The Hong Kong University of Science and Technology

UG Course Syllabus

MA2511: Fundamentals of Actuarial Mathematics

[No. of Credits] 3

[Any pre-/co-requisites] A good knowledge in single variable calculus (equivalent to MATH 1003 OR MATH 1014 OR MATH 1020 OR MATH 1024)

Lecture

Time: Monday and Wednesday, 12:00-13:20

Venue: CYTG001

Name: Qian, Shuaijie

Email: sjqian@ust.hk

Office Hours: By appointment at office

Tutorial 1

Time: Wednesday, 15:00-15:50

Venue: Room 4579

Tutorial 2

Time: Friday, 12:00-12:50

Venue: LIB LG426

Course Description

This course covers the fundamental concepts of actuarial financial mathematics and how these concepts be applied in calculating present and future values for various streams of cash flows. It is of three credits. Topics covered include interest rates, present value and future value, annuities, loan repayment, bond value, bond and portfolio yield, rate of return, yield curve, term structure of interest rates, duration and convexity of general cash flows and portfolio, immunization, stock valuation, capital budgeting, dynamic cash flow processes, and asset and liability management. The course syllabus is same as part 1 (Interest theory) of Financial Mathematics Exam (dated Dec 2023) offered by Society of Actuary (SOA). For detail, please visit https://www.soa.org/education/exam-req/edu-exam-fm-detail.aspx

Intended Learning Outcomes (ILOs)

Upon successful completion of this course, you should be able to

1. Explain fundamentals of interest rates, time value of money and annuity.
2. Compute the return rate of a given investment.
3. Compare the merits of various investment options
4. Construct loan amortization tables
5. Analyze the value of a bond given its price, contract interest rate and maturity date.
6. Develop problem solving skill which is essential in studying advanced courses in Actuarial Science.

Assessment and Grading

This course will be assessed using criterion-referencing and grades will not be assigned using a curve. Detailed rubrics for each assignment are provided below, outlining the criteria used for evaluation.

Assessments:

Assessment Task	Contribution to Overall Course grade (%)	Due date (if applicable)
Homework	20%	
Midterm	30%	
Final Exam	50%	

* Assessment marks for individual assessed tasks will be released within two weeks of the due date.

Mapping of Course ILOs to Assessment Tasks

Assessed Task	Mapped ILOs	Explanation
Homework	ILO 2, 3, 4, 5	
Midterm	ILO 1, 2, 3, 4, 5, 6	
Final Exam	ILO 1, 2, 3, 4, 5, 6	

Grading Rubrics

Marks for each problem will be specified. Full marks will be awarded for completely correct answers. Partial credit will be given for answers that are on the right track but not fully complete.

Final Grade Descriptors:

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	Demonstrates a comprehensive grasp of subject matter, expertise in problem-solving, and significant creativity in thinking. Exhibits a high capacity for scholarship and collaboration, going beyond core requirements to achieve learning goals.

B	Good Performance	Shows good knowledge and understanding of the main subject matter, competence in problem-solving, and the ability to analyze and evaluate issues. Displays high motivation to learn and the ability to work effectively with others.
C	Satisfactory Performance	Possesses adequate knowledge of core subject matter, competence in dealing with familiar problems, and some capacity for analysis and critical thinking. Shows persistence and effort to achieve broadly defined learning goals.
D	Marginal Pass	Has threshold knowledge of core subject matter, potential to achieve key professional skills, and the ability to make basic judgments. Benefits from the course and has the potential to develop in the discipline.
F	Fail	Demonstrates insufficient understanding of the subject matter and lacks the necessary problem-solving skills. Shows limited ability to think critically or analytically and exhibits minimal effort towards achieving learning goals. Does not meet the threshold requirements for professional practice or development in the discipline.

Course AI Policy

This course allows use of generative AI, if any student finds it helpful.

Communication and Feedback

Assessment marks for individual assessed tasks will be communicated via Canvas within two weeks of submission. Feedback on assignments will include scores. Students who have further questions about the feedback including marks should consult the instructor within five working days after the feedback is received.

Resubmission Policy

The resubmission before deadline is always allowed.

Required Texts and Materials

No required textbook. I will provide lecture notes. But the following books may be helpful.

1. Marcel B. Finan, “A basic course in the theory of interest and derivatives markets: A preparation for the Actuarial Exam FM/2”
2. Vaaler, L.J.F., Daniel, J.W., 2019, “Mathematical Interest Theory,” third edition, The mathematical association of America.
3. Broverman, S.A., 2017, “Mathematics of Investment and Credit,” seventh edition, ACTEX.
4. Chan, W.S., Tse, Y.K., 2022, “Financial Mathematics for Actuaries,” third edition, World Scientific Publishing.

Academic Integrity

Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST's Academic Honor Code and to maintain the highest standards of academic integrity. The University has zero tolerance of academic misconduct. Please refer to Academic Integrity | HKUST – Academic Registry for the University's definition of plagiarism and ways to avoid cheating and plagiarism.