هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification

(Bachelor)

Course Title:	Calculus (1)
Course Code:	MAT 1104
Program:	Bachelor of Science in Actuarial and Financial Mathematics
Department:	Mathematics and Statistics
College:	Science
Institution:	Imam Mohammad Ibn Saud Islamic University
Version:	2023 – V1
Last Revision Date:	None

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
5 (4 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 limit, continuity, differentiation and its applications for functions with one variable. 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):					
Understanding basics of differentiation and integration and their applications which are essential to proceed to next courses in all programs.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	72	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**	48
2.	**Laboratory/Studio**	0
3.	**Field**	0
4.	**Tutorial**	24
5.	**Others (specify)**	0
Total		72

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 various types of limits of functions of one variable (graphically, numerically and algebraically)	K1, K3	4 lecture hours\week	Direct: Regular Exams
1.2	Describe different techniques of differentiation and its applications.	K1, K3	• 2 tutorial hours\week • Self-study	Direct: Short Quizzes
2.0	**Skills**			
2.1	Use differentiation and integration to solve real world problems such as rate of change, optimization, and area problems.	S3	• Self-study • Real-life problems	Direct: • Participations • Short Quizzes
2.2	Demonstrate the connection between area and the definite integral through Fundamental theorem of Calculus.	S3	Self-study	Direct: Participations
2.3	Draw graphs of functions handily and by using CAS and online solvers.	S3	Real-life problems	Direct: Short Quizzes
2.4	State, clearly and precisely both orally and in writing, areas and definite integrals by Riemann sums	S3	Self-study	Direct: Participations
3.0	**Values, autonomy, and responsibility**			
3.1	Work individually.	V1, V2	Personal questions	Direct: Participation

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
3.2	**Develop personal values and attributes such as honesty, empathy and respect for others.**	**V1, V2**	**Teamwork and class discussions.**	**Direct: Homework and Mini projects**

C. Course Content

No	List of Topics	Contact Hours
1.	**Preliminaries:** Solving Linear Equations and Inequalities, Absolute value, Solving Inequalities Containing an Absolute Value, Equations of lines, Quadratic Equations and Inequalities, Special Product Formulas, Polynomials, Factoring Polynomials; Functions: Domain, Range, and graphs of functions, Common Functions, Composition of functions, Inverse function; Trigonometry: Unit Circle, Angles and their Measurements, Solving Equations Involving Sines and Cosines, Important Trigonometric Identities, Trigonometric Functions (Sine, Cosine, and Tangent Function), Inverses Trigonometric Functions, Exponential and Logarithmic Functions, Laws of Exponents and Logarithms.	20
2.	**Limits and Continuity:** The Concept of Limit, Formal definition of limit, Limit Theorems, Limits Involving Infinity, Asymptotes, The natural number e as a limit, Continuity of functions, Operations on continuous functions, Intermediate value theorem, The Bisection Method, Formal definition of the limit.	16
3.	**Differentiation:** Tangent Lines and Velocity, The Derivative, Computation of Derivatives: The Power Rule, Higher Order Derivatives, The Product and Quotient Rules, The Chain rule, Derivatives of Trigonometric Functions and their inverses, Derivatives of Exponential and Logarithmic Functions, Implicit Differentiation, The Rule Theorem, The Mean Value Theorem.	18
4.	**Applications of Differentiation:** Indeterminate Forms and L'Hopital's Rule, Maxima and minima values, Monotonic functions and the first derivative test, Concavity and the second derivative test, Graphing functions.	18
Total		**72**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Homeworks, Quizzes, Mini-projects**	**During the term**	**10%**
2.	**First Midterm**	**Week 4-5**	**25%**
3.	**Second Midterm**	**Week 7-8**	**25%**
4.	**Final Exam**	**Week 13**	**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	***Calculus***, 4th Edition, R. T. Smith, R. B. Minton, McGraw-Hill, 2012. **(Main Reference)**
Supportive References	1. ***Calculus***; O. Swokowski, et al, PWS Pub. Co.; 6th Edition, 1994. 2. ***Calculus: Early Transcendentals***, 7th Edition; C. Henry Edwards, David E. Penney, Pearson Prentice Hall, 2008. 3. ***Essential Calculus with Application***; Richard A. Silverman, Dover Publications, 1989. 4. ***Schaum's Outline of Calculus***, 6th Edition; Frank Ayres, Elliott Mendelson, McGraw-Hill, 2013.
Electronic Materials	**None**
Other Learning Materials	**None**

2. Required Facilities and equipment

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.	17/1445
DATE	12/06/1445 (25/12/2023)

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	**Foundations of Mathematics**
Course Code:	**MAT 1152**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
5 (4 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 logic, set theory, methods of proof, relations, functions and basics of algebraic structures limit. The course includes the essential fundamentals of these topics. The emphasis is on step by step reasoning and mathematical thinking.					
5. Pre-requirements for this course (if any):					
None.					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
• To give students the rudiments of mathematical logic and set theory. • To introduce the important concepts of relations, functions, and binary operations. • To expose students to some abstraction by presenting the group concept and studying some of its elementary properties. • To learn about vector calculus.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	72	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**	48
2.	**Laboratory/Studio**	0
3.	**Field**	0
4.	**Tutorial**	24
5.	**Others (specify)**	0
Total		72

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 proofs of basic set-theoretic identities involving unions, intersections, and Cartesian products.**	**K1**	**4 lecture hours\week**	**Direct: Regular Exams**
1.2	**Identify the concept of Logic including truth table logical statement, set theory, method of proofs and basics of algebraic structures.**	**K3**	• **2 tutorial hours\week** • **Self-study**	**Direct: Short Quizzes**
2.0	**Skills**			
2.1	**Construct proofs using a variety of proof techniques including: direct proofs, proofs by contraposition and contradiction, proofs by mathematical**	**S3**	• **Self-study** • **Real-life problems**	**Direct:** • **Participations** • **Short Quizzes**

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	induction to solve a given problem.			
2.2	**Implement the negation, converse, and contrapositive of a quantified implication, both linguistically and in Mathematical symbolic form.**	**S3**	**Self-study**	**Direct: Participations**
2.3	**Analyze carefully abstract proofs to provide appropriate instances**	**S3**	**Real-life problems**	**Direct: Short Quizzes**
2.4	**Produce proofs both orally and in written form using correct and concise English and mathematical grammar.**	**S3**	**Self-study**	**Direct: Participations**
3.0	**Values, autonomy, and responsibility**			
3.1	**Develop learning from mistakes.**	**V2**	**Personal questions**	**Direct: Participation**
3.2	**Debate in group discussions and critical interactions.**	**V2**	**Teamwork and class discussions.**	**Direct: Participation and Mini projects**

C. Course Content

No	List of Topics	Contact Hours
1.	**Logic:** Statements, Negation, and Compound Statements, Truth Tables and Logical Equivalences, Conditional and Biconditional Statements, Open Statements and Quantifiers.	**12**
2.	**Set Theory:** Sets and Subsets, Operations on Sets, Generalized Set Union and Intersection, Cartesian Product.	**9**
3.	**Methods of Proofs:** Direct proof method; Contrapositive proof method; Proof by contradiction; If and only if proof; Existence proof and counterexample method; Mathematical induction and its strong version.	**15**
4.	**Relations:** Binary Relations, Reflexive, Symmetric, antisymmetric, and Transitive Relations, Equivalence Relations, Equivalence Classes, and Partitions, The Order Relations.	**15**
5.	**Functions:** Functions, Onto Functions, One-to-One Functions, The	9

	bijection function, Inverse of a Function, Images and Inverse Images of Sets, Denumerable and Countable Sets, Uncountable Sets.	
6.	**Basics of Algebraic Structures:** Binary operations; Semigroups and Groups; Subgroups and Cyclic Groups; Rings, Integral Domains and Fields.	12
Total		**72**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	HomeWorks, Quizzes, Mini projects	During the term	10%
2.	First Midterm	Week 4-5	25%
3.	Second Midterm	Week 7-8	25%
4.	Final Exam	Week 13	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. ***Introduction to Mathematical Proofs: A Transition***, C. Roberts; Champan & Hall/CRC 2010. **(Main Reference)** 2. ***A Primer for Logic and Proof***, H. P. Hirst and J. L. Hirst, webdraft, (2011-2012 Ed.), 2012.
Supportive References	1. ***Mathematical Thinking & Writing: A transition to Abstract Math***, R. Maddox, Academic Press, 2002. 2. **Mathematical Proofs: *A Transition to Advanced Mathematics*,** 3rd Edition, Gary Chartrand, Albert D. Polimeni, Ping Zhang, Pearson, 2014.
Electronic Materials	None
Other Learning Materials	None

2. Required Facilities and equipment

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)	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.	17/1445
DATE	12/06/1445 (25/12/2023)

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	English (1)
Course Code:	ENG 1140
Program:	Bachelor of Science in Actuarial and Financial Mathematics
Department:	Mathematics and Statistics
College:	Science
Institution:	Imam Mohammad Ibn Saud Islamic University
Version:	2023 – V1
Last Revision Date:	None

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
3 (2 Lectures, 0 Lab, 2 Tutorials)					
2. Course type					
A.	☐ University	☒ College	☐Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (Level 1 / Year1)					
4. Course general Description:					
This is a special English language course for students at the Preparatory Programs Deanship, Applied Sciences Stream Level - 1. The focuses on accuracy and fluency in the four language skills (listening, speaking, reading and writing) that improve student outcomes by integrating language instruction into real-life contexts. It maintains a strategy-based curriculum that aims at developing all language skills. The textbooks used for this course are characterized by a consistent unit sequence that includes vocabulary, life stories, grammar, everyday conversation and real-life reading. The content of each unit is carefully presented to develop learners' other skills in vocabulary and idioms that provide learners with the tools they need to achieve civic, workplace, life skills and academic competencies. The course, through these textbooks, focuses on reading, writing and vocabulary, listening and speaking, and grammar.					
5. Pre-requirements for this course (if any)**:**					
None.					
6. Co-requisites for this course (if any)**:**					
None.					
7. Course Main Objective(s):					
1. Use advanced knowledge of word forms, grammar, and discourse markers to follow the flow of ideas in a written text. 2. Identify main ideas, make inferences, and locate details in a written passage. 3. Summarize information from both oral and written sources. 4. Write words in blank spaces meaningfully. 5. Associate words with their collocations. 6. Write answers to Yes / No questions and WH-Questions. 7. Write simple sentences and develop a topic sentences. 8. Write supporting sentences towards a short paragraph development. 9. Put ideas together in a short paragraph of 7-10 sentences. 10. Develop vocabulary and recognize grammatical structures. 11. Guess word meaning from context clues in intermediate level. 12. Use vocabulary and structure for applied sciences contexts.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	48	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**	24
2.	**Laboratory/Studio**	0
3.	**Field**	0
4.	**Tutorial**	24
5.	**Others (specify)**	0
Total		48

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

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Describe a repertoire of essential words, phrases, topics for related people, weather, places, sports, jobs, homes and culture, food, animals, transport, festival and celebrations, internet and technology.	K3	- Pair Work -Teacher-Fronted Presentation -Pre- and Post-Reading and Listening activities that focus on vocabulary	Direct: - Quizzes -Mid-term Exam - Final Exam
1.2	Identify simple A1 CEFR grammatical structures including comparatives, superlatives, prepositions of time and	K3	- Pair Work -Group Work - Practice Activities	Direct: - Quizzes -Mid-term Exam - Final Exam

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	place, adverbs of frequency, singular and plural nouns, articles, use of future tense such as be going to, present perfect verbs, present progressive have got …etc.			
2.0	**Skills**			
2.1	Produce understanding of phrases and expressions related to people, weather, places, sports, jobs, homes and culture, food, animals, transport, festival and celebrations, internet, and technology.	S3	-Activate Schema -Pre-Listening Activities -Playing recorded lectures and dialogs -Assisting students in answering comprehension and other questions about the listening	Direct: - Quizzes -Mid-term Exam - Final Exam
2.2	Predict reading content and text type by quickly scanning the text.	S3	-Activate Schema -Pre-Reading Activities -Previewing difficult vocabulary	Direct: - Quizzes -Mid-term Exam - Final Exam
3.0	**Values, autonomy, and responsibility**			
3.1	Debate actively in group work and discussions.	V1	-Interactive discussions -Presentation	Direct: -Observation of student performance. -Problem solving exercises.
3.2	Generate initiatives independently.	V1	-Interactive discussions -Presentation	Direct: -Observation of student performance. -Problem solving exercises.

C. Course Content

No	List of Topics	Contact Hours
1.	Unlock 1 (Reading and Writing, Listening and Speaking) Unit 1 People	2
2.	Unlock 1 (Reading and Writing, Listening and Speaking) Unit 2 Seasons	2
3.	Unlock 1 (Reading and Writing, Listening and Speaking) Unit 3 Lifestyle	2

4.	Unlock 1 (Reading and Writing, Listening and Speaking) Unit 4 Place	2
5.	Unlock 1 (Reading and Writing, Listening and Speaking) Unit 5 Sport	2
6.	Unlock 1 (Reading and Writing, Listening and Speaking) Unit 6 Jobs	2
7.	Unlock 1 (Reading and Writing, Listening and Speaking) Unit 7 Homes and Buildings	2
8.	Unlock 1 (Reading and Writing, Listening and Speaking) Unit 8 Food and Culture	2
9.	Unlock 1 (Reading and Writing, Listening and Speaking) Unit 9 Animals	2
10.	Unlock 1 (Reading and Writing, Listening and Speaking) Unit 10 Transport	2
11.	Essential Grammar in Use (Units 1-3)	2
12.	Essential Grammar in Use (Units 4-6)	2
13.	Essential Grammar in Use (Units 7-9)	2
14.	Essential Grammar in Use (Units 10-12)	2
15.	Essential Grammar in Use (Units 13-15)	2
16.	Essential Grammar in Use (Units 16-18)	2
17.	Essential Grammar in Use (Units 19-21)	2
18.	Essential Grammar in Use (Units 22-24)	2
19.	Essential Grammar in Use (Units 25-27)	2
20.	Essential Grammar in Use (Units 28-30)	2
21.	Essential Grammar in Use (Units 31-33)	4
22.	Essential Grammar in Use (Units 34-36)	4
Total		**48**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Class Work (Participation+ Quizzes)	During the Semester	30 %
2.	Mid-Term Exam	7th Week	30 %
3.	Final Exam	13th Week	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	- UNLOCK 1– Course book for Listening & Speaking (Units 1-10) -UNLOCK 1– Course book for Reading & Writing (Units 1-10) -Essential Grammar in Use (Units 1-36)
Supportive References	**None**

Electronic Materials	**None**
Other Learning Materials	**None**

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms
Technology equipment (projector, smart board, software)	Projector, smart board and electronic copy of textbook
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 • Peer Reviewers • Faculty • External Reviewers • Quality Assurance Unit	• Student Surveys (Indirect) • Formal Observations (Indirect) • Course Report and Course File (Direct) • Student Samples (Direct) • Self-Reflection reports (Indirect)
Effectiveness of Students assessment	• Students • Faculty • Curriculum Committee • Assessment Committee • External Reviewers • Quality Assurance Unit	• Item Analysis Data ((Indirect)) • Teacher Feedback (Direct) • Student Feedback (Direct) • Course Report & Course File (Direct)
Quality of learning resources	• Students • Faculty	• Student surveys (Indirect) • Faculty surveys (Indirect)
The extent to which CLOs have been achieved	• Students • Faculty • Quality Assurance Unit	• Item Analysis Data (Indirect) • Course Report & Course File (Direct) • Annual Program Review (Direct)
Other	None	

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**ENGLISH DEPARTMENT COUNCIL**
REFERENCE NO.	15
DATE	**05/06/1445 (18/12/2023)**

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification

(Bachelor)

Course Title:	**Calculus (2)**
Course Code:	**MAT 1105**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
5 (4 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 describes the most important ideas, theoretical results, and examples of integration technics, infinite series, and parametric equations. 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):					
MAT 1104					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
• To understand the meaning of definite integral as a limit of Riemann sum. • To learn different techniques of integration. • To understand the applications of definite integrals to physics and Engineering. • To develop the basics of the calculus of infinite series, and their applications.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	72	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**	**48**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**24**
5.	**Others (specify)**	**0**
Total		**72**

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 different techniques of integration and improper integrals.	K1	4 lecture hours\week	Direct: Regular Exams
1.2	List theorems and tests of convergence of sequences and series.	K3	• 2 tutorial hours\week • Self-study	Direct: Short Quizzes
2.0	**Skills**			
2.1	Use the concepts of definite integrals to solve problems involving area, volume, work, and other physical applications.	S3	• Self-study • Real-life problems	Direct: • Participations • Short Quizzes
2.2	Apply the concepts of limits, convergence, and divergence to evaluate some classes of infinite series and/or improper integrals.	S3	Self-study	Direct: Participations
2.3	Illustrate the revolution of a solid region using CAS and online solvers.	S3	Real-life problems	Direct: Short Quizzes
2.4	State clearly and precisely both orally and in writing, Taylor or MacLaurin series to estimate the representation of functions as power series.	S3	Self-study	Direct: Participations
3.0	**Values, autonomy, and responsibility**			
3.1	Shows self-reliance when working independently.	V2	Personal questions	Direct: Participation

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
3.2	Develop constructive and supportive relationships with classmates.	V2	Teamwork and class discussions.	Direct: Homework and Mini projects

C. Course Content

No	List of Topics	Contact Hours
1.	**Integration:** Anti-derivatives, Indefinite Integral and its properties, Sums and Sigma Notation, Partitions and Riemann sums, Area under curves and The Definite Integral, First and Second Fundamental Theorems of Calculus.	14
2.	**Integration Techniques:** Integration by Substitution, Integration by Parts, Integration of Rational Functions Using Partial Fractions, Trigonometric Techniques of Integration, Integrals involving logarithmic, exponential, and hyperbolic functions, Improper Integrals.	18
3.	**Applications of Definite Integrals:** Area between curves, Volumes by slicing, Volumes using Cylindrical Shells, Arc Length and Surface Area.	10
4.	**Infinite Series:** Sequences of Real Numbers, Convergence and Divergence of Infinite Sequences, Formal definition of a convergent sequence, Infinite Series, Basic Infinite Series (geometric series, p-series, alternating series, telescoping series), Convergence Tests for Positive Series (ratio test, root test, comparison and limit comparison test, integral test), Alternating Series, Absolute and Conditional Convergence, Power Series, Differentiation ad Integration of power series, Taylor and Maclaurin Series, Convergence of Taylor series, Applications of Taylor and Maclaurin Series.	20
5	**Parametric equations:** Plane Curves and Parametric Equations, Calculus and Parametric Equations, Arc Length and Surface in Parametric Equations.	10
	Total	72

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	HomeWorks, Quizzes, Mini projects	During the term	10%
2.	First Midterm	Week 4-5	25%
3.	Second Midterm	Week 7-8	25%
4.	Final Exam	Week 13	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	***Calculus***, 4th Edition, R. T. Smith, R. B. Minton, McGraw-Hill, 2012. **(Main Reference)**
Supportive References	1. ***Calculus***; O. Swokowski, et al, PWS Pub. Co.; 6th Edition, 1994. 2. ***Calculus: Early Transcendentals***, 7th Edition; C. Henry Edwards, David E. Penney, Pearson Prentice Hall, 2008. 3. ***Essential Calculus with Application***; Richard A. Silverman, Dover Publications, 1989. 4. ***Schaum's Outline of Calculus***, 6th Edition; Frank Ayres, Elliott Mendelson, McGraw-Hill, 2013.
Electronic Materials	**None**
Other Learning Materials	**None**

2. Required Facilities and equipment

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

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**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.	**17/1445**
Date	**12/06/1445 (25/12/2023)**

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification

(Bachelor)

Course Title:	**Probability & Statistics 1**
Course Code:	**STA 1104**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 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 describes the most important ideas, theoretical results, and examples of descriptive statistics, counting, random variables probability distributions. The course includes the essential fundamentals of these topics. The emphasis is on calculations, and some applications are mentioned. The use of statistical packages is essential during this course.					
5. Pre-requirements for this course (if any)**:**					
MAT 1104					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					
• **Describe discrete data graphically and compute measures of centrality and dispersion.** • **Compute probabilities by modeling sample spaces and applying rules of permutations and combinations, additive and multiplicative laws and conditional probability.** • **Construct the probability distribution of a random variable, based on a real-world situation, and use it to compute expectation and variance.** • **Compute probabilities based on practical situations using the discrete and continuous distributions.**					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	**72**	**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**	36
2.	**Laboratory/Studio**	0
3.	**Field**	0
4.	**Tutorial**	24
5.	**Others (specify)**	0
Total		72

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

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Describe the various measures of central tendency and dispersion.**	**K1**	**Use of statistical software, Lecturing, Interactive learning.**	**Direct: Lab Exam, Assignments, Practical exam**
1.2	**Outline basic probability concepts and techniques of counting for the calculation of probabilities.**	**K3**	**Lecturing, Interactive learning.**	**Direct: Assignments, Practical exam**
1.3	**Define and reproduce some special probability distributions.**	**K1**	**Lecturing, Interactive learning.**	**Direct: Assignments, Practical exam**
2.0	**Skills**			
2.1	**Analyze data using tables and charts.**	**S1, S2**	**Use of statistical software, Lecturing, Interactive learning.**	**Direct: Lab Exam, Assignments, Practical exam**
2.2	**Produce descriptive summary measures for a population and the coefficient of correlation.**	**S2, S3**	**Use of statistical software, Lecturing, Interactive learning.**	**Direct: Lab Exam, Assignments, Practical exam**

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.3	**Compute probabilities from the binomial, geometric, Poisson, and hypergeometric distributions.**	**S3**	**Lecturing, Interactive learning.**	**Direct: Assignments, Practical exam**
2.4	**Deduce probability mass functions, the expected value and variance for discrete random variables.**	**S1, S2**	**Lecturing, Interactive learning.**	**Direct: Assignments, Practical exam**
3.0	**Values, autonomy, and responsibility**			
3.1	**Argue the formulated conclusions.**	**V2**	**Personal questions**	**Direct: Participation**
3.2	**Debate meaningfully and productively with others.**	**V2**	**Teamwork and class discussions.**	**Direct: Homework and Mini projects**

C. Course Content

No	List of Topics	Contact Hours
1	**The Nature of Probability and Statistics:** Descriptive and inferential Statistics; Variables and Type of Data; Data Collection and Sampling Techniques; Observations and Experimental Studies.	**6**
2	**Frequency Distributions and Graphs:** Organizing Data; Histograms, Frequency Polygons, and Ogives; Other Types of Graphs.	**14**
3	**Data Description:** Measures of Central tendency; Measure of Variation; Measure of Positions; Exploratory Data Analysis.	**14**
4	**Counting Rules and Probability:** Counting Rules; Sample Space and Probability; The Additional Rules for Probability; The Multiplication Rules and Conditional Probability. Probability and Counting Rules.	**13**
5	**Discrete Probability Distributions:** A Discrete Random Variable; Probability distribution; Mean, Variance, Standard Deviation and Expectation; The Binomial Distribution; The Poisson Distribution; The Hyper-Geometric Distribution, The Geometric Distribution; The Negative Binomial Distribution.	**13**
6	**Continuous Random Variables and Probability Distributions:** Continuous Random variables; Probability Distribution and Probability Density Function; Cumulative Distribution Function; Mean and Variance of a Continuous Random Variable; Uniform Distribution; The Normal Distribution.	**12**
Total		**72**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	HomeWorks, Quizzes, Mini projects	During the semester	10%
2.	First Midterm	Week 4-5	25%
3.	Second Midterm	Week 7-8	25%
4.	Final Exam	Week 13	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. ***Elementary Statistics***, 14th edition; Mario F. Triola, Pearson, 2021. 2. ***Introduction to Probability and Statistics;*** 14th Edition, W. Mendenhall, R. J. Beaver, Barbara M. Beaver, Duxbury Press, 2013. 3. ***Applied Probability and Statistics in Engineering***, 4th Edition, William W. Hines, Douglas C. Montgomery, David M. Goldsman, Connie M. Borror, John Wiley & Sons Inc, 2003. 4. ***Probability and Statistics for Engineering and the Sciences,*** 9th Edition, Jay L. Devore, Brooks/Cole, Cengage Learning, 2016. 5. ***Data Analysis with Microsoft Excel,*** 3rd Edition, Kenneth N. Berk, Patrick Carey, Duxbury Press, 2010.
Supportive References	***Elementary Statistics: A Step By Step Approach,*** 10th Edition, Allan Bluman, Mc Graw Hill, 2018. ISBN13: 9781259755330 **(Main Reference).**
Electronic Materials	None
Other Learning Materials	None

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ Each classroom should be equipped with a whiteboard and a projector. ▪ Laboratories should be equipped with computers and an internet connection.
Technology equipment (projector, smart board, software)	The rooms should be equipped with data show and Smart Board. All computers should be equipped with the following software: • Microsoft Excel

Items	Resources
	• IBM SPSS • R-Project • MATLAB
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.	17/1445
DATE	12/06/1445 (25/12/2023)

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	English (1)
Course Code:	ENG 1195
Program:	Bachelor of Science in Actuarial and Financial Mathematics
Department:	Mathematics and Statistics
College:	Science
Institution:	Imam Mohammad Ibn Saud Islamic University
Version:	2023 – V1
Last Revision Date:	None

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
3 (2 Lectures, 0 Lab, 2 Tutorials)					
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 is a special English language course for students at the Preparatory Programs Deanship, Applied Sciences Stream Level 2. This course focuses on accuracy and fluency in the four language skills (listening, speaking, reading and writing) that improve student outcomes by integrating language instruction into real-life contexts. It maintains a strategy-based curriculum that aims at developing all language skills. The textbooks used for this course are characterized by a consistent unit sequence that includes vocabulary, life stories, grammar, everyday conversation and real-life reading. The content of each unit is carefully presented to develop learners' other skills in vocabulary and idioms that provide learners with the tools they need to achieve civic, workplace, life skills and academic competencies. The course, through these textbooks, focuses on reading, writing and vocabulary, listening and speaking, grammar, and English for Specific Purposes (ESP).					
5. Pre-requirements for this course (if any)**:**					
None.					
6. Co-requisites for this course (if any)**:**					
None.					
7. Course Main Objective(s):					
1. Use advanced knowledge of word forms, grammar, and discourse markers to follow the flow of ideas in a written text. 2. Identify main ideas, make inferences, and locate details in a written passage. 3. Summarize information from both oral and written sources. 4. Write words in blank spaces meaningfully. 5. Associate words to their collocations. 6. Write answers to Yes / No questions and WH-Questions. 7. Write simple sentences and develop topic sentences. 8. Write supporting sentences towards a short paragraph development. 9. Put ideas together in a short paragraph of 7-10 sentences. 10. Develop vocabulary and recognize grammatical structures. 11. Guess word meaning from context clues in intermediate level. 12. Develop the students' knowledge in English for specific purposes. 13. Provide the students with simple grammar presented on a need-to-know basis for immediate communication. 14. Learn vocabulary relevant to practical work situations. 15. Provide the students with the criteria that will help them understand technical English. 16. Build students' confidence through expressing themselves in English. 17. Use new language in hands-on contexts such as explaining purpose and giving instructions. 18. Help students in telephoning, socializing, and reading technical information and understand technical documentation and emails.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	48	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**	24
2.	**Laboratory/Studio**	0
3.	**Field**	0
4.	**Tutorial**	24
5.	**Others (specify)**	0
Total		48

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

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Describe a repertoire of essential words, phrases, topics for related people, weather, places, schools and education , internet and technology, communication, weather, people, space and universe.	K3	- Pair Work -Teacher-Fronted Presentation -Pre- and Post-Reading and Listening activities that focus on vocabulary	Direct: - Quizzes -Mid-term Exam - Final Exam
1.2	Identify simple A2 CEFR grammatical structures including sentence structure, There is/ There are, prepositions of time and	K3	- Pair Work -Group Work - Practice Activities	Direct: - Quizzes -Mid-term Exam - Final Exam

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	place, adverbs of frequency, singular and plural nouns, and/also/too, but/however, quantifiers, comparative and superlative… etc.			
2.0	**Skills**			
2.1	Produce understanding of phrases and expressions related to places, schools and education, internet and technology, communication, weather, people, space and universe.	S3	-Activate Schema -Pre-Listening Activities -Playing recorded lectures and dialogs -Assisting students in answering comprehension and other questions about the listening	Direct: - Quizzes -Mid-term Exam - Final Exam
2.2	Predict reading content and text type by quickly scanning the text.	S3	-Activate Schema -Pre-Reading Activities -Previewing difficult vocabulary	Direct: - Quizzes -Mid-term Exam - Final Exam
3.0	**Values, autonomy, and responsibility**			
3.1	Debate actively in group work and discussions.	V1	-Interactive discussions -Presentation	Direct: -Observation of student performance. -Problem solving exercises.
3.2	Generate initiatives independently.	V1	-Interactive discussions -Presentation	Direct: -Observation of student performance. -Problem solving exercises.

C. Course Content

No	List of Topics	Contact Hours
1.	Unlock 2 (Reading and Writing, Listening and Speaking) Unit 1 Places	2
2.	Unlock 2 (Reading and Writing, Listening and Speaking) Unit 2 Festivals and Celebration	2

3.	Unlock 2 (Reading and Writing, Listening and Speaking) Unit 3 School and Education	2
4.	Unlock 2 (Reading and Writing, Listening and Speaking) Unit 4 The Internet and Technology	2
5.	Unlock 2 (Reading and Writing, Listening and Speaking) Unit 5 Language and Communication	2
6.	Unlock 2 (Reading and Writing, Listening and Speaking) Unit 6 Weather and Climate	2
7.	Unlock 2 (Reading and Writing, Listening and Speaking) Unit 7 Sports and Competition	2
8.	Unlock 2 (Reading and Writing, Listening and Speaking) Unit 8 Business	2
9.	Unlock 2 (Reading and Writing, Listening and Speaking) Unit 9 People	2
10.	Unlock 2 (Reading and Writing, Listening and Speaking) Unit 10 Space and the Universe	2
11.	Science – Book 1 (Units 1 & 2)	2
12.	Science – Book 1 (Units 5 & 6)	2
13.	Science – Book 1 (Units 7 & 8)	2
14.	Science – Book 1 (Units 10 & 11)	2
15.	Science – Book 1 (Unit 15)	2
16.	Science – Book 2 (Units 1 & 2)	2
17.	Science – Book 2 (Units 7 & 8)	2
18.	Science – Book 2 (Units 10 & 11)	2
19.	Science – Book 2 (Unit 12)	2
20.	Science – Book 3 (Units 3 & 4)	2
21.	Science – Book 3 (Units 8 & 9)	4
22.	Science – Book 3 (Units 13 & 14)	4
Total		**48**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Class Work (Participation+ Quizzes)	During the Semester	30 %
2.	Mid-Term Exam	7th Week	30 %
3.	Final Exam	13th Week	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	- UNLOCK 2– Course book for Listening & Speaking (Units 1-10) -UNLOCK 2– Course book for Reading & Writing (Units 1-10) - Science (Selected Units)
Supportive References	**None**
Electronic Materials	**None**
Other Learning Materials	**None**

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms
Technology equipment (projector, smart board, software)	Projector, smart board and electronic copy of textbook
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 • Peer Reviewers • Faculty • External Reviewers • Quality Assurance Unit	• Student Surveys (Indirect) • Formal Observations (Indirect) • Course Report and Course File (Direct) • Student Samples (Direct) • Self-Reflection reports (Indirect)
Effectiveness of Students assessment	• Students • Faculty • Curriculum Committee • Assessment Committee • External Reviewers • Quality Assurance Unit	• Item Analysis Data ((Indirect)) • Teacher Feedback (Direct) • Student Feedback (Direct) • Course Report & Course File (Direct)
Quality of learning resources	• Students • Faculty	• Student surveys (Indirect) • Faculty surveys (Indirect)
The extent to which CLOs have been achieved	• Students • Faculty • Quality Assurance Unit	• Item Analysis Data (Indirect) • Course Report & Course File (Direct) • Annual Program Review (Direct)

Assessment Areas/Issues	Assessor	Assessment Methods
Other	None	

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	ENGLISH DEPARTMENT COUNCIL
REFERENCE NO.	15
DATE	05/06/1445 (18/12/2023)

Course Specification

(Bachelor)

Course Title:	Calculus (3)
Course Code:	MAT 1106
Program:	Bachelor of Science in Actuarial and Financial Mathematics
Department:	Mathematics and Statistics
College:	Science
Institution:	Imam Mohammad Ibn Saud Islamic University
Version:	2023 – V1
Last Revision Date:	None

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
5 (4 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 1					
4. Course general Description:					
This course describes the most important ideas, theoretical results, and examples of Vectors and Geometry of Space, Vector-Valued Functions, Functions of several variables, and Multiple Integrals.					
5. Pre-requirements for this course (if any):					
MAT 1105					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
• To demonstrate ability to work with different geometries in the space. • To study functions of several variables and partial differentiation. • To be able to set up and compute multiple integrals in rectangular, polar, cylindrical and spherical coordinates. • To master t vector operations in different coordinate systems.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	72	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	48
2.	Laboratory/Studio	0
3.	Field	0
4.	Tutorial	24
5.	Others (specify)	0
Total		72

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

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Describe parametric and polar curves in plane and recognize regions and quadric surfaces in space.	K1	4 lecture hours\week	Direct: Regular Exams
1.2	Recall double and triple integrals in different coordinate systems. in rectangular, polar, cylindrical, and spherical.	K3	• 2 tutorial hours\week • Self-study	Direct: Short Quizzes
2.0	Skills			
2.1	Apply the computational and conceptual principles of vector calculus, including partial derivatives and multiple integrals, to the solutions of various problems	S3	• Self-study • Real-life problems	Direct: • Participations • Short Quizzes
2.2	Interpret, clearly and precisely both orally and in writing, calculus operations on vector-valued functions including limits, derivatives, integrals, curvature, and the description of motion in plane and space.	S3	Self-study	Direct: Participations
2.3	Illustrate figures in different coordinates using a CAS and some online solvers.	S3	Real-life problems	Direct: Short Quizzes
2.4	Compute arc length /surface/volume of regions in 2 and 3 dimensions, in Cartesian, polar, cylindrical, and spherical coordinate systems, directional derivatives, equations of tangent planes, and gradient vectors.	S3	Self-study	Direct: Participations

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
3.0	**Values, autonomy, and responsibility**			
3.1	**Argue the formulated conclusions.**	**V2**	**Personal questions**	**Direct: Participation**
3.2	**Debate meaningfully and productively with others.**	**V2**	**Teamwork and class discussions.**	**Direct: Homework and Mini projects**

C. Course Content

No	List of Topics	Contact Hours
1.	**Vectors and Geometry of Space:** Vectors in Space, Dot Product, Cross Product, Equations of Lines and Planes in Space, Quadratic Surfaces in Space.	14
2.	**Vector-Valued Functions:** Vector-Valued Functions, Calculus of Vector Functions, Motion in Space, Curvature, Tangent and Normal Vectors.	14
3.	**Functions of several variables:** Functions of Several Variables, Limits and Continuity, Partial Derivatives, Differentiability, The Total Derivative, The Directional Derivatives and Gradient, Tangent Plane and Linear Approximation, Taylor's Theorem in Severable variables, Chain Rule, Maxima and Minima, Method of Lagrange Multipliers.	22
4.	**Multiple Integrals:** Double Integrals in Cartesian Coordinates, Areas and Volumes, Polar Coordinates, Double Integrals in Polar Coordinates, Surface Area, Triple Integrals in Cartesian Coordinates, Cylindrical and Spherical Coordinates, Triple Integrals in Cylindrical and Spherical Coordinates, Change of Variables in Multiple Integrals.	22
Total		**72**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**HomeWorks, Quizzes, Mini projects**	**During the term**	**10%**
2.	**First Midterm**	**Week 4-5**	**25%**
3.	**Second Midterm**	**Week 7-8**	**25%**
4.	**Final Exam**	**Week 13**	**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	***Calculus***, 4th Edition; R. T. Smith, R. B. Minton, McGraw-Hill, 2012. **(Main Reference)**
Supportive References	• ***Advanced Engineering Mathematics, 8th Edition, E. Kreyszig, John Wiley & Sons, INC, 1998.*** • ***Calculus, 6th Edition, O. Swokowski, et al, PWS Pub. Co., 1994.*** • ***Calculus Early Transcendentals, 7th Edition; C. Henry Edwards, David E. Penney, Prentice Hall, 2008.*** • ***Calculus, 1st Edition, F. Ayres & E. Mendelson, Schaum's Outline McGraw-Hill, 1999.***
Electronic Materials	**None**
Other Learning Materials	**None**

2. Required Facilities and equipment

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

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**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.	17/1445
DATE	12/06/1445 (25/12/2023)

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification

(Bachelor)

Course Title:	**Probability & Statistics (2)**
Course Code:	**STA 1105**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
5 (4 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 1					
4. Course general Description:					
This is a calculus-based course. Upon successful completion of this course, the students are introduced to the theory of continuous random variables and their probability distributions. They will understand the concept of test hypothesis for the one sample and two samples and apply the common test hypothesis procedures. They are introduced to the correlation and linear regression.					
5. Pre-requirements for this course (if any):					
STA 1104					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
• To teach students some important scientific concepts of statistics. • To let students be familiar with distributions of continuous random variables. • To expose students to concepts of Expectation and moments. • To let students learn and use some tests of hypothesis. • To let student, learn and use linear regression.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	72	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	48
2.	Laboratory/Studio	0
3.	Field	0
4.	Tutorial	24
5.	Others (specify)	0
Total		72

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 and outline the theory of continuous random variables and their probability distributions.	K1	Lectures, Classroom discussions.	Direct: Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
1.2	Outline the procedures of hypothesis testing. .	K3	Lectures, Classroom discussions.	Direct: Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
1.3	Describe the method of least squares to estimate the parameters in a linear regression model.	K1	Lectures, Classroom discussions.	Direct: Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
2.0	Skills			
2.1	Compute probabilities from cumulative distribution functions	S1	Lectures, Classroom discussions.	Direct: • Written exam (Problem

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	and cumulative distribution functions from probability density functions, and the reverse.			solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
2.2	Evaluate test hypotheses for the one and two samples. .	S1, S2	Lectures, Classroom discussions, Individual or group work	Direct: Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
2.3	Predict the future by using the linear regression model.	S3	Lectures, Individual or group work, Classroom discussions.	Direct: Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
2.4	Construct hypotheses testing problems that will be solved using Excel	S3	Use of statistical software, Lecturing, Interactive learning	Direct: Lab Quiz, Assignments, Practical exam
2.5	Interpret the output of the statistical software of the test hypothesis of a given data set	S3	Use of statistical software, Lecturing, Interactive learning.	Direct: Lab Quiz, Assignments, Practical exam
3.0	**Values, autonomy, and responsibility**			
3.1	Generate initiatives with independence	V2	Interactive learning, Group interaction, Problem solving.	Direct: Lab Quiz, Practical exam
3.2	Debate in groups	V2	Group interaction, Problem solving.	Direct: Assignments and Mini projects

C. Course Content

No	List of Topics	Contact Hours
1.	**Continuous Random Variables and Probability Distributions:** Continuous Random variables. Probability Distribution and Probability Density Function. Cumulative Distribution Function. Mean and Variance of a Continuous Random Variable Moments. Moment Generating functions.	11
2.	**Some Examples of Continuous Probability Distributions:** Uniform Distribution. Normal Distribution and its Approximations to the Binomial and Poisson Distributions; Gamma and Exponential Distributions. Chi-Square Distribution. t-Distribution. F-distribution.	13
3.	**Tests of Hypothesis for one Sample**: Steps in Hypothesis Testing-Traditional Method. z-Test for the Mean; t Test for the Mean. z-Test for the Proportion. Chi-Square Test for a Variance or Standard Deviation.	16
4.	**Tests of Hypothesis for Two Samples:** Testing the Difference Between Two Means of Independent Samples. Testing the Difference Between Two Means of Dependent Samples. Testing the Difference Between Two Proportions. Testing the Difference Between Two Variances.	16
5	**Correlation and Linear Regression:** Scatter Plots and Correlation. Line of Best Fit; Determination of the Regression Line Fit Equation.	16
Total		**72**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Homeworks, Quizzes, Mini-projects**	**During the term**	**10%**
2.	**First Midterm**	**Week 4-5**	**25%**
3.	**Second Midterm**	**Week 7-8**	**25%**
4.	**Final Exam**	**Week 13**	**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).* **Mathematical Statistics with Applications,** 7th Edition, D. Wackerly, W. Mendenhall, R.L. Scheaffer, Brooks/Cole-Cengage Learning, 2008. ISBN-13: 9780495385080. *(Main Reference).*
Supportive References	• **Introduction to Mathematical Statistics,** 6th Edition, Robert V. Hogg, Joseph McKean, Allen T. Craig, Prentice Hall, 2005.

	• **Elementary Statistics,** 14th edition; Mario F. Triola, Pearson, 2021.
Electronic Materials	**None**
Other Learning Materials	**None**

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ **Each classroom should be equipped with a whiteboard and a projector.** ▪ **Laboratories should be equipped with computers and an internet connection.**
Technology equipment (projector, smart board, software)	**The rooms should be equipped with data show and Smart Board.** **All computers should be equipped with the following software:** **▪ Microsoft Excel** **▪ IBM SPSS** **▪ R-Project** **▪ MATLAB**
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.	**17/1445**
DATE	**12/06/1445 (25/12/2023)**

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

Course Specification
(Bachelor)

Course Title:	**Math Software**
Course Code:	**MAT 1244**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2024 - V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
3 (1 Lectures, 2 Lab, 2 Tutorial)					
2. Course type					
A.	☐University	☐ College	☒ Program	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: Level 2 / Year 1					
4. Course general Description:					
This course describes the most important ideas, theoretical results, and examples for an introduction to MATLAB programming. The emphasis is on calculations and programming.					
5. Pre-requirements for this course (if any)**:**					
None					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					
• **To provide an introduction and use some of the high-level mathematical programming languages such MATLAB, Maple and Mathematica, as a practical aid in doing mathematics.** • **To provide the student with some basic skills in the use of this software without attempting deep coverage.**					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	**75**	**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**	15
2.	**Laboratory/Studio**	30
3.	**Field**	0
4.	**Tutorial**	30
5.	**Others (specify)**	0
Total		**75**

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 environment of software "MATLAB".	K2	▪ 1 lecture hours\week ▪ 2 lab hours\week ▪ Self-study	Direct: ▪ Lab Exams ▪ Assignments ▪ Short Quizzes
1.2	Recall a range of syntaxes using MATLAB.	K3		
2.0	**Skills**			
2.1	Create code to provide a solution to a range of Mathematical problems ranging from simple to complex.	S1	▪ Self-study ▪ Real-life problems	Direct: Participations, Short Quizzes
2.2	Produce and implement, clearly and precisely, simple programs.	S3		
2.3	Develop MATLAB code into a given to online solver.	S1		
2.4	Analyze algorithms, M-file script and calculus operation design to solve mathematical problems via MATLAB.	S3	▪ Self-study ▪ Real-life problems	Direct: Participations, Short Quizzes
3.0	**Values, autonomy, and responsibility**			
3.1	Generate initiatives with independence and in groups.	V1	Personal questions	Direct: Participation
3.2	Show attitude of support the use of mathematical software in solving real life problems.	V1	Teamwork	Direct: Homework and Mini projects

C. Course Content

No	List of Topics	Contact Hours
1	Starting with MATLAB: Introduction to the software and computer, MATLAB windows, help and look for commands, arithmetic operations, Display Formats, Built-in functions, Variables assignment, Elementary built-in functions, Command line editing.	5
2	Arrays: Creating arrays (vectors, matrices), Lin space command, some major matrices, operators, Matrix operations in MATLAB, Array addressing, Adding and deleting elements, Strings.	10

3	Other Operators: Operator Precedence, Relational operations, Logical operations, all and any commands, find command, sort command, max and min command.	10
4	2D and 3D graphs: Plot and ezplot command, fplot command, multigraphs plots, others plot commands, axis and graphic handling, layout a figure, 3D line plot, Mesh and Surface plots, view command.	10
5	Script files: Creating and saving a file, disp and fprintf commands, loading a file, search path, defining functions, structure of a function file, inline function, feval command, local and global variables, …	10
6	Starting with MATLAB: Introduction to the software, Command window, help and look for commands, arithmetic operations, Display Formats, Built-in functions, Variables assignment, Command line editing.	10
7	Programming: If-else structure, for and while loops, Break and continue commands, Switch-case statement.	10
8	Symbolic toolbox: Symbolic object and expressions, algebraic expression manipulation, factorization, simplification, solving equations.	10
Total		75

D. Students Assessment Activities

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

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

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	▪ ***Introduction to MATLAB***, Delores Etter, Pearson Education Inc, 4th Edition, 2018. **ISBN: 978-0-13-461528-8 (Main Reference)**
Supportive References	▪ ***MATLAB: An Introduction with Applications,*** 3rd Edition; Amos Gilat, The Ohio State Univ. 2008. ▪ ***MATLAB Primer,*** 7th Edition, K. Sigmon and T. Davis, Chapman & Hall/CRC, 2005. ▪ ***An Introduction to Matlab,*** 5th Edition, David F. Griffiths, University of Dundee, United Kingdom, 2012.
Electronic Materials	MATLAB online documentation (http://www.mathworks.com)
Other Learning Materials	**None**

2. Required Facilities and equipment

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

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**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.	**8/1446**
DATE	**05/04/1446 (08/10/2024)**

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	**Mathematical Statistics for Actuaries**
Course Code:	**STA 1205**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
5 (4 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 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):					
MAT 1106					
6. Co-requisites for this course (if any):					
None					
7. Course Main Objective(s):					
• Use joint probability mass functions and joint probability density functions to calculate probabilities. • Calculate means and variances for linear combinations of random variables. • Determine the distribution of a general function of a random variable. • Calculate moment generating functions and use the functions to determine moments and distributions. • Understand the central limit theorem. • Know how to compute and explain the precision with which a parameter is estimated. • Construct confidence intervals on the mean, variance, standard deviation, and population proportion. • To teach students techniques of estimations.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	72	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**	**48**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**24**
5.	**Others (specify)**	**0**
Total		**72**

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

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Describe the moment generating function, the joint probability mass functions, and joint probability density functions.**	**K1, K2**	**4 lecture hours\week**	**Direct: Regular Exams**
1.2	**Define the confidence intervals on the mean, variance, standard deviation and on a population proportion.**	**K1, K2**	• **2 tutorial hours\week** • **Self-study**	**Direct:** • **Assignments** • **Short Quizzes**
2.0	**Skills**			
2.1	**Develop techniques of problem solving.**	**S1, S2**	• **Some lab hours per term** • **Real-life problems**	**Direct:** • **Lab Quiz** • **Participations**
2.2	**Communicate mathematics clearly and precisely both orally and in writing.**	**S3**	**Self-study**	**Direct: Short Quizzes**
2.3	**Use Internet in searching for scientific information**	**S2**	**Real-life problems**	**Direct: Participations**

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.4	**Calculate out orally and mentally.**	**S3**	**Self-study**	**Direct: Short Quizzes**
3.0	**Values, autonomy, and responsibility**			
3.1	**Work individually.**	**V1, V2**	**Personal questions**	**Direct: Participation**
3.2	**Work in groups.**	**V1, V2**	**Team work**	**Direct: Homework and Mini-projects**

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.	**10**
2.	**Sampling distributions and the central limit theorem:** Sampling distributions, Sampling Distributions of the Means, The chi-square distribution, The t distribution, The F distribution	**10**
3.	**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	**10**
4.	**Sampling Distributions and The Central Limit Theorem:** Sampling Distributions related to the Normal Distribution; The Central Limit Theorem; A proof of the Central Limit Theorem.	**10**
5.	**Estimation: Point estimation:** The Bias and Mean Square Error of Point Estimation; Some Common Point Estimators; Evaluating The goodness of a Point Estimator	**10**
6.	**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.	**12**
7.	**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.	**10**
Total		**72**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	HomeWorks, Quizzes, Mini projects	During the trimester	10%
2.	First Midterm	Week 4-5	25%
3.	Second Midterm	Week 7-8	25%
4	Final Exam	Week 13	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. ***Probability & Statistics for Engineers & Scientists***, 9th Edition, R. Walpole, R. Myers, S. Myers, K. Ye, Pearson Education International, 2012. ISBN 9780321629111. **(Main Reference).** 2. ***Introduction to Mathematical Statistics***, 6th Edition, Robert V. Hogg, Joseph McKean, Allen T. Craig, Prentice Hall, 2005. **(Main Reference).**
Supportive References	1. ***Mathematical Statistics with Applications,*** 7th Edition, D. Wackerly, W. Mendenhall, R.L. Scheaffer, Brooks/Cole-Cengage Learning, 2008. ISBN-13: 9780495385080. 2. ***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.
Electronic Materials	None
Other Learning Materials	None

2. Required Facilities and equipment

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

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**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**
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		

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.	**17/1445**
DATE	**12/06/1445 (25/12/2023)**

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	**Linear Algebra and Differential Equations**
Course Code:	**MAT 1224**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V 1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
5 (4 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 covers matrix theory and linear algebra, emphasizing topics useful in other disciplines. Linear algebra is a branch of mathematics that studies systems of linear equations and the properties of matrices. The concepts of linear algebra are extremely useful in physics, economics and social sciences, natural sciences, and engineering. Due to its broad range of applications, linear algebra is one of the most widely taught subjects in college-level mathematics (and increasingly in high school). The laws of nature are expressed as differential equations. Scientists and engineers must know how to model the world in terms of differential equations, and how to solve those equations and interpret the solutions. This course focuses on linear differential equations and their applications in science and engineering.					
5. Pre-requirements for this course (if any)**:**					
MAT 1105					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					
After successfully completing the course, students will have a good understanding of the following topics and their applications: • Systems of linear equations; • Matrix operations, including inverses, and Block matrices; • Vector spaces; • Gram-Schmidt process; • Linear models and least-squares problems • Eigenvalues, eigenvectors, Diagonalization, and Triangulation of a matrix; • First order differential equations; • Second order differential equations.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	72	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**	48
2.	**Laboratory/Studio**	0
3.	**Field**	0
4.	**Tutorial**	24
5.	**Others (specify)**	0
Total		**72**

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 basics of matrix theory.	K1, K3	4 lecture hours\week	Direct: Regular Exams
1.2	Recall vector spaces and linear transformations	K1	• 2 tutorial hours\week • Self-study	Direct: Short Quizzes
1.3	Describe techniques for solving first order differential equations, second order differential equations with constant coefficients	K3	• 4 lecture hours\week	Direct: Regular Exams
2.0	**Skills**			
2.1	Compute inverses of matrices	S3	• Self-study • Real-life problems	Direct: • Participations • Short Quizzes

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.2	Apply orthonormalization to bases	S3	Self-study	Direct: Participations
2.3	Implement different types of first order differential equations	S3	Real-life problems	Direct: Short Quizzes
2.4	Outline linear second order differential equations	S3	Self-study	Direct: Participations
3.0	**Values**			
3.1	Generate initiatives with independence.	V1, V2	Personal questions	Direct: Participation
3.2	Develop personal values and attributes such as honesty, empathy and respect for others.	V1, V2	Teamwork and class discussions.	Direct: Homework and Mini projects

C. Course Content

No	List of Topics	Contact Hours
1	**Matrices and Gauss Elimination:** Solving linear systems, matrix notation, augmented matrix of a linear system, row and row reduced echelon form a matrix, Gaussian and Gauss-Jordan Elimination. Algebra of matrices, Inverse of a square matrix, Transpose of a matrix. Determinants and their properties. Determinant by cofactor expansions. Cramer's Rule.	20
2	**Vector Spaces:** Vectors in R2 and R3. Dot product, norm, angle and distance, orthogonal vectors. General vector spaces and subspaces. Linear combinations. Linear dependence and independence. Spanning sets, Basis and dimension of a vector space.	10
3	**Eigenvalues and eigenvectors:** Eigenvalues and eigenvectors of a square matrix, characteristic polynomial of a square matrix, and basis of eigenvector subspace, Diagonalization, Triangulation, and Matrix power.	12
4	**First order differential equations:** First order differential equations. Separable equations, Integrating factor. Substitution methods, exact equations, Bernoulli equations, homogeneous differential equations	15
5	**Second order linear differential equations with constant coefficients, general solution of homogeneous second order linear differential equation, particular solution of non-homogeneous equation, The undetermined coefficients and variation of constants methods.**	15
	Total	**72**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	HomeWorks, Quizzes, Mini projects	During the term	10%
2.	First Midterm	Week 4-5	25%
3.	Second Midterm	Week 7-8	25%
4.	Final Exam	Week 12	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	• Gareth Williams, Linear Algebra with Applications, (Jones & Bartlett Learning, LLC), 8th Edition, 2014 (for the first part, Chapters 1-4) • Denis G. Zill, A First Course in Differential Equations with Modeling Applications, 10th Edition, Brooks/Cole, Cengage Learning, 2013 (for the second part, Chapters 5-6)
Supportive References	1. Elementary Linear Algebra; 11th edition; H.Anton, C. Rorres, Wiley, 2014. 2. Linear Algebra with Application; 5th Edition; W.K. Nicholson, McGraw-Hill, 2006. 3. Fundamentals of Differential Equations; 9th Edition, R. Kent Nagle, Edward B. Saff, Arthur David Snider, Pearson, 2017.
Electronic Materials	None
Other Learning Materials	None

2. Required Facilities and equipment

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.	**17/1445**
Date	**12/06/1445 (25/12/2023)**

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	**Statistical Package**
Course Code:	**STA 1240**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (2 Lectures, 2 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:					
Using the statistical tools and the program codes in the statistical software packages, including Excel, Minitab, SPSS and R. Topics include creating and managing data files, graphical presentation – summary statistics, hypotheses testing.					
5. Pre-requirements for this course (if any):					
STA 1105					
6. Co-requisites for this course (if any):					
None					
7. Course Main Objective(s):					
Students after completing the course will have: • To familiarize students with basic Statistical packages such as EXCEL, MINITAB, SPSS and R. • To illustrate the importance of the Statistical packages and how to use it to calculate several statistical computations. • To study the properties of each package, show the statistical tools and the differences between them. • To illustrate how to use each package for analyzing different data sets and explain how can interpret the results and write the statistical reports					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	72	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	24
2.	Laboratory/Studio	24
3.	Field	0
4.	Tutorial	24
5.	Others (specify)	0
Total		72

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

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Describe discrete and continuous distributions and compute sums and partial sums of numerical series and integrals.	K2	Lecture strategy, Laboratory	Direct: Regular Exams, Assignments, Lab exam
1.2	Define random sample from different statistical distributions	K3	Lectures, problem-solving, Classroom discussions	Direct: Regular Exams, Assignments, Lab exam
2.0	Skills			
2.1	Use statistical packages in data analysis and mathematical manipulations of matrices.	S1, S3	Lecturing, Interactive learning.	Direct: Projects, Exams, Homework
2.2	Compute some statistical and mathematical metrics such as the average, mean and average variance of means of several groups of data.	S1, S3	Lecturing, Interactive learning.	Direct: Projects, Exams, Homework
3.0	Values, autonomy, and responsibility			
3.1	Perform tasks with responsibility	V1	Interactive learning, Group	Direct: Lab exam, Assignments

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
			interaction, Problem solving.	
3.2	Construct collaborations with others.	V1	Group interaction, Problem solving.	Direct: Assignments and Mini projects

C. Course Content

No	List of Topics	Contact Hours
1.	Provide general concepts on the course and an overview of statistical programs.	6
2.	Descriptive statistics and Statistical tests using excel. Sampling and random number generation in Excel.	6
3.	Introduction to Minitab. Descriptive statistics using Minitab.	6
4.	Statistical tests using Minitab. Correlation and regression using Minitab.	6
5.	Introduction to SPSS.	6
6.	Descriptive statistics using SPSS. Statistical tests using SPSS.	7
7.	Introduction to R. Statistical and mathematical functions in R.	7
8.	Descriptive statistics using R.	7
9.	Statistical distributions in R.	7
10.	Statistical tests using R.	7
11.	Applications, Programming and simulation.	7
Total		72

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework's, Quizzes, Mini-projects	During the term	10%
2.	First Midterm	Week 4-5	25%
3.	Second Midterm (Lab Exam)	Week 7-8	25%
4.	Final Exam	Week 13	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. **MINITAB Manual, Michael Evans;** W.H. Freeman and Company, 2009. 2. **Excel Data Analysis: Modeling and Simulation;** Hector Guerrero, Springer, 2019. 3. **IBM SPSS Statistics 23 Step by Step: SPSS Survival Manual: A Simple Guide and Reference;** 14th Edition, Darren George, Paul Mallery, Routledge, Taylor & Francis, 2016. 4. **A Beginner's Guide to R; Alain F. Zuur, Elena N. Ieno, Erik H. W. G. Meesters,** Springer Science Business Media, 2009.
Supportive References	
Electronic Materials	**Websites on the internet that are relevant to the topics of the course.**
Other Learning Materials	**Multi-media associated with the text book and the relevant websites.**

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ **Each classroom should be equipped with a whiteboard and a projector.** ▪ **Laboratories should be equipped with computers and an internet connection.**
Technology equipment (projector, smart board, software)	**The rooms should be equipped with data show and Smart Board.** **All computers should be equipped with the following software:** ▪ **Microsoft Excel 365** ▪ **IBM SPSS** ▪ **R-Project** ▪ **MATLAB** ▪ **Minitab**
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.**

Assessment Areas/Issues	Assessor	Assessment Methods
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.	**17/1445**
DATE	**12/06/1445 (25/12/2023)**

Course Specification

(Bachelor)

Course Title:	**Principles of Microeconomics**
Course Code:	**ECO 1206**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Economics**
College:	**Business**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 Lectures, 0 Lab, 2 Tutorials)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (Level 5 / Year 2)					
4. Course general Description:					
This course deals with the basic principles related to the economic concepts of microeconomics, and focuses on clarifying the nature of economics, its methodology and analytical tools, and explains the concept of the economic problem and its causes. The course also includes a study of the basics of supply and demand, market balance and the concept of elasticities. The course also discusses consumer behavior analysis and behavior analysis. The product (production units) through analyzing production relationships and production costs, in addition to discussing the facility's offer in different markets. The course provides the student with some topics that are required to be studied to obtain some professional certificates, such as: - Chartered Financial Analyst (CFA) certification - Certified Economic Analyst (ICCE) certificate					
5. Pre-requirements for this course (if any):					
None					
6. Co-requisites for this course (if any):					
None					
7. Course Main Objective(s):					
The course aims to learn the basic principles of microeconomic theory, which is concerned with studying the economy at the unit level. The course aims to enable the student to understand and analyze economic issues at the micro level. The course topics include introducing economics and economic problems, the production possibilities curve, demand and supply, market equilibrium, elasticity of demand. Supply, consumer balance and producer balance, production costs, different forms of market structures and conditions, and product balance in these markets. Through these topics, the student can understand the economic issues surrounding him.					

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**	**36**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**24**
5.	**Others (specify)**	**0**
Total		60

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

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Recall basic concepts and principles of various basic economic theories related to microeconomics.**	**K1**	▪ **Lectures** ▪ **self-education** ▪ **Brain storming** ▪ **Group discussion** ▪ **Provide real-life examples**	**Direct:** ▪ **Quarterly tests.** ▪ **Oral questions.** ▪ **Assignments.** ▪ **The final test**
1.2	**Identify the foundations and principles of interpreting the behavior of economic decision units and determining the equilibrium situation in the market.**	**K2**	▪ **Lectures** ▪ **Group discussion** ▪ **Provide real-life examples**	**Direct:** ▪ **Quarterly tests.** ▪ **Oral questions.** ▪ **Assignments.** ▪ **The final test**
2.0	**Skills**			
2.1	**Use microeconomic theories to explain the concepts of elasticity and its relationship to producer and consumer behavior**	**S2**	▪ **Lectures** ▪ **Brain storming** ▪ **Group discussion** ▪ **Provide real-life examples**	**Direct:** ▪ **Quarterly tests.** ▪ **Assignments** ▪ **Share.** ▪ **The final test**
2.2	**Apply mathematical and graphical methods to determine market, consumer, and producer equilibrium.**	**S2**	▪ **Lectures** ▪ **self-education** ▪ **Brainstorming** ▪ **Group discussion** ▪ **Provide real-life examples**	**Direct:** ▪ **Quarterly tests.** ▪ **Oral questions.** ▪ **Assignments.** ▪ **The final test**

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
2.3	Evaluate cases of market equilibrium and the balance of both consumer and producer in the market.	S2	▪ Lectures ▪ Group discussion. ▪ Provide real-life examples	Direct: ▪ Quarterly tests. ▪ Oral questions. ▪ Assignments. ▪ The final test
3.0	**Values, autonomy, and responsibility**			
3.1	Organize his duties within a framework of independence and cooperation with the work team.	V2	▪ Collaborative learning. ▪ Exercises and case studies. ▪ Research project	Direct: ▪ Providing presentations and research ▪ Group projects

C. Course Content

No	List of Topics	Contact Hours
1.	The concept of economics and the difference between micro and macro economics	3
2.	The economic problem and the role of economic systems in solving it	3
3.	Production capabilities of society	5
4.	The theory of demand, supply, and market equilibrium.	12
5.	Elasticities of demand and supply	7
6.	Explaining theory of consumer behavior and deriving demand curves	10
7.	Production in the short term	5
8.	Costs in the short term	5
9.	Product equilibrium in a perfectly competitive market	5
10.	Producer equilibrium in a perfect monopoly market	5
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Participation and assignments	continuous	%10
2.	First semester test	6th week	%25
3.	Second semester test	10th week	%25
4.	Final test	13th week	%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	**Principles of Microeconomics Dr. Saud Al-Mutair (in Arabic)**
Supportive References	**Principles of Microeconomics Dr. Majid Al-Munif (in Arabic)** **N. Gregory Mankiw (2021). Principles of Microeconomics 9th Edition, Cengage Learning, Inc.**
Electronic Materials	**None**
Other Learning Materials	**None**

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	**Classrooms** **Computer laboratories**
Technology equipment (projector, smart board, software)	**Classrooms with projectors (DATA SHOW)**
Other equipment (depending on the nature of the specialty)	**Electronic educational platforms (BLACKBOARD)**

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**Students**	▪ **Indirect** **(Results of the student evaluation survey for the course. Student views obtained from students verbally, in writing, or via email. Students' comments on the course in the college student forum)**
	▪ **Course coordinators** ▪ **Program leadership**	▪ **Direct** **(At the end of each semester, the course coordinator prepares a course report that summarizes the positives and negatives and identifies the changes**

Assessment Areas/Issues	Assessor	Assessment Methods
		that are recommended to be taken to develop the course. Communicate with graduates and employees)
Effectiveness of Students assessment	▪ **Program leadership** ▪ **Students**	▪ **Direct (benchmarking)** ▪ **Indirect (poll)**
Quality of learning resources	▪ **Faculty members**	▪ **Direct (Direct assessment of students, exchange of results with other departments and colleges)**
The extent to which CLOs have been achieved	▪ **Faculty members** ▪ **Course coordinators** ▪ **program leadership** ▪ **The students**	▪ **Direct (Periodic review of course vocabulary, course reports)** ▪ **Indirect (Student opinion poll)**
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**ECONOMICS DEPARTMENT COUNCIL**
REFERENCE NO.	**14**
DATE	**21/5/1445**

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	Computer Programming for Science
Course Code:	CS 1248
Program:	Bachelor of Science in Actuarial and Financial Mathematics
Department:	Mathematics and Statistics
College:	Science
Institution:	Imam Mohammad Ibn Saud Islamic University
Version:	2023 – V1
Last Revision Date:	None

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (4)					
4 (3 Lectures, 2 labs, 0 Tutorials)					
2. Course type					
A.	☐University	☒ College	☐Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (Level 5 / Year 2)					
4. Course general Description:					
The course introduces essential computer programming skills and knowledge that are required for students in the different fields of studies. Topics include algorithms and problem-solving strategies, control statements (sequence, selection, and repetition), fundamental data types, data structures, and introduction to object-oriented programming. The course uses Python programming language, which is the preferable choice for science and data analysis due to its huge collection of libraries and built-in data Visualization and analysis tools.					
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 purpose of this course is to provide key programming skills and techniques that enable students to design solutions to nontrivial problems and implement those solutions in Python programming language. The course aims to teach students how to write computer programs, debug and fix errors, use data Visualization and analysis tools in python, and execute programs to solve problems.					

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**	**36**
2.	**Laboratory/Studio**	**24**
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	Describe the uses of primitive and compound data types in programming languages	**K2**	Lectures Class Exercises Lab Tutorials	Direct: Written exams and assignments
1.2	Identify problem-solving strategies	**K2**	Lectures Class Exercises Lab Tutorials	Direct: Written exams and assignments
1.3	Recall the compile-time and run-time errors in programming languages	**K2**	Lectures Class Exercises Lab Tutorials	Direct: Written exams and assignments, and lab exams
2.0	**Skills**			
2.1	Develop, and test a program that implements an algorithm using the appropriate fundamental programming constructs	**S2**	Class Tutorials Lab Tutorials Lectures	Direct: Written and lab exams
2.2	Analyze the syntax errors to execute the program and achieve intended objectives	**S2**	Class Tutorials Lab Tutorials Lectures	Direct: Written and lab exams
2.3	Implement functions, object-oriented concepts, and python tools to solve particular problem	**S2**	Class Tutorials Lab Tutorials Lectures	Direct: Written and lab exams

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
3.0	**Values, autonomy, and responsibility**			
3.1	Debate effectively in a team to achieve computer programming tasks	**V1**	Tutorials Lectures Group assignments	Direct: Group Project and lab assignments

C. Course Content

No	List of Topics	Contact Hours
1.	**Algorithms & Problem Solving**	**5**
2.	**Data Types, Variables, Operators**	**5**
3	**Conditional Control Structures**	**5**
4	**Iterative control Structures**	**5**
5	**Defining Functions**	**5**
6	**Strings, lists, list comprehensions**	**5**
7	**Recursion**	**5**
8	**Tuples, dictionaries, common python mistakes**	**5**
9	**Classes and Objects**	**5**
10	**Data Visualisation in Python**	**5**
11	**Data Analysis Tools in Python**	**10**
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Quizzes/ Assignments**	**2, 5, 7, 9**	**20%**
2.	**Lab Exams**	**6**	**10%**
3.	**Midterm Exam**	**8**	**20%**
4.	**Group Project**	**11**	**10%**
5.	**Final Exam**	**Final Week**	**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	Gowrishankar S, Veena A, 2018, "Introduction to Python Programming", 1st Edition, CRC Press. ISBN-13: 978-0815394372
Supportive References	Jake VanderPlas, 2016, "Python Data Science Handbook: Essential Tools for Working with Data", 1st Edition, O'Reilly Media. ISBN-13: 978-1491912058 Downey, Allen, Jeffrey Elkner, and Chris Meyers. How to Think Like a Computer Scientist: Learning with Python. Green Tea Press, 2002, ISBN: 9780971677500 Yves Hilpisch (2019) Python for Finance: Mastering Data-Driven Finance 2nd Edition.
Electronic Materials	A gentle introduction to programming using python (https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-189-a-gentle-introduction-to-programming-using-python-january-iap-2011/) Blackboard Learning Management System
Other Learning Materials	**None**

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms (or conference video call for girls) with at least 35 seats and teaching board. Computer programming lab with at least 35 PC and required software (operating system, Python, Editors, … etc).
Technology equipment (projector, smart board, software)	Projector, and smart boards
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	1. Students feedback (collected through surveys) as per university policy/procedure 2. Teacher's Course report
Effectiveness of Students assessment	Students Instructors	1.Faculty Members Survey

Assessment Areas/Issues	Assessor	Assessment Methods
		2. Students feedback (collected through surveys) as per university policy/procedure 3. Teacher's Course report
Quality of learning resources	Students	1. Students feedback (collected through surveys) as per university policy/procedure 2. Teacher's Course report
The extent to which CLOs have been achieved	Students Instructors Course Coordinator	1. Faculty Members Survey 2. Students feedback (collected through surveys) as per university policy/procedure 3. Teacher's Course report 4. Course Report
Other	**None**	

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**CS QUALITY COMMITTEE**
REFERENCE NO.	**CS1249-V1**
DATE	**18-DECEMBER-2023**

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	**Introduction to Regression**
Course Code:	**STA 1221**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 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 5 / Year 2					
4. Course general Description:					
In statistics, linear regression is a fundamental technique to approach linearly of statistical modelling, in which we aim to model a response variable using one or more explanatory variables. This course covers the broad class of linear regression models, which are widely used in practice by using basic example data set. The course aims to teach how to formulate such models and fit them to data, how to make predictions with associated measures of uncertainty, and how to select appropriate explanatory variables. Both theory and practical aspects are covered, including the use of computer software for regression.					
5. Pre-requirements for this course (if any)**:**					
STA 1205					
6. Co-requisites for this course (if any)**:**					
None.					
7. Course Main Objective(s):					
Regression analysis consists of a collection of techniques used to explore and understand the relationship between variables and is perhaps the most widely used and most useful of all the techniques in modern Statistics. The objectives of this course are: • **to help students to have a firm understanding of the underlying theory.** • **to learn the tools needed to carry out statistical regression analysis in a variety of applications.** • **to provide students with facility and experience in regression model building, evaluation, and analysis using a modern computer approach.** .					

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**	36
2.	**Laboratory/Studio**	0
3.	**Field**	0
4.	**Tutorial**	24
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	**Outline the concept of linear regression model and properties of model parameters for prediction purposes.**	**K1, K2**	**3lecture hours\week**	**Direct: Regular Exams**
1.2	**Define regression analysis and its limitations.**	**K2, K3**	• **2 tutorial hours\week** • **Self-study**	**Direct: Short Quizzes**
2.0	**Skills**			
2.1	**Analyze procedures of statistical inference for linear**	**S1, S2**	• **Self-study** • **Real-life problems**	**Direct:** • **Participations** • **Short Quizzes**

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	regression models.			
2.2	**Differentiate the situation where linear regression is appropriate**	**S2**	**Self-study**	**Direct: Participations**
2.3	**Interpret statistical outputs.**	**S3**	**Real-life problems**	**Direct: Short Quizzes**
2.4	**Construct linear regression models with the appropriate software.**	**S2**	**Self-study**	**Direct: Participations**
2.5	**Implement advanced methods in regression analysis for applications.**	**S2, S3**	**Self-study**	**Direct: Participations**
3.0	**Values, autonomy, and responsibility**			
3.1	**Use ethical concepts and rules to determine viable alternatives in any given situation.**	**V2**	**Personal questions**	**Direct: Participation**
3.2	**Show findings and results with others.**	**V2**	**Teamwork and class discussions.**	**Direct: Homework and Mini projects**

C. Course Content

No	List of Topics	Contact Hours
1.	**Introduction to Regression Analysis:** Regression Models. Formal uses of regression analysis. The data base.	7
2.	**The Simple Linear Regression Model:** The model description; Assumption and interpretation of model parameters; Last square formulation; Partitioning total variability; Test of hypothesis on a slope and intercept; Quality of fitted model; Confidence interval on mean response and prediction intervals; A look at a residual.	13
3.	**Selection of Variables:** Contribution of a variable in the model; Forward selection and backward elimination; Stepwise procedure; All possible subsets and other techniques of selection variables.	12
4.	**Relations:** Binary Relations, Reflexive, Symmetric, antisymmetric, and Transitive Relations, Equivalence Relations, Equivalence Classes, and Partitions, The Order Relations.	16

5.	**Statistical diagnostics:** Analysis of residual; Diagnostic plots; Detection of outliers; Influence diagnostics.	12
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Homework's, Quizzes, Mini projects**	**During the term**	**10%**
2.	**First Midterm**	**Week 4-5**	**25%**
3.	**Second Midterm**	**Week 7-8**	**25%**
4.	**Final Exam**	**Week 13**	**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. ***Classical and Modern Regression with Applications***; 2nd Edition, Raymond H. Myers, Duxbury Classic, 2000. ISBN-13: 978-0534380168. **(Main Reference)** 2. ***Regression Modeling with Actuarial and Financial Applications***; Edward W. Frees, Cambridge University Press, 2010. ISBN-13 978-0-521-13596-2. **(Main Reference)**
Supportive References	1. ***Regression analysis by example,*** 5th Edition, Samprit Chatterjee and Alis S. Hadi, Wiley Series in Probability and Statistics, 2012. 2. ***Applied Regression,*** 4th Edition, Sanford Weisberg, Wiley Series in Probability and Statistics, 2013. 3. ***Applied Regression Analysis and Multivariable Methods***, 5th Edition, D. G. Kleinbaum, L. L. Kupper, A. Nizam, and E. S. Rosenberg, Cengage Learning, 2013. 4. ***Introduction to Linear Regression Analysis*, 5th Edition;** Douglas C. Montgomery, Elizabeth A. Peck, and G. Geoffrey Vining, Wiley Series in Probability and Statistics, 2012.
Electronic Materials	**Regression Analysis, Theory, Methods and Applications**, A Sen and M. Srivastava, Springer-Verlag, 1990. (it can be download from IMAMU domain)
Other Learning Materials	• Online Linear Regression Calculator • linear regression (UC Business Analytics R Programming Guide)

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ Each classroom should be equipped with a whiteboard and a projector. ▪ Laboratories should be equipped with computers and an internet connection.
Technology equipment (projector, smart board, software)	The rooms should be equipped with data show and Smart Board. All computers should be equipped with the following software: Microsoft Excel, IBM SPSS, R-Project, MATLAB, Minitab
Other equipment (depending on the nature of the specialty)	See the attached file

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.	17/1445
DATE	12/06/1445 (25/12/2023)

Course Specification

(Bachelor)

Course Title:	**Principles of Macroeconomics**
Course Code:	**ECO 1207**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Economics**
College:	**Business**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 Lectures, 0 Lab, 2 Tutorials)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (Level 6 / Year 2)					
4. Course general Description:					
The Principles of Macroeconomics course is taught at 2nd year, semester 4. This course is mainly concerned with study of macroeconomics in terms of its definition, methods of analysis and policies. Therefore, the course deals with Understanding measuring Gross Domestic Product, explaining the relationship between income and expenditure, studying the relationship between inflation and unemployment and explaining the tools of fiscal and monetary policy.					
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 familiarize students with the basic macroeconomic theories and policies as well as the instruments of these policies.					

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**	**36**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**24**
5.	**Others (specify)**	**0**
Total		60

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

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Recall basic concepts and principles of various basic economic theories related to macroeconomics.**	**K1**	▪ **Lectures** ▪ **self-education** ▪ **Brain storming** ▪ **Group discussion** ▪ **Provide real-life examples**	**Direct:** ▪ **Quarterly tests.** ▪ **Oral questions.** ▪ **Assignments.** ▪ **The final test**
1.2	**Identify the foundations and principles of interpreting the behavior of economic decision units and determining the equilibrium situation related to Saudi economy.**	**K2**	▪ **Lectures** ▪ **Group discussion** ▪ **Provide real-life examples**	**Direct:** ▪ **Quarterly tests.** ▪ **Oral questions.** ▪ **Assignments.** ▪ **The final test**
2.0	**Skills**			
2.1	**Analyze economic models to calculate equilibrium income, interpret the results, and provide appropriate solutions.**	**S2**	▪ **Lectures** ▪ **Brain storming** ▪ **Group discussion** ▪ **Provide real-life examples**	**Direct:** ▪ **Quarterly tests.** ▪ **Assignments** ▪ **Share.** ▪ **The final test**
2.2	**Interpret economic data and information and how to use them in drawing economic policies.**	**S2**	▪ **Lectures** ▪ **self-education** ▪ **Brainstorming** ▪ **Group discussion** ▪ **Provide real-life examples**	**Direct:** ▪ **Quarterly tests.** ▪ **Oral questions.** ▪ **Assignments.** ▪ **The final test**
2.3	**Create research projects in economics and communicates**	**S2**	▪ **Lectures** ▪ **Group discussion.** ▪ **Provide real-life examples**	**Direct:** ▪ **Quarterly tests.** **Direct:** ▪ **Oral questions.**

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
	effectively with others in various economic fields.			▪ Assignments. ▪ The final test
3.0	Values, autonomy, and responsibility			
3.1	Organize his duties within a framework of independence and cooperation with the work team.	V2	▪ Collaborative learning. ▪ Exercises and case studies. ▪ Research project	Direct: ▪ Providing presentations and research ▪ Group projects

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to Macroeconomics - differences between macro and microeconomics -Tools of macroeconomic analysis - macroeconomics policies	5
2.	Methods of measuring GDP - Income Approach - expenditure Approach - Product Approach	8
3.	Income and Spending - Consumption Spending - Investment Spending - Government Spending - Externa Sectors	8
4.	Income Equilibrium - Income Equilibrium in closed economy - Income Equilibrium in open economy	9
5.	The MULTIPLIER - concept of multiplier - How the multiplier works - Types of multiplier	8
6.	Aggregate Supply - equilibrium between Aggregate Supply and Aggregate demand - stagflation; supply side - stagflation; demand side	5
7.	Inflation and Unemployment	8
8.	Macroeconomics policies - fiscal policy - monetary policy	9
	Total	60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Participation and assignments	continuous	%10
2.	First semester test	6th week	%25
3.	Second semester test	10th week	%25
4.	Final test	13th week	%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	***Principles of Macroeconomics***, N. Gregory Mankiw, Cengage Learning, 2017. (Main Reference) ISBN: 978-1305971509. ***Principle of macroeconomics***, Mohammed A. Al-Jarrah, Ahamd A. Almohaimied (in arabic).
Supportive References	Principle of macroeconomics, Dr. Faiz Alhabib
Electronic Materials	(/http://www.stats.gov.sa) (/https://www.mof.gov.sa) https://www.mof.gov.sa)
Other Learning Materials	None

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms Computer laboratories
Technology equipment (projector, smart board, software)	Classrooms with projectors (DATA SHOW)
Other equipment (depending on the nature of the specialty)	Electronic educational platforms (BLACKBOARD)

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	▪ Indirect

Assessment Areas/Issues	Assessor	Assessment Methods
		(Results of the student evaluation survey for the course. Student views obtained from students verbally, in writing, or via email. Students' comments on the course in the college student forum)
	▪ Course coordinators ▪ Program leadership	**▪ Direct (At the end of each semester, the course coordinator prepares a course report that summarizes the positives and negatives and identifies the changes that are recommended to be taken to develop the course. Communicate with graduates and employees)**
Effectiveness of Students assessment	**▪ Program leadership ▪ Students**	**▪ Direct (benchmarking) ▪ Indirect (poll)**
Quality of learning resources	**▪ Faculty members**	**▪ Direct (Direct assessment of students, exchange of results with other departments and colleges)**
The extent to which CLOs have been achieved	**▪ Faculty members ▪ Course coordinators ▪ program leadership ▪ The students**	**▪ Direct (Periodic review of course vocabulary, course reports) ▪ Indirect (Student opinion poll)**
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	ECONOMICS DEPARTMENT COUNCIL
REFERENCE NO.	14
DATE	21/5/1445

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	Introduction to Operations Research
Course Code:	MAT 1254
Program:	Bachelor of Science in Actuarial and Financial Mathematics
Department:	Mathematics and Statistics
College:	Science
Institution:	Imam Mohammad Ibn Saud Islamic University
Version:	2023 – V1
Last Revision Date:	None

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 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 6 / Year 2					
4. Course general Description:					
This course describes the most important ideas, theoretical results, and examples of an introduction to operations research. The course includes the essential fundamentals of linear and integer programming. The emphasis is on calculations, and some applications are mentioned.					
5. Pre-requirements for this course (if any)**:**					
MAT 1224					
6. Co-requisites for this course (if any)**:**					
None.					
7. Course Main Objective(s):					
After finishing this course, the student should be able to formulate a real problem with a linear program (if possible) and to solve it with the appropriate method (Simplex algorithm, special algorithms for transportation or assignment problems, or algorithms for integer programming) by hand (if possible) or by using TORA software.					

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	36
2.	Laboratory/Studio	0
3.	Field	0
4.	Tutorial	24
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 a Linear Programming Problem and its formulation.	K1	• 3 lecture hours\week • 2 tutorial hours\ week Self-study	Direct: • Regular Exams • Assignments • Short Quizzes
1.2	Recall techniques of operations research including Linear Programming, Assignment Problem. Integer programming, simplex, duality and sensitive analysis.	K3	• 3 lecture hours\week • 2 tutorial hours\week • Self-study	Direct: • Regular Exams • Assignments • Short Quizzes
2.0	Skills			
2.1	Produce solutions for real-life problems by applying the methodology and tools of Operations Research including Linear Programming, Assignment Problem. Integer programming, simplex, duality and sensitive analysis.	S3	Self-study Real-life problems	Direct: Participations Short Quizzes
2.2	Construct by using mathematical language understandable operational research problems from the verbal description of the real system.	S3	Self-study Real-life problems	Direct: Participations Short Quizzes
2.3	Use TORA software to solve operations research problems.	S3	Self-study Real-life problems	Direct: Participations Short Quizzes
2.4	Analyze linear programming problems using appropriate techniques and optimization solvers.	S3	Self-study Real-life problems	Direct: Participations Short Quizzes
3.0	Values, autonomy, and responsibility			
3.1	Generate initiatives with independence.	V2	Class discussion	Direct: Participation
3.2	Debate in groups.	V2	Class discussion Teamwork	Direct: Homework and Mini projects

C. Course Content

No	List of Topics	Contact Hours
1.	**Introduction to Linear programming:** Overview, Linear programming formulations, Graphical Linear Programming Solution, Graphical Sensitivity analysis.	8
2.	**The Simplex Method:** Standard Linear Programming, Determination of Basic Feasible Solutions; The Simplex Algorithm.	8
3.	**Special Cases of the Simplex:** Degeneracy, Alternative optimum, Unbounded solution, Infeasibility.	6
4.	**Duality and Sensitivity Analysis:** Formulation of the Dual Problem, Relationship between Optimal Primal and Optimal Dual Solutions, Economic interpretation of Duality, Dual Simplex and Sensitivity Analysis.	10
5.	**Special linear programming models:** The transportation model, The assignment model, Application to the Traveling Salesman Problem.	8
6.	**Introduction to Integer Linear Programming:** Illustrative applications, Branch and Bound algorithm.	10
7.	**Tora Software:** Use of TORA software to solve exercises and problems from all course chapters.	10
Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Home-works, Quizzes, Mini-projects	During the term	10%
2.	First Midterm	Week 4-5	25%
3.	Second Midterm	Week 7-8	25%
4.	Final Exam	Week 13	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	***Operations Research: An Introduction***, H. Taha, Prentice Hall, 8th Edition, 2006. **(Main Reference)**
Supportive References	***Introduction to Operations Research***, F. Hillier and G. Lieberman, 7th Edition, McGraw Hill, 2001. ***Operations Research: Applications and Algorithms***; 3rd Edition, Wayne L. Winston, Inc. Thomson Learning, 2004.
Electronic Materials	None
Other Learning Materials	None

2. Required Facilities and equipment

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

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	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.	17/1445
Date	12/06/1445 (25/12/2023)

2023
TP-153

Course Specification

(Bachelor)

Course Title:	**Analysis of Variance for Actuaries**
Course Code:	**STA 1222**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 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 6 / Year 2					
4. Course general Description:					
The course covers the concepts of experimental design, single factor experiment, analysis of variance rationale, randomized complete block design, ANOVA rationale, factorial experiment, fixed model, random model, mixed model, EMS rules, the pseudo-F-test, and repeatability and reproducibility for a Measurement System.					
5. Pre-requirements for this course (if any)**:**					
STA 1221					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					
This course will introduce students: • **To know how the statistical procedures in this course (ANOVA, Correlation, and Multiple Regression) are related to other statistical procedures (Chi square, Discriminant Analysis, t-test and Canonical Analysis).** • **To know the type of data required to do the statistical procedures of this course (correlation, multiple regression, ANOVA).**					

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**	**36**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**24**
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 problem and plan experiment.**	**K1, K2**	**Lectures, problem solving, Classroom discussions**	**Direct: Regular Exams, Assignments, Lab Quiz**
1.2	**List the main assumptions of ANOVA, and how to identify violations of the assumptions of ANOVA.**	**K1, K3**	**Lectures, problem solving, Classroom discussions**	**Direct: Regular Exams, Assignments, Lab Quiz**
1.3	**Outline the components of a two-way ANOVA table and the meaning of sums of squares for rows, columns, and interaction in terms of cell, marginal, and expected means.**	**K2, K3**	**Lectures, problem solving, Classroom discussions**	**Direct: Regular Exams, Lab Assignments, Lab Quiz**
2.0				
2.1	**Analyze experiments involving multi-group and factorial designs**	**S1, S2**	**Lecturing, Interactive learning.**	**Direct: Assignments, Lab Quiz**
2.2	**Interpret analysis of variance (ANOVA) models including conditions and assumptions.**	**S2, S3**	**Lecturing, Interactive learning.**	**Direct: Assignments, Lab Quiz**
2.3	**Justify an appropriate ANOVA model for a given experimental design**	**S2, S3**	**Lecturing, Interactive learning.**	**Direct: Assignments, Lab Quiz**

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.4	**Use the statistical software to carry out the ANOVA analysis.**	**S1, S3**	**Use of statistical software, Lecturing, Interactive learning.**	**Direct: Lab Quiz, Assignments, Practical exam**
3.0	**Values, autonomy, and responsibility**			
3.1	**Argue ethical concepts and rules to determine viable alternatives in any given situation.**	**V2**	**Interactive learning, Group interaction, Problem solving.**	**Direct: Lab Quiz, Practical exam, Assignments**
3.2	**Show findings and discuss the results with others.**	**V2**	**Group interaction, Problem solving.**	**Direct: Assignments and Mini projects**

C. Course Content

No	List of Topics	Contact Hours
1.	**Single-Factor Experiments with No Restrictions on Randomization:** Introduction. Analysis of Variance Rationale. After ANOVA--What? Tests on Means. Confidence Limits on Means. Components of Variance. Checking the Model.	10
2.	**Single-Factor Experiments:** Randomized Block and Latin Square Designs: Introduction. Randomized Complete Block Design. ANOVA Rationale. Missing Values. Latin Squares. Interpretations. Assessing the Model. Graeco-Latin Squares. Extensions.	14
3.	**Factorial Experiments:** Introduction. Factorial Experiments: An Example. Interpretations. The Model and Its Assessment. ANOVA Rationale. One Observation Per Treatment.	12
4.	**Fixed, Random, and Mixed Models:** Introduction. Single-Factor Models. Two-Factor Models. EMS Rules. EMS Derivations. The Pseudo-F Test. Expected Mean Squares Via Statistical Computing Packages. Repeatability and Reproducibility for a Measurement System.	12
5.	**Single-Factor Experiments with No Restrictions on Randomization:** Introduction. Analysis of Variance Rationale. After ANOVA--What? Tests on Means. Confidence Limits on Means. Components of Variance. Checking the Model.	12
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework's, Quizzes, Mini projects	During the term	10%
2.	First Midterm	Week 4-5	25%
3.	Second Midterm	Week 7-8	25%
4.	Final Exam	Week 13	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	***Fundamental Concepts in the Design of Experiments***, 5th Edition, Charles R. Hicks, Kenneth V. Turner, Oxford University Press, 1999. ISBN-13: 9780195122732. ***A Student's Guide to Analysis of Variance***; Maxwell Roberts, Riccardo Russo, Routledge, Taylor & Francis Group, 1999. ISBN-13: 9780415165655.
Supportive References	1- ***Design and Analysis of Experiments***; 7th Edition, Douglas C. Montgomery, John Wiley & Sons Inc, 2005. ISBN-13: 9780470169902. 2- ***Applied Linear Statistical Models***; 5th Edition, Chris J. Nachtsheim, Kutner, Chris Nachtsheim, John Neter, Mike Kutner, William Li, McGraw-Hill College, 2005. ISBN-13: 9780073108742. 3- ***A First Course in Design and Analysis of Experiments***; 1st Edition, Gary W. Oehlert, W H Freeman & Co, 2000. ISBN-13: 9780716735106.
Electronic Materials	**http://www.statsoft.com/textbook/stathome.html** **http://mathworld.wolfram.com/**
Other Learning Materials	**None**

2. Required Facilities and equipment

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.** **All computers should be equipped with the following software: Microsoft Excel, IBM SPSS, R-Project, MATLAB, Minitab**
Other equipment (depending on the nature of the specialty)	**See the Attached File**

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	• **Students** • **Second assessor**	**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**
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		

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.	**17/1445**
DATE	**12/06/1445 (25/12/2023)**

2023
TP-153

Course Specification
(Bachelor)

Course Title:	**Financial Mathematics**
Course Code:	**MAT 1374**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

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

2. Teaching mode (mark all that apply)

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

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	36
2.	Laboratory/Studio	0
3.	Field	0
4.	Tutorial	24
5.	Others (specify)	0
Total		60

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

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Define the interest rate, annuities, problem of interest, accumulation function, future value, current value, present value, discount factor, convertible m-thly, nominal rate, effective rate, inflation and real rate of interest, force of interest, equation of value.	K2, K3	●3 lecture hours\week ●2 tutorial hours\week Self-study	Direct: ●Regular Exams ●Assignments Short Quizzes
1.2	Describe the price, book value, amortization of premium, accumulation of discount, redemption value, par value/face value, yield rate, coupon.	K2, K3	●3 lecture hours\week ●2 tutorial hours\week Self-study	Direct: ●Regular Exams ●Assignments Short Quizzes
2.0	Skills			
2.1	Appraise real-life financial problems	S1, S2	●Self-study	Direct: ●Participations

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

C. Course Content

No	List of Topics	Contact Hours
1.	**The measurement of interest:** Introduction. The accumulation and amount functions. The effective rate of interest. Simple interest. Compound interest. Present value. The effective rate of discount. Nominal rates of interest and discount. Forces of interest and discount. Varying interest.	10
2.	**Solution of problems in interest:** Introduction. The basic problem. Equations of value. Unknown time. Unknown rate of interest. Determining time periods. Practical examples.	8

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

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework's, Quizzes, Mini projects	During the term	10%
2.	First Midterm	Week 4-5	25%
3.	Second Midterm	Week 7-8	25%
4.	Final Exam	Week 13	40%

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

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	***Theory of Interest,*** 3rd Edition, Stephen Kellison, McGraw-Hill Education, 2009.
Supportive References	***Blyth, S.*** *2013. An Introduction to Quantitative Finance.* ***Translated by M. Aba Oud****, Riyadh: IMAMU Press, 2019.* ***Schaum's Outline of Mathematics of Finance****, Revised Edition,* 2nd Edition, McGraw-Hill Education, 2011.

	Introduction to mathematical finance, D. Heath and G. Swindle (Eds), American Mathematical Society, 1999.
Electronic Materials	**None**
Other Learning Materials	**None**

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ **Each 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 and assessment, Quality of learning resources	**Students**	**During the semester and at the end of the course each student will complete two evaluation forms.**
Extent of achievement of course learning outcomes, Quality of learning resources	**Instructor**	**At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.**
Other	**None**	

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	MATHEMATICS AND STATISTICS DEPARTMENT COUNCIL
REFERENCE NO.	17/1445
DATE	12/06/1445 (25/12/2023)

Course Specification

(Bachelor)

Course Title:	Introduction to Financial Accounting
Course Code:	ACC 1319
Program:	Bachelor of Science in Actuarial and Financial Mathematics
Department:	Accounting
College:	College of Business
Institution:	Imam Mohammad Ibn Saud Islamic University
Version:	**2023 - V1**
Last Revision Date:	None

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 Lectures, 0 Lab, 2 Tutorials)					
2. Course type					
A.	☐University	☐College	☐ Department	☐Track	☒ Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: Level 7 / Year 3					
4. Course general Description:					
The main topics covered in this course include: The main objective of accounting and main concepts and principles, the accounting system and its components and how it works: The Accounting Cycle (Journalizing double entry, posting to ledger, preparing trial balance and financial statements), financial statements for merchandising business, interest rates and time value of money, accounting for current assets (cash, receivables, inventory), PP&E and current liabilities, cash flow statement and financial statements analyses.					
5. Pre-requirements for this course (if any)**:**					
None					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					
By completing this course students should be able to: 1. Explain nature of accounting, its branches, and the accounting system components. 2. Apply the recognition and measurement rules. 3. Process the accounting cycle (journalize transactions, post to ledger and prepare trial balance) 4. Prepare financial statements in services and merchandising businesses. 5. Apply measurement techniques for assets and liabilities. 6. Analyse financial data in an accounting sense and interpret results					

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**	**36**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**24**
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 basic concepts of assets, liabilities, equity, income, and expenses	K1, K2	- Lectures. - Presentations	Direct: - Mid-term and Final Exams - Assignments
1.2	Describe basic assumptions and principles of financial accounting.	K2, K3	- Lectures. - discussions -Self-education. - Presentations	Direct: - Mid-term and Final Exams Assignments
2.0	**Skills**			
2.1	Use appropriate technical methods Compose problems associated with recording and posting operations, as well as treatments of current assets, PP&E and current liabilities.	S2	Lectures - Create a hypothetical company case and allocate groups into different tasks to complete the accounting cycle - Learning in small groups (cooperative education)	Direct: - Participations and discussions inside the class - assignments - quizzes and mid-term tests - The final test
2.2	Show accounting information in the financial statements of service and commercial business	S2	Lectures, discussions and self-learning. Allocating students	Direct: - Participations and discussions inside the class - assignments

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	in a way that suits the users' needs.		to groups to solve practical cases.	- quizzes and mid-term tests - The final test - Evaluating the teamwork as a whole, and the contribution of each member
2-3	Choose appropriate technical methods to analyse financial ratios	S2	Lectures, discussions and self-learning. Allocating students to groups to make financial statement analyses and interpret results.	Direct: - Participations and discussions inside the class - assignments - quizzes and mid-term tests - The final test
3.0	**Values, autonomy, and responsibility**			
3.1	Debate effectively within a collective teamwork	V2	Brainstorming through discussions and group work in the class and through other group assignments outside class.	Direct: Participation in the classroom, as well as individual and group assignments

C. Course Content

No	List of Topics	Contact Hours
1.	The accounting objectives, concepts, accounting system and financial reporting.	7
2.	Accounting Cycle and financial statements preparation	11
3.	Financial statements of Merchandising business	5
4.	Interest rates and time value of money	3
5.	Accounting for Current assets (cash, notes receivables and inventories)	12
6.	Accounting for PP&E (Fixed assets).	7
7.	Accounting of current liabilities.	3
8.	Presentation of cash flow statements	5
9.	Financial ratios analysis and risk-return analysis	7
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments, participation and teamwork	During the term	10%
2.	Mid-term (1)	5	25%
3.	Mid-term (2)	10	25%
4.	Final Exam	12-13	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	Financial Accounting, 9th edition: Global Edition: International Financial Reporting Standards, 2013. By Harison, Walter T., Horngren Charles T. and Thomas, C. William, and Suwady, Themin. Published by PEARSON Education, 2013. ISBN 027377807.
Supportive References	Accounting Principles, 12th Edition, 2015. By Weygandt, Kimmel, and Kieso. Published by Wiley, 2015. ISBN 1118969901. Financial Reporting Standards (IFRS)
Electronic Materials	tadawul.com.sa www.socpa.org.sa
Other Learning Materials	None

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms (40-student capacity) Computer Lab.
Technology equipment (projector, smart board, software)	Blackboard platform
Other equipment (depending on the nature of the specialty)	Data-Show and internet connection

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirectly: through questioners

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of Students assessment	Program leaders, teaching staff and students	Indirectly: through questionnaires. Directly by reviewing the evaluation methods and amending them at the department level.
Quality of learning resources	Program leaders and teaching staff	Directly through the course report prepared by the coordinators and the discussions at the Department Council.
The extent to which CLOs have been achieved	teaching staff	Directly through measuring CLOs

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**ACCOUTING DEPARTMENT COUNCIL**
REFERENCE NO.	**14**
DATE	**21/5/1445**

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification

(Bachelor)

Course Title:	**Statistical Methods for Actuaries**
Course Code:	**STA 1335**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 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 7 / Year 3					
4. Course general Description:					
In statistics, estimation theory is fundamental to analyze real as well as simulated data. The course covers basic concepts of random samples, principle of data reduction, methods of finding estimators, methods of evaluating estimators, unbiased estimators, methods of finding tests, methods of evaluating tests, most powerful tests, interval estimations, confidence coefficient or level, Bayesian procedure methods of evaluating interval estimators, maximum likelihood method.					
5. Pre-requirements for this course (if any):					
STA 1222					
6. Co-requisites for this course (if any):					
None					
7. Course Main Objective(s):					
The main objective of this course will be to integrate mathematical statistics. Specifically, this course will further develop estimation theory (point and interval) estimation and tests of hypotheses, including hypothesis testing, information approach to hypothesis testing, uniformly most powerful and likelihood ratio tests.					

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**	36
2.	**Laboratory/Studio**	0
3.	**Field**	0
4.	**Tutorial**	24
5.	**Others (specify)**	0
Total		60

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

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Describe the notions of point estimation and interval estimation and different methods of finding and evaluating interval estimators.**	**K1, K2**	**Lectures, problem solving, Classroom discussions**	**Direct: Regular Exams, Assignments, Practical exam**
1.2	**Define the concepts of random sample, principle of data reduction, best unbiased estimator, likelihood ratio test, and the maximum likelihood test.**	**K1, K3**	**Lectures, problem-solving, Classroom discussions**	**Direct: Regular Exams, Assignments, Practical exam**
2.0	**Skills**			
2.1	**Use Bayes formula to find the posterior, knows the concepts of a prior and posterior distribution, and understands the concept of a conjugate prior distribution**	**S1, S2**	**Lecturing, Interactive learning.**	**Direct: Assignments, Practical exam**
2.2	**Analyze properties of estimators.**	**S1**	**Lecturing, Interactive learning.**	**Direct: Assignments, Practical exam**
2.3	**Choose optimal estimators.**	**S1, S2**	**Lecturing, Interactive learning.**	**Direct: Assignments, Practical exam**

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.4	**Implement methods of statistical inference for discrete data in the appropriate software.**	**S3**	**Lecturing, Interactive learning.**	**Direct: Assignments, Practical exam**
3.0	**Values, autonomy, and responsibility**			
3.1	**Generate initiatives with independence.**	**V2**	**Interactive learning, Group interaction, Problem solving.**	**Direct: Practical exam, Assignments**
3.2	**Debate meaningfully and productively with others.**	**V2**	**Group interaction, Problem solving.**	**Assignments and Mini projects**

C. Course Content

No	List of Topics	Contact Hours
1.	**Introduction:** Probability distributions, Exponential Families, Locations and Scale Families. Central limit theorem.	**5**
2.	**Random Sample:** Basic Concepts of Random Samples. Order Statistics. Convergence Concepts.	**5**
3.	**Principles of Data Reduction:** Introduction. The Sufficiency Principle. The Likelihood Principle. The Equivariance Principle.	**10**
4.	**Point Estimation:** Introduction. Methods of Finding Estimators. Methods of Evaluating Estimators. Best Unbiased Estimator or Uniform Minimum Variance Unbiased Estimator, The Cramer-Rao Inequality, Attaining the Lower Bound. The Rao-Blackwell Theorem, Characterizing Best Unbiased Estimators.	**10**
5.	**Hypothesis Testing:** Introduction. Methods of Finding Tests. Methods of Evaluating Test. Most Powerful Tests: The Neyman-Pearson Lemma, Karlin-Rubin Theorem, The Likelihood Ratio Test, Union and Intersection Tests.	**10**
6.	**Interval Estimation:** Introduction. Methods of Finding Interval Estimators. Methods of Evaluating Interval Estimators. Confidence Coefficient or Level, Procedures based on Hypothesis Test Rejection Regions, on Pivotal Quantities, CDFs, Bayesian Procedures Methods of Evaluating Interval Estimators: Length, Optimality via Test Equivalence, Bayesian Optimality, Optimality via Loss Functions.	**10**
7.	**Maximum Likelihood Methods:** Maximum Likelihood Estimation, Rao-Cramér lower Bound and Efficiency, Maximum Likelihood Test.	**10**
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	HomeWorks, Quizzes, Mini projects	During the term	10%
2.	First Midterm	Week 4-5	25%
3.	Second Midterm	Week 7-8	25%
4.	Final Exam	Week 13	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	***Statistical Inference,*** Roger L. Berger, George Casella, Duxbury Press, 2001. (Main Reference) ISBN: 978-0534243128
Supportive References	1- ***Mathematical Statistics with Applications,*** Richard L. Scheaffer, Dennis D. Wackerly, William Mendenhall, Duxbury Press (Thomson Brooks), 2007. 2- ***Theory of Point Estimation;*** E. L. Lehmann, George Casella, Springer Texts in Statistics (STS), Springer, 1998.
Electronic Materials	None
Other Learning Materials	None

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ Each classroom should be equipped with a whiteboard and a projector. ▪ Laboratories should be equipped with computers and an internet connection.
Technology equipment (projector, smart board, software)	The rooms should be equipped with data show and Smart Board. All computers should be equipped with the following software: Microsoft Excel, IBM SPSS, R-Project, MATLAB, Minitab.
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.	**17/1445**
DATE	**12/06/1445 (25/12/2023)**

Course Specification

(Bachelor)

Course Title:	Introduction to Managerial Accounting
Course Code:	ACC 1320
Program:	Bachelor of Science in Actuarial and Financial Mathematics
Department:	Accounting
College:	College of Business
Institution:	Imam Mohammad Ibn Saud Islamic University
Version:	**2023 - V1**
Last Revision Date:	None

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 Lectures, 0 Lab, 2 Tutorials)					
2. Course type					
A.	☐University	☐College	☐ Department	☐Track	☒ Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: Level 8 / Year 3					
4. Course general Description:					
This course is an introduction, the aim of which is to enable the student to become familiar with the role of accounting in the administrative process and the extent of its ability to provide appropriate accounting information for making various decisions.					
5. Pre-requirements for this course (if any)**:**					
None					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					
The student's familiarity with the role of accounting in the administrative process and the extent of its ability to provide appropriate accounting information for making various decisions, analysing costs and their deviations for various purposes, studying different cost systems, dealing with the analysis and planning tools necessary for making management decisions, differential analysis and evaluating alternatives for making management decisions, and preparing budgets, And the use of performance evaluation tools in the modern automated environment.					

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**	**36**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**24**
5.	**Others (specify)**	**0**
Total		**50**

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 basic concepts related to the fields of management accounting	K1, K2, K3	- Lectures. - Presentations	Direct: -Mid-term and Final Exams - Assignments
2.0	**Skills**			
2.1	Use appropriate technical methods, such as cost functions and differential analysis, to help management solve problems related to planning, control, and decision-making processes.	S2	Lectures - Create a hypothetical company case and allocate groups into different tasks to complete the accounting cycle - Learning in small groups (cooperative education)	Direct: - Participations and discussions inside the class - assignments - quizzes and mid-term tests - The final test - Evaluating the teamwork as a whole, and the contribution of each member
2.2	Show accounting information related to planning budgets and performance evaluation processes in a way that suits the needs of facility management for use in the areas of	S2	Lectures, discussions and self-learning. Allocating students to groups to solve practical cases.	Direct: - Participations and discussions inside the class - assignments - quizzes and mid-term tests Direct: - The final test

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	planning and performance evaluation.			
3.0	**Values, autonomy, and responsibility**			
3.1	Debate effectively within a collective teamwork	V2	Brainstorming through discussions and group work in the class and through other group assignments outside class.	Direct: Allocating a portion of the grades for the student's participation in the classroom, as well as evaluating individual and group assignments

C. Course Content

No	List of Topics	Contact Hours
1.	Overview of Managerial Accounting	4
2.	Managerial Accounting Concepts and Cost behaviour analysis	6
3.	Cost-Volume-Profit Relationships	6
4.	Standard Costing and Variance	8
5.	Job Order Costing	9
6.	Relevant Costs and Decision Making	9
7.	Planning and Budgeting	9
8.	Performance evaluation	9
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments, participation and teamwork	During the term	10%
2.	Mid-term (1)	5	25%
3.	Mid-term (2)	10	25%
4.	Final Exam	12-13	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	Horngren, "Cost Accounting, A Managerial Emphasis," Part One and Part Two, sixteenth edition, translated by the Saudi Organization for Certified Public Accountants.
Supportive References	None
Electronic Materials	None
Other Learning Materials	None

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms (40-student capacity) Computer Lab.
Technology equipment (projector, smart board, software)	Blackboard platform
Other equipment (depending on the nature of the specialty)	Data-Show and internet connection

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirectly: through questioners
Effectiveness of Students assessment	Program leaders, teaching staff and students	Indirectly: through questionnaires. Directly by reviewing the evaluation methods and amending them at the department level.
Quality of learning resources	Program leaders and teaching staff	Directly through the course report prepared by the coordinators and the discussions at the Department Council.
The extent to which CLOs have been achieved	teaching staff	Directly through measuring CLOs

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	ACCOUTING DEPARTMENT COUNCIL
REFERENCE NO.	14
DATE	21/5/1445

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	**Financial Management**
Course Code:	**FIN 1331**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Finance**
College:	**Business**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 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 8 / Year 3					
4. Course general Description:					
This course presents the basic principles of financial management and applies those principles to some of the major decisions facing a corporation. Valuation is a central theme in finance, so we spend much of the course learning to value 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):					
At the end of this course, students should be able to: 1. Perform an NPV analysis of a proposed investment project. This involves deriving the free cash flow generated by the project and specifying the required rate of return. 2. Apply the principles that link the concepts of required (minimum acceptable) rate of return and risk to investment analysis, for both corporate and personal investment. In other words, students should leave this course with a better understanding of how corporations make financial decisions, and better prepared to think about their personal finances.					

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**	**36**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**24**
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 the fundamental concepts and tools of finance.	K2	4 lecture hours\week	Direct: Regular Exams
1.2	Define financial management concepts and tools to the decisions faced by a manager in investment decisions.	K2	• 2 tutorial hours\week • Self-study	Direct: Short Quizzes
1.3	Describe financial management concepts and tools.	K3	• Real-life problems	Direct: Regular Exams
2.0	**Skills**			
2.1	Use the corporate governance structure of firms and the interactions between firm management, financial markets and stakeholders.	S1, S2	• Self-study • Real-life problems	Direct: • Participations • Short Quizzes
2.2	Appraise the risk profile of firms; specifically, the costs of capital, including debt and equity capital using financial data.	S3	Self-study	Direct: Participations
2.3	Apply the operations of three distinct capital markets: the equity market, the bond market and the derivatives market, and the financial assets traded in each of these markets.	S2	Real-life problems	Direct: Short Quizzes

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.4	Interpret the global financial environment and the globalization process experienced by multinational corporations.	S3	Self-study	Direct: Participations
3.0	Values, autonomy, and responsibility			
3.1	Debate with independence and in work team.	V1, V2	Personal questions	Direct: Participation
3.2	Develop personal values and attributes such as honesty, empathy and respect for others.	V1, V2	Teamwork and class discussions.	Direct: Homework and Mini projects

C. Course Content

No	List of Topics	Contact Hours
1.	The Role of the Financial Manager, Corporate Governance, Financial Statements.	12
2.	Analysis FINANCIAL MANAGEMENT, Time Value of Money: Intro Reading, Time Value of Money: Multiple CFs.	12
3.	Capital Budgeting, Capital Budgeting continued, Risk & Return	12
4.	Case Study Final Presentation and Submission. To be confirmed Measuring Risk, The Cost of Capital (WACC), Interest Rates	12
5.	Bonds: Introduction and Valuation, Stock: Introduction and Valuation	12
Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework's, Quizzes, Mini projects	During the term	10%
2.	First Midterm	Week 4-5	25%
3.	Second Midterm	Week 7-8	25%
4.	Final Exam	Week 13	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	Berk, DeMarzo, & Harford (2015). Fundamentals of Corporate Finance, Global Edition, Pearson. England.
Supportive References	1- Agarwal, J. D. 1994. Readings in Financial Management . IIF Publication 2-Alexander Hamilton Institute. 1998. Financial Management Handbook , 1st ed. Global Books and Subscription Services. 3-Ayla, Kayhan, and Sheridan Titman. 2004. "Firms' Histories and Their Capital Structures." NBER Working Papers 10526. National Bureau of Economic Research Inc. 4-Brigham, Eugene F., and Michael C. Ehrhardt. 2002. Financial Management , 10th ed. Thomson Learning.
Electronic Materials	**None**
Other Learning Materials	**None**

2. Required Facilities and equipment

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**

Assessment Areas/Issues	Assessor	Assessment Methods
		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	FINANCE DEPARTMENT COUNCIL
REFERENCE NO.	
DATE	14/11/1445

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	**Mathematics of financial derivatives**
Course Code:	**AFM 1333**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 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 8 / Year 3					
4. Course general Description:					
This course consists in understanding the concept of Derivatives and its types, be familiar with the knowledge of Options and Futures and knowing about Hedging strategies of some derivatives.					
5. Pre-requirements for this course (if any)**:**					
MAT 1374.					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					
Understanding the role of a list of frequently used derivatives and how to implement them in hedging some risks.					

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**	36
2.	**Laboratory/Studio**	0
3.	**Field**	0
4.	**Tutorial**	24
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 different types of derivatives and their roles	K2, K3	4 lecture hours\week	Direct: Regular Exams
1.2	Define about pricing methods of derivatives.	K2, K3	• 2 tutorial hours\week • Self-study	Direct: Short Quizzes
2.0	**Skills**			
2.1	Use financial derivatives, their various features and various types, like forward, futures, options, Swaps, convertible, warrants, etc.	S1, S2	• Self-study • Real-life problems	Direct: • Participations • Short Quizzes
2.2	Analyze forward contract and its various features.	S3	Self-study	Direct: Participations
2.3	Apply different approaches of pricing financial derivatives like Black-Scholes method and Binomial tree method.	S2	Self-study	Direct: Participations
2.4	Construct hedging strategies using individual or basket of financial derivatives.	S3	Self-study	Direct: Participations
3.0	**Values, autonomy, and responsibility**			
3.1	Debate with independence and in work team.	V1, V2	Personal questions	Direct: Participation
3.2	Develop personal values and attributes such as honesty, empathy and respect for others.	V1, V2	Teamwork and class discussions.	Direct: Homework and Mini projects

C. Course Content

No	List of Topics	Contact Hours
1.	Forward contracts: Basics of Financial Derivatives, Forward Contracts, Participants in Derivative Markets, Recent Developments in Global Financial Derivative Markets.	15
2.	Options: Basics of Options, Fundamental Determinants of Option's Price, Options Trading Strategies, Interest rate swaps, Currency Swaps.	15
3.	Futures: Futures Market, Pricing of Futures, Theories of Futures Prices.	15

4.	Hedging process: Hedging Strategy Using Futures, Basis Risk and Hedging, Stock Index.	15
Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework's, Quizzes, Mini projects	During the term	10%
2.	First Midterm	Week 4-5	25%
3.	Second Midterm	Week 7-8	25%
4.	Final Exam	Week 13	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	***Gupta S.L.,*** *FINANCIAL DERIVATIVES THEORY, CONCEPTS AND PROBLEMS PHI, Delhi, Kumar S.S.S. FINANCIAL DERIVATIVES, PHI, New Delhi, 2007.* **(Main Reference)**
Supportive References	• ***Blyth, S.*** *2013. An Introduction to Quantitative Finance.* ***Translated by M. Aba Oud****, Riyadh: IMAMU Press, 2019.* • ***Chance, Don M:*** *DERIVATIVES and Risk Management Basics, Cengage Learning, Delhi.*
Electronic Materials	None
Other Learning Materials	None

2. Required Facilities and equipment

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

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**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.	**17/1445**
DATE	**12/06/1445 (25/12/2023)**

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification

(Bachelor)

Course Title:	**Actuarial Contingencies (1)**
Course Code:	**AFM 1341**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 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 9 / Year 3					
4. Course general Description:					
This course describes the applied mathematical and statistical methods to the systematic observation of natural events to assess the risk of events occurring and help formulate policies that minimize this risk and its financial impact on companies and clients.					
5. Pre-requirements for this course (if any):					
MAT 1374.					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
The objective of actuarial contingencies is to assess and quantify the financial implications of uncertain events or contingencies that may impact an organization's future obligations or risks. Actuarial contingencies typically involve the estimation of future cash flows, liabilities, or potential losses arising from events such as accidents, natural disasters, or legal claims.					

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**	**36**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**24**
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 fundamental concepts and principles of actuarial science, particularly in the context of contingencies**	**K3**	**4 lecture hours\week**	**Direct: Regular Exams**
1.2	**Describe proficiency in probability theory and statistical techniques as applied to actuarial modeling and risk assessment.**	**K3**	• **2 tutorial hours\week** • **Self-study**	**Direct: Short Quizzes**
1.3	**Recall actuarial techniques to analyze and evaluate life insurance, annuity, and general insurance products, including pricing, reserving, and risk management.**	**K3**	• **Real-life problems**	**Direct: Assignments**
2.0	**Skills**			
2.1	**Analyze Skills: Actuarial contingencies courses emphasize the analysis and evaluation of complex actuarial problems.**	**S1**	• **Self-study** • **Real-life problems**	**Direct:** • **Participations** • **Short Quizzes**
2.2	**Examine problems related to contingencies**	**S2**	**Self-study**	**Direct: Participations**
2.3	**Show a solid foundation in risk assessment and management**	**S1**	**Real-life problems**	**Direct: Short Quizzes**
2.4	**Evaluate data/problems, including potentially**	**S2**	**Self-study**	**Direct:**

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	conflicting or incomplete information.			Participations
3.0	Values, autonomy, and responsibility			
3.1	Debate with independence and in work teams.	V1, V2	Personal questions	Direct: Participation
3.2	Develop personal values and attributes such as honesty, empathy and respect for others.	V1, V2	Teamwork and class discussions.	Direct: Homework and Mini projects

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to life insurance: Brief introduction on the terminology and major types of life insurance, - life annuities and pension contracts. Traditional insurance contracts- modern insurance contracts- methods of distributions - premiums.	10
2.	Survival models: Future lifetime random variable, survival function, force of mortality, international actuarial notation (IAN), expected complete and curtate future lifetime. Mean and standard deviation of T_x	10
3.	Life Tables and Selection: Life tables, fractional age assumptions (uniform distribution of deaths and constant force of mortality), life insurance, survival models for life insurance -, select & ultimate survival models, life tables and mortality trends -some comments on heterogeneity in mortality.	10
4.	Insurance Benefits: IAN and EPV (& variance) calculations for various types of life insurance with different death benefit payout timing assumptions (the continuous and annual cases)-Gross premiums-principle of the portfolio percentile premium-age rating (constant addition and constant multiple of mortality rates. Premium Calculation: EPV (& variance) of net future loss random variable, equivalence principle for net premium calculation	10
5.	Policy values: assumptions- policies with annual cash flows (the future loss random variable- policy values for policies with annual cash flows- annual profit by source- asset shares – policy values for continuous cash flows (Thieles differential equations – numerical solution of Thieles differential equations)- policy alterations -	10
6.	Multiple stat models: some examples of multiple state models (the alive dead model-functions of select lives)	10
Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework's, Quizzes, Mini projects	During the term	10%
2.	First Midterm	Week 4-5	25%
3.	Second Midterm	Week 7-8	25%
4.	Final Exam	Week 13	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). **3**-Rob Kaas, Marc Goovaerts, Jan Dhaene, Michel Denuit- Modern Actuarial Risk Theory Using R (2009), Springer **4**-Computational Actuarial Science with R, First Edition,Kindle Edition by Arthur Charpentier(Editor)(2016)
Electronic Materials	None
Other Learning Materials	None

2. Required Facilities and equipment

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

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**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.	**17/1445**
DATE	**12/06/1445 (25/12/2023)**

2023
TP-153

Course Specification
(Bachelor)

Course Title:	**Stochastic Process for Actuaries**
Course Code:	**STA 1352**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 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 9 / Year 3					
4. Course general Description:					
Markov chains are used to model many phenomena which arise in some statistical problems. The course covers an introduction to probability theory, conditional probability, and conditional expectation. Moreover, discrete time Markov chains are introduced, as well as branching processes, time reversible Markov chains, and hidden Markov chains. Then exponential distributions and the Poisson processes are defined. Finally, Continuous time Markov chains are introduced as well as their transition probability function.					
5. Pre-requirements for this course (if any):					
STA 1335					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
The course introduces students to the basic theory of probability to enable students to assimilate the properties of stochastic processes. learn how to build a Markov chain in discrete and continuous time and learn how to use the Markov chain in modelling.					

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	36
2.	Laboratory/Studio	0
3.	Field	0
4.	Tutorial	24
5.	Others (specify)	0
Total		60

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

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Describe the basics of stochastic modeling of real-world systems related to the physical sciences, computer science, and finance.	K1, K3	Lectures, problem solving, Classroom discussions	Direct: Regular Exams, Assignments, Practical exam
1.2	Define exponential distribution to model arrival times, the Poisson process, and outline its application to continuous time Markov chains	K1, K2	Lectures, problem-solving, Classroom discussions	Direct: Regular Exams, Assignments, Practical exam
1.3	Identify the concept of conditional probability, Markov chain, Branching process, Poisson process, and Birth and Death process.	K2	Lectures, problem solving, Classroom discussions	Direct: Regular Exams, Assignments, Practical exam
2.0	Skills			
2.1	Use probability and matrix theory to solve stochastic models.	S1, S2	Lecturing, Interactive learning.	Direct: Assignments, Practical exam
2.2	Evaluate stochastic process problems mathematically and using software.	S1	Lecturing, Interactive learning.	Direct: Assignments, Practical exam

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.3	**Analyze sensitive stochastic models that might occur in model variables.**	**S1, S2**	**Lecturing, Interactive learning.**	**Direct: Assignments, Practical exam**
2.4	**Interpret and explain the solution for a stochastic process application.**	**S3**	**Lecturing, Interactive learning.**	**Direct: Assignments, Practical exam**
3.0	**Values, autonomy, and responsibility**			
3.1	**Generate initiatives with independence.**	**V1**	**Interactive learning, Group interaction, Problem solving.**	**Direct: Practical exam, Assignments**
3.2	**Debate findings and results with others.**	**V1, V2**	**Group interaction, Problem solving.**	**Direct: Assignments and Mini projects**

C. Course Content

No	List of Topics	Contact Hours
1.	**Basic probability:** Random variable, Limit Theorems, Stochastic Processes.	**7**
2.	**Conditional Probability and Conditional Expectation:** Introduction, The Discrete Case, The Continuous Case, Computing Expectations by Conditioning, Computing Probabilities by Conditioning, Some Applications, An Identity for Compound Random Variables.	**12**
3.	**Markov Chains:** Introduction, Chapman–Kolmogorov Equations, Classification of States, Limiting Probabilities, Some Applications, Mean Time Spent in Transient States, Branching Processes, Time Reversible Markov Chains, Markov Chain Monte Carlo Methods, Markov Decision Processes, Hidden Markov Chains.	**13**
4.	**The Exponential Distribution and the Poisson Process:** Introduction, The Exponential Distribution, The Poisson Process, Generalizations of the Poisson Process.	**10**
5.	**Continuous-Time Markov Chains:** Introduction, Continuous-Time Markov Chains, Birth and Death Processes, The Transition Probability Function $P_{ij}(t)$, Limiting Probabilities.	**9**
6.	**Renewal Theory and Its Applications:** Introduction. Distribution of $N(t)$. Limit Theorems and Their Applications. Renewal Reward Processes. Regenerative Processes. Semi-Markov Processes. The Inspection Paradox. Computing the Renewal Function. Applications to Patterns. The Insurance Ruin Problem.	**9**
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	HomeWorks, Quizzes, Mini projects	During the term	10%
2.	First Midterm	Week 4-5	25%
3.	Second Midterm	Week 7-8	25%
4.	Final Exam	Week 13	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	• ***An Introduction to Stochastic Modeling,*** M. A. Pinsky and S. Karlin, 4th Edition, Academic Press Elsevier, 2011. • ***Introduction to Probability Models,*** S. Ross, 11th Edition, Academic Press, 2014. ISBN: 9780123756862 (Main Reference). • ***Introduction to Stochastic Processes With R,*** Robert P. Dobrow, John Wiley & Sons, Inc, 2016. (Main Reference)
Supportive References	1. ***Introduction to Probability,*** D. Bertsekas and J. Tsitsiklis, 2nd Edition; Athena Scientific, 2008. 2. ***Fundamentals of Probability with Stochastic Processes,*** 3rd Edition; Saeed Ghahramani, Prentice Hall, 2004.
Electronic Materials	None
Other Learning Materials	None

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	▪ Each classroom should be equipped with a whiteboard and a projector. ▪ Laboratories should be equipped with computers and an internet connection.
Technology equipment (projector, smart board, software)	The rooms should be equipped with data show and Smart Board. All computers should be equipped with the following software: ▪ Microsoft Excel ▪ IBM SPSS ▪ R-Project

Items	Resources
	▪ MATLAB ▪ Minitab
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.	17/1445
DATE	12/06/1445 (25/12/2023)

2023
TP-153

Course Specification
(Bachelor)

Course Title:	**Investments**
Course Code:	**FIN 1334**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Finance**
College:	**Business**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 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 9 / Year 3					
4. Course general Description:					
The focus of this course to understand and apply the principles of investing. The course covers the valuation of bonds, stocks, and options. Key applications include personal and professional portfolio management, risk management, security valuation, and capital structure, develop the following concepts: risk-return trade-offs, diversification, systematic and idiosyncratic risk, expected returns, market efficiency, performance evaluation, arbitrage, the term structure of interest rates, bond duration, and options and provide sufficient background knowledge for students seeking an overview of capital markets and an introduction to advanced finance courses.					
5. Pre-requirements for this course (if any):					
FIN 1331.					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
The objective of this course is to undertake a rigorous study of the theory and empirical evidence relevant to institutional portfolio management. The major topics treated are optimal portfolio selection; • The relation between risk and return, Market efficiency, Statistical/quantitative characterizations of asset markets; • Active and passive portfolio management; • Asset allocation; • Characteristics of quantitative allocation models • Factor models (including so-called "smart beta" and related concepts) • The behavior and performance evaluation of investment vehicles and approached including mutual funds, exchange traded funds and hedge funds.					

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**	**36**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**24**
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	K2	4 lecture hours\week	Direct: Regular Exams
1.2	Recall basic concepts and calculations to planning and control of investments	K2	• 2 tutorial hours\week • Self-study	Direct: Short Quizzes
1.3	Identify analytical models used for financial decision-making.	K3	• Real-life problems	Direct: Regular Exams
2.0	**Skills**			
2.1	Evaluate earnings and cash flow	S1, S2	• Self-study • Real-life problems	Direct: • Participations • Short Quizzes
2.2	Distinguish interest rates, bond prices, and yields	S3	Self-study	Direct: Participations
2.3	Analyze corporate and government bonds	S2	Real-life problems	Direct: Short Quizzes
2.4	Classify portfolio management, performance evaluation, and risk management	S3	Self-study	Direct: Participations
3.0	**Values, autonomy, and responsibility**			
3.1	Debate with independence and in groups.	V1, V2	Personal questions	Direct: Participation
3.2	Develop personal values and attributes such as honesty, empathy and respect for others.	V1, V2	Teamwork and class discussions.	Direct: Homework and Mini projects

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.	8
2.	Portfolio Theory and Practice, Risk, Return, and the Historical Record, Capital Allocation to Risky Assets, Efficient Diversification, Index Models.	8
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.	10
4.	Fixed-Income Securities, Bond Prices and Yields, The Term Structure of Interest Rates, Managing Bond Portfolios.	7
5.	Security Analysis, Macroeconomic and Industry Analysis, Equity Valuation Models, Financial Statement Analysis.	7
6	Options, Futures, and Other Derivatives, Options Markets: Introduction, Option Valuation, Futures Markets, Futures, Swaps, and Risk Management.	10
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.	10
Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework's, Quizzes, Mini-projects	During the term	10%
2.	First Midterm	Week 4-5	25%
3.	Second Midterm	Week 7-8	25%
4.	Final Exam	Week 13	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 ("BKM"). Investments. 10th Edition, McGraw-Hill/Irwin, 2013.

Supportive References	1- P. Bernstein. Capital Ideas: The Improbable Origins of Modern Wall Street. New York: Free Press, 1992. 2-Amihud, Y., B. Christensen and H. Mendelson, 1992, Further Evidence on the Risk-Return Relationship, Working Paper, New York University. 3-AElton, E.J. and M.J. Gruber, 1995, Modern Portfolio Theory and Investment Management, John Wiley & Sons, New York. 4-Thomas Loeb, 1983, Trading Costs: The Critical Link Between Investment Information and Results, Financial Analysts Journal, May/June 1983.
Electronic Materials	None
Other Learning Materials	None

2. Required Facilities and equipment

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

Assessment Areas/Issues	Assessor	Assessment Methods
		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	FINANCE DEPARTMENT COUNCIL
REFERENCE NO.	
DATE	14/11/1445

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	**Time Series Analysis**
Course Code:	**STA 1427**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 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 10/ Year 4					
4. Course general Description:					
In statistics, time series is a fundamental technique to study model-building strategies. The course introduces the general concept of time series and their stochastic processes, regression methods, residual analysis, models for stationary time series, autoregressive processes, models for nonstationary time series, ARIMA models, specifications of simulated time series, parameter estimations, moment, last square and maximum likelihood estimations.					
5. Pre-requirements for this course (if any)**:**					
STA 1352					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					
At the end of this course, the student will be able to compute and interpret a correlogram and a sample spectrum, derive the properties of ARMA and state-space models, and choose an appropriate ARIMA model for a given set of data and fit the model using an appropriate package.					

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**	**36**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**24**
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 concept of time series and its decomposition in the trend part and stochastic part.**	**K1, K2**	**Lectures, problem solving, Classroom discussions.**	**Direct: Regular Exams, Lab Assignments, Practical exams.**
1.2	**Outline stationary and nonstationary time series and the ARIMA model.**	**K2, K3**	**Lectures, problem solving, Classroom discussions.**	**Direct: Regular Exams, Lab Assignments, Practical exams.**
2.0	**Skills**			
2.1	**Interpret MA, AR, ARMA, ARIMA, and RW models.**	**S1, S2**	**Use of statistical software, Lecturing, Interactive learning.**	**Direct: Lab-Exam, Assignments, Practical exams.**
2.2	**Construct nonlinear stochastic models.**	**S1, S2**	**Lecturing, Interactive learning.**	**Direct: Assignments, Practical exams.**
2.3	**Evaluate stationary in time series.**	**S2, S3**	**Lecturing, Interactive learning.**	**Direct: Assignments,**

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
				Practical exams.
2.4	**Justify the fitted trend and seasonal trend to the data.**	**S3**	**Use of statistical software, Lecturing, Interactive learning.**	**Direct: Lab-Exam, Assignments, Practical exams.**
2.5	**Produce basic calculations and summaries of time series data.**	**S3**	**Use of statistical software, Lecturing, Interactive learning.**	**Direct: Lab-Exam, Assignments, Practical exams.**
3.0	**Values, autonomy, and responsibility**			
3.1	**Generate the formulated conclusions.**	**V2**	**Interactive learning, Group interaction, Problem solving.**	**Direct: Lab-Exam, Practical exams, Assignments.**
3.2	**Debate in groups.**	**V2**	**Group interaction, Problem solving.**	**Direct: Assignments and Mini projects.**

C. Course Content

No	List of Topics	Contact Hours
1.	**Fundamental Concepts:** Examples of Time Series, A Model-Building Strategy, Time Series Plots in History, Time Series and Stochastic Processes, Means, Variances, and Covariances, Stationary.	**12**
2.	**Trends:** Deterministic Versus Stochastic Trends, Estimation of a Constant Mean, Regression Methods, Reliability and Efficiency of Regression Estimates, Interpreting Regression Output, Residual Analysis.	**12**
3.	**Models for Stationary Time Series:** General Linear Processes, Moving Average Processes, Autoregressive Processes, The Mixed Autoregressive Moving Average Model, Invertibility	**6**
4.	**Models for Nonstationary Time Series:** Stationarity Through Differencing, ARIMA Models, Constant Terms in ARIMA Models, Other Transformations.	**12**
5.	**Model Specification:** Properties of the Sample Autocorrelation Function, The Partial and Extended Autocorrelation Functions, Specification of Some	**6**

	Simulated Time Series, Nonstationarity, Other Specification Methods, Specification of Some Actual Time Series.	
6.	**Parameter Estimation:** The Method of Moments, Least Squares Estimation, Maximum Likelihood and Unconditional Least Squares, Properties of the Estimates, Illustrations of Parameter Estimation, Bootstrapping ARIMA Models.	**12**
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**HomeWorks, Quizzes, Mini projects.**	**During the term**	**10%**
2.	**First Midterm.**	**Week 4-5**	**25%**
3.	**Second Midterm.**	**Week 7-8**	**25%**
4.	**Final Exam.**	**Week 13**	**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	▪ ***Time Series Analysis with application in R***, Jonathan D. Cryer and Kung-Sik Chan. (2nd Edition) Springer 2008. ISBN: 978-0-387-75958-6 ▪ ***An Introduction to Time Series Analysis and Forecasting: With Applications of SAS® and SPSS, 1st Edition***, Robert Yaffee, Monnie McGee, Academic Press, 1996. ISBN: 9780127678702.
Supportive References	1- ***Introduction to Time Series and Forecasting***, Peter J. Brockwell, Richard A Davis, Springer, 2002. 2- ***Time Series Analysis***, James Douglas Hamilton, Princeton University Press, 1994. 3- ***The Analysis of Time Series: An Introduction***, Chris Chatfield, Publisher: Chapman and Hall/CRC, 2003.
Electronic Materials	**None**
Other Learning Materials	**None**

2. Required Facilities and equipment

Items	Resources
Facilities	▪ **Each classroom 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 a data show and Smart Board. All computers should be equipped with the following software:** ▪ **Microsoft Excel** ▪ **IBM SPSS** ▪ **R-Project** ▪ **MATLAB**
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**

Assessment Areas/Issues	Assessor	Assessment Methods
		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.	17/1445
DATE	12/06/1445 (25/12/2023)

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification

(Bachelor)

Course Title:	**Actuarial risk theory and credibility**
Course Code:	**AFM 1451**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 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 10 / Year 4					
4. Course general Description:					
This course aims at introducing the class of models for actuarial risk, including individual and collective models. It also introduces a class of models for credibility like Buhlmann and Buhlmann-Straub models.					
5. Pre-requirements for this course (if any)**:**					
STA 1335					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					
Getting a grasp of different models used separately in actuarial risk and in credibility.					

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	36
2.	Laboratory/Studio	0
3.	Field	0
4.	Tutorial	24
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 models in actuarial risk.	K2	4 lecture hours\week	Direct: Regular Exams
1.2	Describe different models in credibility.	K3	• 2 tutorial hours\week • Self-study	Direct: Short Quizzes
2.0	Skills			
2.1	Analyze some classes of utility functions used in the expected utility model.	S1, S2	• Self-study • Real-life problems	Direct: Short Quizzes
2.2	Use mixed distributions in the individual risk model.	S1	Self-study	Direct: Participations
2.3	Apply compound distributions in the collective risk model.	S2	Self-study	Direct: Short Quizzes
2.4	Appraise the Buhlmann and Buhlmann-Straub models in computing credibility parameter.	S2	Self-study	Direct: Participations
3.0	Values, autonomy, and responsibility			
3.1	Debate with independence and in groups.	V2	Personal questions	Direct: Participation
3.2	Develop personal values and attributes such as honesty, empathy and respect for others.	V2	Teamwork and class discussions.	Direct: Homework and Mini projects

C. Course Content

No	List of Topics	Contact Hours

1.	**Utility theory and insurance**. The expected utility model, Classes of utility functions, Stop-loss reinsurance.	10
2.	**The individual risk models**. Mixed distributions and risks, Convolution, Transforms, Approximations, Normal approximation, Translated gamma approximation, NP approximation, Application to optimal reinsurance.	10
3.	**Collective risk models**. Compound distributions, Convolution formula for a compound cdf, Distributions for the number of claims, Properties of compound Poisson distributions, Panjer's recursion, Compound distributions and the Fast Fourier Transform, Approximations for compound distributions, Individual and collective risk model, Loss distributions: properties, estimation, sampling, Techniques to generate pseudo-random samples, Techniques to compute ML-estimates, Poisson claim number distribution, Negative binomial claim number distribution, Gamma claim severity distributions, Inverse Gaussian claim severity distributions, Mixtures/combinations of exponential distributions, Lognormal claim severities, Pareto claim severities, Stop-loss insurance and approximations, Comparing stop-loss premiums in case of unequal variances.	20
4.	**Credibility**. The balanced Buhlmann model, More general credibility models, The Buhlmann-Straub model, Parameter estimation in the Buhlmann-Straub model, Negative binomial model for the number of car insurance claims.	20
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Homework's, Quizzes, Mini projects**	**During the term**	**10%**
2.	**First Midterm**	**Week 4-5**	**25%**
3.	**Second Midterm**	**Week 7-8**	**25%**
4.	**Final Exam**	**Week 13**	**40%**

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

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Theory Modern Actuarial Risk Using R. Rob Kaas, Marc Goovaerts, Jan Dhaene and Michel Denuit. Second Edition 2009. **(Main Reference)**

Supportive References	Risk Theory (Springer Actuarial) 1st ed. 2017 Edition, by Hanspeter Schmidli.
Electronic Materials	**None**
Other Learning Materials	**None**

2. Required Facilities and equipment

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

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**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.	17/1445
Date	12/06/1445 (25/12/2023)

Course Specification

(Bachelor)

Course	**Actuarial Lab 1**
Course Code:	**AFM 1452**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 Lectures, 2 Labs, 0 Tutorials)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (Level 10 / Year 4)					
4. Course general Description:					
The main objectives of an Actuarial Lab 1 course typically include providing students with a strong foundation in the fundamental concepts and skills required for actuarial work.					
5. Pre-requirements for this course (if any)**:**					
MAT 1244.					
6. Co-requisites for this course (if any)**:**					
None.					
7. Course Main Objective(s):					

- **Introduction to Actuarial Science: To introduce students to the field of actuarial science and its role in risk assessment, insurance, and financial planning.**
- **Mathematical Foundations: To develop students' proficiency in mathematical concepts and techniques, including calculus, probability, and statistics, which are essential for actuarial calculations.**
- **Financial Mathematics: To provide a comprehensive understanding of financial mathematics principles, including time value of money, interest rates, and annuities, and how they relate to actuarial science.**
- **Statistical Analysis: To teach students statistical methods for data analysis and interpretation, with a focus on their application to insurance and risk assessment.**
- **Excel and Software Skills: To equip students with the practical skills necessary to use spreadsheet software, such as Microsoft Excel, for actuarial modeling and data analysis.**
- **Risk Assessment: To introduce students to the fundamental principles of risk assessment and the use of probability in actuarial calculations.**
- **Foundation for Further Study: To establish a strong foundation for students to build upon in subsequent actuarial science courses and in preparation for actuarial examinations.**
- **Application to Real-World Problems: To encourage students to apply the knowledge and skills they acquire in the course to solve real-world actuarial problems and scenarios.**
- **Preparation for Actuarial Examinations: Depending on the program, some Actuarial Lab 1 courses may also aim to prepare students for actuarial certification examinations by covering relevant topics and providing practice problems.**
- **Critical Thinking and Problem-Solving: To develop critical thinking skills and problem-solving abilities that are crucial in actuarial work.**

- **Communication Skills: To help students effectively communicate actuarial findings and results to both technical and non-technical audiences.**
- **Ethical Considerations: To introduce students to the ethical principles and considerations relevant to the actuarial profession.**

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**	36
2.	**Laboratory/Studio**	24
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	Describe basic functions, matrix operations, numerical linear algebra functions, and various graphic and plotting commands.	K2, K3	Lab	Direct: Lab reports Midterm and final exam
1.2	Define operations on matrices, such as generating and modifying vectors and matrices, and constructing larger matrices from smaller ones.	K2, K3	Lab	Direct: Lab reports Midterm and final exams

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.0	Skills			
2.1	Apply a range of financial challenges by using numerical methods and financial R-packages.	S1	Problem solving Quizzes Midterm and final exams	Direct: Problem solving Quizzes Midterm and final exams
2.2	Analyze portfolios.	S3	Problem solving Quizzes Midterm and final exams	Direct: Problem solving Quizzes Midterm and final exams
2.3	Create hedging tactics, among other tasks.	S1	Problem solving Quizzes Midterm and final exams	Direct: Problem solving Quizzes Midterm and final exams
3.0	Values, autonomy, and responsibility			
3.1	Construct ethical behavior and respect different points of view.	V1	Personal questions	Direct: Participation
3.2	Debate effectively in teams.	V1	Teamwork and class discussions.	Direct: Homework and Mini projects

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to Actuarial Science	5
2.	Mathematical Foundations for Actuarial Science	5
4	Financial Mathematics	5
5	Statistical Analysis for Actuaries	5
6.	Spreadsheet Skills for Actuarial Modeling	5
7.	Risk Assessment and Probability in Actuarial Work	5
8	Introduction to Actuarial Software (if applicable)	5
9	Application of Actuarial Concepts to Real-World Problems	5
10	Communication Skills for Actuaries	5
11	Teamwork and Collaboration	5
12	Use of Information Technology in Actuarial Work	5
Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework's, Quizzes, Mini projects	During the term	10%
2.	First Midterm	Week 4-5	25%
3.	Second Midterm (Lab Exam)	Week 7-8	25%
4.	Final Exam	Week 13	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 Mathematics for Life Contingent Risks" by David C. M. Dickson, Mary R. Hardy, and Howard R. Waters. "Probability and Statistics with Applications: A Problem-Solving Text" by Leonard A. Asimow and Mark M. Maxwell. "Financial Mathematics: A Comprehensive Treatment" by Giuseppe Campolieti and Roman N. Makarov. "Principles of Risk Management and Insurance" by George E. Rejda and Michael McNamara.
Supportive References	MATLAB: MATLAB is commonly used for actuarial modeling and financial problem-solving. Students may need to use MATLAB for assignments and projects. R or Python: Some courses introduce students to programming languages like R or Python, which are valuable for data analysis and modeling in actuarial work.
Electronic Materials	None
Other Learning Materials	None

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Each classroom should be equipped with computers, 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.	**17/1445**
Date	**12/06/1445 (25/12/2023)**

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course	**Actuarial Lab 2**
Course Code:	**AFM 1453**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 Lectures, 2 Labs, 0 Tutorials)					
2. Course type					
A.	☐University	☐College	☐ Department	☐Track	☒ Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (Level 11 / Year 4)					
4. Course general Description:					
This course is designed to empower students with advanced skills in data science and statistical modeling within the context of actuarial science. Building upon the foundational concepts introduced in Actuarial Lab 1, this course delves deeper into the application of cutting-edge techniques to solve complex problems in risk management, predictive analytics, and time series analysis.					
5. Pre-requirements for this course (if any)**:**					
AFM 1452					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
1) Mastering Data Analysis with R: Students will acquire proficiency in the R programming language, covering the basics of syntax, functions, data structures, and essential programming constructs. Through hands-on exercises, they will explore data exploration techniques, including summary statistics, correlation analysis, and dimensionality reduction. **2) Statistical Inference for Actuarial Studies: The course introduces statistical inference methods crucial for actuarial studies. Students will learn point estimation using Moment and Maximum Likelihood methods, construct confidence intervals for population parameters, and engage in hypothesis testing, both parametric and non-parametric.** **3) Regression Modeling for Actuarial and Financial Applications: Students will delve into advanced regression modeling, including logistic regression, linear regression, and generalized linear models (GLMs). Frequency-severity models and fat-tailed regression models will be explored for their application in real-world scenarios.** **4) Risk Modeling and Predictive Analytics: The course covers predictive analytics using decision trees, random forests, and artificial neural networks (ANN) for big data analysis. Techniques for model evaluation, such as cross-validation, confusion matrix analysis, and various performance metrics, will be thoroughly discussed.** **5) Stochastic Processes and Time Series Analysis: Students will gain an understanding of stochastic processes, Markov chains, and time series analysis. The course explores various time series models, including autoregressive (AR), moving average (MA), and**					

autoregressive integrated moving average (ARIMA), preparing students for forecasting applications.
6) Advanced Clustering Techniques: The course introduces advanced clustering techniques, including principal component analysis, k-means, agglomerative clustering, t-SNE, and UMAP. Students will learn to identify latent sub-structures and detect anomalies in complex data sets.
7) Capstone Project and Peer Learning: Through a capstone project, students will have the opportunity to apply their knowledge to real-world scenarios. Peer learning will be encouraged through individual project presentations, fostering collaboration and the exchange of diverse perspectives.

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**	36
2.	**Laboratory/Studio**	24
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	Describe advanced functions, matrix operations, numerical linear algebra functions, and various graphic and plotting with R-commands.	K2, K3	Lab	Direct: Lab reports Midterm and final exam

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.2	Define mastering operations on matrices.	K2, K3	Lab	Direct: Lab reports Midterm and final exams
2.0	Skills			
2.1	Apply a range of Risk Modeling and Predictive Analytics by using numerical methods and financial R-packages.	S1	Problem solving Quizzes Midterm and final exams	Direct: Problem solving Quizzes Midterm and final exams
2.2	Analyze Advanced Clustering Techniques.	S3	Problem solving Quizzes Midterm and final exams	Direct: Problem solving Quizzes Midterm and final exams
2.3	Create Time Series for financial purposes.	S1	Problem solving Quizzes Midterm and final exams	Direct: Problem solving Quizzes Midterm and final exams
3.0	Values, autonomy, and responsibility			
3.1	Construct ethical behavior and respect different points of view.	V1	Personal questions	Direct: Participation
3.2	Debate effectively in teams.	V1	Teamwork and class discussions.	Direct: Homework and Mini projects

C. Course Content

No	List of Topics	Contact Hours
1.	**Actuarial Data Analysis using R:** Basics of R language (basic syntax, functions, data structures, loops, conditional statements, etc.), Data Exploration (Summary statistics, linear and non-linear correlation), Data quality, Data manipulation and cleansing, Dimensionality reduction.	8
2.	**Statistical inference for Actuarial studies:** Point estimation using Moment and Maximum likelihood methods, Comparison of estimators using their mean square error and bias or unbiasedness, Estimation of Confidence Interval of population parameters mean, variance and proportions from single (small and large-sized) sample, Estimating confidence intervals for the difference between two means from paired data, Hypothesis testing (Parametric and Non-parametric)	8
3.	**Regression Modeling with Actuarial and Financial Applications:** Logistic Regression, Linear regression, Generalized linear models (GLMs), Frequency-Severity models, Fat-Tailed Regression models,	6

4.	**Risk modeling: Predictive Analytics and Model evaluation:** Classifications with Decision trees (DTs), Random Forest, Artificial Neural Networks (ANN) for big-data, Over- or Under-fitting, Cross-validation, Confusion matrix, Accuracy, Precision, Recall, AUC-ROC, F1-score.	**8**
5.	**Stochastic Processes for Actuaries:** Random walks, Markov processes, Poisson processes, Discrete and continuous time Markov chains, Birth-Death and Yule processes, The Markov 2-State Mortality Model	**8**
6.	**Clustering:** Principal Component analysis, K-means, Agglomerative clustering, tSNE, UMAP, identifying latent sub-structures, Detecting anomalies	**8**
6.	**Time Series:** General properties of stationary, integrated, and univariate time series, basic properties of Autoregressive (AR), Moving Average (MA), Autoregressive Moving Average (ARMA) and Autoregressive Integrated Moving Average (ARIMA) time series, Simple applications of a time series model, forecasting from time series data using sample extrapolation and moving average models.	**8**
7.	**Peer learning through Capstone project presentation:** Presentations on Capstone projects (Individual) based on free-to-choose, but demonstrating the topics covered earlier.	**6**
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework's, Quizzes, Mini projects	During the term	10%
2.	First Midterm	Week 4-5	25%
3.	Second Midterm (Lab Exam)	Week 7-8	25%
4.	Final Exam	Week 13	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 Mathematics for Life Contingent Risks" by David C. M. Dickson, Mary R. Hardy, and Howard R. Waters.**

	"Probability and Statistics with Applications: A Problem Solving Text" by Leonard A. Asimow and Mark M. Maxwell. **"Financial Mathematics: A Comprehensive Treatment" by Giuseppe Campolieti and Roman N. Makarov.** **"Principles of Risk Management and Insurance" by George E. Rejda and Michael McNamara.**
Supportive References	MATLAB: MATLAB is commonly used for actuarial modeling and financial problem-solving. Students may need to use MATLAB for assignments and projects. R or Python: Some courses introduce students to programming languages like R or Python, which are valuable for data analysis and modeling in actuarial work.
Electronic Materials	**Nan**
Other Learning Materials	**Nan**

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	**Each class room should be equipped with a computers, 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)	**Nan**

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**

Assessment Areas/Issues	Assessor	Assessment Methods
		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.	17/1445
Date	12/06/1445 (25/12/2023)

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	**Actuarial Contingencies (2)**
Course Code:	**AFM 1442**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 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 11 / Year 4					
4. Course general Description:					
This course is the second part of the Actuarial Contingencies (1) course. This course describes application of multiple life functions and multiple decrement models in the actuarial context. steps involved in modelling life insurance portfolios to determine the probability of survival and death in a multiple decrement basis. In addition, a practical applications of the course through a software based assignment required for the valuation of the reserves for an individual life insurance policyholder. A software used in the actuarial field will be incorporated in the course so that students develop practical skills..					
5. Pre-requirements for this course (if any):					
AFM 1341.					
6. Co-requisites for this course (if any)**:**					
None.					
7. Course Main Objective(s):					
The main objective of this course is to provide a grounding in the principles of modelling as applied to actuarial work – focusing particularly on deterministic models which can be used to model and value cashflows that are dependent on death, survival, or other uncertain risks.					

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	36
2.	Laboratory/Studio	0
3.	Field	0
4.	Tutorial	24
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 financial markets, investment theory, interest rates, and asset-liability management.	K3	4 lecture hours\week	Direct: Regular Exams
1.2	Describe morbidity risk for health insurance and disability insurance products	K3	• 2 tutorial hours\week • Self-study	Direct: Short Quizzes
1.3	Deduce the insurance or pension business.	K3	• Real-life problems	Direct: Regular Exams
2.0	Skills			
2.1	Identify potential risks, quantifying their impact, and developing strategies for reinsurance issues.	S1, S2	• Self-study • Real-life problems	Direct: • Participations • Short Quizzes
2.2	Analyze actuaries mortality rates and life expectancy trends.	S1	Self-study	Direct: Participations
2.3	Develop complex calculations, models, and data analysis using actuarial software and tools.	S2	Real-life problems	Direct: Short Quizzes
2.4	Evaluate the potential duration of benefit payments for pension plans and annuities.	S2	Self-study	Direct: Participations

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
3.0	Values, autonomy, and responsibility			
3.1	Debate with independecnce and in work teams.	V1, V2	Personal questions	Direct: Participation
3.2	Develop personal values and attributes such as honesty, empathy and respect for others.	V1, V2	Teamwork and class discussions.	Direct: Homework and Mini projects

C. Course Content

No	List of Topics	Contact Hours
1.	Joint life and last survivor benefits: joint life notation- independent future lifetime- a multiple state model for independent future lifetimes- model with dependent future lifetimes- the common shock model-	10
2.	Pension Mathematics: the salary scale function; setting the DC contribution; the service table- valuation of benefits (final salary plans- Career average earnings plans) - funding plans	10
3.	Emerging costs for traditional life insurance: profit testing a term insurance policy(time step- profit test basis- incorporating reserves – profit signature)- profit testing principles(Assumptions-the vector of profit – the profit signature – the net present value) -profit measures (calculate the premium and reserves by using the profit test- profit testing for multiple state models.	10
4.	Participating and Universal life insurance: Participating insurance- universal life insurance (key design features- projecting account values- profit testing universal life policies (Universal life Type A- Universal life Type B- no lapse guarantees- comments on UL profit testing- Comparison between UL and whole life insurance policies.	10
5.	Emerging costs for equity linked insurance: Equity linked insurance- Deterministic profit testing for equity linked insurance- stochastic profit testing – stochastic pricing – stochastic reserving (quantile reserving – CTE reserving- comments on reserving.	10
6.	Option pricing: the " no-arbitrage" assumption – options- the binomial option pricing model (pricing over a single and two time periods)- the Black-Scholes -Merton option pricing formula.	10
Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homeworks, Quizzes, Mini-projects	During the term	10%
2.	First Midterm	Week 4-5	25%
3.	Second Midterm	Week 7-8	25%
4.	Final Exam	Week 13	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). **3**-Rob Kaas, Marc Goovaerts, Jan Dhaene, Michel Denuit- Modern Actuarial Risk Theory Using R (2009), Springer **4**-Computational Actuarial Science with R, First Edition,Kindle Edition by Arthur Charpentier(Editor)(2016)
Electronic Materials	None
Other Learning Materials	None

2. Required Facilities and equipment

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.	**17/1445**
DATE	**12/06/1445 (25/12/2023)**

Course Specification

(Bachelor)

Course Title:	Research Project
Course Code:	AFM 1499
Program:	Bachelor of Science in Actuarial and Financial Mathematics
Department:	Mathematics and Statistics
College:	Science
Institution:	Imam Mohammad Ibn Saud Islamic University
Version:	2023 – V1
Last Revision Date:	None

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A. General information about the course:

1. Course Identification

1. Credit hours:					
4					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: Level 12 / Year 4					
4. Course general Description:					
This course allows students to undertake a research project on the topic of Actuarial Sciences and/or Financial Mathematics (AFM). It gives the students an opportunity to perform a subject within the field of Actuarial Sciences and/or Financial Mathematics or related topics under supervision according to an individual study plan and independent thinking. Also, document and summarize results by writing a research report and present the results of the project.					
5. Pre-requirements for this course (if any):					
Research project course starts in the last trimester of the program study (4th year – 12thtrimester).					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
This capstone senior research project in a field of ASFM subjects aims to enable student to Evaluate, and interpret numerical, statistical and general actuarial and financial information. Moreover, it enables students to describe statistical methods for particular applications and formulate significant research questions and then to. analyze data and interpret the results using appropriate statistical methods. The final product that the student will complete is a scientific written report that explains his/her work and results. This final written report must include the Introduction, Literature Review, Research Concerns, Methodology, Findings, and Discussion and Implication. These items will be assessed by using appropriate rubrics. The final decisive requirements of the research project are: Ethical standards (according to IMSIU Standards.), Language Conventions (Proficiency), Style (scientific concepts in writing) and Layout.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	0	0%
2	E-learning	0	0%
3	Hybrid • Traditional classroom • E-learning	0	0%
4	Others (specify): weekly meetings, Readings, Discussions, Reports, and Oral Presentations	48	100%

3. Contact Hours (based on the academic trimester)

No	Activity	Contact Hours
1.	**Lectures**	0
2.	**Laboratory/Studio**	0
3.	**Field**	0
4.	**Tutorial**	0
5.	**Others (specify): weekly meeting**	48
Total		48

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	Produce a substantial research-based project	K2	Meeting and discussion	Direct: • Preliminary Reports
1.2	Transfer depth knowledge of currently active research areas in Actuarial and Financial Mathematics.	K3	• Self-study and personal work	Direct: • Written report Oral presentation (rubrics)
2.0	**Skills**			
2.1	Apply Actuarial techniques to statistical and financial data to synthesize research findings	S1, S2	• Real-life problems • discussion	Direct: • Continuous evaluation of the research by the supervisor (forms of following u) • Attendance
2.2	Evaluate research findings in written and verbal forms	S3	Self-study	Direct: • Written report Oral presentation (rubrics)
2.3	Show achievement, engagement and retention	S2	Self-study	Direct: Written report (rubrics)
2.4	Decide planning, time and change management skills	S3	Real-life problems Discussion	Direct: Oral presentation and discussions
3.0	**Values, autonomy, and responsibility**			
3.1	Generate an understanding of the	V1	Personal questions	Direct:

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	ethical issues associated with practitioner research			Attendance to weekly meeting
3.2	Develop research thinking skills as problem-solvers	V1, V2	Teamwork	Direct: Duties of parts of the project Rubrics

C. Course Content

No	List of Topics	Contact Hours
	The student undertakes supervised independent study and review of research documentation in active field of Mathematics with the guidance of the research supervisor.	48
Total		48

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	First continuous evaluation (reported by the supervisor)	4th week	20%
2.	Second continuous evaluation (reported by the supervisor)	8th week	30%
3.	Written report in English (20-35 pages)	During the trimester	50%
4.	Short talk in English language (oral presentation 15 minutes)	13th week	

*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	Students will be guided by study notes, books, research articles and original sources (or English translations where necessary), which are provided. The students will need to master the appropriate mathematics and ultimately present his /her work in the form of a final presentation. Other appropriate learning resources are possible related to the nature of the research project.
Supportive References	Subject dependent

Electronic Materials	Subject dependent
Other Learning Materials	Subject dependent

2. Required Facilities and equipment

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

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	survey
Effectiveness of Students assessment	Advisor and committee	rubrics
Quality of learning resources	Student	Survey
The extent to which CLOs have been achieved	advisor and committee	Course report and filled rubrics
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.	17/1445
DATE	12/06/1445 (25/12/2023)

Field Experience Specification

Course Title:	**Field Training**
Course Code:	**AFM 1497**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Field Experience Version Number:	**2023 – V1**
Last Revision Date:	**None**

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A. Field Experience Details:

1. Credit hours: (4).		
2. Level/year at which Field Experience is offered: (12/4).		
3. Time allocated for Field Experience activities		
(12) Weeks	(36) Days	(180) Hours
4. Corequisite (or prerequisites if any) to join Field Experience		
Student must complete at least 160 credit hours of the study program.		
5. Mode of delivery		
☒ In-person/onsite	☐hybrid (onsite/online)	☐Online

B. Field Experience Course Learning Outcomes (CLOs), Training Activities and Assessment Methods

Code	Learning Outcomes	Aligned PLO Code	Training Activities	Assessment Methods	Assessment Responsibility
1.0	**Knowledge and understanding**				
1.1	Recall knowledge of the context of the professional career before graduation.	K2	Participation with the field supervisor at workplace.	Direct: Discussion Specific rubric	Field Supervisor
1.2	Explain professional interests in related fields of actuarial and financial Mathematics.	K2, K3	Subject-based study essays written-short answer/long answer/report	Direct: Rubric of evaluation	Field Supervisor
1.3	Identify a range of opportunities for learning, development and mentoring throughout the duration of the training.	K3	Oral test Presentation Written report	Direct: Evaluate student's Discussion	Field Supervisor
2.0	**Skills**				
2.1	Apply what has been learned in classroom to real-world situations.	S1	workplace performance. Oral Presentations	Direct: Portfolio Student's diary/journal.	Field Supervisor Student Teaching staff
2.2	Create critical thinking and innovative problem-solving skills	S1, S2	Written research questions/ Reflection	Direct: Student portfolio	Field Supervisor

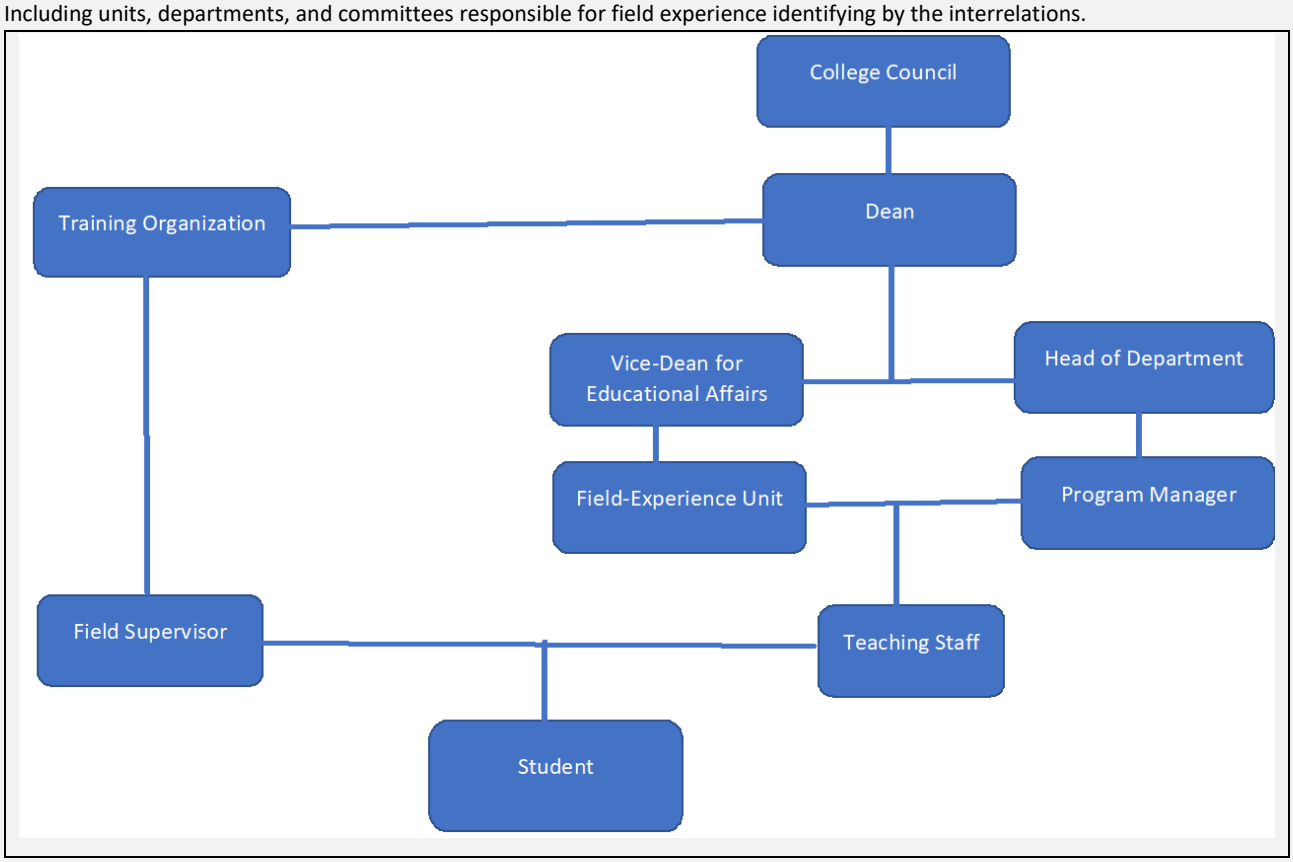
Code	Learning Outcomes	Aligned PLO Code	Training Activities	Assessment Methods	Assessment Responsibility
	with confidence and rigor.				
2.3	Communicate oral and written information in a manner that reflects professional social work skills.	S3	Written tasks Discussion	Direct: Evaluation of Report and mails.	Field Supervisor Teaching staff
2.4	Monitor the various pressures that he/she may face in the labor market.	S1	participation with the field supervisor at workplace	Direct: Direct observation	Field Supervisor
2.5	Construct with other professionals.	S3	participation with the field supervisor at workplace	Direct: Direct observation	Field Supervisor Teaching staff
3.0	Values, autonomy, and responsibility				
3.1	Develop discipline, with the capacity to undertake lifelong learning, self and social responsibility.	V1, V2	Discussion, behavior	Direct: Portfolio and direct observation	Field Supervisor
3.2	Make ethic principles of the profession in practice.	V1, V2	Discussion, behavior	Direct: Direct observation portfolio	Field Supervisor
3.3	Generate integrity and honesty.	V1	Discussion, behavior	Direct: Direct observation	Field Supervisor

*Assessment methods (i.e., practical test, field report, oral test, presentation, group project, essay, etc.).

C. Field Experience Administration

1. Field Experience Flowchart for Responsibility

Including units, departments, and committees responsible for field experience identifying by the interrelations.



2. Distribution of Responsibilities for Field Experience Activities

Activities	Department or College	Teaching Staff	Student	Training Organization	Field Supervisor
Selection of a field experience site	✓		✓		
Selection of supervisory staff	✓			✓	
Provision of the required equipment				✓	✓
Provision of learning resources				✓	✓
Ensuring the safety of the site				✓	
Commuting to and from the field experience site		✓	✓		✓
Provision of support and guidance		✓			✓
Implementation of training activities (duties, reports, projects ...)		✓			✓

Activities	Department or College	Teaching Staff	Student	Training Organization	Field Supervisor
Follow up on student training activities		✓			✓
Monitoring attendance and leave		✓			✓
Assessment of learning outcomes		✓		✓	✓
Evaluating the quality of field experience	✓	✓	✓	✓	✓
Others (specify)					

3. Field Experience Location Requirements

Suggested Field Experience Locations	General Requirements*	Special Requirements**
Banks	IT, appropriate Software for actuarial and financial analysis	• The field experience location activities must be appropriate and consistent with the mission of IMSUI and the requirements for field training learning outcomes • Safe environment for both male and female students. • Awareness of Ethical Code of Conduct.
Maaden	IT, Modeling and Simulation software, Techno-Laboratories	• The field experience location activities must be appropriate and consistent with the mission of IMSUI and the requirements for field training learning outcomes • Safe environment for both male and female students. • Awareness of Ethical Code of Conduct.
Saudi Aramco	IT, Modeling and Simulation software, Techno-Laboratories	• The field experience location activities must be appropriate and consistent with the mission of IMSUI and the requirements for field training learning outcomes • Safe environment for both male and female students. • Awareness of Ethical Code of Conduct.
KACST	IT, Modeling and Simulation software, Techno-Laboratories, office equipment	• The field experience location activities must be appropriate and consistent with the mission of IMSUI and the requirements for field training learning outcomes • Safe environment for both male and female students. • Awareness of Ethical Code of Conduct.
The Zakat, Tax and Customs Authority (ZATCA)	IT, Statistical Software, office equipment.	• The field experience location activities must be appropriate and consistent with the mission of IMSUI and the requirements for field training learning outcomes • Safe environment for both male and female students. • Awareness of Ethical Code of Conduct.

Suggested Field Experience Locations	General Requirements*	Special Requirements**
General Authority for Statistics	IT, Statistical Software	• The field experience location activities must be appropriate and consistent with the mission of IMSUI and the requirements for field training learning outcomes • Safe environment for both male and female students. • Awareness of Ethical Code of Conduct.
Public School	Learning and teaching resources	• The field experience location activities must be appropriate and consistent with the mission of IMSUI and the requirements for field training learning outcomes • Safe environment for both male and female students. Awareness of Ethical Code of Conduct.
Private Schools	The workplace must be registered and approved by the competent Saudi instances. Legal status as determined by the law in Saudi Arabia. Learning and teaching resources.	• The field experience location activities must be appropriate and consistent with the mission of IMSUI and the requirements for field training learning outcomes • Safe environment for both male and female students. • Awareness of Ethical Code of Conduct.

*E.g. provides information technology, equipment, laboratories, halls, housing, learning sources, clinics … etc.
** E.g. Criteria of the institution offering the training or those related to the specialization, such as safety standards, dealing with patients in medical specialties … etc.

4. Decision-Making Procedures for Identifying Appropriate Locations for Field Experience

Before starting the process for field training, the college should state a range of partnerships with potential training organizations that may provide high-level training opportunities.

The list of partnerships should be available in website of college of science.

These partnerships should be based on requirements listed above.

The college should communicate the present document (including qualifications and responsibilities) to the training organization to: ensure skills requirements and determine an appropriate field supervisor.

5. Safety and Risk Management

Potential Risks	Safety Actions	Risk Management Procedures
Potential Risks depend on the workspace and production activities of the training organization.	Basic safety rules and tips that need to be followed at the worksite.	Respecting the last updated version of the booklet "Implementation of Risk Management and Safety Culture" published by The Ministry of Labor and Social development.
Potential sources of harm and hazards should be	Safety guidelines must be established and maintained:	• providing an understanding of how to deal with different types of

identified. This issue should be discussed with Training Organization before starting the training	safety procedures for laboratory investigations and field trips should be implemented.	work-training to help reduce exposure risks. • Offering short risk management training at the beginning of training.

D. Training Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Student performance, effectiveness, and efficiency	Field Supervisor	Direct and Indirect
Quality of learning resources Effectiveness of Training and assessment.	Teaching staff, Student	Indirect
Student performance	Teaching staff, Program manager	Indirect
Evaluation of the field Experience (workspace, Quality of learning resources, supervisory, achievements, skills, behavior, time)	Student, Teaching staff, Program Manager	Indirect

Evaluation areas (e.g., Effectiveness of Training and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

Evaluators (Students, Supervisory Staff, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

E. Specification Approval Data

Council / Committee	**MATHEMATICS AND STATISTICS DEPARTMENT COUNCIL**
Reference No.	**17/1445**
Date	**12/06/1445 (25/12/2023)**

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	**Numerical Optimization**
Course Code:	**MAT 1445**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 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 10 or 11 / Year 4					
4. Course general Description:					
* To provide students a good understanding on constrained and unconstrained optimization whose content is described in detail in this syllabus. * To perform some algorithms and codes in order to deepen programming and numerical analysis tools used in this course. MATLAB software will be handled. * To allow students understanding of the above concepts through study cases and occasional computer-based homework problems.					
5. Pre-requirements for this course (if any):					
MAT 1254.					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
* Understanding Maximizing or minimizing a certain quantity, that is, an objective function that models a system and satisfies a required set of specifications, called constraints, is a frequent problem in science, engineering, business and economics. The function allows comparison of the different choices for determining which might be "best". For instance, by finding an alternative with the most cost effective or highest achievable performance under the given constraints, by maximizing desired factors and minimizing undesired ones. * Numerical Optimization turns out to be considerably important for solving such problems. This course aims at training students to acquire a basic mathematical understanding of modern approaches of numerical optimization and discussing practical aspects of implementation for solving optimization problems. The students learn how to find analytical solutions to some optimization problems.					

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	36
2.	Laboratory/Studio	0
3.	Field	0
4.	Tutorial	24
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 principles of optimization.	K1, K3	• 3 lecture hours\week • 2 tutorial hours\week • Self-study	Direct: • Regular Exams • Assignments *Short Quizzes
1.2	Recall various types of algorithms for solving optimization problems.	K1, K3	• 2 tutorial hours\week • Self-study	Direct: Short Quizzes
2.0	Skills			
2.1	Develop techniques of problem solving.	S3	• Self-study • Real-life problems	Direct: • Participations • Short Quizzes
2.2	Report mathematics clearly and precisely both orally and in writing.	S3	Self-study	Direct: Participations
2.3	Use Internet in searching for scientific information	S3	Real-life problems	Direct: Short Quizzes
2.4	Perform calculations orally and mentally.	S3	Self-study	Direct: Participations
3.0	Values, autonomy, and responsibility			
3.1	Create with independence.	V2	Personal questions	Direct: Participation
3.2	Debate in groups.	V2	Teamwork and class discussions.	Direct: Homework and Mini projects

C. Course Content

No	List of Topics	Contact Hours
1.	**Introduction:** Examples of optimization problem occurring in science, engineering and economics.	6

2.	**Univariate optimization:** Local and global minima, Necessary and sufficient conditions of the first and second order, Iterative numerical methods for univariate optimization: Exhaustive grid search, Golden section search, Brent's method, Newton's method, Secant method.	**18**
3.	**Unconstrained multivariate optimization:** Necessary and sufficient conditions of the first and second order, The case of convex functions, Numerical algorithms for nonlinear multivariate optimization: Linear and superliner convergence, Steepest descent algorithm, Quasi-Newton's methods, Broyden-Fletcher-Goldfarb-Shanno (BFGS) algorithm, Conjugate gradient Methods.	**18**
4.	**Constrained multivariate optimization:** Examples, Equality constraints. Lawrentians and optimality conditions. Geometric interpretation, Equality and inequality constraints, The case of convex programs, Algorithms for constrained optimization: Primal methods: feasible directions methods, active set methods, gradient projection; Penalty and barrier methods.	**18**
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Homework's, Quizzes, Mini projects**	**During the term**	**10%**
2.	**First Midterm**	**Week 4-5**	**25%**
3.	**Second Midterm**	**Week 7-8**	**25%**
4.	**Final Exam**	**Week 13**	**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	**Numerical Optimization**, Jorge Nocedal, Stephen J. Wright, edition 2, Springer 2006 **(Main Reference)**
Supportive References	1-**An introduction to algorithms for non-linear optimization**; N. Gould, S. Leyffer; Springer, 2003. 2-**Numerical Optimization with Applications**; 1st Edition, S. Chandra, Jayadeva, Aparna Mehra; Alpha Science Intl. Ltd., 2009. 3-**Genetic algorithms on search, optimization and machine learning**; D. Goldberg; Addison-Wesley Professional, 1989.
Electronic Materials	**None**
Other Learning Materials	**None**

2. Required Facilities and equipment

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

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**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.	**17/1445**
DATE	**12/06/1445 (25/12/2023)**

Course Specification

(Bachelor)

Course Title:	**Mathematical Modeling of Islamic Finance**
Course Code:	**AFM 1411**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (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 10 or 11 / Year 4					
4. Course general Description:					
This course is an introductory course which presents basic, theories, concepts, analytical techniques in the area of risk management, insurance, and Takaful. Topics covered in the course include theory of risk and risk management; identification; measurement and arrangements to deal with risk in a personal and business situation; types of insurance coverage; basic features of selected insurance contracts; principles and models of Takaful; family Takaful contracts; and re-Takaful.					
5. Pre-requirements for this course (if any):					
None.					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
• Understanding the principles of Islamic finance • Applying mathematical techniques to Islamic financial instruments • . Analyzing risk and return in Islamic finance • Evaluating Islamic financial markets and products • Exploring contemporary issues in Islamic finance					

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	36
2.	Laboratory/Studio	0
3.	Field	0
4.	Tutorial	24
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 concept of Risk in Our Society	K3	4 lecture hours\week	Direct: Regular Exams
1.2	Recall Law of Large Numbers.	K3	• 2 tutorial hours\week • Self-study	Direct: Short Quizzes
2.0	Skills			
2.1	Define the Risk Mgmt, Components of the cost of risk, Valuing losses to property.	S1, S2	• Self-study • Real-life problems	Direct: • Participations • Short Quizzes
2.2	Evaluate the costs of a loss and who impacted	S2	Self-study	Direct: Participations
2.3	Create outputs in risk assessment and management	S1	Real-life problems	Direct: Short Quizzes
3.0	Values, autonomy, and responsibility			
3.1	Generate iniatives with independence.	V2	Personal questions	Direct: Participation
3.2	Develop personal values and attributes such as honesty, empathy and respect for others.	V2	Teamwork and class discussions.	Direct: Homework and Mini-projects

C. Course Content

No	List of Topics	Contact Hours

1.	Risk in Our Society (Property & liability risks- Perils, hazards- Direct and indirect loss- Pre and post-loss risk management- Risk management process basics - Law of large numbers introduced)	10
2.	Introduction to Risk Mgmt: Client Side: Components of the cost of risk Risk management process and analysis: (1) identification of exposures, hazards; (2) assessment of alternatives, use of forecasting and modelling,	10
3.	spread of risk, diversification Valuing losses to property, legal risk Use of contracts, variety of insurance products Evaluating the costs of a loss and who impacted PML and Retaining risk - client side & insurer side Partnership between parties in commerce, in insurance	10
4.	Advanced Topics in Risk Mgmt ☐ Analysis of Strategies for client v. insurer 1- Management of physical risk, contract risk 2-Cost of risk, resources - drivers, strategic decision making, ERM	10
5.	☐ Basics of financial side for insurers: 1-Underwriting cycle, Solvency II 2-Capacity, p/h surplus, securitization 3-Ins regulators: 2 to 1; 4-Client & cost of risk: 7:1 5-Reserving for losses, loss adjustment expenses (LAE), and unearned premium.	10
6.	Takāful (Takāful Operator - Takāful participant- Takāful ndertaking - Technical provisions)	10
Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homeworks, Quizzes, Mini-projects	During the term	10%
2.	First Midterm	Week 4-5	25%
3.	Second Midterm	Week 7-8	25%
4.	Final Exam	Week 13	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	Understanding Islamic Finance, 2007 Author: Muhammad Ayub. **(Main Reference)**
Supportive References	

Electronic Materials	None
Other Learning Materials	None

2. Required Facilities and equipment

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.	17/1445
Date	12/06/1445 (25/12/2023)

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	**Introduction to financial models**
Course Code:	**AFM 1412**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 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 10 or 11 / Year 4					
4. Course general Description:					
This course consists in understanding techniques in evaluating contingent claims in some discrete time models and in computing optimal portfolio of consumption and investment.					
5. Pre-requirements for this course (if any)**:**					
AFM 1333					
6. Co-requisites for this course (if any)**:**					
None.					
7. Course Main Objective(s):					
- **Understanding valuation techniques of European and American options in Binomial models.** - Constructing optimal portfolio using martingale methods and utility maximization methods.					

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	36
2.	Laboratory/Studio	0
3.	Field	0
4.	Tutorial	24
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 techniques of valuation in one period and multiperiod models	K3	3 lecture hours\week	Direct: Regular Exams
1.2	Describe methods for finding optimal portfolio.	K3	• 2 tutorial hours\week • Self-study	Direct: Short Quizzes
2.0	Skills			
2.1	Create potential models for the price of options.	S2	• Self-study • Real-life problems	Direct: • Participations • Short Quizzes
2.2	Construct models for investments and securities.	S1	Self-study	Direct: Participations
2.3	Evaluate forward contract using arbitrage-free pricing methods.	S2	Self-study	Direct: Participations
2.4	Analyze techniques of dynamic programming and their use in maximizing utility.	S1	Self-study	Direct: Participations
3.0	Values, autonomy, and responsibility			
3.1	Perform duties with independence.	V2	Personal questions	Direct: Participation
3.2	Develop personal values and attributes such as honesty, empathy, and respect for others.	V2	Teamwork and class discussions.	Direct: Homework and Mini projects

C. Course Content

No	List of Topics	Contact Hours

1.	**Single period securities markets.** Model specifications, arbitrage, risk neutral probability measure, valuation of contingent claims.	12
2.	**Single period consumption and investment.** Optimal portfolio and viability, risk neutral computational approach, mean variance analysis, equilibrium models.	12
3.	**Multiperiod securities markets.** Model specifications, filtration and stochastic processes. Return and dividend process. Conditional expectation and martingales. Binomial models and Markov models.	12
4.	**Options, futures and derivatives.** Contingent claims. European options under binomial model. American options. Forward price and futures.	12
5.	**Optimal consumption and investment problems.** Optimal portfolio and dynamic programming. Martingale method. Maximum utility.	12
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework's, Quizzes, Mini projects	During the term	10%
2.	First Midterm	Week 4-5	25%
3.	Second Midterm	Week 7-8	25%
4.	Final Exam	Week 13	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 Mathematical Finance: Discrete Time Models. Wiley; 1st edition (July 7, 1997) by Stanley R. Pliska (Main Reference)
Supportive References	None
Electronic Materials	None
Other Learning Materials	None

2. Required Facilities and equipment

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

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.	**17/1445**
DATE	**12/06/1445 (25/12/2023)**

Course Specification

(Bachelor)

Course Title:	**Pension Mathematics**
Course Code:	**AFM 1443**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 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 10 or 11 / Year 4					
4. Course general Description:					
This course presents the basic principles of Pension plans, Salary scale function, Valuation of benefits, Funding plans, Actuarial Cost Methods, Individual Level Premium, Aggregation, Pensioners, Contributory Plans, Ancillary Benefits, Assets: Group Annuity Contracts, Individual Life-Insurance Policies, Interest, Inflation, and Salary Increases, Valuation methods; gains and losses; dynamic control, Cost Methods in Current Actuarial Practice. So, we extended with using Finance packages in lecture or practical.					
5. Pre-requirements for this course (if any):					
AFM 1341.					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
At the end of this course, students should be able to: 1. Perform concepts concerning tabular or parametric survival models and single or multiple-life states. Also, calculations on the present value random variables associated with benefits and expenses for any of the models. 2. Calculate with and explain premium calculation methodologies such as the equivalence principle, the portfolio premium principle, and premiums determined by specified profit objectives, Non-interest-sensitive insurances; Annuities; Universal life insurances; and Participating insurances. Moreover, they will understand reserves for insurances and annuities for models.					

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**	**36**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**24**
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 effects of transitioning between states, the survival models and their interactions.**	**K3**	**3 lecture hours\week**	**Direct: Regular Exams**
1.2	**Describe standard probability functions including survival and mortality probabilities, force of mortality, and complete and expectation of life.**	**K3**	• **2 tutorial hours\week** • **Self-study**	**Direct: Short Quizzes**
1.3	**Explain the random variables associated with models dealing with multiple lives and/or multiple states.**	**K3**	• **Real-life problems**	**Direct: Regular Exams**
2.0	**Skills**			
2.1	**Use the factors, and survival models for cohorts consisting of non-homogeneous populations.**	**S1, S2**	• **Self-study** • **Real-life problems**	**Direct:** • **Participations** • **Short Quizzes**
2.2	**Interpret the behavior of continuous-time and discrete time Markov chain models.**	**S1**	**Self-study**	**Direct: Participations**
2.3	**Apply calculations involving random variables with appropriate approximation methods such as uniform distribution of deaths,**	**S2**	**Real-life problems**	**Direct: Short Quizzes**

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	constant force, Wool house, and Euler.			
2.4	Analyze premiums appropriate approximation methods by using uniform distribution of deaths, constant force, Wool house, and Euler.	S2	Self-study	Direct: Participations
3.0	**Values, autonomy, and responsibility**			
3.1	Create with independence.	V1, V2	Personal questions	Direct: Participation
3.2	Develop personal values and attributes such as honesty, empathy and respect for others.	V1, V2	Teamwork and class discussions.	Direct: Homework and Mini projects

C. Course Content

No	List of Topics	Contact Hours
1.	**Models for single and multiple lives:** Key concepts concerning tabular or parametric survival models and single or multiple-life states.	12
2.	**Present value random variables analysis:** Calculations on the present value random variables associated with benefits and expenses for any of the models.	12
3.	**Premium:** Calculate with and explain premium calculation methodologies such as the equivalence principle, the portfolio premium principle, and premiums determined by specified profit objectives, non-interest-sensitive insurances; Annuities; Universal life insurances; and Participating insurances.	12
4.	**Reserves:** Reserves for insurances and annuities for models.	12
5.	**Pension Plans and Retirement Benefits:** How the models from previous Learning Objectives apply to pension plans and retirement benefits.	12
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	HomeWorks, Quizzes, Mini projects	During the term	10%
2.	First Midterm	Week 4-5	25%
3.	Second Midterm	Week 7-8	25%
4.	Final Exam	Week 13	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	ACTEX, 15th Edition, Fourth Printing Abraham Weishaus, Ph.D., F.S.A., CFA, M.A.A.A. https://www.actexmadriver.com/trials/ASM_3MLC-ASM-17FSMP-E%20FT%20sample.pdf
Supportive References	1- Anderson, A. W. (2006). Pension mathematics for actuaries. Actex Publications. 2- Sharp, K. P. (2006). Pension Mathematics for Actuaries, Commentary and Solutions. Actex publications. 3- Attias, A., Ciavalini, S., Morrone, C., & Saitta, D. (2020). An actuarial mathematical model for a new pension philosophy. An application to the accountant pension fund. Pure Mathematics and Applications, 30(2), 26-57.
Electronic Materials	**None**
Other Learning Materials	**None**

2. Required Facilities and equipment

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

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	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.	**17/1445**
Date	**12/06/1445 (25/12/2023)**

Course Specification
(Bachelor)

Course Title:	Microeconomic Analysis
Course Code:	ECO 1414
Program:	Bachelor of Science in Actuarial and Financial Mathematics
Department:	Economics
College:	Business
Institution:	Imam Mohammad Ibn Saud Islamic University
Version:	2023 – V1
Last Revision Date:	None

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 Lectures, 0 Lab, 2 Tutorials)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (Level 10 or 11 / Year 4)					
4. Course general Description:					
This course covers the fundamentals of microeconomic analysis, including terminology, concepts, theory, and methodology. It equips students with a theoretical framework to analyze and comprehend the economics of consumers, producers, and the market price system. The course emphasizes the nature and functions of factor of production markets, as well as the government's role in promoting efficiency and equity in the economy. The course also includes some topics required to obtain the following professional certifications: - Economics CFA Level 1 - CBE - ICCR Level II					
5. Pre-requirements for this course (if any):					
ECO 1206					
6. Co-requisites for this course (if any):					
None					
7. Course Main Objective(s):					
This course aims to explore the theoretical foundations that govern the economic behavior of consumers and producers, while considering the diverse market structures in which they operate.					

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**	**36**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**24**
5.	**Others (specify)**	**0**
Total		60

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

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Recall basic concepts and principles of consumer and producer behavior, as well as production and costs in the short and long term.**	**K1**	▪ Lectures ▪ self-education ▪ Brain storming ▪ Group discussion ▪ Provide real-life examples	**Direct:** ▪ Quarterly tests. ▪ Oral questions. ▪ Assignments. ▪ The final test
1.2	**Identify how these concepts vary based on the shape of the market.**	**K2**	▪ Lectures ▪ Group discussion ▪ Provide real-life examples	**Direct:** ▪ Quarterly tests. ▪ Oral questions. ▪ Assignments. ▪ The final test
2.0	**Skills**			
2.1	**Use microeconomic theories to explain consumer and producer behavior, examining their equilibriums costs in both the short and long term.**	**S2**	▪ Lectures ▪ Brain storming ▪ Group discussion ▪ Provide real-life examples	**Direct:** ▪ Quarterly tests. ▪ Assignments ▪ Share. ▪ The final test
2.2	**Apply mathematical and graphical methods to address unexpected consumer or producer scenarios.**	**S2**	▪ Lectures ▪ self-education ▪ Brainstorming ▪ Group discussion ▪ Provide real-life examples	**Direct:** ▪ Quarterly tests. ▪ Oral questions. ▪ Assignments. ▪ The final test
2.3	**Interpret mathematical functions and tables to analyze behaviors.**	**S2**	▪ Lectures ▪ Group discussion. ▪ Provide real-life examples	**Direct:** ▪ Quarterly tests. ▪ Oral questions. ▪ Assignments. ▪ The final test

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
3.0	**Values, autonomy, and responsibility**			
3.1	**Organize his duties within a framework of independence and cooperation with the work team.**	**V2**	▪ **Collaborative learning.** ▪ **Exercises and case studies.** ▪ **Research project**	**Direct:** ▪ **Providing presentations and research** ▪ **Group projects**

C. Course Content

No	List of Topics	Contact Hours
1.	Utility theories and consumer behavior	10
2.	Short-term and long-term production	10
3.	Short-term and long-term costs	8
4.	Perfect competition	6
5.	Absolute monopoly	6
6.	Monopolistic competition	10
7.	Oligopoly	10
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Participation and assignments**	**continuous**	%10
2.	**First semester test**	**6th week**	%25
3.	**Second semester test**	**10th week**	%25
4.	**Final test**	**13th week**	%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 Microeconomic Theory Dr. Khaled Ibrahim Al-Dakhil (Arabic edition)**
Supportive References	1. **Microeconomic Analysis, HR Varian.** 2. **Intermediate Microeconomic Theory. Ana Espinola-Arredondo and Felix Muñoz-Garcia (2020), MIT.**

Electronic Materials	**None**
Other Learning Materials	**None**

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	**Classrooms** **Computer laboratories**
Technology equipment (projector, smart board, software)	**Classrooms with projectors (DATA SHOW)**
Other equipment (depending on the nature of the specialty)	**Electronic educational platforms (BLACKBOARD)**

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**Students**	▪ **Indirect** **(Results of the student evaluation survey for the course. Student views obtained from students verbally, in writing, or via email. Students' comments on the course in the college student forum)**
	▪ **Course coordinators** ▪ **Program leadership**	▪ **Direct** **(At the end of each semester, the course coordinator prepares a course report that summarizes the positives and negatives and identifies the changes that are recommended to be taken to develop the course. Communicate with graduates and employees)**
Effectiveness of Students assessment	▪ **Program leadership** ▪ **Students**	▪ **Direct (benchmarking)** ▪ **Indirect**

Assessment Areas/Issues	Assessor	Assessment Methods
		(poll)
Quality of learning resources	▪ Faculty members	▪ Direct (Direct assessment of students, exchange of results with other departments and colleges)
The extent to which CLOs have been achieved	▪ Faculty members ▪ Course coordinators ▪ program leadership ▪ The students	▪ Direct (Periodic review of course vocabulary, course reports) ▪ Indirect (Student opinion poll)
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	ECONOMICS DEPARTMENT COUNCIL
REFERENCE NO.	14
DATE	21/5/1445

Course Specification

(Bachelor)

Course Title:	**Principles of Macroeconomics**
Course Code:	**ECO 1207**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Economics**
College:	**Business**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 Lectures, 0 Lab, 2 Tutorials)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (Level 6 / Year 2)					
4. Course general Description:					
The Principles of Macroeconomics course is taught at 2nd year, semester 4. This course is mainly concerned with study of macroeconomics in terms of its definition, methods of analysis and policies. Therefore, the course deals with Understanding measuring Gross Domestic Product, explaining the relationship between income and expenditure, studying the relationship between inflation and unemployment and explaining the tools of fiscal and monetary policy.					
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 familiarize students with the basic macroeconomic theories and policies as well as the instruments of these policies.					

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**	**36**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**24**
5.	**Others (specify)**	**0**
Total		60

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

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Recall basic concepts and principles of various basic economic theories related to macroeconomics.**	**K1**	▪ **Lectures** ▪ **self-education** ▪ **Brain storming** ▪ **Group discussion** ▪ **Provide real-life examples**	**Direct:** ▪ **Quarterly tests.** ▪ **Oral questions.** ▪ **Assignments.** ▪ **The final test**
1.2	**Identify the foundations and principles of interpreting the behavior of economic decision units and determining the equilibrium situation related to Saudi economy.**	**K2**	▪ **Lectures** ▪ **Group discussion** ▪ **Provide real-life examples**	**Direct:** ▪ **Quarterly tests.** ▪ **Oral questions.** ▪ **Assignments.** ▪ **The final test**
2.0	**Skills**			
2.1	**Analyze economic models to calculate equilibrium income, interpret the results, and provide appropriate solutions.**	**S2**	▪ **Lectures** ▪ **Brain storming** ▪ **Group discussion** ▪ **Provide real-life examples**	**Direct:** ▪ **Quarterly tests.** ▪ **Assignments** ▪ **Share.** ▪ **The final test**
2.2	**Interpret economic data and information and how to use them in drawing economic policies.**	**S2**	▪ **Lectures** ▪ **self-education** ▪ **Brainstorming** ▪ **Group discussion** ▪ **Provide real-life examples**	**Direct:** ▪ **Quarterly tests.** ▪ **Oral questions.** ▪ **Assignments.** ▪ **The final test**
2.3	**Create research projects in economics and communicates**	**S2**	▪ **Lectures** ▪ **Group discussion.** ▪ **Provide real-life examples**	**Direct:** ▪ **Quarterly tests.** **Direct:** ▪ **Oral questions.**

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
	effectively with others in various economic fields.			▪ Assignments. ▪ The final test
3.0	Values, autonomy, and responsibility			
3.1	Organize his duties within a framework of independence and cooperation with the work team.	V2	▪ Collaborative learning. ▪ Exercises and case studies. ▪ Research project	Direct: ▪ Providing presentations and research ▪ Group projects

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to Macroeconomics - differences between macro and microeconomics -Tools of macroeconomic analysis - macroeconomics policies	5
2.	Methods of measuring GDP - Income Approach - expenditure Approach - Product Approach	8
3.	Income and Spending - Consumption Spending - Investment Spending - Government Spending - Externa Sectors	8
4.	Income Equilibrium - Income Equilibrium in closed economy - Income Equilibrium in open economy	9
5.	The MULTIPLIER - concept of multiplier - How the multiplier works - Types of multiplier	8
6.	Aggregate Supply - equilibrium between Aggregate Supply and Aggregate demand - stagflation; supply side - stagflation; demand side	5
7.	Inflation and Unemployment	8
8.	Macroeconomics policies - fiscal policy - monetary policy	9
	Total	60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Participation and assignments	continuous	%10
2.	First semester test	6th week	%25
3.	Second semester test	10th week	%25
4.	Final test	13th week	%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	***Principles of Macroeconomics***, N. Gregory Mankiw, Cengage Learning, 2017. (Main Reference) ISBN: 978-1305971509. ***Principle of macroeconomics***, Mohammed A. Al-Jarrah, Ahamd A. Almohaimied (in arabic).
Supportive References	Principle of macroeconomics, Dr. Faiz Alhabib
Electronic Materials	(/http://www.stats.gov.sa) (/https://www.mof.gov.sa) https://www.mof.gov.sa)
Other Learning Materials	None

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms Computer laboratories
Technology equipment (projector, smart board, software)	Classrooms with projectors (DATA SHOW)
Other equipment (depending on the nature of the specialty)	Electronic educational platforms (BLACKBOARD)

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	▪ Indirect

Assessment Areas/Issues	Assessor	Assessment Methods
		(Results of the student evaluation survey for the course. Student views obtained from students verbally, in writing, or via email. Students' comments on the course in the college student forum)
	▪ Course coordinators ▪ Program leadership	**▪ Direct (At the end of each semester, the course coordinator prepares a course report that summarizes the positives and negatives and identifies the changes that are recommended to be taken to develop the course. Communicate with graduates and employees)**
Effectiveness of Students assessment	**▪ Program leadership ▪ Students**	**▪ Direct (benchmarking) ▪ Indirect (poll)**
Quality of learning resources	**▪ Faculty members**	**▪ Direct (Direct assessment of students, exchange of results with other departments and colleges)**
The extent to which CLOs have been achieved	**▪ Faculty members ▪ Course coordinators ▪ program leadership ▪ The students**	**▪ Direct (Periodic review of course vocabulary, course reports) ▪ Indirect (Student opinion poll)**
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	ECONOMICS DEPARTMENT COUNCIL
REFERENCE NO.	14
DATE	21/5/1445

Course Specification

(Bachelor)

Course Title:	Selected Topics in Actuarial and Financial Mathematics (1)
Course Code:	AFM 1401
Program:	Bachelor of Science in Actuarial and Financial Mathematics
Department:	Mathematics and Statistics
College:	Science
Institution:	Imam Mohammad Ibn Saud Islamic University
Version:	2023 – V1
Last Revision Date:	None

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 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 10 or 11/ Year 4					
4. Course general Description:					
The selected topics course will be described before the course delivery and the approbation of department.					
5. Pre-requirements for this course (if any)**:**					
None.					
6. Co-requisites for this course (if any)**:**					
None.					
7. Course Main Objective(s):					
This course is designed to enable students to study different special topics from special topics in Actuarial science and/or financial mathematics in the increasingly complex world. The topics covered in this course may be changed from trimester to another. **This capstone course aims to enable students to master the system of actuarial risk principles including modeling and management of the eventual potential and the interaction of risks and linking with different types of risks by applying appropriate analytic and quantitative methods issued from financial mathematics, probability and statistics in order to quantify and control risks and their implications in the short and long terms.**					

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 trimester)

No	Activity	Contact Hours
1.	**Lectures**	**36**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**24**
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	**Explain principles related to a range of special topics in Actuarial Science and/or Financial Mathematics.**	**K3**	**3 lecture hours\week**	**Direct: Midterm exams Quizzes**
1.2	**Identify the nature of insurance, finance and various kinds of investment risk in an actuarial approach.**	**K3**	**2 tutorial hours / week**	**Direct: Midterm exams Quizzes**
2.0	**Skills**			
2.1	**Compute possible outcomes by designing and solving problems in insurance, finance, economics, investment, pension, financial risk management and demography by using in using actuarial and financial software.**	**S1, S2**	• **Self-study** • **Real-life problems**	**Direct:** • **Participations** • **Homework**
2.2	**Apply practical methods to integrate risk analysis into the wider economic business management process.**	**S2**	**Self-study**	**Direct: Homework, Final Exam, mini-project report**
2.3	**Predict various kinds of risk that might affect an organization and their implications in the short and long terms;**	**S2**	**Real-life problems**	**Direct: Homework, Direct:**

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
				Midterm, Final Exam, mini-project report
2.4	Analyze the risks to decision makers in a balanced and effective way.	S1	Self-study	Direct: Participations mini-project report, Homework
3.0	Values, autonomy, and responsibility			
3.1	Debate and collaborate with people effectively on issues related to special topics in actuarial science and/or financial Mathematics	V1	Personal questions	Direct: Participation Homework, mini-project report
3.2	Develop analytical skills to evaluate and measure various kinds of risk, and appraise related moral and ethical issues	V2	Teamwork and class discussions.	Direct: Homework and Mini-project report.

C. Course Content

No	List of Topics	Contact Hours
	Course dependent.	60
	Total	60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework, Quizzes, Mini-project, participation	During the term	10%
2.	First Midterm	Week 4-5	25%
3.	Second Midterm	Week 7-8	25%
4.	Final Exam	Week 13	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	Course dependent.
Supportive References	Course dependent.
Electronic Materials	Course dependent.
Other Learning Materials	Course dependent.

2. Required Facilities and equipment

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

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**Students**	**survey**
Effectiveness of Students' assessment	**Instructor**	**Course report**
Quality of learning resources	**Students**	**surveys**
The extent to which CLOs have been achieved	**Instructor**	**At the end of each trimester the 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.	**17/1445**
Date	**12/06/1445 (25/12/2023)**

2023
TP-153

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Course Specification

(Bachelor)

Course Title:	Selected Topics in Actuarial and Financial Mathematics (2)
Course Code:	AFM 1402
Program:	Bachelor of Science in Actuarial and Financial Mathematics
Department:	Mathematics and Statistics
College:	Science
Institution:	Imam Mohammad Ibn Saud Islamic University
Version:	2023 – V1
Last Revision Date:	None

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 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 10 or 11/ Year 4					
4. Course general Description:					
The selected topics course will be described before the course delivery and the approbation of department.					
5. Pre-requirements for this course (if any)**:**					
None.					
6. Co-requisites for this course (if any)**:**					
None.					
7. Course Main Objective(s):					
This course is designed to enable students to study different special topics from special topics in Actuarial science and/or financial mathematics in the increasingly complex world. The topics covered in this course may be changed from trimester to another. **This capstone course aims to enable students to master the system of actuarial risk principles including modeling and management of the eventual potential and the interaction of risks and linking with different types of risks by applying appropriate analytic and quantitative methods issued from financial mathematics, probability and statistics in order to quantify and control risks and their implications in the short and long terms.**					

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 trimester)

No	Activity	Contact Hours
1.	**Lectures**	**36**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**24**
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	**Explain principles related to a range of special topics in Actuarial Science and/or Financial Mathematics.**	**K3**	**3 lecture hours\week**	**Direct: Midterm exams Quizzes**
1.2	**Identify the nature of insurance, finance and various kinds of investment risk in an actuarial approach.**	**K3**	**2 tutorial hours / week**	**Direct: Midterm exams Quizzes**
2.0	**Skills**			
2.1	**Compute possible outcomes by designing and solving problems in insurance, finance, economics, investment, pension, financial risk management and demography by using in using actuarial and financial software.**	**S1, S2**	• **Self-study** • **Real-life problems**	**Direct:** • **Participations** • **Homework**
2.2	**Apply practical methods to integrate risk analysis into the wider economic business management process.**	**S2**	**Self-study**	**Direct: Homework, Final Exam, mini-project report**
2.3	**Predict various kinds of risk that might affect an organization and their implications in the short and long terms;**	**S2**	**Real-life problems**	**Direct: Homework, Direct:**

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
				Midterm, Final Exam, mini-project report
2.4	Analyze the risks to decision makers in a balanced and effective way.	S1	Self-study	Direct: Participations mini-project report, Homework
3.0	Values, autonomy, and responsibility			
3.1	Debate and collaborate with people effectively on issues related to special topics in actuarial science and/or financial Mathematics	V1	Personal questions	Direct: Participation Homework, mini-project report
3.2	Develop analytical skills to evaluate and measure various kinds of risk, and appraise related moral and ethical issues	V2	Teamwork and class discussions.	Direct: Homework and Mini-project report.

C. Course Content

No	List of Topics	Contact Hours
	Course dependent.	60
	Total	60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework, Quizzes, Mini-project, participation	During the term	10%
2.	First Midterm	Week 4-5	25%
3.	Second Midterm	Week 7-8	25%
4.	Final Exam	Week 13	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	Course dependent.
Supportive References	Course dependent.
Electronic Materials	Course dependent.
Other Learning Materials	Course dependent.

2. Required Facilities and equipment

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

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**Students**	**survey**
Effectiveness of Students' assessment	**Instructor**	**Course report**
Quality of learning resources	**Students**	**surveys**
The extent to which CLOs have been achieved	**Instructor**	**At the end of each trimester the 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.	**17/1445**
Date	**12/06/1445 (25/12/2023)**

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	**Real Analysis for Actuaries**
Course Code:	**MAT 1416**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 Lectures, 0 Lab, 2 Tutorials)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☐ Required		☒ Elective		
3. Level/year at which this course is offered: Level 10 or 11/ Year 4					
4. Course general Description:					
This course gives students the theoretical foundations underlying the topics taught in typical Calculus courses. It will cover the fundamentals of mathematical analysis, algebraic and order properties of the real numbers, the least upper bound axiom, sequences, limits, continuity, uniform continuity, differentiation, the Riemann integral, and series of functions. An understanding and construction of proofs will be stressed throughout the course.					
5. Pre-requirements for this course (if any):					
MAT 1106.					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
• To give a careful and rigorous treatment of the main ideas of differential calculus which was taught to students in Calculus I and Calculus II. • To let students gain experience in dealing with axiomatic thinking and concise proofs of calculus. • To expose students to the rudiments of metric and topological spaces.					

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	36
2.	Laboratory/Studio	0
3.	Field	0
4.	Tutorial	24
5.	Others (specify)	0
Total		60

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

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Describe fundamental concepts, real sequences and real functions of a single variable: continuity, limits, differentiation, and integration.	K1	3 lecture hours\week	Direct: Regular Exams
1.2	Define the Riemann integral and its main properties.	K3	• 2 tutorial hours\week • Self-study	Direct: Short Quizzes
2.0	Skills			
2.1	Develop techniques of problem solving.	S3	• Self-study • Real-life problems	Direct: • Participations • Short Quizzes
2.2	Produce mathematics results clearly and precisely both orally and in writing.	S3	Self-study	Direct: Participations
2.3	Use Internet in searching for scientific information.	S3	Real-life problems	Direct: Short Quizzes
2.4	Perform calculations orally and mentally.	S3	Self-study	Direct: Participations
3.0	Values, autonomy, and responsibility			
3.1	Generate initiatives with independence.	V2	Personal questions	Direct: Participation
3.2	Debate in groups.	V2	Teamwork and class discussions.	Direct: Homework and Mini projects

C. Course Content

No	List of Topics	Contact Hours
1.	**Fundamentals:** The Field of Real Numbers, The Least Upper Bound Property, Completeness Property, Archimedean Property, Density of Rationals in the Set of Real Numbers, Nested Intervals property.	12
2.	**Real Sequences:** Formal Definition of the Limit of a Sequence, Limit Theorems, Monotonicity, Boundedness, Subsequences and Bolzano-Weirstrass Theorem, Cauchy Criterion.	12
3.	**Limits and Continuity:** Formal Definition of the Limit, Right and Left Limits, Continuity, Continuous Functions on Intervals, Uniform Continuity.	12
4.	**Differentiation:** Derivative of a Function, the Mean Value Theorem, Main Applications to Calculus.	12
5.	**Sequences of functions: Pointwise convergence, uniform convergence, applications on uniform convergence.**	12
6	**Sequences of Functions:** Pointwise Convergence, Uniform Convergence, Applications on Uniform Convergence.	12
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	HomeWorks, Quizzes, Mini projects	During the term	10%
2.	First Midterm	Week 4-5	25%
3.	Second Midterm	Week 7-8	25%
4.	Final Exam	Week 12	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. Introduction to Real Analysis 4th Edition; R. Bartle, D. Sherbert, Wiley, 2011.
Supportive References	2. Introduction to Real Analysis, William F. Trench, Pearson Education. 3. Real and Complex Analysis, W. Rudin, 3rd edition, McGraw-Hills, 1987.
Electronic Materials	None
Other Learning Materials	None

2. Required Facilities and equipment

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

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	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.	17/1445
Date	12/06/1445 (25/12/2023)

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	**Numerical methods for Actuaries**
Course Code:	**MAT 1446**
Program:	**Bachelor of Science in Actuarial and Financial Mathematics**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2023 – V1**
Last Revision Date:	**None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
4 (3 Lectures, 0 Lab, 2 Tutorials)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☐ Required		☒ Elective		
3. Level/year at which this course is offered: Level 10 or 11 / Year 4					
4. Course general Description:					
This course describes the most important ideas to numerical methods for students in science and Actuaries, Topics include floating-point computation, systems of linear equations, approximation of functions and integrals, the single nonlinear equation, and the numerical solution of ordinary differential equations. Applications in science and engineering: include some programming as well as the use of high-quality mathematical library routines.					
5. Pre-requirements for this course (if any)**:**					
MAT 1224.					
6. Co-requisites for this course (if any)**:**					
None.					
7. Course Main Objective(s):					
Learn the concepts of numerical methods in solving mathematical problems numerically and analyze the convergence and error for these methods.					

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**	**36**
2.	**Laboratory/Studio**	**0**
3.	**Field**	**0**
4.	**Tutorial**	**24**
5.	**Others (specify)**	**0**
Total		**60**

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

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Describe different numerical methods: Bisection method, fixed point method, Newton's method, secant method, for solving a nonlinear equation.**	**K1**	**3 lecture hours\week**	**Direct: Regular Exams**
1.2	**Recall errors and computer algorithms for these methods to implement them.**	**K3**	• **2 tutorial hours\week** • **Self-study**	**Direct: Short Quizzes**
2.0	**Skills**			
2.1	**Compute the root of an equation and the rate of convergence of a convergent iterative scheme**	**S3**	• **Self-study** • **Real-life problems**	**Direct:** • **Participations** • **Short Quizzes**
2.2	**Perform direct methods to solve a system of linear equations and analyze the related errors.**	**S3**	**Self-study**	**Direct: Participations**
2.3	**Construct approximation methods for functions using polynomial interpolation.**	**S3**	**Real-life problems**	**Direct: Short Quizzes**
2.4	**Calculate definite integrals using trapezoidal and Simpson's rules.**	**S3**	**Self-study**	**Direct: Participations**
3.0	**Values, autonomy, and responsibility**			
3.1	**Create with independence.**	**V2**	**Personal questions**	**Direct:**

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
				Participation
3.2	**Develop personal values and attributes such as honesty, empathy and respect for others.**	**V2**	**Teamwork and class discussions.**	**Direct: Homework and Mini projects**

C. Course Content

No	List of Topics	Contact Hours
1.	Roundoff and Truncation Errors Root Finding: Bracketing and Open Methods, Nonlinear equations, Bisection method, Fixed point method, Newton's method, Secant method, Newton's method for solving nonlinear systems, Systems of Linear Equations.	10
2.	Linear Algebraic Equations: Gaussian elimination with partial pivoting, LU-decomposition. Iterative methods: Jacobi and Gauss-Seidel methods. Error analysis for solving Linear system	10
3.	Interpolation and Polynomial Approximations: Lagrange interpolation formula, Divided differences, Newton's interpolation formula, Error in polynomial interpolation.	10
4.	Numerical Differentiation: First derivative: two-point formulas (forward and backward) and three-point formulas (forward, central and backward). Second derivative: the central difference formula and error estimates	10
5.	Numerical Integration: Trapezoidal and Simpson's rules and error bounds.	10
6.	Numerical solutions of ODE's: Euler's method, Taylor methods, Runge-Kutta method of order two and four, and the local truncation error for Euler's and Taylor's formulas.	10
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**HomeWorks, Quizzes, Mini projects**	**During the term**	**10%**
2.	**First Midterm**	**Week 4-5**	**25%**
3.	**Second Midterm**	**Week 7-8**	**25%**
4.	**Final Exam**	**Week 13**	**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	An Introduction to Numerical Analysis using MATLAB, Rizwan Butt, Copyright 2008 by Infinity Science Press, Hingham, Massachusetts, New Delhi. **(Main Reference)**
Supportive References	1. Numerical Analysis, by Richard L. Burden and J. Douglass Faires, 2. An Introduction to Numerical Linear Algebra using MATLAB, by Rizwan Butt, Heldermann Verlag, Germany.
Electronic Materials	**None**
Other Learning Materials	**None**

2. Required Facilities and equipment

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

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**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
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