UNIVERSITI TEKNOLOGI MARA

ASC453: FINANCIAL MATHEMATICS

Course Name (English)	FINANCIAL MATHEMATICS APPROVED
Course Code	ASC453
MQF Credit	4
Course Description	This subject provides an understanding of the fundamental concepts of financial mathematics such as the interest rate, simple and compound, effective and nominal interest, discount rate, accumulation and present value and force of interest. Those concepts are applied in valuing annuities and shall be further applied in loan repayment and measuring the rate of return. This course follows the syllabus of Core Mathematics I from Institute and Faculty of Actuaries (IFoA).
Transferable Skills	Demonstrate ability to identify and articulate self skills, knowledge and understanding confidently and in a variety of contexts. Demonstrate professional skills, knowledge and competencies.
Teaching Methodologies	Lectures, Tutorial
CLO	CLO1 Explain different type of modelling CLO2 Apply concepts and methods to solve problems related to financial mathematics CLO3 Conduct mathematical proving for problem related to financial mathematics CLO4 Demonstrate lifelong learning skills in assignments related to financial mathematics
Pre-Requisite Courses	No course recommendations

Topics
1. Introduction to modelling 1.1) Deterministic modelling, stochastic modelling and actuarial modelling 1.2) Principles of actuarial modelling 1.3) Decisions on choice of models 1.4) Short run and long run properties of a mode
2. Generalised cashflow model 2.1) For a given cashflow process, state the inflows and outflows in each future time period and discuss whether the amount or the timing (or both) is fixed or uncertain. 2.2) Describe in the form of a cashflow model the operation of a zero coupon bond, a fixed interest security, an index-linked security, cash on deposit, an equity, an “interest only” loan, a repayment loan, and an annuity certain.
3. The time value of money 3.1) Accumulate a single investment at a constant rate of interest under the operation of: (i) simple interest (ii) compound interest 3.2) Define the present value of a future payment. 3.3) Discount a single investment under the operation of simple (commercial) discount at a constant rate of discount. 3.4) Describe how a compound interest model can be used to represent the effect of investing a sum of money over a period. 3.5) Derive the relationship between the rates of interest and discount over one effective period arithmetically and by general reasoning.

4. Interest rates
4.1) Derive the relationships between the rate of interest payable once per effective period and the rate of interest payable p times per time period and the force of interest.
4.2) Explain the difference between nominal and effective rates of interest and derive effective rates from nominal rates.
4.3) Calculate the equivalent annual rate of interest implied by the accumulation of a sum of money over a specified period where the force of interest is a function of time.

5. Discounting and accumulating
5.1) Discount and accumulate a sum of money or a series (possibly infinite) of cash flows to any point in time where: (i) the rate of interest or discount is constant (ii) the rate of interest or discount varies with time but is not a continuous function of time (iii) either or both the rate of cash flow and the force of interest are continuous function of time
5.2) Calculate the present value and accumulated value of a series of equal or unequal payments made at regular intervals under the operation of specified rates of interest where the first payment is: (i) deferred for a period of time (ii) not deferred

6. Compound Interest Functions
6.1) Define and use the more important compound interest functions including annuities certain.

7. Equations of Value
7.1) Define an equation of value, where payment or receipt is certain.
7.2) Describe how an equation of value can be adjusted to allow for uncertain receipts or payments.
7.3) Understand the two conditions required for there to be an exact solution to an equation of value.

8. Loan Schedules
8.1) Describe flat rates and annual effective rates.
8.2) Calculate a schedule of repayments under a loan and identify the interest and capital components of annuity payments where the annuity is used to repay a loan for the case where annuity payments are made once per effective time period or p times per effective time period and identify the capital outstanding at any time.

Assessment Breakdown	%
Continuous Assessment	30.00%
Final Assessment	70.00%

Details of Continuous Assessment

Assessment Type	Assessment Description	% of Total Mark	CLO
Assignment	Assignment 1	2%	CLO2
Assignment	Assignment 2	3%	CLO4
Quiz	Quiz 1 Written or online quiz	2%	CLO1
Quiz	Quiz 2 Written or online quiz	3%	CLO2
Test	Test 1 - 10% on week 6; Test 2 - 10% on week 12	20%	CLO2

Reading List

Recommended Text

- **Institute and Faculty of Actuaries (IFoA), UK 2018, *Core Reading for the 2019 exams - CM1 Actuarial Mathematics***

Reference Book Resources

- **Wai-Sum Chan,Yiu-Kuen Tse 2017, *Financial Mathematics for Actuaries*, 2nd Ed., World Scientific Publishing Company [ISBN: 9813224665]**
- **Joe Francis, Ruckman C. 2017, *Interest Theory Financial Mathematics and Deterministic Asset Valuation*, 17th Edition Ed., ActuarialBrew [ISBN: 0998160407]**
- **Yuliya Mishura 2016, *Financial Mathematics*, Iste Press - Elsevier [ISBN: 1785480464]**
- **Clarence H. Richardson,Leslie Miller Isaiah 2018, *Financial Mathematics*, Franklin Classics Trade Press [ISBN: 0353246921]**
- **Perry F. 2016, *Financial Mathematics with MATLAB*, Createspace Independent Publishing Platform [ISBN: 154045276X]**

Article/Paper List: This Course does not have any article/paper resources

Other References: This Course does not have any other resources