All students registered for the programme are expected to have read and to be familiar with the contents of this Handbook

Disclaimer: Every effort has been made to ensure the contents of this handbook are accurate at the time of printing. Unforeseen circumstances may necessitate changes to the procedures, curricula and syllabus described

Heriot-Watt University is a Scottish charity registered under charity number SC000278
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PART A: SCHOOL INFORMATION

1. CONTACT DETAILS

Programme Director
Mr Peter Ridges
Office: CMF.16, Telephone: 451 3906, Email: P.Ridges@hw.ac.uk
Mr Ridges is responsible for all academic matters relating to the programme. He chairs the Board of Examiners.

Appointments with the Programme Director may be arranged by email- or feel free to drop by.

Programme Administrator
Rodi Amiridou
Office: EM 1.24, Telephone: +44 (0) 131 451 8314, E-mail: R.Amiridou@hw.ac.uk
Rodi is responsible for all programme administrative matters and is the secretary to the Board of Examiners.

Students should contact staff in the School Office (EM1.25) in the first instance for any enquiries in relation to the programme. The School Office is open week days from 09.30 to 16.30. The School Office can also be contacted on: macs-schooloffice@hw.ac.uk; tel 0131 451 3432

School Student Website
Lots of information regarding MACS programmes and courses can be found at:
http://www.macs.hw.ac.uk/students/

University Student Website
https://www.hw.ac.uk/students/index.htm

Student Portal
You can access the University Student Portal at: http://portal.hw.ac.uk/

Virtual Learning Environment (VLE)
Most courses have on-line material available at the University’s Virtual Learning Environment (VISION) which can be found at: http://vision.hw.ac.uk/

Student Self Service
This is where you can update your address and where you will get your on-line results - www.hw.ac.uk/selfservice.

Students can also get advice on a range of Finance, Hospitality Services and Academic Registry issues from the Student Service Centre (http://www1.hw.ac.uk/studentcentre/) which is situated in the Hugh Nisbet Building (email: studentcentre@hw.ac.uk)

Course Information
Details on all the courses offered on the programme can be found at:
http://www.macs.hw.ac.uk/students/ams/pg-programmes/msc-actuarial-science. Brief course descriptors are can also be found in the Appendix of this handbook.

Each course will also have on-line material available at the University’s Virtual Learning Environment (VISION) which can be found at: https://vision.hw.ac.uk. You will have access to information for all the courses for which you are enrolled.
Programme Codes
MSc in Actuarial Science – F727-ACS, Postgraduate Diploma in Actuarial Science – F725-ACS, Postgraduate Certificate in Actuarial Science - F720-ZZZ

2. INTRODUCTORY INFORMATION

The University provides information for new students at: http://www.hw.ac.uk/students/index.htm.

2.1. Enrolment
All student enrolment is completed online. You are responsible for ensuring your enrolment details are correct, and that you have enrolled for all courses that you wish to take. Information to assist with course selection will be provided at the Pre-Enrolment meeting. If you have any questions about enrolment you should speak to staff in the School Office. Students are advised to enrol for ALL courses the first instance. This can always be changed at a later date.

You must enrol for either the PG Diploma in Actuarial Science or the MSc in Actuarial Science. If you change your mind and wish to change programme you may only do so before 30 September by advising the Programme Administrator in writing. International students should be aware that any programme changes will be notified to the UK Border Agency and this may have implications for your student visas.

No refunds of programme fees will be provided to students who leave the University without completing the programme for which they are registered for any reason (ie regardless of whether this departure is voluntary or because students have failed to qualify for the desired award).

2.2. Timetable
Timetables can be found at: https://www.hw.ac.uk/students/studies/timetables.htm. Occasionally it is necessary to make adjustments to the timetable, such as rescheduling a class – all changes will be notified on the class VISION pages or by email.

Course F71SZ (Stochastic Modelling) will not begin until Week 3 (24 September 2018).

Classes are timetabled to start and finish at 15 minutes past the hour. The standard Heriot-Watt practice is that classes start at 20 minutes past the hour and finish at 10 minutes past. Please be courteous to staff and fellow students by ensuring you arrive on time to all your classes.

2.3. Attendance
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). Should you have to missed a timetabled session due to ill health or other legitimate reasons, you should submit a self-certification or medical certification or an application for consideration of Mitigating Circumstances https://www.hw.ac.uk/students/studies/examinations/mitigating-circumstances.htm

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/studies/record/attendance.htm

Coursework must be handed in by the stipulated dates, and students are required to see their personal mentors at agreed times. Students who fail to submit compulsory coursework may also be disallowed from presenting themselves for examination in the relevant courses.

All lectures and tutorials are compulsory and registers of attendance may be taken.

If you are absent from class due to illness for four days or less, you should complete a self-certification form, obtainable from the School Office (EM 1.25), and return it to the School office within a week of
your return. If you are absent for more than four days, you must supply a medical certificate to the School Office within a week of your return.

**Students here on a Tier 4 Student Visa are required to attend the signing-in sessions from October to August. You must also attend the re-enrolment session in January.** It is your responsibility to make sure that you attend these events. Failure to attend will mean that you will be reported to UKVI and your right to remain in the UK maybe removed.

2.4. **Computer Facilities**

You will enrol as a user of the University computer network. This will give you an email account, and access to word-processing facilities and various packages which will be needed for some courses. Once you have completed on-line enrolment you will print out a letter which confirms your enrolment. Along with this letter are details of your University user name and password. Your user name will also be your email address eg user name ab111 will have the email address ab111@hw.ac.uk

You will be credited with a printing quota for use over the year. While an additional allocation may be made in the summer for those proceeding to the MSc, you are advised to use your quota sparingly.

Abuse of the computing facilities will result, at the very minimum, in a ban from the facility.

Information about our Information Services can be found at: [http://www.hw.ac.uk/is/guides/getting-started.htm](http://www.hw.ac.uk/is/guides/getting-started.htm)

2.5. **Note from the Programme Director**

The programme is very demanding. In order to be successful you will have to work extremely hard. Also, poor attendance at classes is likely to lead to poor performance.

There are a total of 11 taught courses available and students must pass at least 8 (allowing for course weightings – see Section 5.4) to qualify for the PG Diploma (with an average of at least 50% to progress to the MSc project work). You may wish to discuss with your mentor the most appropriate courses for you to take in order to succeed on the programme.

Anyone who finds they are struggling with any aspect of the coursework should alert the course lecturer at the first available opportunity. Staff are always happy to help but cannot do so if they are not aware there is a problem.

Your academic mentor (see Section 4.5) is also available during the year to provide support when needed. It is a programme requirement to meet with your mentor at least once a semester.
3. **IMPORTANT INFORMATION**

<table>
<thead>
<tr>
<th>2018/19 dates</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 – 7 September 2018</td>
<td>Welcome Week</td>
</tr>
<tr>
<td>10 September – 30 November 2018</td>
<td>Semester 1 teaching</td>
</tr>
<tr>
<td>3 – 14 December 2018</td>
<td>Semester 1 exams</td>
</tr>
<tr>
<td>17 December 2018 – 4 January 2019</td>
<td>Semester 1 break</td>
</tr>
<tr>
<td>7 January – 29 March 2019</td>
<td>Semester 2 teaching</td>
</tr>
<tr>
<td>1 April – 22 April 2019 (Easter: 21 April)</td>
<td>Semester 2 break</td>
</tr>
<tr>
<td>23 April – 17 May 2019</td>
<td>Semester 2 exams</td>
</tr>
<tr>
<td>3 June – 9 August 2019</td>
<td>Dissertation work / Revision</td>
</tr>
<tr>
<td>14 June 2019 (Scottish Borders Campus)</td>
<td>Graduations</td>
</tr>
<tr>
<td>18 – 21 June 2019 (Edinburgh Campus)</td>
<td>Graduations</td>
</tr>
<tr>
<td>14 – 15 November 2019</td>
<td>Graduations</td>
</tr>
</tbody>
</table>

**Case Studies Dates:**

<table>
<thead>
<tr>
<th>2018/19 dates</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 - 7 June 2019</td>
<td>Preparatory Week</td>
</tr>
<tr>
<td>10 June – 12 July 2019</td>
<td>1st Case Study</td>
</tr>
<tr>
<td>15 July – 16 August 2019</td>
<td>2nd Case Study</td>
</tr>
</tbody>
</table>

It is the student's responsibility to check all relevant examination timetables (including resits) on the Registry web page [http://www.hw.ac.uk/registry/examinations.htm](http://www.hw.ac.uk/registry/examinations.htm).

The publication of the exam timetables for Semesters 1 and 2 can be found here [https://www.hw.ac.uk/students/studies/examinations/timetables.htm](https://www.hw.ac.uk/students/studies/examinations/timetables.htm)

Please note that although the majority of semester 2 examinations will take place in the first two weeks of the University assessment block (23 April - 3 May), it may be necessary for examinations to run into the third week.

For both examination blocks, it is important that students do not make any travel arrangements until the final examination timetable has been published. However, please note that changes to the final timetable may still be required after it has been published due to circumstances beyond our control.

You will officially receive the provisional results of your semester 1 assessments in mid-January. You will receive the final results of your semester 1 & 2 assessments in mid-June. You will receive your MSc project work result and your award recommendation in mid-September. You will receive an email to your University email account to inform you when you can view your official results on-line at [www.hw.ac.uk/selfservice](http://www.hw.ac.uk/selfservice). You will receive a final assessment results letter with your award recommendations in mid-September.

Information on graduation can be found at: [http://www.hw.ac.uk/registry/graduation.htm](http://www.hw.ac.uk/registry/graduation.htm)

**Graduate Attributes**

As a student of Heriot-Watt University, you are part of our 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 opportunities to develop skills, qualities and academic abilities during your time as a Heriot-Watt student. These are known as the **Four Heriot-Watt Graduate Attributes**:

- **Specialist**
- **Creative**
- **Global**
- **Professional**

Further information can be found at: [https://www.hw.ac.uk/students/doc/StudentGraduateAttributes.pdf](https://www.hw.ac.uk/students/doc/StudentGraduateAttributes.pdf)

4. **GENERAL INFORMATION**

4.1. **Teaching Accommodation and Staff Accommodation**

Classes may be held in any teaching rooms on campus. Students on other postgraduate programmes will join the class for certain lectures.

The academic staff of the Department of Actuarial Mathematics and Statistics all have their offices in the Colin Maclaurin (CM) building. Administrative staff and the MACS School Office (EM 1.25) are nearby in that section of the Earl Mountbatten building close to the CM building.

4.2. **Contacting You**

The Programme Director, Programme Administrator, and lecturers will regularly communicate with you by email. All emails will be sent to your Heriot-Watt email address (e.g. abc123@hw.ac.uk) and NOT to any personal email address you may have.

It is your responsibility to find out what arrangements have been made and what information has been sent to you.

*You are expected to check your email in-box regularly.*

You should also check the VISION regularly for announcements and updates.

4.3. **Student Mail**

Mail arriving for all students in the School is put in pigeon holes in the School Office.

4.4. **Finance**

Students are reminded that tuition fees are due prior to or at enrolment and are payable immediately. Anyone who is experiencing difficulty in meeting their repayments should contact the Student Service Centre immediately. The University has a strict policy regarding the payment of invoices and students who fail to meet this will have their student privileges withdrawn and may in some cases be subject to legal proceedings.

If you are experiencing difficulties in meeting your payments it is essential you contact the Student Service Centre at the first available opportunity. You may also wish to seek advice from your mentor or from staff in the School Office who can liaise with Finance Office on your behalf.

If you are paying by recurring card plan the payments will be taken in six, equal monthly instalments on specific dates. This option is not flexible and one missed payment will result in the agreement being revoked and the remaining balance will be due for immediate payment.
No student with outstanding debt will be permitted to graduate from the University, and in some cases students with debt may be prevented from continuing to the MSc project work stage of the programme.

4.5  **Personal Tutors**  
All Heriot-Watt students are allocated a personal tutor. [https://www.hw.ac.uk/students/studies/personal-tutors.htm](https://www.hw.ac.uk/students/studies/personal-tutors.htm). If you have any academic, personal or financial problems during the year your personal tutor will be very willing to advise or help you within their competence. If they cannot help you they will advise who you should speak to for more expert advice.

You are required to meet with your mentor at least once each semester. For international students this counts as a required contact point for attendance monitoring purposes.

4.6  **Faculty of Actuaries Students’ Society (FASS)**  
All MSc/Diploma in Actuarial Science students are entitled to become affiliated members of this Society without becoming full student members of the Institute and Faculty of Actuaries (IFoA). There is a small membership fee.

Membership is recommended to students.

The Society meets about five times during the year for discussion of papers which cover a variety of topical actuarial issues. It also gives you the opportunity to meet other actuarial trainees in Edinburgh. Most meetings are preceded by tea, coffee and biscuits. The annual dinner is preceded by a meeting at which there will be a distinguished speaker.

FASS Student Representatives will contact you during the first semester with details on how to join.

4.7  **Class Representatives**  
Early in semester 1 the class will elect two class representatives who will liaise with the Programme Director whenever any problems arise which are of a general nature for the class. It is intended that formal meetings will be held once a semester where any such matters can be discussed.

5.  **PROGRAMME STRUCTURE**

5.1  **Programme Aim**  
The Aim of the MSc/Diploma in Actuarial Science is to give students, in a postgraduate setting, a good grounding in the fundamental mathematical and business-related aspects of actuarial science. Specifically the programme will cover the syllabuses of Subjects CM1, CM2, CS1, CS2, CB1 and CB2 (formerly CT1 to CT8) of the Institute and Faculty of Actuaries.

5.2  **Taught Programme**  
All students commence with the taught Diploma in Actuarial Science courses. There are 11 courses available for the Diploma. These correspond in total to the IFoA subjects listed above. The courses are listed below, with information about the lecturer, the course weight and when it is taught and examined and the corresponding professional actuarial subject.

Full details of courses can be found at: [http://www.macs.hw.ac.uk/students/ams/pg-programmes/msc-actuarial-science/](http://www.macs.hw.ac.uk/students/ams/pg-programmes/msc-actuarial-science/). Brief course descriptors can be found in the Appendix of this handbook.
<table>
<thead>
<tr>
<th>Course</th>
<th>Course code</th>
<th>Semester</th>
<th>Course weight</th>
<th>Examined in</th>
<th>Professional Subject</th>
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</thead>
<tbody>
<tr>
<td>Financial Mathematics</td>
<td>F71AB</td>
<td>1</td>
<td>1</td>
<td>December (3 hours)</td>
<td>CT1/CM1</td>
</tr>
<tr>
<td>Lecturer: Torsten Kleinow. Office CM F.11; telephone 451 3252; <a href="mailto:T.Kleinow@hw.ac.uk">T.Kleinow@hw.ac.uk</a></td>
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</tr>
<tr>
<td>Finance and Financial Reporting</td>
<td>C31FF</td>
<td>1</td>
<td>1</td>
<td>December (3 hours)</td>
<td>CT2/CB1</td>
</tr>
<tr>
<td>Melanie Wilson <a href="mailto:M.J.Wilson@hw.ac.uk">M.J.Wilson@hw.ac.uk</a>, Andrea Eross <a href="mailto:A.Eross@hw.ac.uk">A.Eross@hw.ac.uk</a></td>
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<tr>
<td>Economics</td>
<td>C21AO</td>
<td>1</td>
<td>1</td>
<td>December (2 hours)</td>
<td>CT7/CB2</td>
</tr>
<tr>
<td>Lecturer: Prabir Bhattacharya Office MB1.01; telephone 451 3488; <a href="mailto:P.C.Bhattacharya@hw.ac.uk">P.C.Bhattacharya@hw.ac.uk</a></td>
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<tr>
<td>Statistical Methods</td>
<td>F71SM</td>
<td>1</td>
<td>1</td>
<td>December (3 hours)</td>
<td>CT3/CS1</td>
</tr>
<tr>
<td>Lecturer: Damian Clancy. Office CMS.02; telephone 451 3208, <a href="mailto:D.Clancy@hw.ac.uk">D.Clancy@hw.ac.uk</a></td>
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<tr>
<td>Life Insurance Mathematics 1</td>
<td>F71AF</td>
<td>1</td>
<td>1</td>
<td>December (2 hours)</td>
<td>CT5/CM1</td>
</tr>
<tr>
<td>Lecturer: Angus Macdonald. Office CMT.04; telephone 451 3209; <a href="mailto:A.S.Macdonald@hw.ac.uk">A.S.Macdonald@hw.ac.uk</a></td>
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<tr>
<td>Stochastic Modelling</td>
<td>F71SZ</td>
<td>1</td>
<td>0.5</td>
<td>December (2 hours)</td>
<td>CT4/CS2</td>
</tr>
<tr>
<td>Lecturer: Sergey Foss. Office CMG.07; telephone 451 3238; <a href="mailto:S.Foss@hw.ac.uk">S.Foss@hw.ac.uk</a></td>
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<tr>
<td>Life Insurance Mathematics 2</td>
<td>F71BF</td>
<td>2</td>
<td>1</td>
<td>April/May (2 hours)</td>
<td>CT5/CM1</td>
</tr>
<tr>
<td>Lecturer: Peter Ridges. Office CMF.16; telephone 451 3906; <a href="mailto:P.Ridges@hw.ac.uk">P.Ridges@hw.ac.uk</a></td>
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<tr>
<td>Survival Models</td>
<td>F71AE</td>
<td>2</td>
<td>1</td>
<td>April/May (2 hours)</td>
<td>CT4/CS2</td>
</tr>
<tr>
<td>Lecturer: Angus Macdonald. Office CMT.04; telephone 451 3209; <a href="mailto:A.S.Macdonald@hw.ac.uk">A.S.Macdonald@hw.ac.uk</a></td>
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<tr>
<td>Risk Theory</td>
<td>F71AG</td>
<td>2</td>
<td>1</td>
<td>April/May (2 hours)</td>
<td>CT6/CS2</td>
</tr>
<tr>
<td>Lecturer: Seva Shneer. Office CM.S07; telephone 0131 451 3902; <a href="mailto:V.Shneer@hw.ac.uk">V.Shneer@hw.ac.uk</a></td>
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<tr>
<td>Time Series Analysis</td>
<td>F71TS</td>
<td>2</td>
<td>0.5</td>
<td>April/May (2 hours)</td>
<td>CT6/CS2</td>
</tr>
<tr>
<td>Lecturer: Fraser Daly. Office CM.G06; telephone 451 3212; <a href="mailto:F.Daly@hw.ac.uk">F.Daly@hw.ac.uk</a></td>
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<tr>
<td>Financial Economics 1</td>
<td>F71AH</td>
<td>2</td>
<td>1</td>
<td>April/May (2 hours)</td>
<td>CT8/CM2</td>
</tr>
<tr>
<td>Lecturer: Prof Gavin Gibson. Office CM G.03; telephone 451 3205; <a href="mailto:G.J.Gibson@hw.ac.uk">G.J.Gibson@hw.ac.uk</a></td>
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<tr>
<td>Financial Economics 2</td>
<td>F71AJ</td>
<td>2</td>
<td>1</td>
<td>April/May (2 hours)</td>
<td>CT8/CM2</td>
</tr>
<tr>
<td>Lecturer: Torsten Kleinow. Office CM F.11; telephone 451 3252; <a href="mailto:T.Kleinow@hw.ac.uk">T.Kleinow@hw.ac.uk</a></td>
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</tbody>
</table>
5.3.  Which courses should you take?
To qualify for progression to the MSc, or the award of PG Diploma, you must pass at least eight courses (taking account of course weights). **Therefore you must ensure you are registered for at least eight courses (taking account of course weights).**

If you wish to be considered for exemption from all six subjects you must register for all 12 subjects (equivalent to 11 taught courses, taking account of course weights).

If you are not sure which courses to take, please register for all courses at the start of the year. It is possible to drop one or more of the courses during the year, provided the subjects still being taken are equivalent to eight or more courses.

If you wish to drop a course before the standard University deadline (end of week 3), you should complete a Change of Course Form which is available from and should be handed in to the School Office. If you wish to drop a course after this time you may only do so before any assessments (eg coursework) has been handed in, or by the end of Week 8 of the semester, whichever comes earlier. If you de-register from a course it will not appear on your final transcript. However if you de-register for a course then you will not have a re-assessment opportunity in that course.

Some students may have studied Statistics or Economics before and may wish to drop one or both of these courses. However, it should be noted that it is not possible for us to decide whether this previous study is sufficient for an exemption from the corresponding professional actuarial subject - these exemption decisions can be taken only by the IFoA and then only after you have joined the IFoA. The decision to drop one or more courses should be taken only after a full discussion with your Mentor or the Programme Director.

In exceptional circumstances, you may be permitted to replace one or more of the 12 courses listed above with one or more actuarial courses given to honours undergraduate students. You will be advised accordingly which courses are considered a relevant replacement. Note that such courses may or may not lead to exemptions from professional actuarial subjects.

5.4.  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.

At the end of each course you will receive a Course Questionnaire. This will give you the opportunity to say what you thought was good and what was not so good about that course.

It is important for us that you take these questionnaires seriously - we do. We listen to what you say and always aim to improve the programme wherever possible. You are benefiting this year from improvements to the programme which have been made as a result of past students' comments.

The IFoA may offer an online questionnaire and your participation in this would be appreciated. This questionnaire will be available for completion for a short period in Semester 2.
5.5. Award and Progression Requirements

The University operates 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.

For each course you will receive a mark and grade based on your performance in the examination and related coursework. The University’s standard grade classification is as follows:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Range of Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>70 – 100%</td>
</tr>
<tr>
<td>B</td>
<td>60 – 70%</td>
</tr>
<tr>
<td>C</td>
<td>50 – 60%</td>
</tr>
<tr>
<td>D</td>
<td>40 – 50%</td>
</tr>
<tr>
<td>E</td>
<td>30 – 40%</td>
</tr>
<tr>
<td>F</td>
<td>0 – 30%</td>
</tr>
</tbody>
</table>

However, these grade boundaries may be changed by the Board of Examiners.

For MSc Project Work the Examiners will award a mark and grade based upon the following classification:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Range of Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>70 – 100%</td>
</tr>
<tr>
<td>B</td>
<td>60 – 70%</td>
</tr>
<tr>
<td>C</td>
<td>50 – 60%</td>
</tr>
<tr>
<td>Pass</td>
<td>50% after resubmission with satisfactory amendments.</td>
</tr>
<tr>
<td>Fail</td>
<td>0 – 50%</td>
</tr>
</tbody>
</table>

The Board of Examiners’ Meeting will be held each June and September to consider Progression and Award decisions based on the following criteria:

**PG Certificate**
Award of PG Certificate in Actuarial Science requires a credit weighted average of at least 40% over 4 courses at grades A-E.

**PG Diploma**
Award of PG Diploma in Actuarial Science requires a credit weighted average of at least 40% over 8 courses at grades A-E.

Award of PG Diploma in Actuarial Science with Distinction requires a credit weighted average of at least 70% over 8 courses at grades A-D.

**Progression to MSc**
Progression to MSc requires a credit weighted average of at least 50% over 8 courses at grades A-D.

Progression to MSc carrying Distinction requires a credit weighted average of at least 70% over 8 courses at grades A-C.

The Examiners reserve the right to exclude anyone who meets the minimum progression requirements but whom they consider to be unsuitable for project work.
No student will be permitted to progress to the MSc before meeting the specified coursework requirements.

No “exemptions” from courses, or “credits” of course passes are given, on the grounds of work done elsewhere or on any other grounds.

Students who have registered for the PG Diploma will be permitted to progress to the MSc only upon payment in June of an additional MSc project work fee (for 2017-18 this fee is approximately £3,680).

Students who have registered for the MSc programme and who wish to transfer to the lower fee PG Diploma may only do so during the first two weeks of the academic year. No fee refunds will be permitted after 30 September.

MSc project work (see section 5.8) will normally be carried out over the summer immediately after the end of the summer semester - a period of 11 weeks is specified for this.

**MSc**

*Award of MSc in Actuarial Science* requires a credit weighted average of at least 50% over 8 courses at grades A-D plus project work (or other form of assessment) at a minimum of grade C.

*Award of MSc in Actuarial Science with Distinction* requires a credit weighted average of at least 70% over 8 courses at grades A-D plus project work (or other form of assessment) at a minimum of grade A.

(A precise statement of the requirements for the award of the degree is contained in the University Regulations. In cases of apparent conflict the Regulations take precedence.)

**Re-Assessment Opportunities**

Students will be able to be re-assessed in a **maximum of 3 courses**.

A student who has been awarded a Grade E or a Grade F in a course may be re-assessed in that course.

A student who has been awarded a Grade D in a course may be re-assessed in that course in order to proceed to, or be eligible to receive the award of, Masters.

If you have already passed eight courses at D Grade or above but have not qualified for progression to the MSc (as your average in the best eight courses is lower than 50%) you may resit the exam in up to three courses where you achieved no more than a D Grade at first attempt in order to increase your average in the best eight courses and proceed to the MSc.

You **must** take the resit examinations at the next available opportunity. **For most students this will be in the next academic session - December 2019 and/or April/May 2020. Only one resit opportunity will be permitted.** All reassessment is based on examination results only, even in courses which include assessable coursework.

If you are required to be re-assessed before you are able to progress to the MSc Project Work and if you are in the UK on a Tier 4 Visa, the University is obliged to inform the UKVI that you will not continuing with your project in the summer of 2018 and therefore your visa will cancelled and you will be expected to leave the UK as soon as possible after the release of your results.

If you are not a UK resident you may be able to take the re-assessment exams off-campus i.e. in your home country. Further information on this will be provided to students at the relevant time.
Special arrangements may apply where a student has presented mitigating circumstances in relation to the first attempt. See the relevant section later in this Guide for more information.

Students who achieve the standards required to progress to the MSc following reassessment will be invited to return to the University in Summer 2020 to undertake MSc project work. We do not normally offer MSc supervision at other times of the year.

Students who fail to meet the standards required for the PG Diploma following reassessment may be awarded the PG Certificate in Actuarial Science provided they have met the requirements above.

5.6. MSc Project Work
Students who have been allowed to progress to the MSc may go on to undertake project work leading to the award of MSc. The project work will normally take place during an 11-week period from the beginning of June until mid-August in the same academic year and students are expected to be on campus full-time during this period and available for regular meetings with academic staff.

The project work normally consists of two case studies, each undertaken over about five weeks. Students normally have a choice of two case studies. At the end of each case study, the student submits a substantial written report for assessment. Both count equally for the award of the MSc. The assessment of the first case study should normally be completed, and feedback given to the student, before the student begins to write the report on second case study.

In exceptional cases (e.g. a student intending to undertake a research degree, or a student on an industrial placement) the project work may consist of a single research dissertation.

A list of case studies being offered will be made available during Semester 2 and allocation will be made after the Board of Examiners meeting. Please note that student preferences will be considered but cannot always be guaranteed.

5.7. The Faculty of Actuaries Prize
The Faculty of Actuaries Prize is awarded annually to the student with the best overall performance in the Diploma examinations.

5.8. Graduation
Students who qualify for an award following the May Examiners’ meeting (usually those taking the PG Diploma) are eligible to graduate in June.

Students who qualify for an award following the September Examiners’ meeting are eligible to graduate in November.

Students eligible to graduate will find all the relevant graduation details on Academic Registry’s website http://www.hw.ac.uk/registry/graduation.htm.

It is your responsibility to complete and return the required forms and payment to the Student Service Centre before the specified deadline to ensure you are included in the Graduation ceremony. No student with outstanding debt will be permitted to graduate from the University.
6. **EXEMPTIONS FROM PROFESSIONAL EXAMS**

Recommendations for exemptions from professional exams based on performance in the Diploma examinations will be agreed at the Examiners' Meetings in May.

6.1. **University courses and correspondence with CT subjects**

Please note that exemptions can only be recommended for those who graduate with either the MSc or PG Diploma qualification (i.e. not the PG Certificate).

See the table in section 5.2 for details of which courses correspond to each subject.

To obtain any exemption, a student must take the examinations for all the courses listed for that exemption. For example a student hoping for the CT3 exemption must take the examinations for F71SM, F71AG, and F71SZ.

6.2. **Accreditation**

The MSc programme is accredited by the IFoA, but the Diploma programme is not. Students with an overall average of at least 65% in all courses taken and who pass (at D grade or higher) all courses taken at first attempt will be recommended for block exemptions from all subjects where they have attempted all the underlying exemption courses.

This applies only to students who graduate with the MSc. Students who graduate with the Diploma are eligible only for subject-by-subject examinations, regardless of their overall average.

6.3. **Subject-by-subject Exemptions**

Students who do not achieve an overall average of 65% are recommended for exemption on a subject-by-subject basis. The exemption level varies among subjects but usually lies in the range 60% to 65%.

Exemption levels are determined by the Board of Examiners in May. No information is available regarding exemptions prior to the May meeting.

Following the Board of Examiners' Meetings in September, the Department will write to the education offices of the Institute and Faculty of Actuaries listing the specific exemption recommendations for each student.

6.4. **Resits for Exemption**

*The IFoA has changed its policy on resits for exemption. The general principle is that an exam or other form of assessment may be considered for exemption only if the student is required to take it for progression or graduation.* That is, there are no exams or other assessments taken for exemption purposes alone.

For exemption purposes, the mark in any resit exam or other assessment will be capped at the normal pass mark, which is 40%. This means that it will not usually be possible to gain an exemption on the basis of resits. However, the rules are more lenient if Section 7.4 of this handbook applies to you.

Any resits taken in accordance with this policy are for the purpose of subject-by-subject exemption only. Results from these examinations will not be included in calculating your overall average, and therefore will not affect your entitlement to exemptions under the accreditation agreement.

You may wish to take IFoA exams in September or April. If you wish to take an exam in September, you must join the IFoA in April or May before the exam. The exact date should be on their website.
6.5. **Claiming your exemptions**

To claim your exemptions, you must join the Institute and Faculty of Actuaries as a student member. You must then submit the Application for Exemptions form, accompanied by a certified copy of your academic transcript. You do not need to provide a letter confirming your exemption recommendations as the IFoA will match your application with the information provided by the Department and then confirm your exemptions. More information is available from the IFoA website: www.actuaries.org.uk.

You should note that fees are payable to become a student member and to claim your exemptions. We generally recommend that you wait until after you have completed the programme to join the profession. Applications for exemption will not be accepted by the IFoA until they have officially accepted the Department’s recommendations. At this time you will be provided with a letter from the Department confirming the exemptions for which you have been recommended. We anticipate sending these letters by 30 September 2018.

Universities have the power only to recommend exemptions. The IFoA normally accept our recommendations, but the final decision is theirs alone.
7. HELP DURING THE YEAR

If you have any problems during the year you are encouraged to seek help as soon as possible. There are many sources of help available for students at Heriot-Watt, and staff are always happy to help.

7.1. Programme Problems
If you are having some problems with a particular subject then you should first see the lecturer for that course. It is common for staff to use an appointments system. If he or she is not able to help you then you should see the Programme Director.

7.2 Administrative Help
The Student Service Centre provides a single location for students to deal with the Finance Office, Hospitality Services and Academic Registry teams. It is located in the Hugh Nisbet Building, along from the shop and the bank. It is open Monday – Friday 10.00 – 16.00.

The principal areas of services that the Centre will offer to students are:

- Issue of ID cards
- Council Tax exemptions
- Transcripts and certifications – see [http://www.hw.ac.uk/registry/forms.htm](http://www.hw.ac.uk/registry/forms.htm) under Student Records
- Graduation applications – see [http://www.hw.ac.uk/registry/forms.htm](http://www.hw.ac.uk/registry/forms.htm)
- Processing payments and dealing with payment-related enquiries including tuition and accommodation fees

You can contact them on StudentCentre@hw.ac.uk

Common administrative requirements could include:

(i) Letters/confirrmation of enrolment
   Students often require letters for their sponsor, visas, banks etc to confirm their enrolment on the programme. All students are issued with a certification letter upon enrolling with the University. Please do not lose this letter, however you can reprint this letter by logging back into the on-line enrolment facility ([www.hw.ac.uk/selfservice](http://www.hw.ac.uk/selfservice)).

(ii) Updating contact details
   It is important the University has up-to-date contact details for all students. If your contact details change during the year you can update them at: [www.hw.ac.uk/selfservice](http://www.hw.ac.uk/selfservice)

Other Administrative assistance
If you require any additional help of an administrative nature which is specific to your programme of study you should contact the School Office in the first instance. The School Office (EM 1.25) is normally open Monday – Friday 09.30 – 16.30. The School Office can also be contacted on: [macs-schooloffice@hw.ac.uk](mailto:macs-schooloffice@hw.ac.uk); Tel 0131 451 3432

7.3. Wider Support
For more general problems, your mentor is available to offer support, advice, and help if you run into difficulties, be it personal or academic. They will offer assistance as far as they can, and can put you in touch with appropriate University support services. The University offers a wide range of support services for students and you are encouraged to make use of these to make your time at Heriot-Watt as enjoyable and trouble-free as possible.

The Chaplaincy welcomes all students from any background and is available for prayer, counselling and support and social events. See: [www.hw.ac.uk/chaplaincy](http://www.hw.ac.uk/chaplaincy); email: chaplaincy@hw.ac.uk
**Student Support and Accommodation** provides student counselling and welfare support. See: [http://www.hw.ac.uk/students/health-wellbeing.htm](http://www.hw.ac.uk/students/health-wellbeing.htm)

**University Health Service** is available to all students. You can make an appointment to see a doctor by telephoning 451 3010 or dentist by telephoning 451 3080. See: [http://www.hw.ac.uk/students/health-wellbeing.htm](http://www.hw.ac.uk/students/health-wellbeing.htm)

International Student Advisors are available to provide advice and support with visas, studying in Scotland and any other general support and advice to international students. See: [http://www.hw.ac.uk/support/isao/about-us.htm](http://www.hw.ac.uk/support/isao/about-us.htm)

Heriot-Watt Students Union see: [http://www.hwunion.com/](http://www.hwunion.com/)

**Careers Advisory Service** has in-house advisers with considerable expertise in the actuarial and financial job market and can assist with job applications and preparing for interviews. See: [www.hw.ac.uk/careers](http://www.hw.ac.uk/careers) or contact Alan Smith (telephone 451 3390 or email A.Smith_3@hw.ac.uk).

**Academic Skills Service** provides coaching and counselling to assist students to work smarter. See: [http://www.hw.ac.uk/sbc/library/academic_skills/index.htm](http://www.hw.ac.uk/sbc/library/academic_skills/index.htm)

Also see the A-Z guide for students [http://www.hw.ac.uk/students/doc/a-z-students-ed-sbc.pdf](http://www.hw.ac.uk/students/doc/a-z-students-ed-sbc.pdf)

7.4. **Mitigating Circumstances**

If you experience any mitigating circumstances which affect your ability to complete your assessments you must notify us as soon as possible.

You should read the University’s Policy on Mitigating Circumstances in Relation to Assessment at: [https://www.hw.ac.uk/students/studies/examinations/mitigating-circumstances.htm](https://www.hw.ac.uk/students/studies/examinations/mitigating-circumstances.htm) and then complete the application form. This form along with any relevant evidence (eg medical certificates) should be submitted to the School Office. Evidence submitted after your results have been published cannot be taken into account.

If you think you qualify as a Special Needs student (if for example you are registered with a disability) please bring this to the attention of Mrs Gunn as soon as possible.

7.5. **Important**

It is very important that if you have a problem you see help as soon as possible, and notify us of the situation. The Examiners will always take such circumstances into account where appropriate, but the later the notification, the less scope there is to do so. Notification of mitigating circumstances must be given before the Exam Board meeting is held. Late notification will normally mean that no consideration can be taken of the circumstances.

Any information which you provide to us will be used solely by the Board of Examiners to determine how best to help you, given the circumstances. We will not share the information with other students or services of the University without your consent.
7.6 Temporary Suspension of Studies

If students are unable to study for a considerable period (i.e. more than one diet) they should inform their personal tutor, so that such periods of non-study can be taken into consideration when reviewing the students continued registration on the Programme.

If students continue to be unable to study for a specific known period (for example, more than one year) due to other external factors (for example, maternity), then they should seek to temporarily suspend their studies.

If you intend to apply for a suspension of studies, please contact your School/Institute Office. You can find useful information here: https://www.hw.ac.uk/students/studies/leaving/temporary-suspension-studies.htm

7.7 Withdrawing from Study

Students may find that the Programme is not suitable for them and they may decide to withdraw from it.

Students should think very carefully before they do withdraw. If they do so, it may well be that sometime later they decide that they would like to continue with their studies.

Before making a final decision about withdrawing, students should discuss their situation with their Personal Tutor.

The University has a “Thinking of Leaving” Service which you can use. Please see more information here: https://www.hw.ac.uk/students/studies/leaving.htm where you can find a range of information and advice that can help you make the final decision.
8. IMPORTANT INFORMATION FOR ASSESSMENT

8.1 Unauthorised Material
You must not have any unauthorised electronic devices or pre-printed materials in the examination room. Cheating in an examination is treated very seriously by the University. If you do have any material relevant to the exam which you have brought in by mistake, you must hand it over to an invigilator before the start of the examination. Invigilators will carry out checks on authorised materials and calculators.

8.2 Calculators, Dictionaries & Electronic Devices/Mobile Phones
Where a calculator is required for the completion of an examination, a student may use any basic scientific calculator, except the following: graphics calculator, programmable calculator and a calculator which features text storage or retrieval facilities.

You must provide your own calculator: they will not be provided for you in any exams. Calculators can be purchased from the student union shop.

No translation dictionaries are permitted in any of the University’s examinations. The only exception to the policy is in the case of individual students who had been assessed by the University’s Disability Service as requiring access to a translation dictionary.

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

8.3 Coursework Submission 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
8.4 Plagiarism
The University has a strict policy on Plagiarism – the passing off as one’s own the ideas or writing of another.

Plagiarism undermines every academic principle.

Plagiarism is cheating and the Department, the School, and the University treat it very seriously indeed.

This is relevant for all students and has implications for Diploma exams and the writing of MSc project work.

The sanctions for plagiarism range from the discounting of the course or MSc project work completely, to the withholding of the degree or Diploma concerned, to expulsion from the University.

Anyone indulging in plagiarism of any kind can expect no sympathy or understanding from the University.

All students should be familiar with the University’s policy on plagiarism, which can be downloaded from: http://www.hw.ac.uk/registry/resources/PlagiarismGuide.pdf.

If you have the slightest doubt about any aspect of this matter and of how your own work relates to it, you must discuss it with the Programme Director before submitting any work.

For information, some summary ideas are included below: (ref Georgetown University website, Washington DC, www.georgetown.edu.honor/plagiarism.html).

- If you use someone else's ideas, or quote from someone else's work, you must cite the source (i.e. provide a reference).
- If the way in which you are using the source is unclear, make it clear.
- If you received specific help from someone in writing the project work, acknowledge it.

Here is another version (from the website of the University of Indiana, Bloomington: see www.indiana.edu/~wts/pamphlets/plagiarism.html)

**What is Plagiarism and Why is it Important?**
In college programmes, we are continually engaged with other people’s ideas: we read them in texts, hear them in lecture, discuss them in class, and incorporate them into our own writing. As a result, it is very important that we give credit where it is due. Plagiarism is using others' ideas and words without clearly acknowledging the source of that information.

**How Can Students Avoid Plagiarism?**
To avoid plagiarism, you must give credit whenever you use
- another person’s idea, opinion, or theory;
- any facts, statistics, graphs, drawings, any pieces of information that are not common knowledge;
- quotations of another person’s actual spoken or written words; or
- paraphrase of another person’s spoken or written words.

8.5 Useful Text
A recommended text for all students when starting their MSc project work is:

Although mathematics is highlighted, this book has much useful advice on writing precise technical material. Chapter 5 is entitled "When English is a Foreign Language". The advice in Sections 5.1 and 5.2 may be particularly useful in week 1 of the MSc project work.

9. **GENERAL INFORMATION**

9.1. **National Degree Standards**
All the undergraduate and taught postgraduate programmes offered by the Department of Actuarial Mathematics and Statistics (School of Mathematical and Computer Sciences) are believed to be compliant with the requirements of the Scottish Credit and Qualifications Framework (SCQF).

9.2. **Race Equality and Equal Opportunities Policies**
Heriot-Watt University is committed to the elimination of unlawful racial discrimination; and the promotion of equality of opportunity and good relations between persons of different racial groups. Heriot-Watt University is also committed to equal opportunities for all, irrespective of sex, colour, ethnic origin, disability, marital status, religious or political beliefs, trade union membership, sexual orientation or other irrelevant distinction.

Policies relating to race equality and equal opportunities can be obtained from the following website: www.hw.ac.uk/hr/p_index.php
10. FREQUENTLY ASKED QUESTIONS

10.1 Programme Progression and Award Requirements

FAQ 1  
I have not passed eight courses after the second semester exams. Can I take the resit exams while undertaking my MSc project work this summer?

No. There are no resit examinations in August. You must take the re-assessments in the next academic year. If you are successful in meeting the progression requirements after the December and April/May diets you will be invited to return in Summer 2019 to undertake your MSc project work.

FAQ 2  
Now that I have completed the taught programme, can I come back in a few years and do the MSc project work once I have some work experience / more money / taken a holiday?

Under normal circumstances, the answer to this question is no. The University requires full-time MSc students to complete their degree within 12 months, so you are expected to continue to the MSc project work immediately after completing the taught coursework.

The Board of Examiners may allow students to defer their MSc project work for one year in extenuating circumstances. Requests for deferral must be made in writing to the Programme Director for discussion by the Board of Examiners at their June meeting.

10.2 Accreditation and Exemptions

FAQ 3  
To qualify for exemption from CM1 (say) on a subject-by-subject basis do I have to meet the required exemption standard in each relevant course separately?

No. Your average mark in the underlying courses must meet the required exemption standard for the CT subject as a whole.

FAQ 4  
To qualify for exemption from CM1 (say) on a subject-by-subject basis do I have to achieve at least a D Grade pass in both courses?

No. See answer to FAQ4. There is no minimum mark required in either course.

FAQ 5  
I am eligible for block exemptions because my overall average is higher than 65%. Will I get an exemption even when I failed the underlying course?

For single assessment exemptions (e.g. CB2) if you failed the relevant course assessment you cannot be recommended for exemption (although the fail mark will count towards your accreditation average).

For those exemptions involving assessment in more than one course, you will be recommended for exemption if your average mark in the underlying courses is at least a D Grade pass.
10.3 Medical Certificates

FAQ 6

I am eligible for block exemptions as my actuarial average was greater than 65%. However I did not get all available exemptions due to illness. Can I resit the exam(s) for exemption while I do my MSc project (or other form of assessment)?

No, the IFoA will not allow this.

10.4 Administrative Information

FAQ 7

How do I get a letter for my bank/sponsor/landlord confirming my student status?

All students are issued with a certification letter upon enrolling with the University.

If you require an updated letter during the academic year, please see section 7.2 of this guide for the required procedure. Please bear in mind that support staff are extremely busy during the year and it is your responsibility to plan ahead and give sufficient notice. Please do not ask for a letter to be typed while you wait, as this will be refused.

FAQ 8

Where can I find the exam timetable?

Timetables for all examination diets are prepared by Academic Registry and posted on their website. It is your responsibility to ensure you check the timetable for the correct date, time and location of the exams.

See: http://www1.hw.ac.uk/registry/examinations.htm

FAQ 9

When will I get my results?

Provisional results from the December examinations released on-line following the Assessment Board in January. Final results will be released on-line by Academic Registry after the April/May examination diet and after the programme Award Board in early September. You will be sent an email to your University email address to let you know when your results are available. You can access your results at: www.hw.ac.uk/selfservice

In addition, progression and award notices will be posted on Vision after the May and September Board of Examiners’ Meetings.

Official academic transcripts will be prepared by Academic Registry and mailed to your correspondence address in late September.

The Department will notify you separately about your Exemptions after our recommendations have been accepted by the IFoA. We expect letters to be distributed around the end of September.
## Course Descriptors

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester</th>
<th>Credits</th>
<th>Mandatory/Optional</th>
<th>Exemption</th>
</tr>
</thead>
<tbody>
<tr>
<td>F71AB</td>
<td>Financial Mathematics</td>
<td>1</td>
<td>15</td>
<td>Optional</td>
<td>CT1/CM1</td>
</tr>
<tr>
<td>F71AF</td>
<td>Life Insurance Mathematics 1</td>
<td>1</td>
<td>15</td>
<td>Optional</td>
<td>CT5/CM1</td>
</tr>
<tr>
<td>F71SM</td>
<td>Statistical Methods</td>
<td>1</td>
<td>15</td>
<td>Optional</td>
<td>CT3/CS1</td>
</tr>
<tr>
<td>C31FF</td>
<td>Finance &amp; Financial Reporting</td>
<td>1</td>
<td>15</td>
<td>Optional</td>
<td>CT2/CB1</td>
</tr>
<tr>
<td>C21AO</td>
<td>Economics</td>
<td>1</td>
<td>15</td>
<td>Optional</td>
<td>CT7/CB2</td>
</tr>
<tr>
<td>F71SZ</td>
<td>Stochastic Modelling</td>
<td>1</td>
<td>7.5</td>
<td>Optional</td>
<td>CT3, CT4/CS1,CS2</td>
</tr>
<tr>
<td>F71BF</td>
<td>Life Insurance Mathematics 2</td>
<td>2</td>
<td>15</td>
<td>Optional</td>
<td>CT5/CM1</td>
</tr>
<tr>
<td>F71AE</td>
<td>Survival Models</td>
<td>2</td>
<td>15</td>
<td>Optional</td>
<td>CT4/CS2</td>
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<tr>
<td>F71AG</td>
<td>Risk Theory</td>
<td>2</td>
<td>15</td>
<td>Optional</td>
<td>CT3, CT6/CS1,CS2</td>
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<tr>
<td>F71TS</td>
<td>Time Series</td>
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<td>7.5</td>
<td>Optional</td>
<td>CT6/CS2</td>
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<tr>
<td>F71AH</td>
<td>Financial Economics 1</td>
<td>2</td>
<td>15</td>
<td>Optional</td>
<td>CT8/CM2</td>
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<tr>
<td>F71AJ</td>
<td>Financial Economics 2</td>
<td>2</td>
<td>15</td>
<td>Optional</td>
<td>CT8/CM2</td>
</tr>
<tr>
<td>F71AD</td>
<td>MSc Project Work</td>
<td>3</td>
<td>60</td>
<td>Mandatory for MSc</td>
<td>none</td>
</tr>
<tr>
<td>Course Code: F71AB</td>
<td>Course Title: Financial Mathematics</td>
<td>Course Co-ordinator: Torsten Kleinow</td>
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<tr>
<td><strong>Aims:</strong></td>
<td>This course aims to provide postgraduate students with a broad knowledge of basic concepts in financial mathematics including interest rates, arbitrage, stochastic interest rates, inflation and continuous cash flows.</td>
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<tr>
<td><strong>Syllabus:</strong></td>
<td>♦ Rates of interests ♦ Present values, equations of value and yields ♦ Principle of equivalence ♦ Annuities ♦ Loan schedules and mortgages ♦ Project appraisal and discounted cash flows ♦ Measures of fund performance ♦ Fixed interest securities ♦ Inflation and index-linked securities ♦ Continuous Compounding, force of interest and continuous cash flows ♦ Immunisation, duration and convexity ♦ Arbitrage and forward contracts ♦ The term structure of interest rates and forward rates ♦ Stochastic interest rate models</td>
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<tr>
<td><strong>Learning Outcomes:</strong> <strong>Subject Mastery</strong></td>
<td><em>Understanding, Knowledge and Cognitive Skills; Scholarship, Enquiry and Research (Research-Informed Learning)</em></td>
<td></td>
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<tr>
<td>On completion of this course the student should be able to:</td>
<td>♦ Know how to discount and accumulate cash flows and calculate internal rates of return. ♦ Know the derivation of formulae for standard cash flows. ♦ Derive and solve equations of value. ♦ Understand the principle of equivalence ♦ Understand the theory and practice of loan repayments. ♦ Understand measures of investment performance ♦ Value fixed interest securities subject to tax and determine their yield. ♦ Understand the concept of arbitrage and the no-arbitrage assumption ♦ Calculate the forward price and the value of forward contracts using arbitrage free pricing. ♦ Develop a replicating portfolio for forward contracts ♦ Understand forward interest rates and the term structure of interest rates. ♦ Calculate the duration and convexity of a set of cash flows. ♦ Understand Redington’s theory of immunization and apply it in simple situations ♦ Understand simple stochastic interest rate models. ♦ Calculate the accumulated profit of projects using deterministic interest rates ♦ Understand the concept of inflation and calculate inflation adjusted payoffs ♦ Find the real yield and the monetary yield of inflation linked gilts ♦ Calculate the break-even rate of inflation</td>
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<tr>
<td>Learning Outcomes: Personal Abilities</td>
<td>Industrial, Commercial &amp; Professional Practice; Autonomy, Accountability &amp; Working with Others; Communication, Numeracy &amp; ICT</td>
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<tr>
<td>On completion of this course the student should be able to:</td>
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<tr>
<td>♦ Demonstrate knowledge and critical understanding of the basic concepts and models in financial mathematics.</td>
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<tr>
<td>♦ Demonstrate the ability to learn independently</td>
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<tr>
<td>♦ Manage time, work to deadlines and prioritize workloads</td>
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<tr>
<td>♦ Present results in a way that demonstrates that they have understood the technical and broader issues in financial mathematics</td>
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<tr>
<td>Assessment Methods:</td>
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<tr>
<td>Assessment:</td>
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<tr>
<td>Examination: (weighting - 90%)</td>
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<tr>
<td>Mid Semester Test: (weighting - 10%)</td>
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<td>Re-assessment:</td>
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<tr>
<td>Examination (weighting –100%)</td>
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<tr>
<td><strong>Course Code:</strong></td>
<td><strong>Course Title:</strong></td>
<td><strong>Course Co-ordinator:</strong></td>
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<tr>
<td>F71AF</td>
<td>Life Insurance Mathematics 1</td>
<td>Angus Macdonald</td>
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</tbody>
</table>

**Aims:**
This course aims to provide postgraduate students with a good knowledge of survival models, life tables and first and second moments of the present values of payment streams contingent on survival or death. This knowledge is then applied to the calculation of premiums and reserves for life insurance contracts.

<table>
<thead>
<tr>
<th><strong>Syllabus:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>◆ Survival models</td>
</tr>
<tr>
<td>◆ Select survival models</td>
</tr>
<tr>
<td>◆ Life tables</td>
</tr>
<tr>
<td>◆ Annuities and assurances</td>
</tr>
<tr>
<td>◆ Premiums</td>
</tr>
<tr>
<td>◆ Expenses</td>
</tr>
<tr>
<td>◆ With profits policies and bonuses</td>
</tr>
<tr>
<td>◆ Reserves</td>
</tr>
<tr>
<td>◆ Thiele’s differential equation</td>
</tr>
<tr>
<td>◆ Calculation of annual profit/loss</td>
</tr>
<tr>
<td>◆ Policy alterations</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Learning Outcomes:</strong></th>
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</thead>
<tbody>
<tr>
<td><strong>Subject Mastery</strong></td>
</tr>
<tr>
<td>Understanding, Knowledge and Cognitive Skills; Scholarship, Enquiry and Research (Research-Informed Learning)</td>
</tr>
<tr>
<td>On completion of this module the student should be able to:</td>
</tr>
<tr>
<td>◆ Demonstrate an understanding of survival models</td>
</tr>
<tr>
<td>◆ Demonstrate a knowledge of methods for the calculation of the moments of the present values of payment streams contingent on survival or death</td>
</tr>
<tr>
<td>◆ Demonstrate a knowledge of methods for the calculation of premiums and reserves for life insurance policies</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Learning Outcomes:</strong></th>
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</thead>
<tbody>
<tr>
<td><strong>Personal Abilities</strong></td>
</tr>
<tr>
<td>Industrial, Commercial &amp; Professional Practice; Autonomy, Accountability &amp; Working with Others; Communication, Numeracy &amp; ICT</td>
</tr>
<tr>
<td>At the end of the course students should be able to:</td>
</tr>
<tr>
<td>◆ Demonstrate the ability to learn independently</td>
</tr>
<tr>
<td>◆ Manage time, work to deadlines and prioritise workloads</td>
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<tr>
<td>◆ Perform numerical calculations using a suitable computer package, or other available tools</td>
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<td>◆ Present results in a way which indicates that they have understood the concepts involved</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Assessment Methods:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment:</td>
</tr>
<tr>
<td>Examination: (weighting at least 80%)</td>
</tr>
<tr>
<td>Coursework (weighting up to 20%)</td>
</tr>
<tr>
<td>Re-assessment:</td>
</tr>
<tr>
<td>Examination (weighting –100%)</td>
</tr>
<tr>
<td>Course Code: F71SM</td>
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</tbody>
</table>

**Aims:**
This course aims to provide postgraduate students with a broad knowledge of the principal areas of mathematical statistics and statistical methods widely used in actuarial science and finance.

**Syllabus:**
- Data summary
- Probability
- Random variables, special distributions
- Multivariate distributions and linear combinations
- Sampling distributions, central limit theorem, t and F distributions
- Estimation – properties of estimators, methods of constructing estimators
- Interval estimation
- Hypothesis testing
- Linear relationships – regression and correlation

**Learning Outcomes: Subject Mastery**
*Understanding, Knowledge and Cognitive Skills; Scholarship, Enquiry and Research (Research-Informed Learning)*

On completion of this course the student should be able to:
- demonstrate knowledge of, and a critical understanding of, statistical methodologies (including the main concepts and methods of inference and modelling)
- understand and apply a range of statistical techniques based on the main theories and concepts which comprise the syllabus, including the central limit theorem
- perform basic probability calculations
- find/calculate moments and expected values of random variables and functions of random variables; use generating functions
- determine properties of estimators: efficiency, Cramer-Rao lower bound, (approx.) large sample distributions of MLEs
- perform inference on parameter estimates, including constructing confidence intervals and testing hypotheses on the values of parameters
- fit a linear regression model and critically evaluate other proposed models; test hypotheses concerning correlation coefficients

**Learning Outcomes: Personal Abilities**
*Industrial, Commercial & Professional Practice; Autonomy, Accountability & Working with Others; Communication, Numeracy & ICT*

At the end of the course students should be able to:
- show an awareness of how different statistical models and techniques can be applied to financial problems
- communicate meaningfully and productively with others (including practitioners and professionals in the financial services industry and elsewhere) on matters relating to and/or requiring the use of statistical methods

**Assessment Methods:**
- Assessment: Examination (weighting - 100%)
- Re-assessment: Examination (weighting –100%)
# Stochastic Modelling

**Course Code:** F71SZ  
**Course Title:** Stochastic Modelling  
**Course Co-ordinator:** Sergey Foss

**Aims:**  
To introduce fundamental stochastic processes which are useful in insurance.

**Syllabus:**  
- Conditional expectation.  
- Sequences of random variables and the Markov property  
- Review of matrix algebra  
- Review of summation notation and other useful concepts  
- Using the Markov property  
- Absorbing Markov chains with finite state space  
- First step (backwards) equations  
- Basic examples  
- Stationarity problem for finite state space chains  
- Tricks for the computation of the stationary distribution  
- Convergence to stationarity  
- Markov chains with infinite but countable state space  
- Examples  
- Simple point processes, Poisson and compound Poisson processes  
- Continuous time Markov processes  
- Chi-squared test for contingency tables and goodness of fit.  
- One-way ANOVA.

**Learning Outcomes: Subject Mastery**

*Understanding, Knowledge and Cognitive Skills; Scholarship, Enquiry and Research (Research-Informed Learning)*

After studying this half course, students should be able to:  
- Understand and use the Markov property  
- Write down equations for the stationary distribution of a Markov chain and use, wherever possible, additional structure to solve them  
- Write down first step equations and use them to compute the time to death, probability of absorption etc.  
- Apply Markov chain modelling in several problems  
- Understand long term behaviour and stationarity of a Markov chain  
- Apply Chi-squared tests for contingency tables or goodness of fit.  
- Carry out a one-way ANOVA.

**Learning Outcomes: Personal Abilities**

*Industrial, Commercial & Professional Practice; Autonomy, Accountability & Working with Others; Communication, Numeracy & ICT*

At the end of the half course, students should be able to:  
- Demonstrate the ability to learn independently  
- Manage time work to deadlines and prioritise workloads  
- Present results in a way which demonstrates that they have understood the technical and broader issues of stochastic processes

**Assessment Methods:**  
Assessment: Examination (weighting - at least 75%)  
Coursework (weighting – no more than 25%)  

**Re-assessment:**  
Examination (weighting –100%)
### Linked courses:

**Aims:**
To provide a basic understanding of issues in corporate finance

**Syllabus:**
- Instruments used by companies to raise finance
- Management of financial risk
- Personal and corporate taxation
- Interpretation of financial statements of companies and financial institutions

### Learning Outcomes:

**Subject Mastery**

*Understanding, Knowledge and Cognitive Skills; Scholarship, Enquiry and Research (Research-Informed Learning)*

- Understanding of the principal terms in use in investment and asset management
- Awareness of the principles of finance and how business of organisations are financed
- Awareness of the principles of corporate governance
- Understanding of the principles of personal and corporate taxation
- Understanding of influences on capital structure and dividend policy
- Awareness of the process of capital investment appraisal
- Understanding of and the ability to interpret financial accounting statements of individual and groups of companies

**Personal Abilities**

*Industrial, Commercial & Professional Practice; Autonomy, Accountability & Working with Others; Communication, Numeracy & ICT*

- Use of core computational and report writing skills in a variety of situations
- Work both independently and as a team player
- Develop a professional awareness of contemporary issues in finance and accounting

### Assessment

**Assessment Methods:**
- Assessment: Examination (Weighting - 100%)
- Re-assessment: Examination (weighting –100%)
<table>
<thead>
<tr>
<th>Course Code:</th>
<th>Course Title:</th>
<th>Course Co-ordinator:</th>
</tr>
</thead>
<tbody>
<tr>
<td>C21AO</td>
<td>Economics</td>
<td>Prabir Bhattacharya</td>
</tr>
</tbody>
</table>

**Aims:**
The aim of this module is to equip students with knowledge and understanding of the fundamental principles and concepts of microeconomics and macroeconomics. By the end of the module students should be able to apply their knowledge and understanding in the analysis of a range of economic problems.

**Syllabus:**
- The economic problem – scarcity, choice, resource allocation, opportunity cost, production possibility curve.
- Comparative and absolute advantage, gains from trade.
- Demand and supply, price determination, equilibrium.
- Elasticity, normal, inferior and Giffen goods.
- Risk, utility and insurance.
- The short and long run, production and costs.
- Market structures – perfect competition, monopolistic competition, oligopoly, monopoly.
- Wages and the distribution of income.
- Market failure.
- The national economy – circular flow of income, growth, the equilibrium level of national income, the business cycle, the multiplier.
- Aggregate demand and supply.
- Money – demand and supply, interest rates and prices.
- Unemployment, inflation and growth.
- Fiscal and monetary policy, demand and supply side policies.
- Balance of payments and exchange rates.

**Learning Outcomes:**

**Subject Mastery**
*Understanding, Knowledge and Cognitive Skills; Scholarship, Enquiry and Research (Research-Informed Learning)*

Knowledge and understanding of:
- key concepts and principles of microeconomics and macroeconomics
- economic theory, modelling approaches and elementary analysis
- how to apply economic reasoning to policy issues in a critical manner

Development of:
- general study and enquiry skills
- ability to abstract and simplify complex problems
- the ability to apply knowledge and skills to the solution of theoretical and applied problems in economics

**Personal Abilities**
*Industrial, Commercial & Professional Practice; Autonomy, Accountability & Working with Others; Communication, Numeracy & ICT*

The course aims to develop:
- The ability to deploy key transferable concepts in addressing economic problems. These concepts include, opportunity cost, incentives, equilibrium, disequilibrium, stability, the relevance of marginal considerations and the possible gains from voluntary exchange.
- Familiarity with the possibility that many economic problems may admit of more than one approach, and may have more than one solution
- The ability to work autonomously and collaboratively
- The ability to draw on text-based, graphical and statistical sources of information (sourcing and gathering information)
- The ability to handle data and to use it in analysing simple economic problems
- The ability to communicate the results of economic analysis
<p>| Assessment Methods: | Assessment: Examination: (weighting - 60%) | Mid Semester Test (weighting - 20%) | Coursework: (weighting - 20%) | Re-assessment: Examination (weighting - 100%) |</p>
<table>
<thead>
<tr>
<th>Course Code: F71BF</th>
<th>Course Title: Life Insurance Mathematics 2</th>
<th>Course Co-ordinator: Peter Ridges</th>
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</thead>
<tbody>
<tr>
<td><strong>Aims:</strong></td>
<td>To introduce some more advanced topics in life insurance mathematics, and complete the material covered in Subject CM1.</td>
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</tbody>
</table>
| **Syllabus:**     | - Markov multiple-state models,  
- Insurances written on multiple lives,  
- The features of disability and long-term care insurance contracts  
- Duration dependence and semi-Markov models,  
- Heterogeneity and selection,  
- Single-figure indices,  
- Population projections,  
- Pension fund mathematics,  
- Profit testing conventional insurance contracts,  
- Profit testing unit-linked contracts. |
| **Learning Outcomes: Subject Mastery** | Understanding, Knowledge and Cognitive Skills; Scholarship, Enquiry and Research (Research-Informed Learning)  
- Define Markov life-history models in terms of states, transitions and transition intensities;  
- State and prove Kolmogorov's forward equations, state Thiele's differential equations, and use an Euler scheme to solve both numerically, for a general Markov multiple-state model;  
- Define models for the joint life histories of two individuals; (a) as a multiple-state model; and (b) in terms of random future lifetimes;  
- Calculate expected present values, premiums and policy values for the following types of joint-life policies: first-death and second-death assurances and annuities, reversionary annuities, and contingent assurances;  
- Describe the main features of disability insurance and long-term care insurance;  
- Define multiple-state models representing life histories involving disability and long-term care, and show how these introduce duration dependence, hence semi-Markov models;  
- Derive integro-differential equations for the occupancy probabilities needed to compute actuarial quantities in special cases of semi-Markov models;  
- Give expressions for expected present values, premiums and policy values in special cases of semi-Markov models;  
- Understand possible sources of heterogeneity, its effect on the analysis of insurance data, and its possible impact on insurance business;  
- Construct single figure indices to summarise mortality and other experiences, and understand the strengths and weakness of each;  
- Explain mathematical and component methods of population projection;  
- Describe the main retirement and death-in-service lump sum benefits found in a defined benefit pension scheme in the UK;  
- Derive commutation functions to perform valuations of the main retirement benefits, death-in-service lump sum benefits, and future contributions;  
- Calculate the profit vector, profit signature, net present value, profit margin, discounted payback period, and internal rate of return for conventional policies;  
- Describe the effect on the profit vector of changes in the premium, valuation, and experience bases;  
- Describe the operation of the unit price and the charging structure for unit-linked policies;  
- Calculate the unit fund, sterling fund, sterling reserve, and measures of profit for unit-linked policies. |
<table>
<thead>
<tr>
<th>Learning Outcomes: Personal Abilities</th>
<th><em>Industrial, Commercial &amp; Professional Practice; Autonomy, Accountability &amp; Working with Others; Communication, Numeracy &amp; ICT</em></th>
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<tbody>
<tr>
<td>At the end of this course students should be able to:</td>
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<tr>
<td>♦ Demonstrate the ability to learn independently</td>
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<tr>
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<tr>
<td>♦ Perform numerical calculations using a suitable computer package, or other available tools</td>
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<tr>
<td>♦ Present results in a way which indicates that they have understood the concepts involved</td>
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| Assessment Methods: | Assessment: Examination: (weighting - at least 80%) Coursework (weighting up to 20%) | Re-assessment: Examination (weighting –100%) |
Course Code: F71AE  
Course Title: Survival Models  
Course Co-ordinator: Angus Macdonald

Aims:
- To understand the use of mathematical models of mortality, illness and other life history events in the study of processes of actuarial interest
- To be able to estimate the parameters in these models, mainly by maximum likelihood
- To apply methods of smoothing observed rates of mortality and to test the goodness-of-fit of the models

Syllabus:
- Estimating the lifetime distribution
- Markov models: theory
- Markov models: data and estimation
- Binomial and Poisson models of mortality
- Graduation and statistical tests
- Exposed to risk

Learning Outcomes: 
Subject Mastery
Understanding, Knowledge and Cognitive Skills; Scholarship, Enquiry and Research (Research-Informed Learning)
After studying this course, students should be able to:
- Estimate a survival function using the Kaplan-Meier method
- Find the partial likelihood function in the Cox model
- Use the partial likelihood to estimate parameters (with standard errors) in the Cox model
- Write down an appropriate Markov multi-state model for a system with multiple transfers
- Obtain the Kolmogorov Forward Equations in a Markov multi-state model
- Derive the likelihood function in a Markov multi-state model
- Use the likelihood function to estimate parameters (with standard errors) in a Markov multi-state model
- Obtain the likelihood function in the 2-state model with states Alive and Dead under the binomial or Poisson models
- Use any of two assumptions (uniform distribution of death, constant force of mortality) to reduce the binomial likelihood to a function of a single parameter, and estimate the parameter
- Understand the need for graduation of observed rates of mortality and be familiar with the main methodologies in this area of survival modelling
- Apply a range of appropriate tests to check adherence of a graduation to data
- Understand the effects of duplicate policies on estimates of mortality
- Calculate exactly and from census data the central exposed to risk

Learning Outcomes: 
Personal Abilities
Industrial, Commercial & Professional Practice; Autonomy, Accountability & Working with Others; Communication, Numeracy & ICT
At the end of the course, students should be able to:
- Demonstrate the ability to learn independently
- Manage time, work to deadlines and prioritise workloads
- Present results in a way which demonstrates that they have understood the technical and broader issues of modelling mortality and morbidity data
- Communicate findings effectively in the actuarial and financial services industry

Assessment Methods:
Assessment: Examination (weighting - at least 75%)
Coursework (weighting – no more than 25%)
Re-assessment: Examination (weighting –100%)

Course Code:  
Course Title:  
Course Co-ordinator:
| Aims:       | ♦ To provide an introduction to risk theory as applied to insurance processes and problems  
|            | ♦ To teach students methods of assessing premiums for short term insurance policies  
|            | ♦ To introduce students to simple methods of claim reserving  
| Syllabus:  | ♦ Loss distributions  
|            | ♦ Aggregate risk model and individual risk model  
|            | ♦ Risk sharing - simple reinsurance and deductibles  
|            | ♦ Premium calculation principles  
|            | ♦ Bayesian estimation and credibility theory  
|            | ♦ Experience rating - No Claims Discount Systems  
|            | ♦ Ruin Theory  
|            | ♦ Claims reserving - run-off triangles  
|            | ♦ Simulation  
| Learning Outcomes: Subject Mastery | Understanding, Knowledge and Cognitive Skills; Scholarship, Enquiry and Research (Research-Informed Learning)  
|            | After studying this course, students should be able to:  
|            | ♦ Explain and apply the concepts of conditional expectation and compound distribution  
|            | ♦ Calculate probabilities and moments of loss distributions  
|            | ♦ Construct and use collective and individual risk models  
|            | ♦ Explain the properties of and apply some simple premium calculation principles  
|            | ♦ Describe and apply the fundamental concepts of Bayesian statistics  
|            | ♦ Describe and apply the fundamental concepts of credibility theory  
|            | ♦ Explain a simple no claims discount system  
|            | ♦ Describe the problems of reserving in short term insurance, explain run-off triangles and calculate outstanding claim reserves using simple models  
|            | ♦ Explain what is meant by the surplus for an insurance process; define and understand probabilities of ruin  
|            | ♦ Simulate data from specified distributions  
| Learning Outcomes: Personal Abilities | Industrial, Commercial & Professional Practice; Autonomy, Accountability & Working with Others; Communication, Numeracy & ICT  
|            | At the end of the course, students should be able to:  
|            | ♦ Demonstrate the ability to earn independently  
|            | ♦ Manage time, work to deadlines and prioritise workloads  
|            | ♦ Use an appropriate computer package to process data  
|            | ♦ Present results in a way which demonstrates that they have understood the broader issues of risk theory  
| Assessment Methods: | Assessment:  
|            | Examination: (weighting - at least 80%)  
|            | Coursework: (weighting – up to 20%)  
|            | Re-assessment:  
|            | Examination (weighting –100%)  

<table>
<thead>
<tr>
<th>Course Code: F71TS</th>
<th>Course Title: Time Series</th>
<th>Course Co-ordinator: Fraser Daly</th>
</tr>
</thead>
</table>

**Aims:**
This half-course aims to provide students with an introduction to time series analysis, including models with applications in finance. Presenting the material in the form of a specific half-course allows for greater flexibility and makes it available to postgraduate students on other programmes who would benefit.

**Syllabus:**
- Basic time series concepts and operators
- Stationary processes, general linear filter, autocorrelation function and spectrum
- MA, AR and ARMA processes
- ARIMA processes and Random Walk (RW) with or without drift
- Model estimation and model selection
- Models with trend and/or seasonality
- Forecasting
- Introduction to nonlinear processes

**Learning Outcomes: Subject Mastery**
*Understanding, Knowledge and Cognitive Skills; Scholarship, Enquiry and Research (Research-Informed Learning)*

On completion of this module the student should be able to:
- demonstrate knowledge of, and a critical understanding of, the main concepts of time series analysis
- demonstrate knowledge of, and a critical understanding of, the main properties of MA, AR, ARMA, ARIMA, and RW models
- use least squares, maximum likelihood and other methods to fit time series models to the data
- select proper model(s) using e.g. AIC or BIC
- fit trend and seasonal trend to the data, and fit time series models to the residuals
- understand methods used to produce forecasts
- understand ARCH, GARCH and other nonlinear time series models and their applications for modelling of financial data
- understand time series data well, and perform basic calculations and summaries of time series data
- understand and critically assess time series models fitted by computer packages
- use a range of time series models to produce forecasts

**Learning Outcomes: Personal Abilities**
*Industrial, Commercial & Professional Practice; Autonomy, Accountability & Working with Others; Communication, Numeracy & ICT*

At the end of the module student should be able to:
- communicate meaningfully and productively with others (including practitioners and professionals in the financial services industry) on time series analysis issues
- Demonstrate the ability to earn independently
- Manage time, work to deadlines and prioritise workloads

**Assessment Methods:**
- **Assessment:**
  - Examination: (weighting – 80%)
  - Coursework: (weighting – up to 20%)
- **Re-assessment:**
  - Examination (weighting – 100%)
Course Code: F71AH  
Course Title: Financial Economics 1  
Course Co-ordinator: Gavin Gibson

**Aims:**
This aim of this course is to provide postgraduate students with a broad knowledge of asset pricing and portfolio selection models.

**Syllabus:**
- Utility Theory
- Stochastic Dominance
- Measures of Investment Risk
- Mean-Variance Portfolio Theory
- Models of Asset Returns
- Capital Asset Pricing Model
- Efficient Market Hypothesis and Behavioural Finance and Prospect Theory

**Learning Outcomes:**

**Subject Mastery**

*Understanding, Knowledge and Cognitive Skills; Scholarship, Enquiry and Research (Research-Informed Learning)*

On completion of this module the student should be able to:
- Derive the properties of a utility function
- State the conditions for absolute, first order and second order stochastic dominance.
- Calculate some important measures of risk: variance, semi-variance, shortfall probability and mean shortfall.
- Calculate the mean and variance of return on a portfolio of assets.
- Demonstrate an understanding of methods used to select portfolios of assets, including utility theory, stochastic dominance and mean-variance analysis
- Describe the purpose and calculation of the following: opportunity set, efficient frontier, indifference curve, separation theorem.
- Develop a critical understanding on the theory of mean-variance model and understand its modifications using other risk measures
- Describe the properties of single-factor and multi-factor models. Show how to fit a single-factor model to market price data.
- Discuss the assumptions underlying and applications of the Capital Asset Pricing Model.
- Derive the capital market line and the security market line
- Understand the concept of risk premium in Arbitrage Pricing Theory.
- State the weak, semi-strong and strong forms of the efficient market hypotheses and discuss their economic implications
- Discuss the topics in prospect theory: framing, reference points, probability estimates

**Learning Outcomes:**

**Personal Abilities**

*Industrial, Commercial & Professional Practice; Autonomy, Accountability & Working with Others; Communication, Numeracy & ICT*

- Demonstrate the ability to learn independently
- Manage time, work to deadlines and prioritise workloads
- Present results in a way which demonstrates that they have understood the technical and broader issues of asset pricing.
- Communicate findings effectively in the financial services industry.

**Assessment Methods:**
- Assessment:
  - Examination: (weighting - at least 80%)
  - Coursework (weighting up to 20%)
- Re-assessment:
  - Examination (weighting ~100%)
<table>
<thead>
<tr>
<th>Course Code: F71AJ</th>
<th>Course Title: Financial Economics 2</th>
<th>Course Co-ordinator: Torsten Kleinow</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aims:</strong></td>
<td>This course aims to provide a good understanding of the concepts, methods and mathematics used in arbitrage pricing in discrete and continuous time.</td>
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</tbody>
</table>
| **Syllabus:**     | ♦ Background on financial derivatives.  
♦ The binomial model of stock prices.  
♦ Definition and properties of Brownian motion and stochastic integrals.  
♦ Stochastic differential equations.  
♦ Geometric Brownian motion and Ornstein-Uhlenbeck process.  
♦ Definition and examples of continuous-time martingales, including the stochastic integral as a martingale.  
♦ Statement of the Martingale Representation Theorem.  
♦ Stochastic calculus and Ito’s Formula.  
♦ Change of measure and Girsanov’s Theorem.  
♦ The Black-Scholes Model.  
♦ Other models of stock prices.  
♦ Portfolio risk management.  
♦ Models of the term structure of interest rates.  
♦ Introduction to credit risk models. |
| **Learning Outcomes:**  
**Subject Mastery** | *Understanding, Knowledge and Cognitive Skills; Scholarship, Enquiry and Research (Research-Informed Learning)*  
Students should be able to:  
♦ Demonstrate an understanding of the main aspects of martingale theory in discrete and continuous time.  
♦ Know the main results and basic applications of stochastic Ito calculus in problems of financial mathematics.  
♦ Understand the role of equivalent martingale measures in the arbitrage-free pricing of contingent claims and their connection with arbitrage free/complete markets.  
♦ Understand the martingale representation theorem and its role in financial applications.  
♦ Understand stochastic differential equations.  
♦ State the binomial and Black Scholes model.  
♦ Derive the Black-Scholes formula and the Black-Scholes partial differential equation.  
♦ Price simple contingent claims (in particular, European-style options and forward contracts).  
♦ Understand the concepts of replication and hedging.  
♦ Construct a buy-and-hold portfolio for a simple contingent claim.  
♦ Construct a portfolio that is neutral with respect to the delta and gamma, and understand the implications of the neutrality.  
♦ Simple extensions of the Black-Scholes model, for example to dividend-paying stocks, and the corresponding Black-Scholes formula.  
♦ Know desirable characteristics of term structure models.  
♦ Know well-known short rate models and their advantages and disadvantages.  
♦ Derive relationships between forward interest rates, spot rates and zero-coupon bond prices.  
♦ Manipulate explicit zero-coupon bond price formulae for the Vasicek and Cox-Ingersoll-Ross models, and derive the implied forward rate curves.  
♦ Understand basic credit risk models and define the different approaches to the modelling of credit risk.  
♦ Know stochastic models for stock prices other than the Black-Scholes model. |
Learning Outcomes: Industrial, Commercial & Professional Practice; Autonomy, Accountability & Working with Others; Communication, Numeracy & ICT

On completion of this course the student should be able to:
- Demonstrate knowledge and critical understanding of the concepts and models in financial mathematics.
- Demonstrate the ability to learn independently.
- Manage time, work to deadlines and prioritize workloads.
- Present results in a way that demonstrates that they have understood the technical and broader issues in financial mathematics.

Assessment Methods:

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<tr>
<td>Assessment:</td>
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<td>Coursework (weighting around 10%)</td>
<td>Re-assessment:</td>
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<tr>
<td>Examination (weighting –100%)</td>
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<tr>
<td><strong>Course Code:</strong></td>
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<tr>
<td>F71AD</td>
<td>MSc Project Work</td>
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**Linked courses:**

**Aims:** To carry out one or two sustained and intensive pieces of independent work on topics in actuarial science and to write a substantial report or reports communicating the results of this work to others interested in actuarial mathematics and practice.

**Syllabus:** Students can carry out projects on topics in Actuarial Science. The project or projects should take the student beyond the courses they have already been taught and examined in on the MSc.

**Learning Outcomes:**

**Subject Mastery**

*Understanding, Knowledge and Cognitive Skills; Scholarship, Enquiry and Research (Research-Informed Learning)*

On completion of this course the student should:

- Be able to access, use and demonstrate an understanding of the appropriate research literature
- Have broadened their knowledge of actuarial science
- Have improved their skills in reading research papers in actuarial science
- Detailed and critical understanding of a selected recent development in actuarial science
- Demonstrate expertise in applying a variety of actuarial techniques in the context of the problems contained within the project(s)

**Personal Abilities**

*Industrial, Commercial & Professional Practice; Autonomy, Accountability & Working with Others; Communication, Numeracy & ICT*

- Demonstrate the ability to learn independently
- Manage time, work to deadlines and prioritise workloads
- Conduct a sustained and intensive piece of independent work on topics in actuarial science over a period of weeks
- Perform numerical calculations using a suitable computer language or package as required for the project(s)
- Write well-structured and coherent reports on their work in a way which can be easily be understood by their examiners
- Assess issues with working as part of a team, if required for the project(s)

**Assessment Methods:**

**Assessment:** Coursework (weighting - 100%)

**Re-assessment:** Coursework (weighting - 100%)
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:

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Discipline  
Discretionary Credits (please refer to the appropriate Regulation(s) for your level of study) |
|---|---|
| E | Email  
Enrolment  
Equality and Diversity Services  
Erasmus+  
Exchanges  
Examinations & Examination Diets  
Exam Diets  
Exam Conduct and Identity Checks  
Exams in Different Time Zones  
Exam Timetables  
Exit Awards  
External Examiners Information |
| F | Failing a Course  
Faith and Belief:  
Edinburgh Campus  
Dubai Campus  
Malaysia Campus  
Financial Services |
| G | Go Global  
Guide to Student Life  
New Student Information:  
Edinburgh and Scottish Borders Campuses available [here](#)  
Dubai Campus available [here](#)  
Malaysia Campus available [here](#)  
Graduate Attributes  
Graduation |
| H | Harassment and Bullying  
Heriot-Watt Assessment & Progression System (HAPS)  
Health and Wellbeing |
| I | Ill Health & Mitigating Circumstances  
Information Services (Library & IT) guides  
IT Essentials  
Inter-Campus Transfer  
Intermediate Awards  
International Student Support |
| L | Learning and Teaching Matters  
Library Essentials  
Library Resources for your Subject  
| | Maternity and Paternity  
O | Oriam (Scotland’s Sport Performance Centre) |
| P | People Finder  
|   | Periods of Study (please refer to the appropriate Regulation(s) for your level of study)  
|   | Personal Tutors  
|   | Plagiarism  
| R | Re-Assessment  
|   | Requirements for Awards (please refer to the appropriate Regulation(s) for your level of study)  
|   | Recognition of Prior Learning & Credit Transfer  
| S | Sexual Misconduct  
|   | Skills Development  
|   | Sport and Exercise (Edinburgh campus)  
|   | Student Council (Dubai Campus)  
|   | Student Feedback  
|   | Student Fees, Funding and Additional Charges  
|   | Student Policies and Guidance  
|   | Student Service Centre:  
|   |   | Dubai Campus (please contact dubaistudentservices@hw.ac.uk)  
|   |   | Edinburgh Campus  
|   |   | Malaysia Campus  
|   | Student Services  
|   | Student Support Services  
|   | Student Surveys  
|   | Study Spaces  
|   | Student Union (Edinburgh, Orkney and Scottish Borders Campuses)  
|   | Student Wellbeing Services  
|   | Students with Caring Responsibilities  
| T | Teaching Timetables  
|   | Temporary Suspension of Studies  
|   | Thinking of Leaving  
| U | Use of Calculators in Examinations  
|   | Use of Dictionaries in Examinations  
| V | Virtual Learning Environment (Vision)  
|   | Visas & Immigration  