# 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 | AY2022-2023 |
| Semester/Trimester/Others (specify approx. Start/End date) | Semester 2 |
| Course Author<br>* Faculty proposing/revising the course | Nie Ciyu |
| Course Author Email | cynie@ntu.edu.sg |
| Course Title | Actuarial Aspect of Asset/Liability Valuation |
| Course Code | BA3203 |
| Academic Units | 4 |
| Contact Hours | 52 |
| Research Experience Components | |

## Course Requisites (if applicable)

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

## Course Aims

The aim of this course is to develop the necessary skills to construct and apply asset/liability models and to value stocks, financial derivatives and insurance liabilities. These skills are necessary to communicate with other financial professionals and to critically evaluate modern financial theories.

## Course's Intended Learning Outcomes (ILOs)

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

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| ILO 1 | Explain the basics Economic model and statistical model of asset pricing; |
| ILO 2 | Describe of basic stochastic modelling theories; |
| ILO 3 | Apply the most common derivative pricing models; |
| ILO 4 | Describe the framework of Ruin Theory and derive the key results; |
| ILO 5 | Apply triangle methods for general insurance reserving and pricing. |

## Course Content

•Portfolio Theory/Models of Asset Returns •Asset Pricing Models •Brownian Motion and Martingales •Stochastic Calculus and Ito Processes •Stochastic Models of Security Prices •Introduction to Derivatives/Greeks •Binomial Model •Black-Scholes Option Pricing Formula •Martingale Representation Theorem and 5-Step Method •Arbitrage-Free Pricing and 5-Step Method with Black-Scholes Model •Ruin Theory •Run-off triangles

## Reading and References (if applicable)

CM2 –Actuarial Mathematics 2 Study material and relevant curriculum information can be found at http://www.actuaries.org.uk/. Baxter, M. and Rennie, A., Financial calculus: An introduction to derivative pricing, Cambridge University Press (HG6024.A3B355) Cairns, A. J. G., Interest rate models: An introduction, Princeton University Press (HG1621.C136) Dickson, D.C.M. (2005): Insurance Risk and Ruin. Cambridge University Press, Cambridge Elton, E. J., Gruber, M. J., Brown, S. J. et al., Modern portfolio theory and investment analysis, 8th ed., John Wiley, (HG4529.5.E51) Hull, J. C., Options, futures and other derivatives, 8th edition, Prentice Hall (HG6024.H913)

## Planned Schedule

| Week or Session | Topics or Themes | ILO | Readings | Delivery Mode | Activities |
|---|---|---|---|---|---|
| 1 | Portfolio Theory Models of Asset Returns | 1 | Handout & Tutorial questions | | |
| 2 | Asset Pricing Models Brownian Motion and Martingales | 1 | Handout & Tutorial questions | | |
| 3 | Stochastic Calculus and Ito Processes | 2 | Handout & Tutorial questions | | |
| 4 | Stochastic Models of Security Prices | 2 | Handout & Tutorial questions | | |
| 5 | Introduction to Derivatives Greeks | 3 | Handout & Tutorial questions | | |
| 6 | Binomial Model | 3 | Handout & Tutorial questions | | |
| 7 | Black-Scholes Option Pricing Formula | 3 | Handout & Tutorial questions | | |
| 8 | Recess | | | | |
| 9 | Martingale Representation Theorem and 5-Step Method | 3 | Handout & Tutorial questions | | |
| 10 | Arbitrage-Free Pricing and 5-Step Method with Black-Scholes Model | 3 | Handout & Tutorial questions | | |
| 11 | Ruin Theory I | 4 | Handout & Tutorial questions | | |

| Week or Session | Topics or Themes | ILO | Readings | Delivery Mode | Activities |
|---|---|---|---|---|---|
| 12 | Ruin Theory II | 4 | Handout & Tutorial questions | | |
| 13 | Run-off triangles | 5 | Handout & Tutorial questions | | |

## Learning and Teaching Approach

| Approach | How does this approach support you in achieving the learning outcomes? |
|---|---|
| Seminars | Key concepts introduced in this module will be explained in detail in the seminars supported with examples and exercises. The seminars provide opportunities for open discussion on the conceptual questions, which allow you to think critically and share your ideas with the class. The seminars involve the interaction between the instructor and the entire class, making sure that the targeted learning outcomes could be successfully achieved. |
| In-Class activities | In-class activities, including questions & answers, going through tutorial questions, discussions, etc., provides you hands-on experience to apply materials and concepts introduced in this module to practice of the risk management and insurance practice. Such in-class activities guarantee that learning outcomes could be satisfying achieved. |

## 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) | 1-5 | Acquisition of knowledge | 70 | Individual | | |
| 2 | Continuous Assessment (CA): Class Participation(Coursework: Participation) | 1-5 | Communication, Acquisition of knowledge | 10 | Individual | | |
| 3 | Continuous Assessment (CA): Presentation(Coursework: Seminar presentatio n) | 1-5 | Communication, Acquisition of knowledge | 10 | Individual | | |
| 4 | Continuous Assessment (CA): Test/Quiz(Coursework: Mid-term quiz) | 1-3 | Communication, Acquisition of knowledge | 10 | Individual | | |

Description of Assessment Components (if applicable)

The 70% weightage for final is required by the accreditation agreement with the IFOA.

Formative Feedback

You will receive verbal feedback through in-class discussion to your course participation. You will receive written summative feedback on the mid-term quiz.You will receive summative group feedback on the exam following the conclusion of the module.

## NTU Graduate Attributes/Competency Mapping

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

| Attributes/Competency | Level |
|---|---|

# 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 complete all assigned post-class readings and activities(e.g. tutorial questions provided), attend all seminar classes punctually and take all scheduled assignments and tests by due dates. 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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