

MODULE SPECIFICATION

- 1 The title of the module  
Survival Models (MAxx3)
- 2 The Department which will be responsible for management of the module  
Institute of Mathematics, Statistics and Actuarial Science.
- 3 The Start Date of the Module  
September 2007
- 4 The number of students expected to take the module  
50 (Year 2007/8). This number will increase in future years.
- 5 Modules to be withdrawn on the introduction of this proposed module and consultation with other relevant Departments and Faculties regarding the withdrawal  
This module is a replacement for module of MA525 for graduate students.
- 6 The level of the module (eg Certificate [C], Intermediate [I], Honours [H] or Postgraduate [M])  
M
- 7 The number of credits which the module represents  
15 (ECTS 7.5)
- 8 Which term(s) the module is to be taught in (or other teaching pattern)  
Autumn Term
- 9 Prerequisite and co-requisite modules  
Students will be exempted from pre-requisite and co-requisite modules if they have taken equivalent modules as part of other studies.
- 10 The programmes of study to which the module contributes  
Postgraduate Diploma/Certificate in Actuarial Science
- 11 The intended subject specific learning outcomes and, as appropriate, their relationship to programme learning outcomes  
On successful completion of the module students will be able to:
  - a. show a systematic knowledge, understanding and critical awareness of the actuarial theory in the areas of the syllabus listed in Section 13 (A1, A2, B1, C1)
  - b. to show a comprehensive understanding of the complex techniques applicable to solve problems in the areas of the syllabus listed in Section 13 (B2, B3, C1)
  - c. to appreciate recent developments and methodologies in Survival Models and the links between the theory of Survival Models and their practical application and to critically evaluate such methodologies (C3)
- 12 The intended generic learning outcomes and, as appropriate, their relationship to programme learning outcomes  
On successful completion of the Module, students will have:
  - a. developed a logical mathematical approach to solving complex problems including cases where information/data is not complete (B4, B5, D1, D3)
  - b. developed skills in written communication to both technical and non-technical audiences (D2),
  - c. developed skills in the use of relevant information technology (D4),
  - d. developed skills in time management, organisation and studying so that tasks can be planned and implemented at a professional level (D5, D6).
- 13 A synopsis of the curriculum

Lecture syllabus: 36 lectures (Autumn Term)

The syllabus includes objectives (v) to (xi) of the professional curriculum of the Faculty and Institute of Actuaries examination CT4.

- § Describe the principles of actuarial modelling, to critically evaluate the benefits and limitations of modelling, to critically evaluate whether a model is suitable for any particular application. and to analyse the potential output from a model and explain why this is relevant to the choice of model
- § Explain the concept of survival models.
- § Describe estimation procedures for lifetime distributions including the Kaplan-Meier (or product limit) estimate of the survival function, the Nelson-Aalen estimate of the cumulative hazard rate, the Cox model for proportional hazards and to critically evaluate the benefits and the problems that arise when using these procedures.
- § Describe statistical models of transfer between multiple states, including processes with single or multiple decrements, derive relationships between probabilities of transfer and transition intensities and to solve equations that arise out of these relationships.
- § Derive maximum likelihood estimators for the transition intensities in models of transfers between states with piecewise constant transition intensities.
- § Describe how to estimate transition intensities depending on age, exactly or using the census approximation and to critically evaluate the procedure and the underlying assumptions.
- § Describe the Binomial model of mortality, derive a maximum likelihood estimator for the probability of death and compare the Binomial model with the multiple state models and to critically evaluate the benefits and drawbacks of each model.
- § Describe how to test crude estimates for consistency with a standard table or a set of graduated estimates, and describe and explain the process of graduation.

(See [www.actuaries.org.uk/Display\\_Page.cgi?url=/students/syllabuses2007.html](http://www.actuaries.org.uk/Display_Page.cgi?url=/students/syllabuses2007.html))

This is a dynamic syllabus, changing regularly to reflect current practice. The latest syllabus is appended.

14 Indicative Reading List

The students are required to purchase the study notes published by the Actuarial Education Company for Subject CT4 – Survival Models. These are ordered from the Company by the Lecturer.

15 Learning and Teaching Methods, including the nature and number of contact hours and the total study hours which will be expected of students, and how these relate to achievement of the intended learning outcomes

Target intake, hours of study and contact hours.

The module consists of: 36 lectures.

No. of contact hours: 36

Total study hours: 150

The lectures contain numerous worked examples to emphasise the practical application of the theory. The exercise sheets, which count towards the degree mark, are intended to reinforce the lecture material, encourage the student to read the study notes and to apply the concepts taught to practical problems.

16 Assessment methods and how these relate to testing achievement of the intended learning outcomes

**Assessment:** The unit is assessed by examination (75%) and by continuous assessment (25%).

**Continuous Assessment:** This will consist of two regular open-book written assessments which are completed by Students outside contact hours. These test all the learning outcomes as outlined in Sections 11 and 12 and these also test the higher level techniques of analysis and critical evaluation listed under the syllabus.

**Examination:** One 3-hour written examination in the Summer term that will consist of questions and numerical problems requiring short and long answers and they test the learning outcomes (a)-(c) as outlined in Section 11.

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- 17 Implications for learning resources, including staff, library, IT and space

This module has been redesigned as part of an overall restructure of the Actuarial Science modules. However, there will be some extra staff resource required to set and mark the higher level coursework assessments.

- 18 A statement confirming that, As far as can be reasonably anticipated, the curriculum, learning and teaching methods and forms of assessment do not present any non-justifiable disadvantage to students with disabilities

As far as can be reasonably anticipated, the curriculum, learning and teaching methods and forms of assessment do not present any non-justifiable disadvantage to students with disabilities

**Statement by the Director of Learning and Teaching:** "I confirm I have been consulted on the above module proposal and have given advice on the correct procedures and required content of module proposals"

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Director of Learning and Teaching

.....  
Date

**Statement by the Head of Department:** "I confirm that the Department has approved the introduction of the module and will be responsible for its resourcing"

.....  
Head of Department

.....  
Date