Course Specification
(Bachelor)

Course Title:	**Financial Mathematics (1)**
Course Code:	**AFM 1231**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2024 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
3 (2 Lectures, 0 Lab, 2 Tutorial)					
2. Course type					
A.	☐University	☐College	☒ Program	☐Track	☒ Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: Level 4 / Year 2					
4. Course general Description:					
This course is designed to introduce students to Financial Mathematics. They will learn about the different types of interest (simple interest, compound interest) and annuities. The topics expose as well as the fundamental concepts such as cash flows, present value, and yield that form the basis for further advanced learning. More topics will also be covered.					
5. Pre-requirements for this course (if any):					
MAT 1105					
6. Co-requisites for this course (if any):					
None					
7. Course Main Objective(s):					
On completion of this module, students should be able: • to understand and to perform calculations relating to present value, current value, and accumulated value, • to calculate present value, current value, and accumulated value for sequences of non-contingent payments, • to understand key concepts concerning loans and how to perform related calculations, • to understand key concepts concerning bonds, and how to perform related calculations, • to understand key concepts concerning yield curves, rates of return, and measures of duration and convexity, and how to perform related calculations.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning	0	0%
3	Hybrid • Traditional classroom • E-learning	0	0%
4	Distance learning	0	0%

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	**30**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**30**
5.	**Others (specify)**	**0**
Total		**60**

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Define the interest rate, annuities, problem of interest, accumulation function, future value, current value, present value, discount factor, convertible m -thly, nominal rate, effective rate, inflation and real rate of interest, force of interest, equation of value.**	**K2, K3**	**●2 lecture hours\week ●2 tutorial hours\week Self-study**	**Direct: ●Regular Exams ●Assignments Short Quizzes**
1.2	**Describe the price, book value, amortization of premium, accumulation of discount, redemption value, par value/face value, yield rate, coupon.**	**K2, K3**	**●2 lecture hours\week ●2 tutorial hours\week Self-study**	**Direct: ●Regular Exams ●Assignments Short Quizzes**
2.0	**Skills**			
2.1	**Appraise real-life financial problems involving compound interest, present and**	**S1, S2**	**●Self-study ● Real-life problems**	**Direct: ●Participations ● Short Quizzes**

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	future values, and annuities.			
2.2	Apply logical thinking to problem solving in context to communicate results clearly and precisely both orally and in writing.	S3	Self-study Real-life problems	Direct: Participations Short Quizzes
2.3	Use appropriate technology to aid problem solving.	S2	Self-study Real-life problems	Direct: Participations Short Quizzes
2.4	Compute appropriately the value(s) of money. the annual effective rate of interest, the loan amount or outstanding loan balance, the value of a stock.	S3	Self-study Real-life problems	Direct: Participations Short Quizzes
3.0	Values, autonomy, and responsibility			
3.1	Organize individually and in groups.	V1, V2	Personal questions and teamwork.	Direct: Participation, Homework and Mini projects
3.2	Show a hypothesis test before accepting it.	V1, V2	Class discussion	Direct: Participation

C. Course Content

No	List of Topics	Contact Hours
1.	**The measurement of interest:** Introduction. The accumulation and amount functions. The effective rate of interest. Simple interest. Compound interest. Present value. The effective rate of discount. Nominal rates of interest and discount. Forces of interest and discount. Varying interest.	10
2.	**Solution of problems in interest:** Introduction. The basic problem. Equations of value. Unknown time. Unknown rate of interest. Determining time periods. Practical examples.	8
3.	**Basic annuities:** Introduction. Annuity-immediate. Annuity-due. Annuity values on any date. Perpetuities. Unknown time. Unknown rate of interest. Varying interest.	8

4.	**More general annuities:** Introduction. Differing payment and interest conversion periods. Annuities payable less frequently than interest is convertible. Annuities payable more frequently than interest is convertible. Continuous annuities. Payments varying in arithmetic progression. Payments vary in geometric progression. More general varying annuities. Continuous varying annuities.	7
5	**Amortization schedules and sinking funds**: Introduction. Finding the outstanding loan balance. Amortization schedules. Sinking funds. Differing payment periods and interest conversion periods. Varying series of payments.	8
6	**Bonds and other securities**: Introduction. Types of securities. Price of a bond. Premium and discount. Valuation between coupon payment dates. Determination of yield rates. Callable and puttable bonds. Other securities.	8
7	**Yield rates**: Introduction. Discounted cash flow analysis. Uniqueness of the yield rate. Reinvestment rates. Interest measurement of a fund. Time-weighted rates of interest. Portfolio methods and investment year methods.	7
8	**Practical applications**: Introduction. Truth in lending. Automobile financing. Real estate mortgages. Approximate methods. Depreciation methods. Capitalized cost. Modern financial instruments.	4
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework's, Quizzes, Mini projects	During the term	10%
2.	First Midterm	Week 5-6	25%
3.	Second Midterm	Week 10-11	25%
4.	Final Exam	Week 16	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	***Theory of Interest,*** 3rd Edition, Stephen Kellison, McGraw-Hill Education, 2009.
Supportive References	***Schaum's Outline of Mathematics of Finance****, Revised Edition*, 2nd Edition, McGraw-Hill Education, 2011. ***Introduction to mathematical finance***, D. Heath and G. Swindle (Eds), American Mathematical Society, 1999.
Electronic Materials	None
Other Learning Materials	None

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ Each classroom should be equipped with a whiteboard and a projector. ▪ Laboratories should be equipped with computers and an internet connection.
Technology equipment (projector, smart board, software)	The rooms should be equipped with data show and Smart Board.
Other equipment (depending on the nature of the specialty)	None

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching and assessment, Quality of learning resources	Students	During the semester and at the end of the course each student will complete two evaluation forms.
Extent of achievement of course learning outcomes, Quality of learning resources	Instructor	At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.
Other	None	

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	MATHEMATICS AND STATISTICS DEPARTMENT COUNCIL
REFERENCE NO.	8/1446
DATE	05/04/1446 (08/10/2024)