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 1
Course Author * Faculty proposing/revising the course	Yeo Keng Leong
Course Author Email	klyeo@ntu.edu.sg
Course Title	Life Contingencies And Demography
Course Code	BA3201
Academic Units	4
Contact Hours	52
Research Experience Components	

Course Requisites (if applicable)

Pre-requisites	BA2204 Models
Co-requisites	
Pre-requisite to	
Mutually exclusive to	
Replacement course to	
Remarks (if any)	

Course Aims

This course prepares students interested in working in the field of actuarial science in life insurance with the basic skillsets required for it. Specifically, you will be able to price and set reserves for various life insurance contracts after completing the course. This course builds on the knowledge of BA2202 Mathematics of Finance and BA2204 Models.

Course's Intended Learning Outcomes (ILOs)

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

ILO 1	Define various assurance and annuity contracts.
ILO 2	Develop formulae for the means and variances of the payments under various assurance and annuity contracts, assuming constant deterministic interest rate.
ILO 3	Use assurance and annuity functions involving two lives.
ILO 4	Use methods of valuing cashflows that are contingent upon multiple transition events.
ILO 5	Use methods of projecting and valuing expected cashflows that are contingent upon multiple decrement events.
ILO 6	Apply the gross random future loss under an insurance contract and the principle of equivalence.
ILO 7	Calculate net and gross premiums and reserves of assurance and annuity contracts.
ILO 8	Calculate, for a single policy or a portfolio of policies, death strain at risk, expected death strain, actual death strain and mortality profit for various assurance and annuity contracts.
ILO 9	Project expected future cashflows for various assurance and annuity contracts, incorporating multiple decrement models as appropriate.
ILO 10	Show how, for unit-linked contracts, non-unit reserves can be established to eliminate ("zeroise") future negative cashflows, using a profit test model.
ILO 11	Explain orally any of the above actuarial concepts to an audience with financial background.

Course Content

- Life Insurance Contracts

- Life Annuity Contracts

- Life Table

- Evaluation of Life Insurance and Life Annuities

- Net Premiums

- Net Premium Reserves

- Variable Benefits

- With-Profits Policies

- Unit-Linked Insurance Contracts

- Accumulating With-Profits and Unitised (Accumulating) With-Profits Contracts

- Gross Premiums

- Gross Premium Reserves

- Simple Annuities and Assurances Involving Two Lives

- Contingent and Reversionary Benefits

- Competing Risks

- Multiple Decrement Tables

- Profit Testing (Cashflow) Method

- Reserving via Profit Testing (Cashflow) Method

Reading and References (if applicable)

Basic Text

Nil

Readings and References

Institute and Faculty of Actuaries Subject CM1 Actuarial Mathematics Core Principles Core Reading for the 2023 exams

ActEd Study Materials - 2023 Institute and Faculty of Actuaries Subject CM1 Actuarial Mathematics Core Principles, The Actuarial Education Company

Bowers, Newton L. et al., Actuarial Mathematics, 2nd ed., Schaumburg for Society of Actuaries (HG8781.A188)

Benjamin, B. and Pollard, J. H., The Analysis of Mortality and Other Actuarial Statistics, 3rd ed., Faculty of Actuaries and Institute of Actuaries (not in NTU library)

Neil, A., Life Contingencies, Heinemann (HG8781.N411)

Gerber, H. U., Life Insurance Mathematics, 3rd ed., Springer for Swiss Association of Actuaries (HG8782.G362)

Booth, P. M. et al., Modern Actuarial Theory and Practice, 2nd ed., Chapman & Hall (HG8781.M689)

Planned Schedule

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
1	Life Insurance Contracts	1,2,11	Handouts*	In-person	
2	Life Annuity Contracts	1,2,11	Handouts*	In-person	
3	Life Table, Evaluation of Life Insurances and Life Annuities	2,11	Handouts*	In-person	
4	Net Premiums, Net Premium Reserves	6,7,8,11	Handouts*	In-person	
5	Variable Benefits, With-Profits Policies, Unit-Linked Insurance Contracts, Accumulating With-Profits and Unitised (Accumulating) With-Profits Contracts	6,7,11	Handouts*	In-person	
6	Gross Premiums, Gross Premium Reserves	6,7,11	Handouts*	In-person	
7	Simple Annuities and Assurances Involving Two Lives	3,11	Handouts*	In-person	
8	Mid-term Assessment		Handouts*	In-person	
9	Contingent and Reversionary Benefits	3,11	Handouts*	In-person	

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
10	Competing Risks, Multiple Decrement Tables	4,5,11	Handouts*	In-person	
11	Profit Testing (Cashflow) Method	5,9,11	Handouts*	In-person	
12	Reserving via Profit Testing (Cashflow) Method	10,11	Handouts*	In-person	
13	Review			In-person	

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Seminars	There will be delivery of lectures covering all topics. Many examples of how these concepts are applicable in actuarial work in life insurance will be provided as part of the lectures. Time will be set aside for you to ask conceptual questions. Time permitting, higher level conceptual questions will be asked by the lecturer and discussion of them with you will follow.
Tutorials	You will try problems of various difficulties to assess your ability to recall and apply the various concepts. Solutions to these problems will be discussed in class. Presentations of pre-assigned tutorial questions will test students' ability to explain these concepts.
Mid-term assessment	A mid-term assessment covering roughly half the topics of the entire course tests your ability to recall and apply the concepts of those topics.

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)	1,2,3,4,5,6,7,8,9,10	Acquisition of Knowledge	70	Individual		
2	Continuous Assessment (CA): Test/Quiz(Mid-Term Test)	1,2,6,7,8	Acquisition of Knowledge	10	Individual		
3	Continuous Assessment (CA): Class Participation(Class Participation)	1,2,3,4,5,6,7,8,9,10	Acquisition of Knowledge	10	Individual		
4	Continuous Assessment (CA): Presentation(Individual Presentation (Presentation of tutorial question))	11	Oral Communication	10	Individual		

Description of Assessment Components (if applicable)

*70% weightage for final examination is required by the accreditation agreement with the Institute and Faculty of Actuaries.

Formative Feedback

Tutorial questions will be discussed in class every week to cover the topic lectured in the previous week, in order to reinforce the concepts learnt then. You will identify your own areas of weakness and have ample opportunity to clarify your doubts through discussion.

After the mid-term assessment, the full solutions together with the marking scale will be made available to you. You will learn the importance of showing all relevant working steps and correct any misconceptions you may have up till then about any topics.

Individualised written feedback will be sent to you after your oral presentation for that week. You will learn which parts of your presentation went well and which parts can be improved on in your future work presentations.

NTU Graduate Attributes/Competency Mapping

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

Attributes/Competency	Level
Problem Solving	Basic
Sense Making	Basic
Critical Thinking	Basic

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 attend all seminar classes punctually, try all tutorial questions, participate in seminar discussions, prepare presentation slides and deliver the presentation for the pre-assigned tutorial question, and take the mid-term assessment. You are also expected to take responsibility to follow up with course handouts and course related announcements for seminar sessions you may have missed.

Policy (Absenteeism)

If you miss a seminar, you must inform the course instructor via e-mail prior to the start of the class.

Policy (Others, if applicable)

Last Updated Date: 18-06-2024 01:47:27

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