SCHOOL OF MATHEMATICAL AND COMPUTER SCIENCES

Programme Structure Information for Academic Year 2020/2021
Actuarial Mathematics and Statistics Undergraduate Programmes

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Selection of Courses

The online enrolment system will allow you to select the courses you wish to study during the Academic Year 2020/21. Your courses are categorised into Mandatory and Optional courses:

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<th>Mandatory Courses</th>
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<td>All mandatory courses for your programme are listed on the online enrolment system. These courses cannot be altered and must be taken to meet the requirements for your programme of study. If your programme consists entirely of mandatory courses, then no further action is required regarding selection of courses.</td>
<td>All optional courses for your programme are listed within the online enrolment system, if applicable. If no optional courses are listed, please ignore and move to the next screen within the online enrolment system. For further information on the selection of your courses, please refer to your specific programme information below.</td>
<td>Elective courses are listed under the specific programme information later in this document. If no information is present, please ignore and move on to the next screen on the online enrolment system.</td>
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Further Information

To assist you in the selection of your optional/elective courses, please find below additional information relating to the programme for which you are currently enrolling. Be aware that there may be more than one year of study for this programme, therefore please ensure that you only refer to your appropriate year. For example, if you are enrolling for year/level 4 of the course, only refer to Year/Stage 4 within the appropriate information below.

Number of Courses – There is a typical number of courses you are expected to register on for the academic year. Undergraduate students usually enrol for 8 courses for a total of 120 credits. Any exceptions are described below.

Timetable Clashes - Please note that mandatory courses will not clash on your timetable. Whilst the University aims to accommodate a full range of optional/elective courses, it may not be possible for the timetable to provide all choice combinations. Please be aware that your optional/elective courses may be subject to change before the start of Semester.
Maximum Limit Exceeded for a Course - We try to offer everyone the possibility to study the optional/elective course they request. However, in certain courses, we are required to limit the numbers participating. In the event that you have selected a course which is over-subscribed, you will be contacted by your Academic School and advised accordingly.

Further Assistance

For more information about the undergraduate programmes offered by the Actuarial Mathematics and Statistics department, please consult the 2020-2021 AMS Students’ Guide (follow the link at www.macs.hw.ac.uk/students/wp-content/uploads/AMS-UG-Student-Guide.pdf). This will, of course, be updated before the start of the next academic year.

If you require further help in choosing your courses, please contact your Personal Tutor or the Year Coordinator for the year you are about to enrol on, as follows:

First year: Dr Marcelo Pereyra (m.pereyra@hw.ac.uk)
Second year: Mrs Andrea Sneddon (A.E.Sneddon@hw.ac.uk)
Third year: Professor George Streftaris (G.Streftaris@hw.ac.uk)
Fourth year: Mr John Phillips (J.Phillips@hw.ac.uk) (main)
Dr Wei Wei (Wei.Wei@hw.ac.uk) (deputy)

F723  BSc in Actuarial Science

Year 1

- You must select one optional course in Semester 1 and one optional course in Semester 2, from the list displayed within the online enrolment system.
- Students are advised to select the options C27IE Introductory Economics in Semester 1 and the option C37FF Finance and Financial Reporting in Semester 2 as these courses can lead to exemptions from the CB1 and CB2 examinations of the Institute and Faculty of Actuaries.

Year 2

- You must select one of the optional courses in Semester 2, from the list displayed within the online enrolment system.
- Students who took Finance and Financial Reporting (C37FF) in the first year should select Numerical Analysis (F18NA). You cannot enrol for C37FF again in order to improve your grade.
- The department strongly recommends that direct entrants into Year 2 should select Finance and Financial Reporting (C37FF), because this subject leads to exemption from the CB1 examination of the Institute and Faculty of Actuaries, provided your overall mark is high enough (see the last page of this document for more information).

Year 3

- Semester 1: You must select the following courses which are mandatory for the BSc in Actuarial Science (even though they may be listed on the online system as optional courses).
  - F70LA Life Insurance Mathematics A
  - F79MA Statistical Models A
  - F79PA Portfolio Theory and Asset Models
  - F79SP Stochastic Processes
- **Semester 2**: You must select the following courses which are mandatory for the BSc in Actuarial Science (even though they may be listed on the online system as optional courses).
  - F70LB Life Insurance Mathematics B
  - F79MB Statistical Models B
  - F79DF Derivative Markets and Discrete Time Finance
  - F79SU Survival Models

**Year 4**

- **Semester 1**: You must select *either three or four* of the following optional courses:
  - F79PS Statistics for Social Science
  - F70CF Continuous-time Finance
  - F70PE Pensions
  - F10MM Optimisation
  - F20ML Statistical Machine Learning
In addition, you may select *at most* one of either:
  - C39SM International Bond and Currency Markets
  - Any other course *approved by the 4th Year Director of Studies*
Additional advice for students who were Direct Entrants to either Year 2 or Year 3 is given below.

- **Semester 2**: You must select *either three or four* of the following optional courses:
  - F79BI Bayesian Inference and Computational Methods
  - F70TS Time Series
  - F70RT Risk Theory
  - F70LP Life Office Practice
  - F71TT Risk Management: Techniques and Tools
In addition, you may select *at most* one of the following elective courses:
  - F19MO Ordinary Differential Equations
  - C39TA Taxation (Tax Law)
  - Any course *approved by the 4th Year Director of Studies*
Additional advice for students who were Direct Entrants to Year 3 is given below.

*(Note: On online enrolment you may need to search for F19MO, but it is an allowable option)*

- **IMPORTANT**: The following optional courses are NOT AVAILABLE in 2020-2021:
  - F70SC Statistical Computing
  - F70SP Further Stochastic Processes
*DO NOT REGISTER FOR THESE COURSES!*

- **Direct Entrants into Year 2** may take the optional course Introductory Economics (C27IE) to obtain the CB2 exemption. However, if you take this you cannot take C39SM International Bond and Currency Markets.

- **Direct Entrants into Year 3** may take
  - Financial Mathematics (F71AB) as an optional course to obtain the CM1 exemption.
  - Introductory Economics (C27IE) as an elective course to obtain the CB2 exemption.
  - Finance and Financial Reporting (C37FF) as an elective course to obtain the CB1 exemption.

Please note however that for Direct Entrants the Examiners will only take into account marks from level 9 and 10 courses in deciding the class of Honours.

Please bear in mind the following important information when choosing your courses:
Pensions (F70PE) and Life Office Practice (F70LP) are synoptically linked, so you should select both of them or neither of them.

Risk Theory (F70RT) and Time Series (F70TS) lead to exemption from the CS2 examination of the Institute and Faculty of Actuaries, provided your overall mark is high enough (see the last page of this document for more information).

Portfolio Theory and Asset Models (F79PA), Derivative Markets and Discrete-Time Finance (F79DF) and Continuous-Time Finance (F70CF) lead to exemption from the CM2 examination of the Institute and Faculty of Actuaries, provided your overall mark is high enough (see the last page of this document for more information).

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**F771  BSc in Financial Mathematics**

**Year 1**
- There are no optional courses in Year 1.

**Year 2**
- You must select one optional course in Semester 2, from the list displayed within the online enrolment system. You cannot enrol for C37FF, Finance and Financial Reporting, unless you are a direct entry student to year 2.
- There are no elective courses.

**Year 3**
- You must select one optional course in Semester 1, and one optional course in Semester 2, from the list displayed within the online enrolment system.
- The department strongly recommends you take Vector Analysis (F19MV) in Semester 1.
- Your choice of options in Semester 2 will be influenced by your preferred destination on graduation. For example,
  - if you are considering a career as a Quantitative Analyst you should opt for Numerical Analysis B (F19NB).
  - If you are thinking about a career in Risk Management, then Bayesian Inference and Computational Methods (F79BI) would be preferred.
- There are no elective courses.

**Year 4**
- You must select three optional courses in Semester 1, and three optional courses in Semester 2, from the list displayed within the online enrolment system. When finished, you should have a total of six optional courses for the whole year.
- Your choice of options will be influenced by your preferred destination on graduation. For example,
  - For **Quantitative Analyst** roles:
    - Numerical Analysis C (F10NC), and
    - Optimisation (F10MM)
  - are recommended in Semester 1. In Semester 2
    - Bayesian Inference & Computational Methods (F79BI),
    - Numerical Analysis D (F10ND),
Time Series (F70TS) are recommended.

For Risk Management roles:
- Optimisation (F10MM) and
- Statistics for Social Science (F79PS)
are recommended in Semester 1. In Semester 2 you should choose
- Risk Theory (F70RT),
- Time Series (F70TS) and
- Credit Risk Modelling (F71CM)

For post-graduate study:
- Functional Analysis (F10MF),
- Numerical Analysis C (F10NC) and
- Optimisation (F10MM)
are recommended in Semester 1. In Semester 2
- Numerical Analysis D (F10ND),
- Time Series (F70TS),
- Bayesian Inference & Computational Methods (F79BI),
are recommended.

F712  BSc in Actuarial Science and Diploma in Industrial Training 1

Year 1, Year 2, Year 3

- Your course choices are the same as for the BSc Actuarial Science programme (F723).

Year 4

- Semester 1: You must select:
  - F78IA Industrial Training Placement A.
- Semester 2: You must select:
  - F78IB Industrial Training Placement B.

Year 5

- Your course choices are the same as for Year 4 of the BSc Actuarial Science programme.

F706  BSc in Actuarial Science and Diploma in Industrial Training 2

Year 5

- Semester 1: You must select the following course which is mandatory for F706.
  - F78IA Industrial Training Placement A.
- Semester 2: You must select the following two courses which are mandatory for F706.
  - F70RT Risk Theory
  - F70TS Time Series.
- You must select either one or two of the following optional courses:
  - F70LP Life Office Practice
If you select only one optional course, then you must select exactly one of the following elective courses:
  o If not already taken in Year/Stage 4, F19MO Ordinary Differential Equations
  o C39TA Taxation
  o Any other course approved by the 4th/5th Year Director of Studies.

Please bear in mind the following important information when choosing your courses:
  • Portfolio Theory and Asset Models (F79PA) and Financial Economics 2 (F71AJ) lead to exemption from the CM2 examination of the Institute and Faculty of Actuaries, provided your overall mark is high enough enough (see the last page of this document for more information).

F740  BSc in Statistical Data Science

Year 1
  • You must select two optional courses in Semester 1 and two optional courses in Semester 2, from the list displayed within the online enrolment system.
  • For students enrolling on the Edinburgh campus, the optional courses available in Semester 1 are C27IE Introductory Economics and F17CC Introduction to University Mathematics. The optional courses available in Semester 2 are C37FF Finance and Financial Reporting and F77PD Professional Development Planning.
  • The options C27IE Introductory Economics and C37FF Finance and Financial Reporting can lead to exemptions from the CB1 and CB2 examinations of the Institute and Faculty of Actuaries.

Year 2
  • You must select one of the optional courses in Semester 2, from the list displayed within the online enrolment system.

  • Students who took Finance and Financial Reporting (C37FF) in the first year should select Numerical Analysis (F18NA). You cannot enrol for C37FF again in order to improve your grade.

Year 3
  • You may select one optional course in Semester 1, and one optional course in Semester 2, from the list displayed within the online enrolment system.

Year 4
  • You may select one optional course in Semester 1, and two optional courses in Semester 2, from the list displayed within the online enrolment system.

  • IMPORTANT: The following optional courses are NOT AVAILABLE in 2020-2021:
    o F70SC Statistical Computing
    o F70SP Further Stochastic Processes

DO NOT REGISTER FOR THESE COURSES!
Prerequisites

The following lists contains details of prerequisites for all level 8, 9 and 10 courses taught in the department of Actuarial Mathematics and Statistics. This information will be particularly useful for Year 4 students who are choosing their optional courses. For courses taught by other departments, please check the webpage of the relevant department. Where prerequisites are mentioned, students must have obtained a D or better in these subjects in order to be allowed to take their chosen course.

Level 8

**Probability and Statistics A (F78PA):** Introduction to Statistical Science A (F77SA) and Introduction to Statistical Science B (F77SB) or equivalent.

**Probability and Statistics B (F78PB):** Introduction to Statistical Science A (F77SA) and Introduction to Statistical Science B (F77SB) or equivalent.

**Actuarial and Financial Mathematics A (F78AA):** No prerequisites.

**Actuarial and Financial Mathematics B (F78AB):** No prerequisites.

**Algorithmic and Scientific Programming (F78AP):** No prerequisites

**Industrial Training Placement A (F78IA):** Obtain a full-time work placement lasting at least 9 months that is approved by the Department.

**Industrial Training Placement B (F78IB):** Obtain a full-time work placement lasting at least 9 months that is approved by the Department.

Level 9

**Statistical Models A (F79MA):** Probability and Statistics A (F78PA) and Probability and Statistics B (F78PB) or equivalent.

**Statistical Models B (F79MB):** Probability and Statistics A (F78PA) and Probability and Statistics B (F78PB) or equivalent.

**Statistics for Social Science (F79PS):** Probability and Statistics A (F78PA) and Probability and Statistics B (F78PB), (or alternatively Statistics for Science (F78SC)), or equivalent.

**Stochastic Processes (F79SP):** Probability and Statistics A (F78PA) and Probability and Statistics B (F78PB) or equivalent.

**Bayesian Inference & Computational Methods (F79BI):** Probability and Statistics A (F78PA) and Probability and Statistics B (F78PB) or equivalent.

**Portfolio Theory and Asset Models (F79PA):** Probability and Statistics A (F78PA) and Actuarial and Financial Mathematics B (F78AB) or equivalent.

**Derivative Markets and Discrete-Time Finance (F79DF):** Probability and Statistics A (F78PA) and Actuarial and Financial Mathematics B (F78AB) or equivalent.

**Survival Models (F79SU):** Financial Mathematics B (F78AB) and Probability and Statistics B (F78PB) or equivalent.
Level 10/11

**Time Series (F70TS):** Probability and Statistics A (F78PA) and Probability and Statistics B (F78PB) or equivalent.

**Statistics Dissertation A (F70DA):** Statistical Models A (F79MA) and Statistical Models B (F79MB).

**Statistics Dissertation B (F70DB):** Statistical Models A (F79MA) and Statistical Models B (F79MB).

**Life Insurance Mathematics A (F70LA):** Actuarial and Financial Mathematics A (F78AA) and Actuarial and Financial Mathematics B (F78AB) or equivalent.

**Life Insurance Mathematics B (F70LB):** Actuarial and Financial Mathematics A (F78AA) and Actuarial and Financial Mathematics B (F78AB) or equivalent.

**Continuous-Time Finance (F70CF):** Stochastic Processes (F79SP) and Derivatives Markets and Discrete-Time Finance (F79DF) or equivalent.

**Pensions (F70PE):** Life Insurance Mathematics A (F70LA) and Life Insurance Mathematics B (F70LB) or equivalent.

**Statistics Special Topic (F70ST):** Statistical Models A (F79MA) and Statistical Models B (F79MB) or equivalent.

**Life Office Practice (F70LP):** Life Insurance Mathematics A (F70LA) and Life Insurance Mathematics B (F70LB) or equivalent.

**Risk Theory (F70RT):** Statistical Models A (F79MA) or equivalent.

**Advanced Derivative Pricing (F70DP):** Stochastic Processes (F79SP) and Derivatives Markets and Discrete-time Finance (F79DF) or equivalent.

**Optimisation (F10MM):** Multivariable Calculus and Real Analysis A (F18CD) and Linear Algebra (F18CF).

**Risk Management: Techniques and Tools (F71TT):** Probability and Statistics B (F78PB) and Portfolio Theory and Asset Models (F79PA) or equivalent.

**Actuarial Subjects (Exemptions):**

CM1: Actuarial and Financial Mathematics A (F78AA), Actuarial and Financial Mathematics B (F78AB), Life Insurance Mathematics A (F70LA) and Life Insurance Mathematics B (F70LB)

CM2: Portfolio Theory and Asset Models (F79PA), Derivative Markets and Discrete-Time Finance (F79DF) and Continuous-Time Finance (F70CF). Students who went on exchange to either Melbourne or Waterloo, or who are on programme F706 BSc Actuarial Science and Diploma in Industrial Training 2 may obtain the CM2 exemption through the courses: Portfolio Theory and Asset Models (F79PA) and Financial Economics 2 (F71AJ).

CS1: Probability and Statistics A (F78PA), Probability and Statistics B (F78PB), Statistical Models A (F79MA) and Statistical Models B (F79MB)

CS2: Stochastic Processes (F79SP), Survival Models (F79SU), Risk Theory (F70RT) and Time Series (F70TS)

CB1: Finance and Financial Reporting (C37FF)

CB2: Introductory Economics (C27IE)