Course Specification

(Postgraduate Programs)

Course Title:	**Actuarial Statistics**
Course Code:	**STA 6101**
Program:	**Executive Master of Science in Actuaries and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2024 – V1**
Last Revision Date:	**None**

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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	☐ Department	☐Track	☒ Others
B.	☒ Required		☐ Elective		
3. Level/year at which this course is offered: Level 1 / Year 1					
4. Course general Description:					
This course describes the most important ideas, theoretical results, and examples of bivariate probability distributions, sampling distributions and the CLT, functions of random variables, parameter estimations and hypothesis testing. 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):					
None.					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
The main objective of this course is to: - To teach students some important scientific concepts of statistics. - To let students be familiar with distributions of random vectors. - To expose students to concepts of Expectation and moments. - To let students know limit theorems and some of their applications. - To teach students techniques of estimations. - To let students learn and use some tests of hypothesis.					

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 moment generating function, the joint probability mass functions, and joint probability density functions.**	**K1**	**2 lecture hours\week**	**Direct: Regular Exams**
1.2	**Produce the confidence intervals on the mean, variance, standard deviation and on a population proportion.**	**K2**	• **2 tutorial hours\week** • **Self-study**	**Direct: Short Quizzes**
2.0	**Skills**			
2.1	**Explain the importance of central limit theorem.**	**S1**	**Self-study**	**Direct:** • **Participations** • **Short Quizzes**
2.2	**Evaluate means and variances for linear combinations of random variables.**	**S3**	**Real-life problems**	**Direct: Simulation Mini-projects**
2.3	**Construct confidence intervals on the appropriate case.**	**S2**	**Real-life problems**	**Direct: Cases study**
2.4	**Discuss important properties of point estimators, including bias, variance, and mean square error.**	**S2, S3**	**Self-study**	**Direct:** **Oral questions** **Final Exam**
3.0	**Values, autonomy, and responsibility**			

3.1	**Perform individually.**	**V1, V2**	**Teamwork and class discussions.**	**Direct:** **-Oral questions** **- All exams**
3.2	**Relate well to others and maintain good relationships.**	**V1, V2**	**Teamwork and class discussions.**	**Direct:** **-Teamwork** **- All exams**

C. Course Content

No	List of Topics	Contact Hours
1.	**Bivariate Probability Distribution:** Two Discrete Random Variables, Two Continuous Random Variables, Covariance and Correlation, Bivariate Normal Distribution, Linear Combinations of Random Variables.	6

2.	**Functions of Random Variables:** Finding the probability distribution of a function of random variable. The method of distribution function, The method of transformations, Using the Moment-Generating Functions	9
3.	**The Central Limit Theorem:** Sampling Distributions related to the Normal Distribution; The Central Limit Theorem; A proof of the Central Limit Theorem.	9
4.	**Sampling distributions:** Sampling distributions, Sampling Distributions of the Means, The chi-square distribution, The t distribution, The F distribution.	9
5.	**Estimation: Point estimation:** The Bias and Mean Square Error of Point Estimation; Some Common Point Estimators; Evaluating The goodness of a Point Estimator.	9
6.	**Properties of Point Estimators and Methods of Estimation:** Relative Efficiency. Consistency. Sufficiency. Rao-Blackwell Theorem and Minimum Variance Estimation. The Method of Moments. The Method of Maximum Likelihood.	9
7	**Confidence Interval Estimation:** Confidence interval for the Mean when σ is Known: Confidence interval for the Mean when σ is Unknown. Confidence Interval and Sample Sizes for Proportions. Confidence Intervals for Variance And standard Deviations.	9
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes, & Homework	During the semester	30%
2.	Midterm	Week 8-9	30%
3.	Final Exam	Week 15	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	***Probability & Statistics for Engineers & Scientists***, 9th Edition, R. Walpole, R. Myers, S. Myers, K. Ye, Pearson Education International, 2012. ISBN 9780321629111. **(Main Reference).**
Supportive References	▪ ***Introduction to Mathematical Statistics***, 6th Edition, Robert V. Hogg, Joseph McKean, Allen T. Craig, Prentice Hall, 2005. ▪ ***Mathematical Statistics with Applications***, 7th

	Edition, D. Wackerly, W. Mendenhall, R.L. Scheaffer, Brooks/Cole-Cengage Learning, 2008. ISBN-13: 9780495385080. ▪ ***Probability and Statistics in Engineering***, 4th Edition, William W. Hines, Douglas C. Montgomery, David M. Goldsman, Connie M. Borror, John Wiley & Sons Inc, 2003. ISBN: 9780471240877. ▪ ***Introduction to Mathematical Statistics***, 6th Edition, Robert V. Hogg, Joseph McKean, Allen T. Craig, Prentice Hall, 2005.
Electronic Materials	**None**
Other Learning Materials	**None**

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ **Each class room 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	**Students**	**During the semester and at the end of the course each student will complete two evaluation forms.**
Effectiveness of Students assessment	**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.**
Quality of learning resources	**Students**	**During the semester and at the end of the course each student will complete two evaluation forms.**
The extent to which CLOs have been achieved	**Instructor**	**At the end of each semester the course instructor should complete the course report,**

Assessment Areas/Issues	Assessor	Assessment Methods
		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.	20/1446
DATE	11/08/1446 (10/02/2025)

Course Specification

(Postgraduate Programs)

Course Title:	**Actuarial Methods**
Course Code:	**AFM 6101**
Program:	**Executive Master of Science in Actuaries and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2024 – V1**
Last Revision Date:	**None**

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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	☐ Department	☐Track	☒ Others
B.	☒ Required		☐ Elective		
3. Level/year at which this course is offered: Level 1 / Year 1					
4. Course general Description:					
This course introduces students to the mathematical models for valuation of life contingencies (e.g. life insurance policies). The course covers both the statistical aspects of modelling survival data, and the financial aspects of valuing uncertain future cash-flows.					
5. Pre-requirements for this course (if any):					
None.					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
The main objectives of this course are to: • Provide students with a comprehensive understanding of life insurance and life annuity contracts. • Introduce students to the concepts of reserves, policy values, and death profits in life contingencies. • Equip students with the skills of premium calculation, reserves, and conduct profit testing in life insurance. • Enable students to design, evaluate, and plan life insurance, annuities, and pension plans. • Develop students' proficiency in constructing survival models and applying probability theory to analyze the cost and risk of life contingencies.					

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	Find out fundamental concepts and principles of actuarial methods, particularly in the context of contingencies. Demonstrate proficiency in probability theory and statistical techniques as applied to actuarial and assessment. Risk.	K1	2 lecture hours\week	Direct: Regular Exams
1.2	Apply actuarial techniques to analyze and evaluate life insurance and general insurance products, including pricing, reserving, and risk management.	K2	• 2 tutorial hours\week • Self-study	Direct: Short Quizzes
2.0	**Skills**			
2.1	Make and emphasize the analysis and evaluation of complex actuarial problems.	S1	Self-study	Direct: • Participations • Short Quizzes
2.2	Identify and solve problems related to contingencies.	S2	Real-life problems	Direct: Simulation mini-projects
2.3	Develop a solid foundation in risk assessment and management.	S3	Real-life problems	Direct: Cases study
2.4	Evaluate data/problems, including potentially conflicting or incomplete information. Formulate an appropriate analysis/solution strategy.	S3	Self-study	Direct: Project
3.0	**Values, autonomy, and responsibility**			
3.1	Create connections in groups, adaptable to new circumstances, both	V1	Personal questions	Direct: Participation

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	independently and in collaboration with others.			
3.2	Generate the highest standards of ethical conduct and professional behavior, critical, interpersonal and communication skills as well as a commitment to life-long learning	V2	Teamwork and class discussions.	Direct: Real-life project

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to life insurance: life insurance and annuity contracts. Other insurance contracts. Pension contracts. Mutual and proprietary insurers.	9
2.	Survival models: Future lifetime random variable, force of mortality, actuarial notation. Mean and deviation of random lifetime.	8
3.	Life Tables and Selection: Life tables, fractional age assumptions, Survival models for life insurance, selection of ultimate survival models.	9
4.	Insurance Benefits: Valuation of insurance benefits, Variable insurance benefits, Functions of select lives.	8
5.	Annuities.: Review of annuities-certain. Annual life annuities. Annuities payable continuously. Annuities payable m times per year. Comparison of annuities by payment frequency. Deferred annuities. Guaranteed annuities. Increasing annuities. Evaluating annuity functions. Numerical illustrations. Functions for select lives.	9
6.	Premium calculation: Preliminaries. Assumptions. The present value of future loss random variable. The equivalence principle. Gross premium calculation. Profit. The portfolio percentile premium principle. Extra risks.	9
7	Policy values: Policies with annual cash flows. Policy values for policies with cash flows at discrete intervals other than annually. Policy values with continuous cash flows. Policy alterations. Retrospective policy value. Negative policy values.	8
Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes, Mini projects, Real-life project	During the semester	30%
2.	Midterm	Week 8-9	30%
3.	Final Exam	Week 15	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	**Dickson, D.C., Hardy, M., Hardy, M.R. and Waters, H.R.. Actuarial mathematics for life contingent risks. Cambridge University Press, Second edition (2020. (Main Reference)**
Supportive References	***1- Promislow, S. D. (2015) Fundamentals of actuarial mathematics. Third edition. West Sussex, England: John Wiley & Sons Ltd.*** ***2- Dickson, D.C., Hardy, M., Hardy, M.R. and Waters, H.R.. Solutions manual for actuarial mathematics for life contingent risks. Cambridge University Press, Second edition (2013).***
Electronic Materials	**None**
Other Learning Materials	**None**

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ **Each class room 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	**Students**	**During the semester and at the end of the course each student will complete two evaluation forms.**
Effectiveness of Students assessment	**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.**
Quality of learning resources	**Students**	**During the semester and at the end of the course each student**

Assessment Areas/Issues	Assessor	Assessment Methods
		will complete two evaluation forms.
The extent to which CLOs have been achieved	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.	20/1446
DATE	11/08/1446 (10/02/2025)

Course Specification

(Postgraduate Programs)

Course Title:	**Actuarial Models**
Course Code:	**AFM 6102**
Program:	**Executive Master of Science in Actuaries and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2024 – V1**
Last Revision Date:	**None**

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G. Specification Approval 7

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	☐ Department	☐Track	☒ Others
B.	☒ Required		☐ Elective		
3. Level/year at which this course is offered: Level 1 / Year 1					
4. Course general Description:					
This course provides an in-depth understanding of actuarial models used in the assessment of risk and uncertainty in insurance and finance. Students will learn to apply statistical and mathematical techniques to model various types of risks and make informed decisions based on data.					
5. Pre-requirements for this course (if any):					
• Calculus • Probability and Statistics • Introduction to Actuarial Science (recommended)					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
The main objective of this course is to: • Understand the fundamental concepts of actuarial science and risk theory. • Develop and analyze actuarial models for different insurance products. • Apply statistical methods to estimate probabilities and expected values. • Use software tools for data analysis and model implementation. • Communicate results effectively to stakeholders.					

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	Identify the principles of actuarial modelling	K1	2 lecture hours\week	Direct: Regular Exams
1.2	Describe the general principles of stochastic processes and their classification into different types.	K2	• 2 tutorial hours\week • Self-study	Direct: Short Quizzes
2.0	**Skills**			
2.1	Apply and define and a Markov jump process.	S1	Self-study	Direct: • Participations • Short Quizzes
2.2	Use the concepts of survival models.	S3	Real-life problems	Direct: Simulation mini-projects
2.3	Develop an estimation procedures for lifetime distributions.	S2	Real-life problems	Direct: Cases study
2.4	Perform and derive maximum likelihood estimators for the transition intensities in models of transfers between states with piecewise constant transition intensities.	S2	Self-study	Direct: Project
3.0	**Values, autonomy, and responsibility**			
3.1	Create and describe the two-state model of a single decrement and compare its assumptions	V1	Personal questions	Direct: Participation

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	with those of the random lifetime model, derive maximum likelihood estimators for transition intensities and state the Poisson approximation to the estimator in the case of a single decrement.			
3.2	**Generate how to estimate transition intensities depending on age, exactly or using the census approximation.**	**V2**	**Teamwork and class discussions.**	**Direct: Real-life project**

C. Course Content

No	List of Topics	Contact Hours
1.	**Preliminary Facts from Probability and Interest:** Probability and Random Variables, Expectation, Some Basic Distributions, Moment Generating Functions, Convergence of Random Variables and Distributions, Limit Theorems, Conditional Expectations. Conditioning and Elements of the Theory of Interest	5
2.	**Comparison of Random Variables. Preferences of Individuals:** A General Framework and First Criteria, Comparison of R.V.s and Limit Theorems, Expected Utility, Non-Linear Criteria and Optimal Payment from the Standpoint of an Insured	5
3.	**An Individual Risk Model for a Short Period:** The Distribution of an Individual Payment, The Aggregate Payment Premiums and Solvency and Approximations for Aggregate Claim Distributions Some General Premium Principles.	5
4.	**A Collective Risk Model for a Short Period:** Three Basic Propositions, Counting or Frequency Distributions, The Distribution of the Aggregate Claim and Premiums and Solvency. Normal Approximation.	5
5.	**Random Processes and Their Applications I:** A General Framework and Typical Situations, Poisson and Other Counting Processes, Compound Processes and Markov Chains. Cash Flows in the Markov Environment.	5
6.	**Random Processes and Their Applications II:** Brownian Motion and Its Generalizations and Martingales.	3
7.	**Global Characteristics of the Surplus Process:** A General Framework, Ruin Models and Criteria Connected with Paying Dividends.	4
8.	**Survival Distributions:** The Probability Distribution of Lifetime, A Multiple Decrement Model and Multiple Life Models	5
9.	**Life Insurance Models:** A General Model, Some Particular Types of Contracts, Varying Benefits, Multiple Decrement and Multiple Life Models and On the Actuarial Notation	4
10.	**Annuity Models:**	12

	Two Approaches to the Evaluation of Annuities, Level Annuities. A Connection with Insurance, Some Particular Types of Level Annuities, More on Varying Payments, Annuities with m-thly Payments and Multiple Decrement and Multiple Life Models.	
11.	**Premiums and Reserves:** Premium Annuities and Reserves.	2
12.	**Pensions Plans and Risk Exchange: Reinsurance and Coinsurance:** Valuation of Individual Pension Plans, Pension Funding. Cost Methods, Reinsurance from the Standpoint of a Cedent, Risk Exchange and Reciprocity of Companies and Reinsurance Market	5
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Quizzes, Mini projects, Real-life project**	**During the semester**	**30%**
2.	**Midterm**	**Week 8-9**	**30%**
3.	**Final Exam**	**Week 15**	**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	***Actuarial Models; The Mathematics of Insurance*, Vladimir I. Rotar,** 2nd Edition, 2015, Chapman & Hall.
Supportive References	***Actuarial Mathematics for life contingent Risks*, David C. M. Dickson, Mary R. Hardy, and Howard R. Waters,** 2nd Edition, 2013, Campridge.
Electronic Materials	**None**
Other Learning Materials	**Basic Computer applications (like MS- office, media player, Google chrome) for enhanced knowledge & learning. MS- Project will be more helpful to understand practical side of project management.**

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ **Each class room 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.**

Items	Resources
Other equipment (depending on the nature of the specialty)	▪ **Projectors** ▪ **Printers, scanners, etc.**

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**Students**	**During the semester and at the end of the course each student will complete two evaluation forms.**
Effectiveness of Students assessment	**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.**
Quality of learning resources	**Students**	**During the semester and at the end of the course each student will complete two evaluation forms.**
The extent to which CLOs have been achieved	**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.	**20/1446**
DATE	**11/08/1446 (10/02/2025)**

Course Specification

(Postgraduate Programs)

Course Title:	**Data Science in Finance and Insurance**
Course Code:	**AFM 6111**
Program:	**Executive Master of Science in Actuaries and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2025 – V1**
Last Revision Date:	**None**

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A. General information about the course:

1. Course Identification

1. Credit hours:					
3 (2 Lectures, 2 Lab, 0 Tutorial)					
2. Course type					
A.	☐University	☐ College	☐ Department	☐Track	☒ Others
B.	☒ Required		☐ Elective		
3. Level/year at which this course is offered: Level 2 / Year 1					
4. Course general Description:					
This course provides an in-depth exploration of the foundational concepts, tools, and techniques used to analyze and solve complex problems in the financial and insurance sectors. Students will learn to apply data science methodologies, including predictive modeling, statistical analysis, and machine learning, to assess risks, optimize financial strategies, and drive data-informed decision-making. Emphasizing both theoretical understanding and practical application, the course integrates case studies and real-world data to develop skills in financial modeling, risk assessment, and data interpretation. Additionally, students will cultivate professional values, ethical responsibility, and teamwork capabilities, preparing them for impactful careers in finance and insurance analytics.					
5. Pre-requirements for this course (if any):					
None.					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
The main objective of this course is to: • Understand foundational principles of data science and their applications in the finance and insurance industries. • Apply statistical and machine learning techniques to analyze and predict financial risks and opportunities. • Develop and implement actuarial models to address life-contingent and other financial risks. • Master the data analysis process, including data preparation, modeling, evaluation, and interpretation, to solve business problems. • Utilize advanced tools and software to build and deploy predictive models in real-world financial and insurance contexts. • Interpret and communicate analytical findings effectively to stakeholders for informed decision-making. • Foster ethical practices and professional standards in data-driven financial and insurance decision-making. • Enhance teamwork and collaboration skills for working in interdisciplinary and diverse teams.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning	0	0%

No	Mode of Instruction	Contact Hours	Percentage
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**	30
3.	**Field**	0
4.	**Tutorial**	0
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	**Demonstrate understanding of fundamental probability tools to assess risks and insurance issues.**	**K1**	**- Lectures with real-world examples - Case studies on insurance risk scenarios**	**Direct: - Written exams - Quizzes - Case study evaluations**
1.2	**Explain quantitative concepts and financial analysis basics relevant to insurance companies.**	**K2**	**- Lectures and discussions - Problem-solving sessions on financial metrics**	**Direct: - Written exams - Assignments - Presentation assessments**
2.0	**Skills**			
2.1	**Apply actuarial and financial risk models to solve specific problems in insurance and finance.**	**S1**	**- Interactive workshops - Problem-based learning (PBL)**	**Direct: - Case studies - Practical problem-solving tasks**
2.2	**Identify and execute the steps of the modeling process to solve financial and insurance problems.**	**S2**	**- Hands-on modeling sessions - Guided use of software tools (e.g., R, Python)**	**Direct: - Project-based evaluations - Individual assignments**
2.3	**Analyze real-world business data to extract insights for decision-**	**S3**	**- Data analysis exercises - Industry-focused case studies**	**Direct: - Data analysis projects**

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	making in finance and insurance.			- Reports with presentations
2.4	Evaluate the results of data models and interpret their impact in a financial or insurance context.	S2,S3	- Interactive discussions - Peer review of model results	Direct: - Peer-reviewed assignments - Oral presentations
3.0	**Values, autonomy, and responsibility**			
3.1	Perform and collaborate effectively in diverse teams to tackle financial and insurance challenges.	V1	- Group projects - Role-playing activities	Direct: - Group project evaluations - Peer assessment
3.2	Generate the highest standards of ethical conduct and professional behavior, critical, interpersonal and communication skills as well as a commitment to life-long learning	V2	Teamwork and class discussions.	Direct: Real-life project

C. Course Content

No	List of Topics	Contact Hours
1.	**Introduction to Data Science in Finance and Insurance** Overview of data opportunities in finance and insurance, Examples of fraud detection, risk assessment, customer segmentation, Data science versus traditional approaches in these sectors, Strategic use of data and big data evolution (Big Data 1.0 to 2.0), Importance of data-analytic thinking	6
2.	**Business Problems and Data Science Solutions** Translating business problems into data mining tasks, Supervised and unsupervised methods with applications in credit scoring and claims management Data mining process: Understanding, preparation, modeling, evaluation, deployment, Additional techniques (statistics, machine learning, data warehousing)	8
3.	**Predictive Modeling and Risk Analysis** Supervised segmentation and predictive modeling fundamentals, Decision trees and other models for customer churn and default prediction, Attribute selection and its importance in financial models, Case study: Using predictive models for insurance underwriting	10
4.	**Model Fitting and Overfitting Avoidance** Classification models (logistic regression, SVMs, neural networks), Overfitting: Causes, examples, and remedies, Cross-validation techniques, Evaluation metrics relevant to financial decisions	10
5.	**Clustering and Similarity-Based Methods** Clustering for customer segmentation and portfolio analysis, Nearest-neighbor methods for credit scoring and recommendation systems, Practical aspects:	8

	Dimensionality, computational efficiency, and domain knowledge, Case study: Clustering insurance claims data for fraud detection	
6.	**Decision Analytic Thinking and Model Evaluation** Evaluating classifiers using accuracy, ROC, AUC, and lift charts, Importance of expected value frameworks in financial decision-making, Case studies: Evaluating risk-adjusted returns, designing marketing strategies for banks	6
7.	**Visualizing Model Performance** Ranking instead of Classifying, Profit Curves, ROC graphs, The area under the ROC curve (AUROC)	6
8.	**Advanced Topics and Data Science Strategy** Data reduction, ensemble methods, and bias-variance tradeoff, Achieving and sustaining competitive advantage with data science, Link Prediction and Social Recommendation	6
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Quizzes, Mini projects, Real-life project**	**During the semester**	**30%**
2.	**Midterm**	**Week 8-9**	**30%**
3.	**Final Exam**	**Week 15**	**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	**1. Data Science for Business** – by Foster Provost and Tom Fawcett, O'REILLY, 1st Edition, ISBN: 978-1-449-36132-7
Supportive References	**1. Data Science and Risk Analytics in Finance and Insurance** – by Tze Leung Lai, Haipeng Xing, CRC Press, eBook ISBN: 9781315117041
Electronic Materials	**None**
Other Learning Materials	**None**

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities	▪ **Each class room should be equipped with a whiteboard and a projector.**

Items	Resources
(Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ 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	Students	During the semester and at the end of the course each student will complete two evaluation forms.
Effectiveness of Students assessment	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.
Quality of learning resources	Students	During the semester and at the end of the course each student will complete two evaluation forms.
The extent to which CLOs have been achieved	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.	20/1446
DATE	11/08/1446 (10/02/2025)

Course Specification

(Postgraduate Programs)

Course Title:	**Probability Models with Actuarial Applications**
Course Code:	**STA 6103**
Program:	**Executive Master of Science in Actuaries and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2025 – V1**
Last Revision Date:	**None**

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G. Specification Approval 7

A. General information about the course:

1. Course Identification

1. Credit hours:					
3 (2 Lectures, 2 Lab, 0 Tutorial)					
2. Course type					
A.	☐University	☐ College	☐ Department	☐Track	☒ Others
B.	☒ Required		☐ Elective		
3. Level/year at which this course is offered: Level 2 / Year 1					
4. Course general Description:					
This course provides a comprehensive understanding of probability concepts and their application in actuarial science. The course delves into random variables, key distributional quantities, and actuarial models, focusing on continuous and discrete distributions, coverage modifications, and aggregate loss models. Students will explore advanced topics such as maximum likelihood estimation, frequentist, and Bayesian estimation methods. Emphasis is placed on the practical application of these models in assessing risks and solving real-world problems in insurance and finance. Through analytical techniques and computational tools, the course equips students with the skills to analyze and interpret data effectively in an actuarial context.					
5. Pre-requirements for this course (if any):					
None.					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
The main objective of this course is to: • Understand fundamental concepts of probability and their applications in actuarial science. • Analyze and model frequency and severity distributions with modifications like deductibles and limits. • Develop a comprehensive understanding of aggregate loss models and compute claims distributions. • Apply maximum likelihood estimation and other statistical methods to actuarial data, including censored and grouped datasets. • Explore frequentist and Bayesian estimation techniques in actuarial modeling. • Use computational tools and software to implement probability models in real-world insurance and financial contexts. • Cultivate critical thinking and problem-solving skills in actuarial applications. • Foster ethical practices and collaborative teamwork in actuarial modeling and decision-making.					

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	0	0%

No	Mode of Instruction	Contact Hours	Percentage
	• Traditional classroom • E-learning		
4	Distance learning	0	0%

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	30
2.	**Laboratory/Studio**	30
3.	**Field**	0
4.	**Tutorial**	0
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	**Demonstrate an understanding of key probability tools and their application to actuarial problems, including distributional quantities and risk measures.**	**K1**	**Interactive lectures with examples; Problem-solving sessions**	**Direct: Quizzes; Mid-term and final exams**
1.2	**Explain the characteristics of actuarial models, including parametric distributions, finite mixtures, and their application to insurance.**	**K1, K2**	**Case studies; Class discussions**	**Direct: Case study-based assignments; Written exams**
2.0	**Skills**			
2.1	**Apply frequency and severity models with coverage modifications to analyze insurance claims.**	**S1, S3**	**Hands-on workshops using real-world datasets; Software-based exercises (e.g., R, Python)**	**Direct: Project work; Lab assignments**
2.2	**Develop aggregate loss models, including compound and individual risk models, and compute aggregate claims distributions.**	**S1, S2**	**Step-by-step tutorials; Group problem-solving sessions**	**Direct: Group projects; Problem sets**

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.3	Use maximum likelihood and Bayesian estimation techniques for parameter estimation in actuarial models.	S2, S3	Practical demonstrations of estimation techniques; Guided computational tutorials	Direct: Data-driven assignments; Exams with computational problems
2.4	Analyze the impact of policy modifications such as deductibles and limits on claim frequency and aggregate payments.	S3	Discussion of practical examples; Simulations using actuarial software	Direct: Simulation-based assignments; Scenario-based exams
3.0	**Values, autonomy, and responsibility**			
3.1	Perform effectively in teams to model real-world actuarial problems and communicate results with clarity and professionalism.	V1	Group assignments; Peer-review exercises	Direct: Group presentations; Peer evaluation
3.2	Show and uphold ethical principles and professional behavior while applying predictive and probabilistic modeling techniques in actuarial and financial problems.	V2	Ethical case studies; Role-playing exercises on professional scenarios	Direct: Reflective essays; Ethics-focused components in exams

C. Course Content

No	List of Topics	Contact Hours (Lectures, Tutorials, Labs)
1.	**Random Variables & Basic Distributional Quantities** Key Functions and Four Models, Moments, Percentiles, Generating Functions and Sums of Random Variables, Tails of Distributions, Measures of Risk	2
2.	**Characteristics of Actuarial Models** Parametric and Scale Distributions, Parametric Distribution Families, Finite Mixture Distributions, Data-Dependent Distributions	6
3.	**Continuous Models** Creating New Distributions, Selected Distributions and Their Relationships, The Linear Exponential Family	8
4.	**Discrete Distributions** Poisson Distribution, Negative Binomial Distribution, Binomial Distribution, The $(a, b, 0)$ Class, Truncation and Modification at Zero	8
5.	**Frequency and Severity with Coverage Modifications** Deductibles, The Loss Elimination Ratio and the Effect of Inflation for Ordinary	10

	Deductibles, Policy Limits, Coinsurance, Deductibles, and Limits, The Impact of Deductibles on Claim Frequency	
6.	**Aggregate Loss Models** Model Choices, The Compound Model for Aggregate Claims, Analytic Results, Computing the Aggregate Claims Distribution, The Recursive Method, The Impact of Individual Policy Modifications on Aggregate Payments, The Individual Risk Model	10
7.	**Maximum Likelihood Estimation** Individual Data, Grouped Data, Truncated or Censored Data, Variance and Interval Estimation for Maximum Likelihood Estimators, Functions of Asymptotically Normal Estimators, Nonnormal Confidence Intervals	8
8.	**Frequentist Estimation for Discrete Distributions** Poisson Distribution, Negative Binomial Distribution, Binomial Distribution, The $(a, b, 1)$ Class, Compound Models, The Effect of Exposure on Maximum Likelihood Estimation	4
9.	**Bayesian Estimation** Inference and Prediction, Conjugate Prior Distributions and the Linear Exponential Family, Computational Issues	4
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes, Mini projects, Real-life project	During the semester	30%
2.	Midterm	Week 8-9	30%
3.	Final Exam	Week 15	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	1. *Loss Models: From Data to Decisions, (Fourth Edition), 2012, by Klugman, S.A., Panjer, H.H. and Willmot, G.E., ISBN 978-1-118-31532-3.*
Supportive References	None
Electronic Materials	2. LMS – Blackboard
Other Learning Materials	3. Study notes and sample exams: https://www.soa.org/education/exam-req/syllabus-study-materials/edu-multiple-choice-exam#october-2024-pa

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ Each class room 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)	Scientific calculator

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	During the semester and at the end of the course each student will complete two evaluation forms.
Effectiveness of Students assessment	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.
Quality of learning resources	Students	During the semester and at the end of the course each student will complete two evaluation forms.
The extent to which CLOs have been achieved	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.	20/1446
DATE	11/08/1446 (10/02/2025)

Course Specification

(Postgraduate Programs)

Course Title:	**Survival Models**
Course Code:	**AFM 6203**
Program:	**Executive Master of Science in Actuaries and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2024 – V1**
Last Revision Date:	**None**

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G. Specification Approval 6

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	☐ Department	☐Track	☒ Others
B.	☒ Required		☐ Elective		
3. Level/year at which this course is offered: Level 2 / Year 1					
4. Course general Description:					
This course equip students with a strong foundation in survival analysis concepts and techniques. The course includes the essential fundamentals to apply statistical methods needed for analyzing time-to-event data. The studied survival models are related to real-world scenarios, particularly in the fields of insurance and finance. The student will use a statistical software for survival data analysis.					
5. Pre-requirements for this course (if any):					
None.					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
The main objective of this course is to: • Equip students with a strong foundation in survival analysis concepts and techniques. • Develop students' ability to apply statistical methods to analyze time-to-event data. • Teach students how to use survival models in real-world scenarios in insurance and finance areas. • Enhance students' skills in using statistical software for survival data analysis. • Foster the ability to critically assess and choose appropriate survival analysis methods for various data types and research questions.					

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	Identify key concepts and terminology used in survival analysis.	K1	2 lecture hours\week	Direct: Regular Exams
1.2	Describe types of survival models, including non-parametric, semi-parametric, and parametric models.	K2	• 2 tutorial hours\week • Self-study	Direct: Short Quizzes
2.0	**Skills**			
2.1	Apply survival analysis techniques to real-world data, interpreting the results accurately.	S1	Self-study	Direct: • Participations • Short Quizzes
2.2	Use statistical software to perform survival analysis, including handling censored and truncated data.	S3	Real-life problems	Direct: Simulation mini-projects
2.3	Develop and assess survival models, choosing the most appropriate model based on the data.	S2	Real-life problems	Direct: Cases study
2.4	Perform a project using survival analysis, demonstrating the ability to formulate and test hypotheses.	S2	Self-study	Direct: Project
3.0	**Values, autonomy, and responsibility**			
3.1	Create connections in groups, adaptable to new circumstances, both independently and in collaboration with others.	V1	Personal questions	Direct: Participation
3.2	Generate the highest standards of ethical conduct and professional behavior, critical, interpersonal and communication skills as well as a commitment to life-long learning.	V2	Teamwork and class discussions.	Direct: Real-life project

C. Course Content

No	List of Topics	Contact Hours
1.	**Introduction to Survival Models:** Overview of Survival Analysis, Applications in Actuarial Science, Basic Concepts and Terminology.	6
2.	**Life Tables and Survival Functions:** Construction of Life Tables, Understanding Survival Functions, Key Measures: Mortality, Survival, and Hazard Rates.	9
3.	**Non-Parametric Survival Models:** Kaplan-Meier Estimator, Nelson-Aalen Estimator, Comparison of Survival Curves.	9
4.	**Parametric Survival Models:** Exponential and Weibull Models, Gompertz and Log-Normal Models, Mo6del Selection and Parameter Estimation.	9
5.	**Multivariate Survival Analysis:** Introduction to Multivariate Risks, The Cox Proportional Hazards Model, Time-Dependent Covariates.	9
6.	**Modeling Censored and Truncated Data:** Understanding Censoring and Truncation, Techniques for Handling Incomplete Data, Likelihood Construction for Censored Data.	9
7	**Applications of Survival Models in Insurance:** Pricing Life Insurance Products, Reserving for Life Insurance and Annuity Products, Survival Models in Health and Pension Actuarial Practice.	9
	Total	**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Quizzes, Mini projects, Real-life project**	**During the semester**	**30%**
2.	**Midterm**	**Week 8-9**	**30%**
3.	**Final Exam**	**Week 15**	**40%**

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

. Learning Resources and Facilities

1. References and Learning Resources

Essential References	***Applied Survival Analysis: Regression Modeling of Time-to-Event Data*, David W. Hosmer, Stanley Lemeshow, and Susanne May**, 2nd Edition, 2008, John Wiley & Sons.
Supportive References	***Survival Analysis: Techniques for Censored and Truncated Data*, John P. Klein and Melvin L. Moeschberger**, 1st Edition, 1997, Springer. Dynamic Regression Models for Survival Data, Torben Martinussen and Thomas H. Scheike, 2nd edition, 2010, Springer**.**
Electronic Materials	**None**
Other Learning Materials	**None**

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ Each class room 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	Students	During the semester and at the end of the course each student will complete two evaluation forms.
Effectiveness of Students assessment	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.
Quality of learning resources	Students	During the semester and at the end of the course each student will complete two evaluation forms.
The extent to which CLOs have been achieved	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.	20/1446
DATE	11/08/1446 (10/02/2025)

Course Specification

(Postgraduate Programs)

Course Title:	**Financial Derivatives**
Course Code:	**AFM 6212**
Program:	**Executive Master of Science in Actuaries and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2024 – V1**
Last Revision Date:	**None**

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F. Assessment of Course Quality 6

G. Specification Approval 6

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	☐ Department	☐Track	☒ Others
B.	☒ Required		☐ Elective		
3. Level/year at which this course is offered: Level 3 / Year 2					
4. Course general Description:					
This course emphasizes the important role of financial derivatives as one of the main tools in managing different types of risk. Topics include: theoretical frameworks for valuing different derivatives with emphasis on options and futures contracts, the markets for financial derivatives, and the speculative and hedging applications of derivatives.					
5. Pre-requirements for this course (if any):					
None.					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
The main objectives of this course are to: • Understand the concept of derivative contracts. • Be aware of the characteristics of various derivatives and explain the differences among them. • Grasp the intuition and gain skills on pricing of forward, futures, and swap contracts using no-arbitrage principle, Binomial tree model and the Black-Scholes-Merton model. • Learn how financial institutions hedge their risks by trading in derivatives.					

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 different types of derivatives and their roles.	K1	2 lecture hours\week	Direct: Regular Exams
1.2	Classify pricing methods of derivatives, including Binomial and Blacl-Scholes methods.	K2	• 2 tutorial hours\week • Self-study	Direct: Short Quizzes
2.0	**Skills**			
2.1	Apply financial derivatives methods, with their various features and types, including forward, options, futures and Swaps.	S1	Self-study	Direct: • Participations • Short Quizzes
2.2	Analyze forward contract and its various features and to nderstand the difference between futures and forward contracts.	S2	Real-life problems	Direct: Simulation mini-projects
2.3	Differentiate approaches of pricing financial derivatives like Black-Scholes method and Binomial tree method.	S3	Real-life problems	Direct: Cases study
2.4	Construct strategies for hedging using individual or basket of financial derivatives.	S3	Self-study	Direct: Project
3.0	**Values, autonomy, and responsibility**			
3.1	Create connections in groups, adaptable to new circumstances, both independently and in collaboration with others.	V1	Personal questions	Direct: Participation
3.2	Generate the highest standards of ethical conduct and professional behavior, critical, interpersonal and communication skills as well as a commitment to life-long learning	V2	Teamwork and class discussions.	Direct: Real-life project

C. Course Content

No	List of Topics	Contact Hours
1.	Insurance, Hedging and Simple Strategies: Introduction to Derivatives, Forwards and Options. Insurance, Collars and Other Strategies, Introduction to Risk Management.	12
2.	Forwards, Futures and Swaps: Financial Forwards and Futures. Commodity Forwards and Futures. Interest Rate Forwards and Futures.	12
3.	Options: Parity and Other Option Relationships. Binomial Option Pricing. The Black-Scholes Formula. Market-Making and Delta-Hedging. Exotic Options.	12
4.	Financial Engineering and Applications: Financial Engineering and Security Design. Corporate Applications. Real Options.	12
5.	Advanced Pricing Theory and Applications: The Lognormal Distribution. Monte Carlo Valuation. Brownian Motion and Ito's Lemma. The Black-Scholes-Merton Equation. Risk-Neutral and Martingale Pricing. Exotic Options.	12
Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes, Mini projects, Real-life project	During the semester	30%
2.	Midterm	Week 8-9	30%
3.	Final Exam	Week 15	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	*McDonald, Robert L., Derivatives Markets, Third Edition, Pearson Addison Wesley, 2013.*
Supportive References	*Hull, John C., Options, Futures, and Other Derivatives. 9th Edition, Global Edition, 2018.*
Electronic Materials	None
Other Learning Materials	None

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ Each class room should be equipped with a whiteboard and a projector. ▪ Laboratories should be equipped with computers and an internet connection.

Items	Resources
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	**Students**	**During the semester and at the end of the course each student will complete two evaluation forms.**
Effectiveness of Students assessment	**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.**
Quality of learning resources	**Students**	**During the semester and at the end of the course each student will complete two evaluation forms.**
The extent to which CLOs have been achieved	**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.	**20/1446**
DATE	**11/08/1446 (10/02/2025)**

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission
اعتماد
NCAA
2024
TPG-153

Course Specification

(Postgraduate Programs)

Course Title:	**Predictive Modeling in Finance and Insurance (1)**
Course Code:	**AFM 6213**
Program:	**Executive Master of Science in Actuaries and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2025 – V1**
Last Revision Date:	**None**

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G. Specification Approval 7

A. General information about the course:

1. Course Identification

1. Credit hours:					
3 (2 Lectures, 2 Lab, 0 Tutorial)					
2. Course type					
A.	☐University	☐ College	☐ Department	☐Track	☒ Others
B.	☒ Required		☐ Elective		
3. Level/year at which this course is offered: Level 3 / Year 2					
4. Course general Description:					
This course introduces students to advanced statistical and machine learning techniques used to forecast financial outcomes and assess risks in the insurance industry. Emphasizing practical applications, the course covers linear models, generalized linear models, regression analysis, frequency-severity models, and spatial and unsupervised learning approaches. Students will explore real-world datasets to design and evaluate predictive models that address complex actuarial and financial challenges.					
5. Pre-requirements for this course (if any):					
None.					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
The main objective of this course is to: • Provide a comprehensive understanding of predictive modeling techniques, including linear and generalized linear models, and their applications in finance and insurance. • Explore regression methods for different dependent variable types, such as categorical, count, and continuous, in various business contexts. • Teach students to apply frequency-severity modeling for financial and insurance claims analysis. • Introduce advanced topics like longitudinal data modeling, spatial modeling, and fat-tailed regression techniques. • Develop proficiency in unsupervised learning techniques such as factor analysis and clustering for extracting meaningful insights from complex datasets. • Foster the ability to critically evaluate and compare predictive models, ensuring their validity and applicability in real-world scenarios. • Promote teamwork, ethical conduct, and professional communication in the development and presentation of predictive modeling projects.					

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	0	0%

No	Mode of Instruction	Contact Hours	Percentage
	• E-learning		
4	Distance learning	0	0%

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	30
2.	**Laboratory/Studio**	30
3.	**Field**	0
4.	**Tutorial**	0
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	**Demonstrate understanding of predictive modeling techniques, including generalized linear models and their applications in actuarial science.**	**K1, K2**	**Lectures, case study discussions, and guided readings.**	**Direct: Written exams, quizzes, and assignments analyzing real data.**
1.2	**Explain the theoretical foundation of linear regression, logistic regression, and frequency-severity models in financial and insurance contexts.**	**K1, K2**	**Interactive lectures, problem-solving sessions, and case studies.**	**Direct: Midterm exams, final exams, and report-based assessments.**
2.0	**Skills**			
2.1	**Apply regression techniques (e.g., linear, logistic, and Poisson) to real-world financial and insurance datasets for predictive analysis.**	**S1,S3**	**Practical labs with software like R/Python, case-based learning.**	**Direct: Project work, lab reports, and practical exams.**
2.2	**Distinguish the appropriate modeling techniques for various types of dependent variables, such as**	**S1,S2**	**Hands-on modeling workshops, guided assignments, and group activities.**	**Direct: Assignments involving data analysis and case study reports.**

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	categorical and count data.			
2.3	**Analyze data using unsupervised learning methods such as factor analysis and clustering to extract meaningful insights.**	**S3**	**Data visualization workshops, tutorials, and interactive problem-solving.**	**Direct: Data analysis project, presentations, and software-based evaluations.**
2.4	**Design and evaluate predictive models for frequency-severity and spatial data applications in finance and insurance.**	**S1,S2**	**Advanced workshops, project-based learning, and simulations.**	**Direct: Project-based evaluation, oral presentations, and peer reviews.**
3.0	**Values, autonomy, and responsibility**			
3.1	**Perform effectively in teams to implement predictive modeling solutions and present findings.**	**V1**	**Group projects, peer learning activities, and team discussions.**	**Direct: Peer assessments, group project evaluations, and presentations.**
3.2	**Show ethical considerations and professional conduct in the interpretation and communication of predictive modeling results.**	**V2**	**Case study analysis focusing on ethical dilemmas and discussions on professional standards.**	**Direct: Ethics-focused essays, reflective journals, and oral defenses.**

C. Course Content

No	List of Topics	Contact Hours (Lectures, Tutorials, Labs)
1.	**Introduction** Predictive Modeling and Insurance Company Operations, A Short History of Predictive Modeling in Actuarial Science	2
2.	**Overview of Linear Models** Linear Model Theory (Linear Regression) with Examples, Case Study (MEPS Diabetes Data)	4
3.	**Regression with Categorical Dependent Variables** Coding Categorical Variables, Modeling a Binary Response, Logistic Regression Model, Probit and Other Binary Regression Models, Models for Categorical Dependent Variables (Ordinal and Nominal)	6
4.	**Regression with Count-Dependent Variables** Poisson Distribution, Poisson Regression, Heterogeneity in the Distribution, Zero-Inflated Distribution	4
5.	**Generalized Linear Models** Introduction to Generalized Linear Models, Exponential Family of Distributions, Link Functions, Applications and Comparing models	6
6.	**Frequency and Severity Models**	6

	Sampling and the Generalized Linear Model, Frequency-Severity Models, Application: Massachusetts Automobile Claims	
7.	**Longitudinal and Panel Data Models** Intrduction, Linear and Nonlinear models	4
8.	**Linear Mixed Models** Mixed Models in Actuarial Science, Linear Mixed Models (with examples)	4
9.	**Credibility and Regression Modeling** Credibility and the LMM Framework, Numerical Examples, Theory versus Practice	4
10.	**Fat-Tailed Regression Models** Transformation, GLM, Regression with Generalized Distributions, Median Regression	6
11.	**Spatial Modeling** Exploratory Analysis of Spatial Data, Spatial Autoregression, Average Claim Size Modeling, Hierarchical Model for Total Loss	6
12.	**Unsupervised Learning** Factor and Principal Components Analysis, Cluster Analysis, Applications with Datasets (Indices, SimClus)	8
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes, Mini projects, Real-life project	During the semester	30%
2.	Midterm	Week 8-9	30%
3.	Final Exam	Week 15	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	1. ***Predictive Modelling Applications in Actuarial Science - Volume I: Predictive Modeling Techniques***, EDWARD W. FREES, RICHARD A. DERRIG, GLENN MEYERS, 2014, Cambridge University Press.
Supportive References	2. **An Introduction to Statistical Learning with Applications in R -** Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, 2nd edition, Springer
Electronic Materials	3. **LMS – Blackboard**
Other Learning Materials	4. **Online supplements (Dataset and R-code) for Ref.1 (https://instruction.bus.wisc.edu/jfrees/jfreesbooks/PredictiveModelingVol1/index.htm)**

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ **Each class room 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	**Students**	**During the semester and at the end of the course each student will complete two evaluation forms.**
Effectiveness of Students assessment	**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.**
Quality of learning resources	**Students**	**During the semester and at the end of the course each student will complete two evaluation forms.**
The extent to which CLOs have been achieved	**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.	**20/1446**
DATE	**11/08/1446 (10/02/2025)**

Course Specification

(Postgraduate Programs)

Course Title:	**Risk and Regulations**
Course Code:	**AFM 6204**
Program:	**Executive Master of Science in Actuaries and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2024 – V1**
Last Revision Date:	**None**

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D. Students Assessment Activities 5

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F. Assessment of Course Quality 6

G. Specification Approval 6

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	☐ Department	☐Track	☒ Others
B.	☒ Required		☐ Elective		
3. Level/year at which this course is offered: Level 3 / Year 2					
4. Course general Description:					
This course explores the principles of risk management and the regulatory frameworks that govern various industries. Students will learn to identify, assess, and mitigate risks while understanding the impact of regulations on organizational practices.					
5. Pre-requirements for this course (if any):					
None.					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
The main objective of this course is to: • Understand the fundamental concepts of risk management and regulation. • Analyze the impact of regulations on risk management practices. • Evaluate different risk assessment methodologies. • Develop risk mitigation strategies in compliance with regulatory requirements. • Critically assess case studies related to risk and regulation in various sectors.					

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 concepts, principles and terminologies of risk management and insurance.	K1	• Lectures • Reading	Direct: • Quizzes • Homework • Exams
1.2	Describe the fundamental legal rules, methods, tools and techniques of identifying and measuring risk and appropriate insurance against risk.	K2	• Lectures • Illustrative examples	Direct: • Quizzes • Assignment • Exams
1.3	Report the appropriate insurance company operations and marketing system in the risk management processes and dynamics of insurance.	K2	• Lectures • Reading • Illustrative examples	Direct: • Quizzes • Assignment • Exams
2.0	**Skills**			
2.1	Implement the insurance rules, methods, tools and techniques to design a finance for a risk management program in a business.	S1	• Lectures • Self-Learning • Discussion	Direct: • Exams • Homework • Direct Questions
2.2	Apply the various insurance strategies in insurance company investments, operations and marketing system.	S2	• Lectures • Self-learning • Problem solving	Direct: • Exams • Quizzes • Homework • Assignment
2.3	Evaluate the various methods used to identify the risk of banking, financing, and tax schemes in risk management decision making process.	S3	• Lectures • Reading • Self-learning	Direct: • Exams • Quizzes • Homework • Assignment
2.4	Appraise the fundamental legal principles and standardization of the insurance contracts.	S3	• Lectures • Active Learning	Direct: • Exams • Homework
3.0	**Values, autonomy, and responsibility**			

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
3.1	**Perform appropriate practices ethical values and social responsibility related to risk management and insurance.**	**V1**	• **Discussion** • **Self-learning**	**Direct:** • **Panel discussion** • **Assignment**
3.2	**Develop the ability for self-learning in identifying and selecting risk financing along with proper insurance coverage.**	**V2**	• **Active Learning** • **Case studies**	**Direct:** • **Assignment** • **Projects**

C. Course Content

No	List of Topics	Contact Hours
1.	**Introduction Risk Regulation Regimes:** What are risk regulation regimes?, The comparative anatomy of risk regulation regimes, and Nine risk regulation regimes Compared.	18
2.	**Explaining Variation in Risk Regulation Regimes:** How far does context shape content in risk regulation regimes?, Exploring the "Market Failure" hypothes, Opinion-responsive government and risk regulation, Intersts,lobbies, and experts, and Regime content and context revisited: an overall picture.	24
3.	**Exploring the Dynamics of Risk Regulation Regime:** Regime development under pressure: staged retreats and lateral mutations?, The regimes perspective in risk regulation: implications for policy and institutional design.	18
	Total	**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Quizzes, Mini projects, Real-life project**	**During the semester**	**30%**
2.	**Midterm**	**Week 8-9**	**30%**
3.	**Final Exam**	**Week 15**	**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	***The Government of Risk; Understanding Risk Regulation Regimes*, Christopher H., Henry R. and Robert B.**,2001, Oxford.
Supportive References	***Enterprise Risk Management From Incentives to Controls*, James Lam**, 2nd Edition, 2014, Wiley.
Electronic Materials	**http://www.brev.org/websites/business.htm**

Other Learning Materials	Basic Computer applications (like MS- office, media player, Google chrome) for enhanced knowledge & learning. MS- Project will be more helpful to understand practical side of project management.

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ **Each class room 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)	▪ **Projectors** ▪ **Printers, scanners, etc.**

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**Students**	**During the semester and at the end of the course each student will complete two evaluation forms.**
Effectiveness of Students assessment	**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.**
Quality of learning resources	**Students**	**During the semester and at the end of the course each student will complete two evaluation forms.**
The extent to which CLOs have been achieved	**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.	**20/1446**
DATE	**11/08/1446 (10/02/2025)**

Course Specification

(Postgraduate Programs)

Course Title:	**Valuation and Hedging**
Course Code:	**AFM 6214**
Program:	**Executive Master of Science in Actuaries and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2024 – V1**
Last Revision Date:	**None**

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G. Specification Approval 6

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	☐ Department	☐Track	☒ Others
B.	☐ Required		☒ Elective		
3. Level/year at which this course is offered: Level 4 / Year 2					
4. Course general Description:					
This course provides an in-depth understanding of the principles and techniques of valuation and hedging in financial markets. Students will learn how to evaluate financial instruments and utilize hedging strategies to manage risk effectively.					
5. Pre-requirements for this course (if any):					
None.					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
The main objective of this course is to: • Understand the fundamental concepts of asset valuation. • Apply various valuation methods to financial instruments. • Identify and analyze risks in financial markets. • Develop and implement hedging strategies using derivatives. • Evaluate the effectiveness of hedging techniques.					

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	Use variety of hedging strategies.	K1	• Lectures • Reading	Direct: • Quizzes • Homework • Exams
1.2	Describe the importance of valuation and hedging strategies for different assets.	K2	• Lectures • Illustrative examples	Direct: • Quizzes • Assignment • Exams
1.3	List the characteristics of the different evaluation methods.	K2	• Lectures • Reading • Illustrative examples	Direct: • Quizzes • Assignment • Exams
2.0	**Skills**			
2.1	Evaluate the possible hedging strategies using different derivatives securities to reduce risk of firms.	S1	• Lectures • Self-Learning • Discussion	Direct: • Exams • Homework • Direct Questions
2.2	Apply the possible speculation and arbitrage strategies using different derivatives securities to increase profitability at both the individual level and firm level.	S2	• Lectures • Self-learning • Problem solving	Direct: • Exams • Quizzes • Homework • Assignment
2.3	Analyze the payoff of each derivatives securities from the point of view of both the issuer and the holder.	S3	• Lectures • Reading • Self-learning	Direct: • Exams • Quizzes • Homework • Assignment
3.0	**Values, autonomy, and responsibility**			
3.1	Create connections within groups, demonstrating adaptability to new circumstances, both independently and collaboratively.	V1	• Discussion • Self-learning	Direct: • Panel discussion • Assignment
3.2	Develop the highest standards of ethical conduct and professional behavior, along with critical,	V2	• Active Learning • Case studies	Direct: • Assignment • Projects

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	interpersonal, and communication skills, and maintain a commitment to lifelong learning.			

C. Course Content

No	List of Topics	Contact Hours
1.	**Introduction to Valuation:** Overview of valuation, Time value of money, Present value and future value oncepts.	10
2.	**Valuation Methods:** Discounted Cash Flow (DCF) Analysis, Comparable company analysis, Precedent transactions analysis, Option pricing models (Black-Scholes, Binomial).	10
3.	**Financial Derivatives:** Types of derivatives (options, futures, swaps), Market mechanics and pricing.	10
4.	**Risk Management and Hedging:** Understanding Risk: market, credit, operational, Hedging fundamentals, Hedging with futures and options.	10
5.	**Advanced Hedging Strategies:** Delta hedging, Cross-hedging, Using swaps for hedging.	10
6.	**Case Studies and Practical Applications:** Real-world valuation and hedging examples, Group projects on valuation and hedging strategies.	10
	Total	**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Quizzes, Mini projects, Real-life project**	**During the semester**	**30%**
2.	**Midterm**	**Week 8-9**	**30%**
3.	**Final Exam**	**Week 15**	**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	***Investment Valuation: Tools and Techniques for Determining the Value of Any Asset,*** Aswath Damodaran, 3rd Edition, 2012, Wiley Finance.
Supportive References	***Options, Futures, and Other Derivatives,*** John Hull, 10th Edition, 2017, Pearson.
Electronic Materials	**None.**
Other Learning Materials	Basic Computer applications (like MS- office, media player, Google chrome) for enhanced knowledge & learning. MS- Project will be more helpful to understand practical side of project management.

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ **Each class room 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)	▪ **Projectors** ▪ **Printers, scanners, etc.**

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**Students**	**During the semester and at the end of the course each student will complete two evaluation forms.**
Effectiveness of Students assessment	**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.**
Quality of learning resources	**Students**	**During the semester and at the end of the course each student will complete two evaluation forms.**
The extent to which CLOs have been achieved	**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.	**20/1446**
DATE	**11/08/1446 (10/02/2025)**

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission
اعتماد
NCAAA
2024
TPG-153

Course Specification

(Postgraduate Programs)

Course Title:	**Predictive Modeling in Finance and Insurance (2)**
Course Code:	**AFM 6215**
Program:	**Executive Master of Science in Actuaries and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2025 – V1**
Last Revision Date:	**None**

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G. Specification Approval 7

A. General information about the course:

1. Course Identification

1. Credit hours:					
3 (2 Lectures, 2 Lab, 0 Tutorial)					
2. Course type					
A.	☐University	☐ College	☐ Department	☐Track	☒ Others
B.	☒ Required		☐ Elective		
3. Level/year at which this course is offered: Level 3 / Year 2					
4. Course general Description:					
This course provides advanced insights into applying predictive modeling techniques in financial and insurance contexts. Building on foundational concepts, this course delves into generalized linear models (GLMs), unsupervised learning methods, and predictive frameworks for risk assessment and claim management. It emphasizes hands-on learning with real-world datasets to model pure premiums, detect fraud, analyze loss reserves, and design usage-based insurance plans. By integrating statistical modeling, machine learning, and actuarial applications, the course equips students with the technical expertise and analytical skills required for data-driven decision-making in finance and insurance industries.					
5. Pre-requirements for this course (if any):					
None.					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
The main objective of this course is to: • Understand and apply advanced GLMs for predictive modeling in insurance and finance. • Explore unsupervised learning techniques for clustering and fraud detection in insurance claims. • Develop frameworks for ratemaking, claim escalation, and risk assessment using predictive models. • Analyze and interpret predictive distributions of loss reserve estimates for capital management. • Implement usage-based insurance models using classification trees and statistical methods. • Foster collaboration and teamwork to solve complex modeling problems in a real-world context.					

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%

No	Mode of Instruction	Contact Hours	Percentage
4	Distance learning	0	0%

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	30
2.	**Laboratory/Studio**	30
3.	**Field**	0
4.	**Tutorial**	0
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	**Perform and understand the application of GLMs in insurance data analysis, including frequency and severity modeling.**	**K1**	**Lectures, case study discussions, and Data-driven problem-solving sessions**	**Direct: Written exams, quizzes, and assignments analyzing real data.**
1.2	**Explain the principles of unsupervised learning and its application in claim fraud detection.**	**K2**	**Conceptual lectures, Case studies, and Group discussions**	**Direct: Quizzes, Midterm exams, final exams**
2.0	**Skills**			
2.1	**Apply GLMs to predict pure premiums and validate models using real-world datasets.**	**S1**	**Hands-on lab sessions, Guided exercises with datasets, and Software tools training**	**Direct: Practical lab evaluations, Project report.**
2.2	**Develop univariate and multivariate ratemaking frameworks using insurance data.**	**S2**	**Workshops, Group discussions, Model comparison exercises**	**Direct: Group project and Mid-term exam.**
2.3	**Analyze the predictive distribution of loss reserve estimates for capital management purposes.**	**S3**	**Data analysis workshops, Real-life problem-solving, and Simulation exercises.**	**Direct: Data analysis assignments, Practical exams.**

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.4	**Implement predictive models for usage-based auto insurance using Poisson models and classification trees.**	**S1, S3**	**Case study exercises, Software-based model implementation workshops.**	**Direct: Final project, Peer assessment.**
3.0	**Values, autonomy, and responsibility**			
3.1	**Perform effectively within teams to solve complex modeling problems in general insurance.**	**V1**	**Team-based projects, Role-playing activities, and Peer learning.**	**Direct: Group project evaluation, and Peer feedback.**
3.2	**Show and uphold ethical standards and professional responsibility in predictive modeling and actuarial practices.**	**V2**	**Ethics seminars, Reflective discussions.**	**Direct: Reflection essays, Scenario-based evaluations.**

C. Course Content

No	List of Topics	Contact Hours (Lectures, Tutorials, Labs)
1.	**Pure Premium Modeling using GLMs** Data characteristics, Exploratory data analysis, Frequency modeling, Severity modeling, Pure Premium, and Validation.	8
2.	**Applying Generalized Linear Models to Insurance Data** Comparing model forms, The datasets and model forms, Proof of Equivalence between pure premium model forms, The Gini Index	6
3.	**Generalized Linear Models as Predictive Claim Models** Review of loss reserving, Additional notations, GLM background, Advantages of GLMs, Diagnostics and Examples	6
4.	**Frameworks for General Insurance Ratemaking** Data, Univariate ratemaking framework, Multivariate ratemaking framework, Model comparison	4
5.	**Using Multilevel Modeling for Group Health Insurance Ratemaking: A case study** Data from the Egyptian market, Methods and models, Results	4
6.	**Clustering in General Insurance Pricing** Overview of clustering, Dataset for case study, Clustering methods, Exposure-Adjusted Hybrid (EAH) clustering method, Results	4
7.	**Application of Two Unsupervised Learning Techniques to Questionable Claims** Unsupervised learning basics, Simulated automobile PIP questionable claims data and the fraud issue, The questionable claims dependent variable problem, The PRIDIT method, Processing the questionable claims data from PRIDIT analysis, Computing RIDITS and PRIDITS, PRIDIT results for simulated PIP questionable Claims Data Trees and Random forests, Unsupervised learning with Random	12

	forests, Random forest visualization via Multi-dimensional scaling, Kohonen Neural Network	
8.	**The Predictive Distribution of Loss Reserve Estimates over a Finite Time Horizon** The CASS loss reserve database, Correlated chain ladder model, Predictive distribution of future estimates, Implications for capital management	4
9.	**Finite Mixture Model and Workers' Compensation Large-Loss Regression Analysis** DGLM and FMM, Data with Traditional Distribution analysis, Univariate and correlation analysis, Regression analysis	4
10.	**A Framework for Managing Claim Escalation Using Predictive Modeling** Loss development models, Additioan data for Triage models, Factor selection, Modeling method	4
11.	**Predictive Modeling for Usage-Based Auto Insurance** Usage-based auto insurance, Poisson model for usage-based auto insurance, Classification trees, Implementing UBI models with a traditional rating plan	4
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Quizzes, Mini projects, Real-life project**	**During the semester**	**30%**
2.	**Midterm**	**Week 8-9**	**30%**
3.	**Final Exam**	**Week 15**	**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	1. ***Predictive Modelling Applications in Actuarial Science - Volume II: Case Studies in Insurance***, EDWARD W. FREES, RICHARD A. DERRIG, GLENN MEYERS, 2016, Cambridge University Press.
Supportive References	2. **An Introduction to Statistical Learning with Applications in R -** Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, 2nd edition, Springer
Electronic Materials	3. **LMS – Blackboard**
Other Learning Materials	4. **Online supplements (Dataset and R-code) for Ref.1 (https://instruction.bus.wisc.edu/jfrees/jfreesbooks/PredictiveModelingVol1/glm/v2-chapter-1.html)**

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ Each class room 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	Students	During the semester and at the end of the course each student will complete two evaluation forms.
Effectiveness of Students assessment	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.
Quality of learning resources	Students	During the semester and at the end of the course each student will complete two evaluation forms.
The extent to which CLOs have been achieved	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.	20/1446
DATE	11/08/1446 (10/02/2025)

Course Specification

(Postgraduate Programs)

Course Title:	**Property and Casualty**
Course Code:	**AFM 6216**
Program:	**Executive Master of Science in Actuaries and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2024 – V1**
Last Revision Date:	**None**

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D. Students Assessment Activities 5

E. Learning Resources and Facilities 5

F. Assessment of Course Quality 6

G. Specification Approval 6

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	☐ Department	☐Track	☒ Others
B.	☐ Required		☒ Elective		
3. Level/year at which this course is offered: Level 4 / Year 2					
4. Course general Description:					
This course introduces general principles of ratemaking and reserving as they relate to P&C insurance products. Students will learn actuarial conventions and terminology and structure insurance data accordingly. The course discusses also techniques needed to restate historical premium and loss information at current levels and derive consistent profitability metrics. Advantages and disadvantages of various traditional pricing and reserving techniques will be discussed.					
5. Pre-requirements for this course (if any):					
None.					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
The main objectives of this course are to: • Understand how the P & C insurance policies are arranged. • Firm up an understanding of the stakeholders in the insurance industry. • Appreciate the differences involved between property and casualty covers. • Draw up the difference between Sum Insured and Limit of Liability. • Highlight the importance of investigation to establish "cause" when there is a loss.					

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	Identifiy property-casualty insurers benefit individuals, businesses and society through the insurance mechanism.	K1	2 lecture hours\week	Direct: Regular Exams
1.2	Classify major property-casualty insurer functional areas (marketing, underwriting, and claims). Operate to ensure the efficient and economic transfer of risk while avoiding adverse selection.	K2	• 2 tutorial hours\week • Self-study	Direct: Short Quizzes
2.0	Skills			
2.1	Select regulations of the property-casualty insurance business, in order to ensure property market conduct and to ensure insurer claim-paying ability.	S1	Self-study	Direct: • Participations • Short Quizzes
2.2	Analyze property-casualty insurer's promise to indemnify claimants is presented in an insurance policy.	S2	Real-life problems	Direct: Simulation mini-projects
2.3	Appraise usual loss exposures facing individuals and families.	S3	Real-life problems	Direct: Cases study
2.4	Evaluate the usual loss exposures facing commercial organizations through commercial insurance policies.	S3	Self-study	Direct: Project
3.0	Values, autonomy, and responsibility			
3.1	Create connections in groups, adaptable to new circumstances, both independently and in collaboration with others.	V1	Personal questions	Direct: Participation
3.2	Generate the highest standards of ethical conduct and professional behavior, critical,	V2	Teamwork and class discussions.	Direct: Real-life project

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	interpersonal and communication skills as well as a commitment to life-long learning			

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to insurance: the evolution of insurance, how insurance works, insurance and utility, what makes a risk insurable, what insurance is and is not, risk, peril, and hazard, purchase of insurance: other reasons.	12
2.	Property/casualty coverages: the evolution of insurance, automobile insurance, home-owners insurance, tenants package, workers compensation, commercial property insurance, marine insurance, liability insurance, limits to coverage.	12
3.	Loss reserving: Introduction, how outstanding claim payments arise, definition of terms, professional considerations, data for reserving, loss reserving methods, discounting loss reserves, statistical methods.	12
4.	Ratemaking: Introduction, objectives of ratemaking, data for ratemaking, premium data, the exposure unit, the expected effective period, ingredients of ratemaking, rate changes.	12
5.	Intermediate topics: Introduction, individual risk rating plans, increased limits factors, deductible pricing, reinsurance.	12
	Total	60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes, Mini projects, Real-life project	During the semester	30%
2.	Midterm	Week 8-9	30%
3.	Final Exam	Week 15	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	*Introduction to ratemaking and loss reserving for property and casualty insurance, Robert Brown and Scott Lennox*, 5th Edition, 2015, Actex publications.
Supportive References	
Electronic Materials	None
Other Learning Materials	None

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ **Each class room 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	**Students**	**During the semester and at the end of the course each student will complete two evaluation forms.**
Effectiveness of Students assessment	**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.**
Quality of learning resources	**Students**	**During the semester and at the end of the course each student will complete two evaluation forms.**
The extent to which CLOs have been achieved	**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.	**20/1446**
DATE	**11/08/1446 (10/02/2025)**

Course Specification

(Postgraduate Programs)

Course Title:	**Multi-Asset Portfolio Management.**
Course Code:	**AFM 6217**
Program:	**Executive Master of Science in Actuaries and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2024 – V1**
Last Revision Date:	**None**

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G. Specification Approval 6

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	☐ Department	☐Track	☒ Others
B.	☐ Required		☒ Elective		
3. Level/year at which this course is offered: Level 4 / Year 2					
4. Course general Description:					
This course focuses on the principles of investing by covering valuation of bonds, stocks, and options. Key applications include personal and professional portfolio management, risk management, security valuation, and capital structure. The course develops the concepts of risk-return trade-offs, diversification, systematic and idiosyncratic risk, expected returns, market efficiency, performance evaluation and arbitrage.					
5. Pre-requirements for this course (if any):					
AFM 6212.					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
The main objectives of this course are to: • Undertake a rigorous study of Portfolio theory. • Be aware of the empirical evidence relevant to institutional portfolio management. • Provide knowledge on investment and investment schemes. • Acquire techniques of calculation and decision making on financial products. • Be able to assess and understand the risk associated with investments.					

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 terms related to investments. Apply basic concepts and calculations to planning and control of investments.	K1	2 lecture hours\week	Direct: Regular Exams
1.2	Identify analytical models used for financial decision-making.	K2	• 2 tutorial hours\week • Self-study	Direct: Short Quizzes
2.0	**Skills**			
2.1	Reprot earnings and cash flow.	S1	Self-study	Direct: • Participations • Short Quizzes
2.2	Apply interest rates, bond prices, and yields.	S2	Real-life problems	Direct: Simulation mini-projects
2.3	Analyze corporate and government bonds	S3	Real-life problems	Direct: Cases study
2.4	Choose portfolio management and review performance evaluation and risk management	S3	Self-study	Direct: Project
3.0	**Values, autonomy, and responsibility**			
3.1	Create connections in groups, adaptable to new circumstances, both independently and in collaboration with others.	V1	Personal questions	Direct: Participation
3.2	Generate the highest standards of ethical conduct and professional behavior, critical, interpersonal and communication skills as well as a commitment to life-long learning	V2	Teamwork and class discussions.	Direct: Real-life project

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction: The Investment Environment, Asset Classes and Financial Instruments, How Securities Are Traded, Mutual Funds and Other Investment Companies.	6
2.	Portfolio Theory and Practice: Risk, Return, and the Historical Record, Capital Allocation to Risky Assets, Efficient Diversification, Index Models.	9

3.	Equilibrium in Capital Markets: The Capital Asset Pricing Model, Arbitrage Pricing Theory and Multifactor Models of Risk and Return, The Efficient Market Hypothesis, Behavioral Finance and Technical Analysis, Empirical Evidence on Security Returns.	9
4.	Fixed-Income Securities: Bond Prices and Yields, The Term Structure of Interest Rates, Managing Bond Portfolios.	9
5.	Security Analysis: Macroeconomic and Industry Analysis, Equity Valuation Models, Financial Statement Analysis.	9
6.	Options, Futures, and Other Derivatives: Options Markets: Introduction, Option Valuation, Futures Markets, Futures, Swaps, and Risk Management.	9
7	Applied Portfolio Management: Portfolio Performance Evaluation, International Diversification, Hedge Funds, The Theory of Active Portfolio Management, Investment Policy and the Framework of the CFA Institute.	9
Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes, Mini projects, Real-life project	During the semester	30%
2.	Midterm	Week 8-9	30%
3.	Final Exam	Week 15	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	Bodie, Zvi, Alex Kane, and Alan J. Marcus, Investments. 5th Edition, McGraw-Hill/Irwin, 2002.
Supportive References	AElton, E.J. and M.J. Gruber, 1995, Modern Portfolio Theory and Investment Management, John Wiley & Sons, New York.
Electronic Materials	None
Other Learning Materials	None

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ Each class room 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	**Students**	**During the semester and at the end of the course each student will complete two evaluation forms.**
Effectiveness of Students assessment	**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.**
Quality of learning resources	**Students**	**During the semester and at the end of the course each student will complete two evaluation forms.**
The extent to which CLOs have been achieved	**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.	**20/1446**
DATE	**11/08/1446 (10/02/2025)**

Course Specification

(Postgraduate Programs)

Course Title:	**Insurance Law and Accounting**
Course Code:	**AFM 6218**
Program:	**Executive Master of Science in Actuaries and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2024 – V1**
Last Revision Date:	**None**

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F. Assessment of Course Quality 6

G. Specification Approval 7

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	☐ Department	☐Track	☒ Others
B.	☐ Required		☒ Elective		
3. Level/year at which this course is offered: Level 4 / Year 2					
4. Course general Description:					
This course provide in one part, a clear understanding of the basic principles of Insurance Law. It also examine specific classes of cover with the view of dealing with policy coverage and exclusions as well as claims processes. In the other part, the course explore statutory accounting principles, compare SAP to GAAP, and investigates the components of the NAIC annual statement.					
5. Pre-requirements for this course (if any):					
None.					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
The main objectives of this course are to: ▪ Recognize the purpose and concept of insurance. ▪ Apply the fundamental concepts of the insurance industry. ▪ Define how insurance is regulated. ▪ Apply Statutory and GAAP financial reporting for insurance companies. ▪ Identify key concepts of reinsurance. ▪ Apply the Risk-Based Capital (RBC) Concept.					

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 frameworks and the intended users and focus on generally accepted accounting Principles.	K1	2 lecture hours\week	Direct: Regular Exams
1.2	Compare the principles of insurance law and different types of covering.	K2	• 2 tutorial hours\week • Self-study	Direct: Short Quizzes
2.0	**Skills**			
2.1	Analyze negligence claims in terms of elements and required proof.	S1	Self-study	Direct: • Participations • Short Quizzes
2.2	Apply laws in tort cases.	S3	Real-life problems	Direct: Simulation mini-projects
2.3	Debate the purpose and primary components of the key schedules of an insurer's financial statements (Balance sheet, income statement and cash flow statement).	S3	Real-life problems	Direct: Cases study
2.4	Conclude the implications of some premium accounting issues.	S3	Self-study	Direct: Project
3.0	**Values, autonomy, and responsibility**			
3.1	Create connections in groups, adaptable to new circumstances, both independently and in collaboration with others.	V1	Personal questions	Direct: Participation
3.2	Generate the highest standards of ethical conduct and professional behavior, critical, interpersonal and communication skills as well as a commitment to life-long learning	V2	Teamwork and class discussions.	Direct: Real-life project

C. Course Content

No	List of Topics	Contact Hours
1.	**Introductory Insurance Accounting.** **Qualitative Accounting Information Criteria, Types of Accounting Frameworks, Accounting Frameworks and Rule Hierarchies, Selected Accounting Concepts, Fundamentals of Insurer Financial Statements, Premium Accounting – Revenue Recognition, Premium Accounting – Types of Written Premium, Other Premium Accounting Issues, Unearned Premium, Examining the Relationship Between Loss Reserves and the Unearned Premium. Reserve, Loss and Loss Adjustment Expense Accounting, Reinsurance Accounting Basics, Deposit Accounting.**	10
2.	**Insurance Policy Analysis.** **Ideally Insurable Loss Exposures, Characteristics of Insurance Policies, Insurance Policy Structure, Insurance Policy Provisions, Identifying and Protecting Insurable Interests, Determining Replacement Cost and Actual Cost Value, Other Valuation or Loss Settlement Provisions, Applying Coinsurance and other Insurance to Value Provisions, Applying Property Insurance Limits and Deductibles, Applying Book Value to a Property Damage Claim, Factors Affecting Liability Claim Valuation.**	10
3.	**Personal Auto Policy.** **The Personal Vehicle Risk Management Environment, Understanding the Personal Auto Policy, Examining Personal Auto Liability Coverage, PAP Medical Payments Coverage and Uninsured Motorists Coverage, PAP Coverage for Damage to Your Auto, PAP Duties and General Provisions, PAP Endorsements for Vehicles Other Than Personal Auto, Additional PAP Endorsements.**	10
4.	**Homeowners Property Coverage.** **Managing Personal Property Exposures, Managing Personal Liability Exposures, Determining HO-3 Property Coverages,Analyzing HO-3 Section I – Perils Insured Against and Exclusions, Examining HO-3 Property Conditions.**	10
5.	**Insurance Law.** **Negligence, Defenses Against Negligence Claims, Liability of Landowners or Occupiers of Land, Intentional Torts, Liability in Extraordinary Circumstances, Products Liability, Damages in Tort Suits, Liability Concepts Affecting Tort Claims.**	10
6.	**Insurance Regulation.** **Reasons for Insurance Regulations, Insurance Regulators, Licensing Insurers and Insurance Personnel, Monitoring Insurer Solvency, Regulating Insurance Rates, Regulating Insurance Policies, Market Conduct and Consumer Protection.**	10
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes, Mini projects, Real-life project	During the semester	30%
2.	Midterm	Week 8-9	30%
3.	Final Exam	Week 15	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	Insurance Theory and Practice - 1st Edition - Rob Thoyts 2010.
Supportive References	1. Bird's modern insurance law. 12th ed, John Birds. Sweet and Maxwell, 2022. 2. Colinvaux's law of insurance. 13th ed. London: Sweet & Maxwell, 2022.
Electronic Materials	None
Other Learning Materials	None

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ Each class room 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	Students	During the semester and at the end of the course each student will complete two evaluation forms.
Effectiveness of Students assessment	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.

Assessment Areas/Issues	Assessor	Assessment Methods
Quality of learning resources	**Students**	**During the semester and at the end of the course each student will complete two evaluation forms.**
The extent to which CLOs have been achieved	**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.	**20/1446**
DATE	**11/08/1446 (10/02/2025)**

Course Specification

(Postgraduate Programs)

Course Title:	**Actuarial and Financial Cases**
Course Code:	**AFM 6297**
Program:	**Executive Master of Science in Actuaries and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2024 – V1**
Last Revision Date:	**None**

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G. Specification Approval 6

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	☐ Department	☐Track	☒ Others
B.	☒ Required		☐ Elective		
3. Level/year at which this course is offered: Level 4 / Year 2					
4. Course general Description:					
This course focuses on the application of actuarial and financial principles to real-world cases. Students will work on projects that simulate professional scenarios, enhancing their analytical, problem-solving, and presentation skills.					
5. Pre-requirements for this course (if any):					
None.					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
By the end of this course, students will be able to: 1. Analyze complex actuarial and financial data. 2. Apply theoretical knowledge to practical situations. 3. Develop and present comprehensive reports on financial cases. 4. Utilize relevant software tools for data analysis and modeling. 5. Collaborate effectively in teams to solve case studies.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lecture	30
2.	Laboratory/Studio	0
3.	Seminars	0
4.	Tutorials	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	Recall knowledge and skills to a research problem.	K1, K2	• 2 lecture hours/week	Direct: • Presentations
1.2	Develop a skill set relevant to a specific research project.	K1, K2	• 2 tutorial hours/week • Self-study	Direct: • Assignments • Discussions
2.0	**Skills**			
2.1	Create techniques of proof in the corresponding subject.	S1, S2	• Deep problems	Direct: • Assignments
2.2	Demonstrate oral communication and technical writing skills through writing and oral presentation.	S3	• Self-study	Direct: • Presentations
2.3	Use Internet in searching for scientific information.	S3	• Deep problems	Direct: • Assignments
2.4	Design projects from real life problems.	S1, S2	• Self-study	Direct: • Discussions
3.0	**Values, autonomy, and responsibility**			
3.1	Create connections in groups, adaptable to new circumstances, both independently and in collaboration with others.	V1	• Personal questions	Direct: • Written report • Presentation in face of an experts committee
3.2	Generate the highest standards of ethical conduct and professional behavior, critical, interpersonal and communication skills as well as a commitment to life-long learning.	V2	Teamwork and class discussions.	Direct: • Presentations • Assignments • Discussions

C. Course Content

No	List of Topics	Contact Hours
1.	Actuarial and Financial Cases treated dependent.	60
	Total	**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Written report in English (40-50 pages).	At the end of the semester.	70%
2.	Oral exam: (presentation 20 minutes in English language).	At the end of the semester.	30%

*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	Research subject dependent.
Supportive References	Research subject dependent.
Electronic Materials	Research subject dependent.
Other Learning Materials	None

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ Each class room 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	Students	During the semester and at the end of the course each student will complete two evaluation forms.
Effectiveness of Students assessment	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.
Quality of learning resources	Students	During the semester and at the end of the course each student will complete two evaluation forms.

Assessment Areas/Issues	Assessor	Assessment Methods
The extent to which CLOs have been achieved	**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.	**20/1446**
DATE	**11/08/1446 (10/02/2025)**