

Annexe A: New/Revised Course Content in OBTL+ Format

Course Overview

The sections shown on this interface are based on the templates [UG OBTL+](#) or [PG OBTL+](#)

If you are revising/duplicating an existing course and do not see the pre-filled contents you expect in the subsequent sections e.g. Course Aims, Intended Learning Outcomes etc. please refer to [Data Transformation Status](#) for more information.

Expected Implementation in Academic Year	AY2024-2025
Semester/Trimester/Others (specify approx. Start/End date)	Semester 2
Course Author * Faculty proposing/revising the course	Jinggong Zhang
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Course Title	Models
Course Code	BA2204
Academic Units	4
Contact Hours	52
Research Experience Components	

Course Requisites (if applicable)

Pre-requisites	AB1202
Co-requisites	
Pre-requisite to	
Mutually exclusive to	
Replacement course to	
Remarks (if any)	

Course Aims

This course introduces statistical models that are used to model actuarial, insurance, and finance data. Fundamental principles and techniques of modelling stochastic and life processes are discussed. The aim of the course is to provide students with a set of actuarial tools and techniques that can be applied in a more general setting in life, health, general insurance, and financial areas.

This course is mandatory for students in Bachelor of Business with a specialization in Actuarial Science. Students in the Risk Analytics (Risk Management and Insurance) Program and students in Bachelor of Business who are interested in quantitative and statistical models may also take this course.

This is a fundamental course for students who want to pursue an actuarial career in the future, and they will learn important topics such as actuarial models and statistical inference in this course. Quantitative models take a major part of the daily jobs for actuaries, and they need to understand very well how to build models, test models, analyze model outputs and communicate the results. It would be also helpful for other quantitative roles in finance and insurance to effectively analyze data using various quantitative models.

Course's Intended Learning Outcomes (ILOs)

Upon the successful completion of this course, you (student) would be able to:

ILO 1	Describe the principles of actuarial modelling.
ILO 2	Describe the general principles of stochastic processes, and their classification into different types.
ILO 3	Apply a Markov chain.
ILO 4	Apply a Markov process.
ILO 5	Explain the concept of survival models.
ILO 6	Describe estimation procedure for lifetime distributions.
ILO 7	Derive maximum likelihood estimators for the transition intensities in models of transfers between states with piecewise constant transition intensities.
ILO 8	Describe how to estimate transition intensities depending on age, exactly of using the census approximation.
ILO 9	Describe how to test crude estimates for consistency with a standard table or a set of graduated estimates, and describe the process of graduation.
ILO 10	Describe the methods for mortality projections.

Course Content

1. Principles of actuarial modelling.
2. Stochastic processes.
3. Markov chains.
4. The two-state Markov Model.
5. Time-homogeneous and Time-inhomogeneous Markov jump processes.
6. Survival models.
7. Estimating the lifetime distribution function.
8. The Cox regression model.
9. Exposed to risk.
10. Graduation and statistical tests.
11. Methods of graduation.
12. Mortality projection.

Reading and References (if applicable)

Benjamin, The Analysis of Mortality and Other Actuarial Statistics, Heinemann, 1980 (HG8783.B468)

Durrett, Essentials of Stochastic Processes, Springer, 1999 (QA274.D965)

Lawler, Introduction to Stochastic Processes, Chapman & Hall, 2006 (QA274.L418)

Neill, Life Contingencies, Heinemann, 1977 (HG8781.N411)

Planned Schedule

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
1	Principles of actuarial modelling, Stochastic Processes	ILO1 &2	Handout	In-person	
2	Markov chains	ILO3	Handout	In-person	
3	Time-homogeneous Markov jump processes	ILO4	Handout	In-person	
4	Time-inhomogeneous Markov jump processes	ILO4	Handout	In-person	
5	Survival models	ILO5	Handout	In-person	
6	Estimation of lifetime distribution function	ILO6	Handout	In-person	
7	Estimation in the Markov Model	ILO7	Handout	In-person	
8	RECESS				
9	Midterm test	ILO1 -6	Handout	In-person	
10	Proportional hazard models, Exposed to risk	ILO8	Handout	In-person	
11	Graduation tests	ILO9	Handout	In-person	
12	Graduation techniques	ILO9	Handout	In-person	

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
13	Holiday				
14	Mortality projection	ILO10	Handout	In-person	

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Seminars	You will be introduced to the statistical models that are used to model actuarial, insurance, and finance data. Theories and mathematical derivations will be provided as the foundation of the course, and example will be used to illustrate how they can be applied in practice. You are welcome to question and critique in class and take part in the problem solving process.
Individual assignment(s)	You will get the chance to practice to review the knowledge learnt in class and to apply it to solve exercise problems. This will help you better grasp the essence of the course and achieve the course objective.
In-Class activities	Interactions are encouraged in class to enhance critical thinking and class engagement. This will permit sharing of ideas amongst students and instant feedback on questions.

Assessment Structure

Assessment Components (includes both continuous and summative assessment)

No.	Component	ILO	Related PLO or Accreditation	Weightage	Team/Individual	Rubrics	Level of Understanding
1	Summative Assessment (EXAM): Final exam(Final Examination)	ILO1-10	Critical Thinking, Acquisition of knowledge	70	Individual		
2	Continuous Assessment (CA): Test/Quiz(Midterm Examination)	ILO1-7	Acquisition of knowledge & Problem Solving	10	Individual		
3	Continuous Assessment (CA): Presentation(Class Presentation)	ILO1-10	Acquisition of knowledge & Critical Thinking	10	Individual		
4	Continuous Assessment (CA): Class Participation(Class Participation)	ILO1-10	Acquisition of knowledge & Critical Thinking	10	Individual		

Description of Assessment Components (if applicable)

Note: this course is an actuarial course with IFoA credit which is highly quantitative, so it is important for the final exam to have a relatively large weight of 70%.

Formative Feedback

You will receive written feedback for written homework, and verbal feedback for in-class discussion and other in-class participations. Emails to individual students are also used when it is needed.

Informally stay after each class provides you informal feedback and interactions with you.

NTU Graduate Attributes/Competency Mapping

This course intends to develop the following graduate attributes and competencies (maximum 5 most relevant)

Attributes/Competency	Level
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Course Policy

Policy (Academic Integrity)

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values. As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the academic integrity website for more information. On the use of technological tools (such as Generative AI tools), different courses / assignments have different intended learning outcomes. Students should refer to the specific assignment instructions on their use and requirements and/or consult your instructors on how you can use these tools to help your learning. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Policy (General)

You are expected to read ahead for each session, be ready to participate in the class discussions and present solutions to the questions assigned. You are expected to take responsibility to follow up with course notes, assignments and course related announcements for seminar sessions they have missed. You are expected to participate in all seminar discussions and activities.

Policy (Absenteeism)

Absence from class without a valid reason will affect your overall course grade. Valid reasons include falling sick supported by a medical certificate and participation in NTU's approved activities supported by an excuse letter from the relevant bodies.

If you miss a lecture, you must inform the course instructor via email prior to the start of the class.

Policy (Others, if applicable)

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