Course Specification
(Bachelor)

Course Title:	**Financial Mathematics (2)**
Course Code:	**AFM 1334**
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 6 / Year 3					
4. Course general Description:					
This course describes the most important ideas, theoretical results, and examples of simple market model, risk-free assets, risky assets, discrete time market models, portfolio management, forward and future contracts, and option pricing. The course includes the essential fundamentals of these topics. The emphasis is on calculations, and some applications are mentioned.					
5. Pre-requirements for this course (if any):					
AFM 1333					
6. Co-requisites for this course (if any):					
None					
7. Course Main Objective(s):					
By the end of this course students must be able to: • Understand different financial models in discrete time; • Do pricing and hedging options; • Manage optimal portfolios.					

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	**Describe the theory of one-period and multi-period financial models.**	**K2, K3**	**2 lecture hours\week 2 tutorial hours\week Self-study**	**Direct: Regular Exams Assignments Short Quizzes**
1.2	**Define techniques and features of Market Models with both continuous time and discrete time.**	**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 Risk-Free Assets.**	**S1, S2**	**Self-study Real-life problems**	**Direct: Participations Short Quizzes**
2.2	**Apply Discrete Time Market Models.**	**S3**	**Self-study Real-life problems**	**Direct: Participations Short Quizzes**
2.3	**Use appropriate technology to aid Portfolio Management.**	**S2**	**Self-study Real-life problems**	**Direct: Participations Short Quizzes**
2.4	**Compute appropriately values involved in Option Pricing.**	**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	**Analyze Forward and Futures Contracts.**	**V1, V2**	**Class discussion**	**Direct: Participation**

C. Course Content

No	List of Topics	Contact Hours
1.	**Introduction to a Simple Market Model:** Basic Notions and Assumptions, No-Arbitrage Principle, One-Step Binomial Model, Risk and Return, Forward Contracts, Call and Put Options, Managing Risk with Options.	8
2.	**Risk-Free Assets:** Time Value of Money, Simple Interest, Periodic Compounding, Streams of Payments, Continuous Compounding, How to Compare Compounding Methods, Money Market, Zero-Coupon Bonds, Coupon Bonds, Money Market Account.	8
3.	**Risky Assets:** Dynamics of Stock Prices, Return, Expected Return, Binomial Tree Model, Risk-Neutral Probability, Martingale Property, Other Models, Trinomial Tree Model, Continuous-Time Limit.	12
4.	**Discrete Time Market Models:** Stock and Money Market Models, Investment Strategies, The Principle of No Arbitrage, Application to the Binomial Tree Model, Fundamental Theorem of Asset Pricing, Extended Models.	8
5	**Portfolio Management:** Risk, Two Securities, Risk and Expected Return on a Portfolio, Several Securities, Risk and Expected Return on a Portfolio, Efficient Frontier, Capital Asset Pricing Model, Capital Market Line, Beta Factor, Security Market Line.	8
6	**Forward and Futures Contracts:** Forward Contracts, Forward Price, Value of a Forward Contract, Futures, Pricing, Hedging with Futures.	8
7	**Option Pricing:** European Options in the Binomial Tree Model, One Step, Two Steps, General N-Step Model, Cox–Ross–Rubinstein Formula, American Options in the Binomial Tree Model, Black–Scholes Formula.	8
	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	Mathematics for Finance: An Introduction to Financial engineering, 2nd Edition. M. Capinski and T. Zastawniak, Springer Verlag, 2011. (Main Reference). ISBN: 1852333308

Supportive References	1. Stochastic Finance: An Introduction in Discrete Time, DeGruyter Studies in Mathematics, 2nd Edition, H. Föllmer and A. Schied, Walter de Gruyter, Berlin, 2011.ISBN: 3110171198. 2. Introduction to Mathematical Finance: Discrete Time Models, Stanley R. Pliska, Wiley, 1997.ISBN: 978-1-55786-945-6.
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)**