Course Specification
(Bachelor)

Course Title:	**Financial Mathematics (2)**
Course Code:	**AFM 1335**
Program:	**Bachelor of Science in Applied Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2024 – V1**
Last Revision Date:	**08/10/2024**

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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: 6 /3 or 8/ Year4					
4. Course general Description:					
This course offers an in-depth exploration of fundamental concepts and theoretical principles in advanced financial mathematics. It examines essential topics such as simple market models, risk-free and risky assets, and discrete-time market frameworks. Students will engage with portfolio management strategies, forward and futures contracts, and option pricing methodologies. The course emphasizes rigorous mathematical calculations while also highlighting practical applications within the financial industry. Through a combination of theoretical insights and real-world examples, students will develop a comprehensive understanding of the intricacies of financial markets and instruments.					
5. Pre-requirements for this course (if any)**:**					
AFM 1235 Financial AMthematics (1)					
6. Co-requisites for this course (if any)**:**					
None.					
7. Course Main Objective(s):					
The course integrates mathematical theory with practical financial applications, equipping students with essential skills in modeling, pricing, and portfolio management. It fosters analytical problem-solving abilities, prepares students for advanced studies and careers in finance, and enhances their competitiveness in the job market by addressing industry-relevant practices.					

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	
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	To understand the fundamentals of the theory of one-period and multi-period financial models.	K1	●3 lecture hours\week	●Regular Exams
1.2	To understand techniques and features of Market Models with both continuous time and discrete time.	K2	●2 tutorial hours\week ●Self-study	●Assignments ●Short Quizzes
2.0	Skills			
2.1	To develop techniques of problem solving.	S1, S2	Self-study	Participations
2.2	To communicate mathematics clearly and precisely both orally and in writing.	S4	Real-life problems	Short Quizzes
2.3	To use Internet in searching for scientific information	S5	Self-study	Participations

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.4	**To carry out calculations orally and mentally.**	**S3**	**Real-life problems**	**Short Quizzes**
3.0	**Values, autonomy, and responsibility**			
3.1	**To work individually.**	**V1, V3**	**Personal questions**	**Participation**
3.2	**To work in groups.**	**V1, V2**	**Team work**	**Homework and Mini-projects**

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.	**10**
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.	**10**
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.	**10**
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.	**10**
6.	**Forward and Futures Contracts:** Forward Contracts, Forward Price, Value of a Forward Contract, Futures, Pricing, Hedging with Futures.	**8**
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	HomeWorks, 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 15-16	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	
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• **Classrooms:** Equipped with whiteboards, projectors, and Smart Boards for interactive lessons and group discussions. • **Laboratories:** Feature computers with internet access, enabling hands-on activities and exploration of algebraic and trigonometric concepts. • **Exhibition Rooms:** Spaces for showcasing projects and presentations to encourage collaborative learning.
Technology equipment (projector, smart board, software)	• **Data Show Projectors:** For clear presentations in classrooms and labs. • **Smart Boards:** To enhance interactivity during lessons. • **Mathematical Software:** Essential for graphing and analysis.
Other equipment (depending on the nature of the specialty)	• **Computers:** For mini-project and homework and practical applications in laboratories. • **Advanced Calculators:** For computations and problem-solving and supporting the study of limits, continuity, and differentiation.

Items	Resources
	• **Whiteboards and Markers:** To facilitate brainstorming and collaboration.

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Faculty, Program Manager, Students, Course Coordinator	- **Student Course Evaluation**: Student feedback surveys to assess teaching quality (clarity, engagement, delivery). - **Instructor Course Report**: Instructor reflection on their teaching effectiveness and challenges. - **Classroom Observations**: Conducted by the program manager or course coordinator to directly observe teaching methods. - **Benchmarking Between Male and Female Sections**: Compare student evaluations and performance across gender-based sections to identify any disparities in teaching effectiveness. - **Advisory Board Feedback**: Gathering insights on teaching methods from external academic or industry professionals.
Effectiveness of Students assessment	Faculty, External Reviewers, Program Manager, Course Coordinator	- **Alignment of Assessments with CLOs**: Ensuring exams, assignments, and projects measure the intended CLOs. - **Benchmarking Between Semesters**: Comparing assessment effectiveness across different semesters to maintain consistency and improvement. - **CLOs Assessment Excel Sheet**: Tracking student performance in relation to CLOs to evaluate the strength of assessments. - **Instructor Course Report**: Faculty analysis of assessment outcomes and potential adjustments. - **External Audit/Reviewers**: External examiners review assessments for rigor and fairness.
Quality of learning resources	Program Manager, Librarians, Faculty, Course Coordinator	- **Student Course Evaluation**: Students provide feedback on the usefulness and availability of learning resources (textbooks, software, etc.). - **Instructor Course Report**: Faculty report on the adequacy and relevance of learning materials. - **Resource Usage Statistics**: Data on the usage of learning resources (digital/physical) such as library access, software downloads. - **Benchmarking Between Sections/Semesters**: Compare resource satisfaction across male/female sections and over semesters. - **Advisory Board Input**: External experts suggest

Assessment Areas/Issues	Assessor	Assessment Methods
		updated or alternative resources to align with industry or academic developments.
The extent to which CLOs have been achieved	Faculty, Program Manager, External Reviewers, Course Coordinator	- **CLOs Assessment Excel Sheet**: Regular tracking of student performance for each CLO based on exams, projects, and assignments. - **Instructor Course Report**: Faculty reflection on CLO achievement and any gaps identified. - **Student Course Evaluation**: Students assess whether they feel they've met the course learning outcomes. - **Benchmarking Between Semesters**: Analyze CLO achievement across different semesters to ensure continuous improvement. - **Advisory Board Feedback**: Assess whether CLOs are aligned with industry or academic standards and if students are adequately prepared.
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)**