writings or ideas belong to or have come from another source.
- 1.4. Most academic writing involves building on the work of others and this is acceptable as long as their contribution is identified and fully acknowledged. It is not wrong in itself to use the ideas, writings or inventions of others, provided that whoever does so is honest about acknowledging the source of that information. Many aspects of plagiarism can be simply avoided through proper referencing. However, plagiarism extends beyond minor errors in referencing the work of others and also includes the reproduction of an entire paper or passage of work or of the ideas and views contained in such pieces of work.

### Good Practice

- 1.5. Academic work is almost always drawn from other published information supplemented by the writer's own ideas, results or findings. Thus drawing from other work is entirely acceptable, but it is unacceptable not to acknowledge

---

<sup>1</sup> The author acknowledges the following sources of information used in preparing this guide to Plagiarism:

"Plagiarism – A Good Practice Guide", Carroll, J and Appleton, J (2001) and various extracts from Student/Course Handbooks 2004/2005, Schools at Heriot-Watt University

such work. Conventions or methods for making acknowledgements can vary slightly from subject to subject, and students should seek the advice of staff in their own School about ways of doing this. Generally, referencing systems fall into the Harvard (where the text citation is by author and date) and numeric (where the text citation is by using a number). Both systems refer readers to a list at the end of the piece of work where sufficient information is provided to enable the reader to locate the source for themselves.

1.6. When a student undertakes a piece of work that involves drawing on the writings or ideas of others, they must ensure that they acknowledge each contribution in the following manner:

- **Citations:** when a direct quotation, a figure, a general idea or other piece of information is taken from another source, the work and its source must be acknowledged and identified where it occurs in the text;
- **Quotations:** inverted commas must always be used to identify direct quotations, and the source of the quotation must be cited;
- **References:** the full details of all references and other sources must be listed in a section at the end of any piece of work, such as an essay, together with the full publication details. This is normally referred to as a “List of References” and it must include details of any and all sources of information that the student has referred to in producing their work. (This is slightly different to a Bibliography, which may also contain references and sources which, although not directly referred to in your work, you consulted in producing your work).

1.7. Students may wish to refer to the following examples which illustrate the basic principles of plagiarism and how students might avoid it in their work by using some very simple techniques:

1.7.1. Example 1: A Clear Case of Plagiarism

Examine the following example in which a student has simply inserted a passage of text (*in italics*) into their work directly from a book they have read:

University and college managers should consider implementing strategic frameworks if they wish to embrace good management standards. *One of the key problems in setting a strategic framework for a college or university is that the individual institution has both positive and negative constraints placed upon its freedom of action.* Managers are employed to resolve these issues effectively.

This is an example of bad practice as the student makes no attempt to distinguish the passage they have inserted from their own work. Thus, this constitutes a clear case of plagiarism. Simply changing a few key words in such a passage of text (e.g. replace ‘*problems*’ with ‘*difficulties*’) does not make it the student’s work and it is still considered to be an act of plagiarism.



### 1.7.2. Common Mistakes

Students may also find the following examples<sup>2</sup> of common plagiarism mistakes made by other students useful when reflecting on their own work:

- “I thought it would be okay as long as I included the source in my bibliography” [without indicating a quotation had been used in the text]
- “I made lots of notes for my essay and couldn't remember where I found the information”
- “I thought it would be okay to use material that I had purchased online”
- “I thought it would be okay to copy the text if I changed some of the words into my own”
- “I thought that plagiarism only applied to essays, I didn't know that it also applies to oral presentations/group projects etc”
- “I thought it would be okay just to use my tutor's notes”
- “I didn't think that you needed to reference material found on the web”
- “I left it too late and just didn't have time to reference my sources”

**None of the above are acceptable reasons for failing to acknowledge the use of others' work and thereby constitute plagiarism.**

- 1.8. What follows are examples of the measures that students should employ in order to correctly cite the words, thought or ideas of others that have influenced their work:

#### 1.8.1. Example 2: Quoting the work of others

If a student wishes to cite a passage of text in order to support their own work, the correct way of doing so is to use quotation marks (e.g. “ ”) to show that the passage is someone else's work, as follows:

*“One of the key problems in setting a strategic framework for a college or university is that the individual institution has both positive and negative constraints placed upon its freedom of action”.*

#### 1.8.2. Example 3: Referencing the work of others

In addition to using quotation marks as above, students must also use a text citation. If the work being cited is a book, page numbers would also normally be required. Thus, using the Harvard system for a book:

*“One of the key problems in setting a strategic framework for a college or university is that the individual institution has both positive and negative constraints placed upon its freedom of action” (Jones, 2001, p121).*

The same reference could also be made to a book using the numeric system:

*“One of the key problems in setting a strategic framework for a college or university is that the individual institution has both positive*

---

<sup>2</sup> Extract from 'Plagiarism at the University of Essex' advice copyrighted and published by the Learning, Teaching and Quality Unit at the University of Essex (<http://www.essex.ac.uk/plagiarism/reasons.html>), reproduced with kind permission.

*and negative constraints placed upon its freedom of action” (Ref.1, p121).*

More often, a piece of work will have multiple references and this serves to show an examiner that the student is drawing from a number of sources. For example, articles by Brown and by Smith may be cited as follows in the Harvard system

*“It has been asserted that Higher Education in the United Kingdom continued to be poorly funded during the 1980’s [Brown, 1991], whereas more modern writers [Smith, 2002] argue that the HE sector actually received, in real terms, more funding during this period than the thirty year period immediately preceding it”.*

or as follows using the numeric system:

*“It has been asserted that Higher Education in the United Kingdom continued to be poorly funded during the 1980’s [Ref 1], whereas more modern writers [Ref 2] argue that the HE sector actually received, in real terms, more funding during this period than the thirty year period immediately preceding it”.*

### 1.8.3. Example 4: Use of reference lists

Whichever system is used, a list must be included at the end, which allows the reader to locate the works cited for themselves. The Internet is also an increasingly popular source of information for students and details must again be provided. You should adhere to the following guidelines in all cases where you reference the work of others:

If the source is a book, the required information is as follows:

- Author’s name(s)
- Year of Publication
- Title of Book
- Place of Publication
- Publishers Name
- All Page Numbers cited
- Edition (if more than one, e.g. 3<sup>rd</sup> edition, 2001)

If the source is an article in a journal or periodical, the required information is as follows:

- Author’s name(s)
- Year of Publication
- Title of Journal
- Volume and part number
- Page numbers for the article

If the source is from the Internet, the required information is as follows:

- Author’s or Institution’s name (“Anon”, if not known)
- Title of Document
- Date last accessed by student
- Full URL (e.g. <http://www.lib.utk.edu/instruction/plagiarism/>)
- Affiliation of author, if given (e.g. University of Tennessee)

The way in which the information is organised can vary, and there are some types of work (for example edited volumes and conference proceedings) where the required information is slightly different. Essentially, though, it is your responsibility to make it clear where you are citing references within your work

and what the source is within your reference list. **Failure to do so is an act of plagiarism.**

- 1.9. Students are encouraged to use a style of acknowledgement that is appropriate to their own academic discipline and should seek advice from their mentor, course leader or other appropriate member of academic staff. There are also many reference sources available in the University Library which will provide useful guidance on referencing styles.

### Managing Plagiarism

- 1.10. Students, supervisors and institutions have a joint role in ensuring that plagiarism is avoided in all areas of academic activity. Each role is outlined below as follows:

*How you can ensure that you avoid plagiarism in your work:*

- Take responsibility for applying the above principles of best practice and integrity within all of your work
- Be aware that your written work will be checked for plagiarism and that all incidents of plagiarism, if found, are likely to result in severe disciplinary action by the University. The standard penalty is to annul all assessments taken in the same diet of examinations (for details please refer to Regulation 50 at <http://www1.hw.ac.uk/ordinances/regulations.pdf> and to the Guidelines for Staff and Students on Discipline at <http://www.hw.ac.uk/students/studies/record/discipline.htm>).

*How your School will help you to avoid plagiarism:*

- Highlight written guidance on how you can avoid plagiarism and provide you with supplementary, verbal guidance wherever appropriate
- Regularly check student work to ensure that plagiarism has not taken place. This may involve both manual and electronic methods of checking. A number of plagiarism detection packages are in use at Heriot-Watt University, one example being the Joint Information Systems Committee (JISC) "Turnitin" plagiarism detection software.
- Alert you to the procedures that will apply should you be found to have committed or be suspected of having committed an act of plagiarism and explain how further action will be taken in accordance with University policy and procedures.

*How the University will endeavour to reduce student plagiarism:*

- Provide clear written guidance on what constitutes plagiarism and how to avoid it directly to your School and to you
- Alert you and staff in your School to the penalties employed when dealing with plagiarism cases
- Take steps to ensure that a consistent approach is applied when dealing with cases of suspected plagiarism across the institution
- Take the issue of academic dishonesty very seriously and routinely investigate cases where students have plagiarised and apply appropriate penalties in all proven cases.

## PART B: UNIVERSITY INFORMATION

The Academic Registry is responsible for producing Part B of the handbook to provide information and assistance on University policies and support services.

Please note that the following sections are standard sources of information provided to all students. However, certain aspects are programme-specific and you should refer to Part A where directed. Students are advised that the University will make changes to study programmes and progression requirements from time to time in accordance with strategic developments and it is therefore important to ensure that you check the most recent version of the handbook for up-to-date information.

### B1. Our Values

At Heriot-Watt, we have an established set of values that help up to nurture innovation and leadership and show our commitment to continuous development in all our activities. They are:

- Value and Respecting Everyone
- Pursuing Excellence
- Pride and Belonging
- Shaping the Future
- Outward Looking

Find out more about the [Heriot-Watt values](#) and what they mean to us.

### B2. Student Learning Code of Practice

The Student Learning Code of Practice outlines information about the University, its culture, policies, regulations and the expectation for students and staff. Please familiarise yourself with the relevant Code that is located within the [Learning and Teaching Policy Bank](#).

### B3. University Policies and Support Services

Heriot-Watt University has a detailed set of rules that governs the operation and management of University business. These are referred to as Ordinances and these Ordinances are set by the Court, which is the governing body of the University. The Ordinances provide a regulatory framework for corporate governance. The University Ordinances are supported by University Regulations which provide a

regulatory framework for the governance of academic-related matters which staff and student must adhere to for all academic matters. Wherever practicable, University policy is designed to include all members of the University's community, both within and outwith the main campus environments.

Read more about the University [Policies, Ordinances and Regulations](#).

As part of your University enrolment, you signed the Student Declaration and agreed to abide by the regulations of the University and conform to its policies, procedures, ordinances and regulations that underpin the Ordinances and Regulations. During your time at Heriot-Watt, the following policies, procedures, reference information and support services may be relevant and useful guidance for you.

## B4. Your Student Portal

The Student Portal brings together your services and relevant information in one place. Below is a summary of the services available to you via the portal:

- Office 365 suite: through single sign-on, all of your Office 365 services will be accessible through the Portal.
- Library: whether you want to search for books or view your loans & reservations, the Portal allows you to do this on your phone or desktop.
- Vision: your Portal will present you with announcements and tasks related to this course.
- Student Information: all university-level regulations and policies relating to your studies can be found on the Portal.
- Campus and School News: the Portal enables the University to promote events and experiences which will help you develop your skills.
- Personalised: You can hide, add and move tiles on your dashboard.
- AskHWU: You can find everything you need to help you navigate your time at HWU through the new AskHWU search tile. Ask questions of the University and enquire directly with members of staff to get information about exams, enrolment, careers, wellbeing services and much more.

You can access your student portal [here](#).

## B5. Quick Finder Guide to Academic and Support Services

The following provides an A-Z guide on the academic and support services available to you during your studies.

By clicking on the subject heading you will link to the relevant information in the student portal/website. Please ensure that you check the portal/web at the regular times throughout the year for the most up-to-date information:

|          |   |
|----------|---|
| <b>A</b> | <ul style="list-style-type: none"><li>• <a href="#">Academic Appeals</a></li><li>• <a href="#">Academic Registry</a></li><li>• Accommodation Services:<ul style="list-style-type: none"><li>➤ <a href="#">Accommodation (Dubai Campus)</a></li><li>➤ <a href="#">Accommodation (Edinburgh Campus)</a></li><li>➤ <a href="#">Accommodation (Malaysia Campus)</a></li><li>➤ <a href="#">Accommodation (Orkney Campus)</a></li></ul></li></ul> |
|----------|---|

|          |   |
|----------|---|
|          | <ul style="list-style-type: none"> <li>➤ <a href="#">Accommodation (Scottish Borders Campus)</a></li> <li>• <a href="#">Alumni</a></li> <li>• <a href="#">Amendment to Enrolment</a></li> <li>• <a href="#">Assessment</a> <ul style="list-style-type: none"> <li>➤ <a href="#">Feedback on Assessment</a></li> <li>➤ <a href="#">Assessment Results</a></li> </ul> </li> <li>• <a href="#">Assistive Software</a></li> <li>• <a href="#">Attendance &amp; Absence</a></li> </ul>   |
| <b>C</b> | <ul style="list-style-type: none"> <li>• <a href="#">Care Leavers</a></li> <li>• <a href="#">Career Mentoring</a></li> <li>• <a href="#">Careers Service</a></li> <li>• <a href="#">Change of Address</a></li> <li>• <a href="#">Complaints</a></li> <li>• <a href="#">Counselling</a></li> </ul>   |
| <b>D</b> | <ul style="list-style-type: none"> <li>• <a href="#">Data Protection (or email <a href="mailto:foi@hw.ac.uk">foi@hw.ac.uk</a>)</a></li> <li>• <a href="#">Disability Support</a></li> <li>• <a href="#">Discipline</a></li> <li>• <a href="#">Discretionary Credits (please refer to the appropriate Regulation(s) for your level of study)</a></li> </ul>  |
| <b>E</b> | <ul style="list-style-type: none"> <li>• <a href="#">Email</a></li> <li>• <a href="#">Enrolment</a></li> <li>• <a href="#">Equality and Diversity Services</a></li> <li>• <a href="#">Erasmus+</a></li> <li>• <a href="#">Exchanges</a></li> <li>• <a href="#">Examinations &amp; Examination Diets</a> <ul style="list-style-type: none"> <li>➤ <a href="#">Exam Diets</a></li> <li>➤ <a href="#">Exam Conduct and Identity Checks</a></li> <li>➤ <a href="#">Exams in Different Time Zones</a></li> <li>➤ <a href="#">Exam Timetables</a></li> </ul> </li> <li>• <a href="#">Exit Awards</a></li> <li>• <a href="#">External Examiners Information</a></li> </ul> |
| <b>F</b> | <ul style="list-style-type: none"> <li>• <a href="#">Failing a Course</a></li> <li>• <a href="#">Faith and Belief:</a> <ul style="list-style-type: none"> <li>➤ <a href="#">Edinburgh Campus</a></li> <li>➤ <a href="#">Dubai Campus</a></li> <li>➤ <a href="#">Malaysia Campus</a></li> </ul> </li> <li>• <a href="#">Financial Services</a></li> </ul>  |
| <b>G</b> | <ul style="list-style-type: none"> <li>• <a href="#">Go Global</a></li> <li>• <a href="#">Guide to Student Life</a></li> <li>• New Student Information: <ul style="list-style-type: none"> <li>➤ Edinburgh and Scottish Borders Campuses available <a href="#">here</a></li> <li>➤ Dubai Campus available <a href="#">here</a></li> <li>➤ Malaysia Campus available <a href="#">here</a></li> </ul> </li> </ul>   |

|          |   |
|----------|---|
|          | <ul style="list-style-type: none"> <li>• <a href="#">Graduate Attributes</a></li> <li>• <a href="#">Graduation</a></li> </ul>   |
| <b>H</b> | <ul style="list-style-type: none"> <li>• <a href="#">Harassment and Bullying</a></li> <li>• <a href="#">Heriot-Watt Assessment &amp; Progression System (HAPS)</a></li> <li>• <a href="#">Health and Wellbeing</a></li> </ul>   |
| <b>I</b> | <ul style="list-style-type: none"> <li>• <a href="#">Ill Health &amp; Mitigating Circumstances</a></li> <li>• <a href="#">Information Services (Library &amp; IT) guides</a></li> <li>• <a href="#">IT Essentials</a></li> <li>• <a href="#">Inter-Campus Transfer</a></li> <li>• <a href="#">Intermediate Awards</a></li> <li>• <a href="#">International Student Support</a></li> </ul>   |
| <b>L</b> | <ul style="list-style-type: none"> <li>• <a href="#">Learning and Teaching Matters</a></li> <li>• <a href="#">Library Essentials</a></li> <li>• <a href="#">Library Resources for your Subject</a></li> </ul> <hr/>   |
| <b>M</b> | <ul style="list-style-type: none"> <li>• <a href="#">Maternity and Paternity</a></li> </ul>   |
| <b>O</b> | <ul style="list-style-type: none"> <li>• <a href="#">Oriam (Scotland's Sport Performance Centre)</a></li> </ul>   |
| <b>P</b> | <ul style="list-style-type: none"> <li>• <a href="#">People Finder</a></li> <li>• <a href="#">Periods of Study (please refer to the appropriate Regulation(s) for your level of study)</a></li> <li>• <a href="#">Personal Tutors</a></li> <li>• <a href="#">Plagiarism</a></li> </ul>  |
| <b>R</b> | <ul style="list-style-type: none"> <li>• <a href="#">Re-Assessment</a></li> <li>• <a href="#">Requirements for Awards (please refer to the appropriate Regulation(s) for your level of study)</a></li> <li>• <a href="#">Recognition of Prior Learning &amp; Credit Transfer</a></li> </ul>   |
| <b>S</b> | <ul style="list-style-type: none"> <li>• <a href="#">Sexual Misconduct</a></li> <li>• <a href="#">Skills Development</a></li> <li>• <a href="#">Sport and Exercise (Edinburgh campus)</a></li> <li>• <a href="#">Student Council (Dubai Campus)</a></li> <li>• <a href="#">Student Feedback</a></li> <li>• <a href="#">Student Fees, Funding and Additional Charges</a></li> <li>• <a href="#">Student Policies and Guidance</a></li> <li>• Student Service Centre: <ul style="list-style-type: none"> <li>➤ Dubai Campus (please contact <a href="mailto:dubaistudentservices@hw.ac.uk">dubaistudentservices@hw.ac.uk</a>)</li> <li>➤ <a href="#">Edinburgh Campus</a></li> <li>➤ <a href="#">Malaysia Campus</a></li> </ul> </li> <li>• <a href="#">Student Services</a></li> <li>• <a href="#">Student Support Services</a></li> </ul> |

|          |   |
|----------|---|
|          | <ul style="list-style-type: none"> <li>• <a href="#">Student Surveys</a></li> <li>• <a href="#">Study Spaces</a></li> <li>• <a href="#">Student Union (Edinburgh, Orkney and Scottish Borders Campuses)</a></li> <li>• <a href="#">Student Wellbeing Services</a></li> <li>• <a href="#">Students with Caring Responsibilities</a></li> </ul> |
| <b>T</b> | <ul style="list-style-type: none"> <li>• <a href="#">Teaching Timetables</a></li> <li>• <a href="#">Temporary Suspension of Studies</a></li> <li>• <a href="#">Thinking of Leaving</a></li> </ul>   |
| <b>U</b> | <ul style="list-style-type: none"> <li>• <a href="#">Use of Calculators in Examinations</a></li> <li>• <a href="#">Use of Dictionaries in Examinations</a></li> </ul>   |
| <b>V</b> | <ul style="list-style-type: none"> <li>• <a href="#">Virtual Learning Environment (Vision)</a></li> <li>• <a href="#">Visas &amp; Immigration</a></li> </ul>  |