Bachelor of Science in Applied Mathematics

Courses Handbook

SYLLABUS
MAT 1101

Instructor:

Office Location:

Office Phone:

Email address:

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	1101	Calculus 1	5	4	0	2	128	None	None	1	English

Program(s) offered for:

- Bachelor of Science in Applied Mathematics
- Bachelor of Science in Applied Statistics

B. 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.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	Identify various types of limits of functions of one variable (graphically, numerically and algebraically)	K1, K2	Midterm exam 1 – Final exam
1.2	Describe different techniques of differentiation and its applications.	K1, K2	Midterm exam 2 – Final exam
2.0	**Skills**		
2.1	Use differentiation and integration to solve real world problems such as rate of change and optimization problems.	S1, S2	Midterm exam 2 – Final exam
2.2	Develop methods for applications of differentiation	S4	Final exam
2.3	Draw graphs of functions handily and by using CAS and online solvers.	S5	Final exam

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
2.4	State, clearly and precisely both orally and in writing, different kinds of differentials.	S3	Final exam
3.0	**Values, autonomy, and responsibility**		
3.1	Work individually	V1, V3	Oral questions
3.2	Develop personal values and attributes such as honesty, empathy and respect for others.	V1, V2	Team work

D. COURSE MATERIALS

- **Required Textbook:**

  Calculus, 4th Edition, R. T. Smith, R. B. Minton, McGraw-Hill, 2012. **(Main Reference)**
- **Other References:**
- ***Calculus***; O. Swokowski, et al, PWS Pub. Co.; 6th Edition, 1994.
- ***Calculus: Early Transcendentals***, 7th Edition; C. Henry Edwards, David E. Penney, Pearson Prentice Hall, 2008.
- ***Essential Calculus with Application***; Richard A. Silverman, Dover Publications, 1989.
- ***Schaum's Outline of Calculus***, 6th Edition; Frank Ayres, Elliott Mendelson, McGraw-Hill, 2013.
- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
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.	14	6	0
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.	14	6	0
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.	10	6	0
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.	10	6	0
Total		48	24	0
		72		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
1	0.1	Polynomials and Rational Functions: Solving Equations and Inequalities with and without Absolute Value, Solving a Quadratic Equation and Factoring a Polynomial, Functions and Rational Functions.	1, 3, 6, 10, 15, 23, 29, 43, 45, 47, 48.	None
	0.3	Inverse Functions	3, 4, 5, 7, 9, 14, 37.	
	0.4	Trigonometric and Inverse Trigonometric Functions	1, 3, 5, 8, 33, 35, 37, 38, 40, 46, 57, 58.	
	0.5	Exponential and Logarithmic Functions	27, 29, 32, 35, 38, 42, 46, 47.	
2	1.2	The concept of limits	2, 3, 6, 7, 9, 13, 17, 22.	
	1.3	Computation of limits	2, 3, 4, 7, 9, 10, 11, 13, 14, 22, 23 24.	
	1.4	Continuity and consequences, method of bisections	3, 4, 7, 11, 12, 13, 16, 19, 22, 33, 39, 40.	
	1.5	limits involving infinity: Asymptotes	2, 4, 5, 9, 11, 12, 23, 24.	
	1.6	Formal definitions of limits	2, 4, 6 and 12.	
3	2.2	The Derivatives	2, 3, 4, 7, 9, 12, 19, 20, 21.	
	2.3 2.1	Computation of derivatives Tangent line and Velocity	2, 4, 6,11,14,17, 19, 27, 40.	
	2.4	The product and Quotient rules	1, 4, 7, 12, 16, 17, 19, 20.	
	2.5	the Chain rule	4, 6, 12, 16, 27, 28, 47.	
	2.6	Derivatives of trigonometric functions	1, 2.6, 9, 13, 15, 18, 19, 20, 22, 23, 33, 34, 35.	
	2.7	Derivatives of Exponential and logarithmic functions	1, 2, 9, 13, 14, 17, 22, 23, 25, 29.	
	2.8	Implicit differentiation and Inverse Trigonometric functions	1, 2, 4, 6, 8, 14, 29, 30, 31, 34, 39.	
	2.10	The mean Value Theorem	1, 2, 3, 4, 5, 6, 7, 8, 9, 15, 19.	
4	3.2	Indeterminate forms & l'Hopital's rule	1, 2, 3, 4, 5, 6, 7, 11, 12, 15, 16, 21, 22.	
	3.3	Maximum and Minimum	1, 3, 5, 7, 8, 13, 25,	

		values	**26.**	
	3.4	**Increasing and decreasing functions**	**1, 2, 3, 4, 8, 11, 18, 34.**	
	3.5	**Concavity & second derivative test**	**1, 2, 8, 11, 14.**	
	3.6	**Overview of curve sketching**	**1, 2, 4, 6, 9, 10 13.**	

G. Laboratory Components

None

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1: 4th or 5th week.**
- **Midterm 2: 8th or 9th week.**
- **Quizzes & Homework: During the trimester.**
- **Lab Exam(s)** (if any): **None.**
- **Final Exam: 12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 0%.**
Quizzes: 5%.	**Homework: 5%.**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☐ **Allowed** ☒ **Not allowed**

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية **1444**

Regulations

للوائح والأنظمة

SYLLABUS
MAT 1102

Instructor:

Office Location: Office Phone:

Email address :

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	1102	Calculus 2	5	4	0	2	128	MAT 1101	None	2	English

Program(s) offered for:

- Bachelor of Science in Applied Mathematics
- Bachelor of Science in Applied Statistics

B. 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.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	Identify different techniques of integration and improper integrals.	K1, K2	Midterm exam 1 – Final exam
1.2	List theorems and tests of convergence of sequences and series.	K1, K2	Midterm exam 2 – Final exam
2.0	**Skills**		
2.1	Use the concepts of definite integrals to solve problems involving area, volume, work, and other physical applications.	S1, S2	Midterm exam 2 – Final exam
2.2	Apply the concepts of limits, convergence, and divergence to evaluate some classes of infinite series, and improper integrals.	S4	Final exam
2.3	Illustrate the revolution of a solid region using CAS and online solvers.	S5	Final exam
2.4	State clearly and precisely both orally and in writing, Taylor or Mac Laurin series to estimate the representation of functions as	S3	Final exam

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
	power series.		
3.0	**Values, autonomy, and responsibility**		
3.1	**Work individually.**	**V1, V3**	**Oral questions**
3.2	**Develop personal values and attributes such as honesty, empathy and respect for others.**	**V1, V2**	**Team work**

D. COURSE MATERIALS

- **Required Textbook:**
  Calculus, 4th Edition, R. T. Smith, R. B. Minton, McGraw-Hill, 2012**. (Main Reference)**
- **Other References:**
- ***Calculus***; O. Swokowski, et al, PWS Pub. Co.; 6th Edition, 1994.
- ***Calculus: Early Transcendentals***, 7th Edition; C. Henry Edwards, David E. Penney, Pearson Prentice Hall, 2008.
- ***Essential Calculus with Application***; Richard A. Silverman, Dover Publications, 1989.
- ***Schaum's Outline of Calculus***, 6th Edition; Frank Ayres, Elliott Mendelson, McGraw-Hill, 2013.
- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
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.	**10**	**4**	**0**
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.	**12**	**6**	**0**
3.	**Applications of Definite Integrals:** Area between curves, Volumes by slicing, Volumes using Cylindrical Shells, Arc Length and Surface Area.	**6**	**4**	**0**
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.	**14**	**6**	**0**
5	**Parametric equations:** Plane Curves and Parametric Equations, Calculus and Parametric Equations, Arc Length and Surface in Parametric Equations.	**6**	**4**	
Total		**48**	**24**	**0**
		72		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
1	1.1	Antiderivatives	1, 2,4, 6, 8, 12, 13, 14, 15, 16, 17, 23, 25, 26.	None
	1.3	The definite integral	5, 6, 7, 9, 14, 18, 23, 25, 37.	
	1.5	Area under curves and The Definite Integral	15, 16, 18	
	1.6	First and second fundamental theorems of Calculus	2, 3, 7, 9, 11, 12, 17, 18, 25, 27, 32, 39, 41	
2	2.1	Integration by substitution	2, 3, 6, 7, 9, 13, 17, 22.	
	2.2	Integration by parts	2, 3, 4, 7, 9, 10, 11, 13, 14, 22, 23 24.	
	2.3	Integration of Rational Functions Using Partial Fractions	3, 4, 7, 11, 17, 20, 21, 22, 29, 33, 35, 36.	
	2.4	Trigonometric Techniques of Integration, Integrals involving logarithmic, exponential, and hyperbolic functions	2, 4, 5, 7, 9, 11, 12, 23, 24, 27, 30, 35, 39, 42, 44.	
	2.5	Improper Integrals.	2, 4, 6, 7, 8, 9, 11 12, 15.	
3	3.1	Area between curves	2, 3, 4, 7, 9, 12, 19	
	3.2	Volumes by slicing, Volumes using Cylindrical Shells	17, 19, 21, 25.	
4	4.1	Sequences of Real Numbers, Convergence and Divergence of Infinite Sequences, Formal definition of a convergent sequence	5, 6, 9, 11, 12, 15, 16, 21, 22, 25, 27	
	4.2	Convergence Tests for Positive Series, and Conditional Convergence, Ratio test, Root	1, 3, 5, 7, 8, 13, 14	
		Comparison and limit comparison test, integral test	4, 5, 7, 9, 12, 16, 17, 19, 20	
	4.3	Alternating Series	1, 2, 3, 4, 8, 11, 18	
	4.5	Absolute and Conditional Convergence, Ratio test, Root test	1, 2, 8, 11, 14, 16, 17, 20, 21, 24, 30, 31, 44, 49, 57	
	4.6	Power Series, Differentiation and Integration of power series	1, 2, 4, 6, 9, 10 13.	
		Taylor and Maclaurin Series, Convergence of Taylor series, Applications of Taylor and Maclaurin Series	1, 2, 4, 6, 9, 10 13.	
5	5.1	Plane Curves and Parametric Equations	1, 2, 4, 6, 9, 10 13,	

			17.	
	5.2	Calculus and Parametric Equations	**1, 2, 4, 6, 9, 10 13.**	
	5.3	Arc Length and Surface in Parametric Equations	**1, 2, 4, 6, 8.**	

G. Laboratory Components

None

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1: 4th or 5th week.**
- **Midterm 2: 8th or 9th week.**
- **Quizzes & Homework: During the trimester.**
- **Lab Exam(s)** (if any): **None.**
- **Final Exam: 12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 0%.**
Quizzes: 5%.	**Homework: 5%.**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☒ **Allowed**	☐ **Not allowed**

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية **1444**_

Regulations

للوائح والأنظمة

SYLLABUS
MAT 1151

Instructor:

Office Location:

Office Phone:

Email address :

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	1151	Foundations of Mathematics	5	4	0	2	128	None	None	3	English

Program(s) offered for:

- Bachelor of Science in Applied Mathematics
- Bachelor of Science in Applied Statistics

B. . 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.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	Reproduce proofs of basic set-theoretic identities involving unions, intersections, and Cartesian products.	K1, K2	Midterm exam 1 – Final exam
1.2	Recognize the concept of Logic including truth table logical statement, set theory ,method of proofs and basics of algebraic structures.	K1, K2	Oral questions - All exams
2.0	**Skills**		
2.1	Construct proofs using a variety of proof techniques including: direct	S1, S2	Oral questions - All exams

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
	proofs, proofs by contraposition and contradiction, proofs by mathematical induction to solve a given problem.		
2.2	Formulate in logical the negation, converse, and contrapositive of a quantified implication, both linguistically and in Mathematical symbolic form.	S4	Midterm exam 1 – Final exam
2.3	Analyze carefully abstract proofs to provide appropriate instances.	S5	Oral questions - All exams
2.4	Present proofs both orally and in written form using correct and concise English and mathematical grammar.	S3	Midterm exam 2 – Final exam
3.0	**Values, autonomy, and responsibility**		
3.1	Aspire to improve and develop, learning from mistakes.	V1, V3	Oral questions - All exams
3.2	Engage in group discussions and critical interactions.	V1, V2	Team work - All exams

D. COURSE MATERIALS

- **Required Textbook:**
- *Introduction to Mathematical Proofs: A Transition, C. Roberts; Champan & Hall/CRC 2010. (Main Reference)*
- *A Primer for Logic and Proof, H. P. Hirst and J. L. Hirst, webdraft, (2011-2012 Ed.), 2012.*
- **Other References:**
- *Mathematical Thinking & Writing: A transition to Abstract Math, R. Maddox, Academic Press, 2002.*
- *Mathematical Proofs: A Transition to Advanced Mathematics, 3rd Edition, Gary Chartrand, Albert D. Polimeni, Ping Zhang, Pearson, 2014.*
- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1.	Logic: Statements, Negation, and Compound Statements, Truth Tables and Logical Equivalences, Conditional and Biconditional Statements, Open Statements and Quantifiers.	10	5	0
2.	Set Theory: Sets and Subsets, Operations on Sets, Generalized Set Union and Intersection, Cartesian Product.	8	4	0
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.	4	2	0
4.	Relations: Binary Relations, Reflexive, Symmetric, antisymmetric, and Transitive Relations, Equivalence Relations, Equivalence Classes, and Partitions, The Order Relations.	8	4	0
5	Functions: Functions, Onto Functions, One-to-One Functions, The bijection function, Inverse of a Function, Images and Inverse Images of Sets, Denumerable and Countable Sets, Uncountable Sets.	8	4	0
6	Basics of Algebraic Structures: Binary operations; Semigroups and Groups; Subgroups and Cyclic Groups; Rings, Integral Domains and Fields..	10	5	0
Total		48	24	0
		72		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
1. Logic	1.1	Elementary logic	1,2,4,5,6,11,13 3,4,6,7,19,20,25	None
	1.2	Truth table		
	1.3	Conditional and Biconditional Statements	1,2,5,6,19,26	
	1.5	Open Statements and Quantifiers	1, 2, 3, 4, 6, 8, 10	
2. Mathematical Proofs	2.2.1	Proof Techniques	3,8,11,12,14,15,17	
	2.2.2	Additional Proof Techniques	1,2,3,9,10,11,13	
3. Mathematical Induction	6.1	Mathematical Induction	1,4,5,7,8,10,15	
4. Set theory	3.1	Laws of the set theory	2, 3, 4, 5, 6, 10, 11	
	3.2	Operations on sets	1, 3, 5, 6, 7, 10,	
	3.3	Cartesian product	1, 2, 3, 5, 7, 13, 14	
5. Relations	4.1	Binary relations	3, 4, 5,9, 10	
	4.3		1, 5, 8, 12, 15	
	4.4	Equivalence relations and set partition	1, 3, 6, 8, 9	
6. Functions	5.1	Composition of functions	3, 5, 6, 8, 9, 10	
	5.2	Functions onto, injective and bijective	8, 9	
	5.3	Inverse of a bijective function	2, 3, 7	
	5.4		1, 2, 8, 9, 11, 12	
7. Binary operations	9.1	Identity and inverse element, semi-groups and monoid	1, 2, 3	
8. Groups	9.2	Cayley tables, subgroups order of an element, cyclic groups.	1, 2, 3,6	
	9.3		1,2,3,11,13,14	

G. Laboratory Components

None

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1: 4th or 5th week.**

- **Midterm 2:** **8th or 9th week.**
- **Quizzes & Homework:** **During the trimester.**
- **Lab Exam(s)** (if any): **None**
- **Final Exam:** **12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: **25%.**	**Midterm 2:** **25%.**	**Final Exam:** **40%.**	**Lab Exam(s):** **0%.**
Quizzes: **3%.**	**Homework:** **3%.**	**Project(s):** **0%.**	**Other:** **4%.**

J. CALCULATOR INSTRUCTIONS

☒ **Allowed** ☐ **Not allowed**

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية 1444_

Regulations

للوائح والأنظمة

SYLLABUS
STA 1101

Instructor:

Office Location:

Office Phone:

Email address : username@imamu.edu.sa

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
STA	1101	Probability & Statistics 1	4	3	0	2	100	MAT 1102	None	3	English

Program(s) offered for:

- Bachelor of Science in Applied Mathematics
- Bachelor of Science in Applied Statistics

B. 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.

C. COURSE OUTCOMES AND ASSESSMENT PLAN:

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	To state the various measures of central tendency and dispersion.	K1, K2	Midterm exam 1 – Final exam
1.2	To outline basic probability concepts and techniques of counting for the calculation of probabilities.	K1, K2	Oral questions - All exams
1.2	To define and reproduce some special probability distributions.	K1, K2	Midterm exam 2 – Final exam
2.0	**Skills**		
2.1	To summarize data using tables and charts.	S1, S2, S5	Oral questions - All exams
2.2	To compute descriptive summary measures for a population and the	S2, S3, S5	Midterm exam 1 – Final exam

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
	coefficient of correlation.		
2.3	**To compute probabilities from the binomial, geometric, Poisson, and hypergeometric distributions.**	**S3, S4**	**Midterm exam 1 – Final exam**
2.4	**To calculate probability mass functions, the expected value and variance for discrete random variables.**	**S1, S2, S3**	**Midterm exam 2 – Final exam**
3.0	**Values, autonomy, and responsibility**		
3.1	**To defend the formulated conclusions.**	**V1, V2**	**Oral questions - All exams**
3.2	**To operate meaningfully and productively with others.**	**V1, V3**	**Team work - All exams**

D. COURSE MATERIALS

- **Required Textbook:**

Elementary Statistics: A Step By Step Approach, 10th Edition, Allan Bluman, Mc Graw Hill, 2018. ISBN13: 9781259755330 **(Main Reference).**

- **Other 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.

- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
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**	**4**	**0**
2	**Frequency Distributions and Graphs:** Organizing Data; Histograms, Frequency Polygons, and Ogives; Other Types of Graphs.	**5**	**4**	**0**
3	**Data Description:** Measures of Central tendency; Measure of Variation; Measure of Positions; Exploratory Data Analysis.	**5**	**4**	**0**
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.	**6**	**4**	**0**

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.	**7**	**4**	**0**
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.	**7**	**4**	**0**
Total		**36**	**24**	**0**
		60		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
Ch.1 (The Nature of Probability and Statistics) [Book Ref-1]	**1.1**	**Descriptive and inferential Statistics**		**None**
	1.2	**Variables and Type of Data**		
	1.3	**Data Collection and Sampling Techniques**		
	1.4	**Observations and Experimental Studies**		
Ch.2 (Frequency Distributions and Graphs) [Book Ref-1]	**2.1**	**Organizing Data**	**Examples: 2-1, 2-2, 2-3** **Exercises 2-1: 3, 4, 5, 7, 8, 9, 11, 12, 13**	
	2.2	**Histograms, Frequency polygons and Ogives**		
	2.3	**Other Types of Graphs**		
Ch.3 (Data Description) [Book Ref-1]	**3.1**	**Measures of Central Tendency**	**Examples: 3-1, 3-2, 3-3, 3-4, 3-6, 3-9, 3-11, 3-15** **Exercises 3-1: 13, 33**	
	3.2	**Measures of Variation**	**Examples: 3-19, 3-20, 3-21, 3-22, 3-23, 3-25, 3-26,** **Exercises 3-2: 7-17**	
	3.3	**Measures of Position**	**Examples: 3-29, 3-30, 3-32, 3-33, 3-34, 3-36, 3-37** **Exercises 3-3: 12, 20, 21, 23, 24**	
	3.4	**Exploratory Data Analysis**	**Examples: 3-38, 3-39** **Exercises 3-4: 1-6, 11, 15, 16, 17**	
Ch.4 (Counting Rules and Probability)	**4.1**	**Sample Spaces and Probability**	**Examples: 4-1 till 4-14** **Exercises 4-1: 18, 19, 21, 22, 24, 29**	

[Book Ref-1]	4.2	The Addition Rules for Probability	Examples: 4-15 till 4-22 Exercises 4-2: 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 22, 23, 24, 25, 26	
	4.3	The Multiplication Rules and Conditional Probability	Examples: 4-23 till 4-37 Exercises 4-3: 1 till 29, 34 till 52	
	4.4	Counting Rules	Examples: 4-38 till 4-49 Exercises 4-4: 1 till 59	
	4.5	Probability and Counting Rules	Examples: 4-50 till 4-54 Exercises 4-5: 1 till 17	
Ch.3 (Random Variables (Discrete & Continuous) and Probability Distributions) [Book Ref-2]	3.1	Concept of a Random Variable	Examples: 3.1 till 3.13 Exercises 3.1 till 3.36	
	3.2	Discrete Probability Distributions & Cumulative Distribution		
	3.3	Continuous Probability Distributions & Cumulative Density function		
Ch.4 (Expectation and Variance) [Book Ref-2]	4.1	Mean of a Random Variable	Examples: 4.1 till 4.7 Exercises 4.1 till 4.32	
	4.2	Variance of Random Variable	Examples: 4.8 till 4.16 Exercises 4.33 till 4.52	
	4.3	Means and Variances of Linear combinations of Random variables	Examples: 4.17 till 4.26 Exercises 4.53 till 4.75	
Ch.5 (Some Discrete Probability Distributions) [Book Ref-2]	5.2	Binomial distribution	Examples: 5.1 till 5.7 Exercises 5.1 till 5.28	
	5.3	Hypergeometric distribution	Examples: 5.8 till 5.13 Exercises 5.29 till 5.48	
	5.4	Negative Binomial & Geometric distributions	Examples: 5.14 till 5.20 Exercises 5.49 till 5.76	
	5.5	Poisson distribution		
Ch.6 (Some Continuous Probability Distributions) [Book Ref-2]	6.1	Continuous Uniform distribution	Examples: 6.1 till 6.14 Exercises 6.1 till 6.23	
	6.2	Normal Distribution		
	6.3	Area under the normal curve		
	6.4	Applications of the normal distribution		
	6.5	Normal Approximation to the Binomial	Examples: 6.15 and 6.16	

			Exercises 6.24 till 6.38	

G. Laboratory Components

None.

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1: 4th or 5th week.**
- **Midterm 2: 8th or 9th week.**
- **Quizzes & Homework: During the trimester.**
- **Lab Exam(s)** (if any): **None.**
- **Final Exam: 12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 0%.**
Quizzes: 5%.	**Homework: 5%.**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☒ **Allowed** ☐ **Not allowed**

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية **1444**

Regulations

للوائح والأنظمة

SYLLABUS
MAT 1203

Instructor:

Office Location:

Office Phone:

Email address:

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	1203	Calculus (3)	5	4	0	2	128	MAT 1102	None	4	English

Program(s) offered for:

- Bachelor of Science in Applied Mathematics

B. . COURSE GENERAL DESCRIPTION:

This course:

- **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 the vector operations in different coordinate systems.**

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	Describe parametric and polar curves in plane and recognize regions and quadric surfaces in space.	K1, K2	Midterm exam 1 – Final exam
1.2	Express double and triple integrals in different coordinate systems. in rectangular, polar, cylindrical, and spherical.	K1, K2	Oral questions - All exams
2.0	**Skills**		
2.1	Apply the computational and conceptual principles of vector	S1, S2	Oral questions - All exams

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
	calculus, including partial derivatives and multiple integrals, to the solutions of various problems		
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.**	**S4**	**Oral questions - Midterm exam 2 – Final exam**
2.3	**Illustrate figures in different coordinates using a CAS and some online solvers.**	**S5**	**Homework**
2.4	**Calculate 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**	**Midterm exam 2 – Final exam**
3.0	**Values, autonomy, and responsibility**		
3.1	**listen to the teacher's explanation of the Mathematics reasoning and illustration of 3D figures.**	**V1, V3**	**Oral questions - All exams**
3.2	**Show attitude of support the use of computers in learning/teaching mathematics**	**V1, V2**	**Team work - All exams**

D. COURSE MATERIALS

- **Required Textbook:**

Calculus, 4th Edition; R. T. Smith, R. B. Minton, McGraw-Hill, 2012.**(Main Reference)**.

- **Other 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.***

- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1.	**Vectors and Geometry of Space:** Vectors in Space, Dot Product, Cross Product, Equations of Lines and Planes in Space, Quadratic Surfaces in Space.	**10**	**4**	**0**
2.	**Vector-Valued Functions:** Vector-Valued Functions, Calculus of Vector Functions, Motion in Space, Curvature, Tangent and Normal Vectors.	**10**	**4**	**0**
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,	**14**	**8**	**0**

	Maxima and Minima, Method of Lagrange Multipliers.			
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.	**14**	**8**	**0**
Total		**48**	**24**	**0**
		72		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
1	1.1	Vector in the plane: 1.1 to 1.4	4, 6, 12, 14	None
	1.2	Vectors in Space: 2.2 to 2.5	6, 12, 14, 18, 20, 24, 30	
	1.3	Dot Product: 3.1 to 3.4	12, 14, 16, 18	
	1.4	Cross Product: 4.3 to 4.5	6, 14, 18, 24, 42, 44	
	1.5	Equations of Lines and Planes in Space: 5.1 to 5.6, 5.8, 5.9	4,6,12,16,18, 36, 40, 44	
2	2.1	Vector-Valued Functions: 1.1 to 1.6 except 1.5	2, 4, 6, 12, 30, 32	None
	2.2	Calculus of Vector Functions: 2.1 to 2.9	4, 12, 16, 22, 26, 34, 40	
	2.3	Curvature: 4.1 to 4.6	4, 10, 20, 24	
	2.4	Tangent and Normal Vectors: 5.1, 5.2	4, 6, 8	
3	3.1	Functions of Several Variables: 1.1, 1.2	2, 4	None
	3.2	Limits and Continuity: 2.2 to 2.11	6, 10, 18, 20, 26, 30, 36, 38	
	3.3	Partial Derivatives: 3.1, 3.4, 3.5	2, 12	
	3.4	Tangent planes: 4.1, 4.2	4, 6	
	3.5	The Chain Rule: 5.1, 5.3, 5.6	4, 6, 22	
	3.6	The Gradient and Directional Derivatives: 6.1, 6.2	2, 8, 12, 14	
	3.7	Extrema of functions of several variables:7.1, 7.2, 7.3	2, 4, 6	
4	4.1	Double Integrals: 1.2, 1.3, 1.6, 1.7	10, 12, 16, 44, 46	None
	4.2	Area and Volume:2.1, 2.2, 2.3	6, 8, 10	
	4.3	Double Integrals in Polar Coordinates: 3.2 to 3.4	8, 10, 14, 16	
	4.4	Triple Integrals: 5.1 to 5.3	4, 6, 44	
	4.5	Cylindrical and Spherical Coordinates: 6.1 to 6.5	4, 6, 8, 10, 12, 26, 30, 42, 44	

	4.6	Spherical Coordinates: 7.1 to 7.5	**2, 6, 8, 10, 12, 30**	
5	**5.1**	**Vectors Fields: 1.1, 1.2**	**2, 4, 10**	**None**
	5.2	**Line Integrals: 2.1 to 2.4**	**2, 4, 6, 12, 14, 16, 20, 26**	
	5.3	**Independence of Path and Conservative vector Fields: 3.1 to 3.3**	**4, 6, 10, 14, 18, 20, 22, 30**	
	5.4	**Green's Theorem: 4.1 to 4.4**	**4, 8, 12, 16, 20, 24**	
	5.5	**Curl and Divergence: 5.1 to 5.4**	**4, 8, 10, 14, 18, 26**	
	5.6	**Surface integrals: 6.1, 6.2**	**22, 24, 44, 46, 56, 58, 62**	
	5.7	**The Divergence Theorem: 7.1 to 7.4**	**6, 12, 16, 20, 24, 35**	
	5.8	**Stokes' Theorem: 7.1 to 7.4**	**6, 8, 10, 14, 18, 22, 24**	

G. Laboratory Components None.

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1: 4th or 5th week.**
- **Midterm 2: 7th or 8th week.**
- **Quizzes & Homework: During the trimester.**
- **Lab Exam(s)** (if any): **None.**
- **Final Exam: 12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 0%.**
Quizzes: 5%.	**Homework: 5%.**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☒ **Allowed** ☐ **Not allowed**

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. (“Immediate family” is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444



لائحة الدراسة والقواعد التنفيذية **1444_**

Regulations



للوائح والأنظمة

SYLLABUS
MAT 1223

Instructor:

Office Location:

Office Phone:

Email address:

Office hours:

BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	**1223**	**Linear Algebra**	**5**	**4**	**0**	**2**	**128**	**MAT 1151**	**None**	**4**	**English**

Program(s) offered for:

- Bachelor of Science in Applied Mathematics
- Bachelor of Science in Applied Statistics

A. . COURSE GENERAL DESCRIPTION:

This course describes the most important ideas, theoretical results, and examples of matrices, vector spaces, linear transformations, eigenvalues and eigenvectors. The course includes the essential fundamentals of these topics. The emphasis is on calculations.

B. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1	**Knowledge and Understanding**		
1.1	**Recognize concept of concepts of linear algebra matrix and determinant and eigenvalues.**	**K1, K2**	**Midterm exam 1 – Final exam**
1.2	**Identify structure and features of**	**K1, K2**	**Oral questions - All exams**

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
	vector space and linear dependence and linear independence.		
2	**Skills:**		
2.1	**Find inverse of a square matrix by using its determinant and extension matrix to solve some world-real problems.**	**S1, S2**	**Oral questions - All exams**
2.2	**State, clearly and precisely both orally and in writing, the general solution of at most a 4×4 linear system using appropriate method of linear algebra matrix including Gaussian elimination and matrix inversion.**	**S4**	**Midterm exam 1 – Final exam**
2.3	**Use CAS and online solver to manipulate matrices.**	**S5**	
2.4	**Compute eigenvalues and eigenvectors of square matrix to produce the diagonalization of the matrix.**	**S3**	**Midterm exam 2 – Final exam**
3	**Values:**		
3.1	**Work individually and in group**	**V1, V3**	**Oral questions - All exams**
3.2	**Show attitude of support the use of computers in Matrix manipulation.**	**V1, V2**	**Team work - All exams**

C. COURSE MATERIALS

- **Required Textbook:**

Elementary Linear Algebra; 11th Edition; H. Anton, C. Rorres, Wiley, 2014. (Main Reference)

- **Other References:**

- *Linear Algebra with Application,* **5th Edition; W. K. Nicholson, McGraw- Hill, 2006.**
- *Linear Algebra with Application,* **4th Edition; O. Bretscher; Pearson Ed. Int., 2009.**
- *Linear Algebra, Schaum's Outline,* **S. Lipschutz, M. Lipson, McGraw-Hill 3rd Edition, 2000**

- **Course Website:** Learning Management Systems (Blackboard)

D. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1.	**Matrices and Gauss Elimination**: Linear Systems and Matrices (Gauss Eliminations, Echelon & Reduced Echelon Forms, Matrix Operations, Matrix Inverses), Determinants (Minor & Cofactors, Evaluating Determinants, Cramer's Rule, Adjoints & Matrix Inverses).	**13**	**7**	**0**
2.	**Vector Spaces:** Spaces $\mathbb{R}2$ & $\mathbb{R}3$ and their Geometry, Vector Spaces and Subspaces, Euclidean Vector Spaces $\mathbb{R}n$, Linear Dependence & Independence, Basis and Dimensions of Vector Space, Change of a Basis-Inner Products (Norms, Angle and Orthogonality).	**13**	**7**	**0**
3.	**Linear Transformations**: Definition and Basics, The Kernel and the Image, Linear Transformation Matrix, Nonsingular Transformations and their Inverses, The Direct Sum, The Dimension Theorem.	**12**	**6**	**0**
4.	**Eigenvalues and Eigenvectors:** Characteristic Polynomial, Eigenvalues, Eigenvectors, Diagonalization, Triangulation, Matrix Powers	**10**	**4**	**0**

Total	**48**	**24**	**0**
	72		

E. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
1	1.1	Matrices and systems of linear equations	1 (e),2, 5(g,h), 6 (b,d), 7(a,b,c), 10 (d,e), 11(b,c), 12(d)	None
	1.2	Gauss-Jordan Elimination	1 (a,b,c,d,f), 2 (a,f), 3 (a,b,d),4 (a), 5(d), 6(b), 7(a,d), 8(e)	
	1.3	Gaussian Elimination		
2	2.1	Addition, scalar multiplication, and multiplication of Matrices	1(a,c,f), 3 (a,h,f), 4(a,b,f), 12, 14	
	2.2	Algebraic Properties of Matrix operations	1(a), 3,5(a,d),7, 12,17.	
	2.3	Symmetric Matrices	1(a,d,e,f,g),3,9,12,15,17	
	2.4	The inverse of a matrix	1(a,d),3(a,c), 5 (a,b),7(c,b), 9(b,c), 11, 13,15, 17,19	
3	3.1	Introduction to determinants	1 (d), 3 (c), 5 (d),7 (c), 9(b), 11 (a,b), 13,15	
	3.2	Properties of Determinants	1 (b), 3 (a), 5, 7(c,d), 9(a,b,f), 13(b,c), 14(a)	
	3.3	Numerical Evaluation of a determinant	1 (a), 3 (a,b),5(c,d) 7(a,c), 8(c), 11(c), 13 (b), 15, 17	
	3.4	Determinants, Matrix inverse, and systems of linear equations	1,9,13,15	
4	4.1	The vector space R^n	19(a,c,d), 21(a,b), 26(a,d).	
	4.2	Dot product, Norm, Angle, and distance	2(b),8(a,b),9(a,c).	
	4.3	General vector spaces	2(a,b,d),6(a,b), 8 (a,b,c).	
	4.4	Subspaces	2(a,b), 4 (a,b), 6(a,d),7,11,12,20(a,c).	
	4.5	Linear combinations of vectors	1,2,3,5,7,9,11,15,17	
	4.6	Linear dependence and Independence	1,2,3,5,8,9,13,15,17	
	4.7	Bases and Dimension	1,3,5,11,13,15,17,20	
	4.8	Rank	1,3,5,7,15	
	4.9	Orthonormal vectors and projection	1,3,5,7,11	
	4.10	Inner product spaces	1,4,8,9,10,12,13,15,20	
5	5.1	Eigenvalues and	1, 2c, 2d, 2e, 2g, 4, 5	

		Eigenvectors		
	5.3	**Diagonalization of Matrices**		

F. Laboratory Components

None

G. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

H. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1: 4th or 5th week.**
- **Midterm 2: 8th or 9th week.**
- **Quizzes & Homework: During the trimester.**
- **Lab Exam(s)** (if any): **None.**
- **Final Exam: 12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 0%**
Quizzes: 5%.	**Homework: 5%.**	**Project(s): 0%.**	**Other: 0%.**

I. CALCULATOR INSTRUCTIONS

☒ **Allowed** ☐ **Not allowed**

J. THE GRADING DISTRIBUTION:

A^+	A	B^+	B	C^+	C	D^+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

K. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية **1444_**

Regulations_

للوائح والأنظمة_

SYLLABUS

MAT1241

Instructor:

Office Location:

Office Phone:

Email address:

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Weekly Privat estudy*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	**1241**	**MATH Software**	**3**	**2**	**2**	**0**	**7.5**	**MAT 1102**	**None**	**3**	**English**

Program(s) offered for:

- Bachelor of Science in Applied Mathematics
- Bachelor of Science in Applied Statistics

B. . COURSE GENERAL DESCRIPTION:

This course introduces the basic skills in mathematical programming languages such as MATLAB without attempting deep coverage.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	Recognize the environment of software "MATLAB".	K1, K2	Quizzes
1.2	Reproduce a range of syntaxes using MATLAB.	K1, K2	Lab Exams (1 , 2 and final)
2.0	**Skills**		
2.1	Create code to provide a solution to a range of Mathematical problems ranging from simple to complex.	S1, S2	Lab Quizzes - Lab Exams
2.2	Design and implement, clearly and precisely, simple programs.	S4	Lab Assignments - Lab exams
2.3	Convert MATLAB code into a given to online solver.	S5	Lab exams
2.4	Construct algorithms, M-file script and calculus operation design to solve mathematical problems via MATLAB.	S3	Lab Assignments - Lab exams
3.0	**Values, autonomy, and responsibility**		
3.1	Work individually and in groups.	V1, V3	Oral questions - Lab assigments
3.2	Relate well to others and maintain good relationships;	V1, V2	Team work – Lab assigments

D. COURSE MATERIALS

- **Required Textbook:**

MATLAB: An Introduction with Applications, 6th Edition; Amos Gilat, The Ohio State Univ. 2017.

- **Other References:**

Introduction to MATLAB, Delores Etter, Pearson Education Inc, 4th Edition, 2018. ISBN: 978-0-13-461528-8

- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
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.	2	0	2
2.	Other Operators: Operator Precedence, Relational operations, Logical operations, all and any commands, find command, sort command, max and min command.	2	0	2
3.	Arrays: Creating arrays (vectors, matrices), Lin space command, some major matrices, operators, Matrix operations in MATLAB, Array addressing, Adding and deleting elements, Strings.	4	0	2
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.	4	0	4
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, …	4	0	4
6	Programming: If-else structure, for and while loops, Break and continue commands, Switch-case statement.	6	0	6
7	Symbolic toolbox: Symbolic object and expressions, algebraic expression manipulation, factorization, simplification, solving equations.	4	0	4
Total		**30**	**0**	**30**
		60		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
1		Working in the command window	4, 6, 8, 9, 10, 15, 16, 18, 21, 23, 24, 26, 27, 28, 32, 38, 39, 40.	All exercises are solved in lab using MATLAB
		Arithmetic operations with scalars (order of precedence, Using MATLAB as a Calculator)		
		Display formats		
		elementary math built-in functions		
		Defining scalar variables (The Assignment Operator, Rules Variable Names, Predefined Variables and Keywords)		
2		Creating a one-dimensional array (vector)	2,3, 5, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27, 28, 29, 34	
		Creating a two-dimensional array (matrix) (The zeros, ones and, eye Commands)		
		Array addressing (Vector, Matrix)		
		Using a colon : in addressing arrays		
		Adding elements to existing variables, deleting elements		
		Built-in functions for handling arrays		
		Strings and strings as variables		
		Array addition, subtraction , multiplication and division.		
3		Using arrays in MATLAB built-in math functions		
		Built-in functions for analyzing arrays		
		Generation of random numbers		
		Using arrays in MATLAB built-in math functions		
4		Input to a script file		
		Output commands(the disp command, the fprintf command)	1, 2, 3, 14, 15	
		The save and load commands		
		Importing and exporting data (commands for importing and exporting data, using the import wizard)		
		Creating a function file.		
5		The plot command (Plot of Given Data. Plot of a Function)	7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 20, 24, 27, 31, 39, 40.	
		The fplot command(the hold on and hold off Commands, the line Command)		
		Formatting a plot(Using Commands, Using the Plot Editor)		
		Putting multiple plots on the same page		

		Multiple figure windows	2, 4, 5, 6, 7, 8, 9, 11, 13, 18, 19, 21		
		Line plots			
		Mesh and surface plots			
		The view command			
6		Relational and logical operators	2, 3, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 24, 26, 27, 29		
		Conditional statements(the if-end structure, the if-else-end structure, the if-elseif-else-end structure)			
		The switch-case statement			
		Loops(for-end loops, while-end loops)			
7		Solving an equation with one variable	2, 3, 4, 5, 8, 9, 10, 12, 13, 16, 17, 18, 22, 26, 27, 28, 29, 30, 31, 32, 33, 36, 37, 38, 39, 40		
		Finding a minimum or a maximum of a function			

G. Laboratory Components

N/A

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Lab Exam 1:** 4th or 5th week.
- **Lab Exam 2:** 8th or 9th week.
- **Lab assignments:** During the trimester.
- **Final Lab Exam**: 10th or 11th week.
- **Final Exam:** 12th week.

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2:** 25%.	**Final Exam:** 40%.	**Lab assignments:** 10 %.
Quizzes: 0%	**Homework:** 0%.	**Project(s):** 0%.	**Other:** 0%.

J. CALCULATOR INSTRUCTIONS

☐ Allowed ☒ Not allowed

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. (“Immediate family” is

defined by the University as spouse, grandparents, parents, brother, or sister).

- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية **1444_**

Regulations

للوائح والأنظمة

SYLLABUS
STA 1202

Instructor:

Office Location:

Office Phone:

Email address :

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
STA	1202	Probability and Statistics (2)	5	4	0	2	128	STA 1101	None	5	English

Program(s) offered for:

- Bachelor of Science in Applied Statistics

B. . 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.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	To define and outline the theory of continuous random variables and their probability distributions.	K1, K2	Midterm exam 1 – Final exam
1.2	To outline the procedures of hypothesis testing.	K1, K2	Oral questions - All exams
1.3	To state the method of least squares to estimate the parameters in a linear regression model.	K1, K2	Oral questions - All exams
2.0	**Skills**		
2.1	To estimate probabilities from cumulative distribution functions and cumulative distribution functions from probability density functions, and the reverse.	S1	Oral questions - All exams
2.2	To use and evaluate test hypotheses for the one and two	S1, S2	Midterm exam 1 – Final exam

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
	samples.		
2.3	To predict the future by using the linear regression model.	S3, S4	Midterm exam 1 – Final exam
2.4	To design and formulate hypothesis testing problems that will be solved using Excel.	S3, S5	Oral questions - All exams
2.5	To interpret the output of the statistical software of the test hypothesis of a given data set.	S4, S5	Midterm exam 2 – Final exam
3.0	**Values, autonomy, and responsibility**		
3.1	To work individually and defend the formulated conclusions.	V1, V2	Oral questions - All exams
3.2	To work in groups.	V1, V3	Team work - All exams

D. COURSE MATERIALS

- **Required Textbook:**

Probability & Statistics for Engineers & Scientists, 9th Edition, R. Walpole, R. Myers, S. Myers, K. Ye, Pearson Education International, 2012. ISBN 9780321629111. (Main Reference).

- **Other 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. ISBN-13: 9781133103752.
3. Mathematical Statistics with Applications, 7th Edition, D. Wackerly, W. Mendenhall, R.L. Scheaffer, Brooks/Cole-Cengage Learning, 2008. ISBN-13: 9780495385080.

Course Website:

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
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.	12	4	1
2.	**Some Examples of Continuous Probability Distributions:** Uniform Distribution. The Normal Distribution and its Approximations to the Binomial and Poisson Distributions; Gamma and Exponential Distributions. Chi-Square Distribution. t-Distribution. F-distribution.	9	4	1
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.	9	4	1
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.	9	4	1
5	**Correlation and Linear Regression:** Scatter Plots and Correlation. Line of Best Fit; Determination of the Regression Line Fit Equation.	9	3	1
Total		**48**	**19**	**5**
		72		

F. COURSE OUTLINE

Chapter	Sections	List of Definitions,	List of	Laboratory

(if any)	(if any)	Theorems and Examples In the Lectures (if any)	Exercises for Tutorials (if any)	Components (if any)
6	6.1	Continuous Probability Distributions	1, 2, 3, 4, 5	Solving all exercises by using EXCEL
	6.2	The Normal Distribution Constraint		
	6.3	Evaluating Normality	1, 2, 7, 11, 14, 16	
	6.4	The Uniform Distribution		
9	9.1	Fundamentals of Hypothesis-Testing Methodology	1, 2, 3, 7, 15, 19, 26, 30, 31	
	9.2	T test of Hypothesis for the Mean (σ Unknown)		
	9.3	One-Tail Tests		
	9.4	Z Test of Hypothesis for the Proportion		
10	10.1	Comparing the Means of Two Independent Populations		
	10.2	Comparing the Means of Two Related Populations		
	10.3	F Test for the Ratio of Two Variances		
11	11.1	The Completely Randomized Design: One-Way Analysis of Variance	1, 2, 3, 14, 15	
	11.2	The Factorial Design: Two-Way Analysis of Variance		
13	13.1	Types of Regression Models	1, 2, 3, 14, 15,18,21,25	
	13.2	Determining the Simple Linear Regression Equation		
	13.3	Measures of Variation		
	13.7	Inferences About the Slope and Correlation Coefficient		
	13.8	Estimation of Mean Values and Prediction of Individual Values		

G. Laboratory Components

- Lab 1: **Introducing EXCEL software - Solving all exercises by using EXCEL**

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusionor interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1: 4th or 5th week.**

- **Midterm 2: 8th or 9th week.**
- **Quizzes & Homework: During the trimester.**
- **Lab Exam(s)** (if any): **10th week.**
- **Final Exam: 12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 5%**
Quizzes: 2.5%	**Homework: 2.5%**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☒ **Allowed** ☐ **Not allowed**

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية 1444_

Regulations

للوائح والأنظمة

SYLLABUS
MAT1231

Instructor:

Office Location:

Office Phone:

Email address:

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	1231	Intro. Differential Equations	5	4	0	2	128	MAT 1102 MAT 1223	None	5	English

Program(s) offered for:

- **Bachelor of Science in Applied Mathematics**

B. . COURSE GENERAL DESCRIPTION:

This course describes the most important ideas, theoretical results, and examples of first order differential equations, second and higher order linear differential equations, Laplace transform and linear systems of linear differential equations. The course includes the essential fundamentals of these topics. The emphasis is on calculations, and some applications are mentioned. The use of Symbolic MATLAB software to solve differential equations is essential.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	Summarize the concept of ordinary differential equations, the meaning of the meaning of their solutions, and the methods to find them.	K1, K2	Midterm exam 1 – Final exam
1.2	Classify differential equations with respect to their order and linearity to match the corresponding methods to solve them.	K1, K2	Oral questions - All exams
2.0	**Skills**		
2.1	Summarize the concept of ordinary differential equations, the meaning of the meaning of their solutions, and the methods to find them.	S1, S2	Oral questions - All exams
2.2	Classify differential equations with respect to their order and linearity to match the corresponding methods to solve them.	S4	Midterm exam 1 – Final exam
2.3	Summarize the concept of ordinary differential equations, the meaning of the meaning of their solutions, and the methods to find them.	S5	Matlab exam

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
2.4	**Classify differential equations with respect to their order and linearity to match the corresponding methods to solve them.**	**S3**	**Midterm exam 2 – Final exam**
3.0	**Values, autonomy, and responsibility**		
3.1	**Engage in group discussions and critical interactions**	**V1, V3**	**Oral questions - All exams**
3.2	**Differentiate between valid and fallacious Mathematical arguments to model real problem involving differential equations.**	**V1, V2**	**Team work - All exams**

D. COURSE MATERIALS

- **Required Textbook:**

Elementary Differential Equations and Boundary Value Problems, W. Boyce and R. DiPrima, 9th Edition, New York: John Wiley & Sons, 2010. (Main Reference

- **Other References:**

- ***Advanced Engineering Mathematics,*** E. Kreyszig, John Wiley & Sons, INC 10th Edition, 2010.
- ***Fundamentals of Differential Equations,*** R. Nagle, E. Saff and A. Snider, Addison-Wisley, 6th Edition, 2011.
- ***A first course in differential equations with applications,*** Dennis G. Zill, 5th Edition, PWS Kent Publishing Company, 2000.

- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1.	**First order differential equations:** Separable equations, First order linear equations, Exact differential equations, Homogeneous differential equations, Bernoulli equations, Riccati equations.	**9**	**5**	**0**
2.	**Second order linear differential equations:** General solution of the homogeneous linear equation with constant coefficients, Particular solution of the non-homogeneous equation, Method of Undetermined Coefficients, Variation of Parameters Method.	**9**	**5**	**0**
3.	**Higher order linear differential equations:** General theory of linear differential equations, Homogeneous linear equations with constant coefficients, Undetermined Coefficients Method, Variation of Parameters Method.	**7**	**3**	**0**
4.	**Laplace Transforms:** Basic definitions and properties, First shifting theorem, Partial fractions, Differentiation and integration of Laplace transforms, Laplace transform of some particular discontinuous functions, the unit step function, Dirac function, shifting on the t- axes and second shifting theorem, Inverse of Laplace transform, Convolution, Solving Initial Value Problems Using Laplace Transforms.	**11**	**5**	**0**
5	**Linear systems of differential equations:** Superposition principle, Independence, Matrix exponential, Basic theory of systems of first order linear equations, Homogeneous linear systems with constant coefficients, non-homogeneous linear systems of differential equations.	**8**	**4**	**0**
6	**Using Symbolic MATLAB software to solve differential equations.** Brief introduction to symbolic MATLAB software, solving some generic ODE with examples.	**4**	**2**	**0**
Total		**48**	**24**	**0**
		72		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
1	1.1	Introduction	1,3,5,11,13,12,15	None
	1.2	Solutions and initial value problems	1a, 2a, 3, 5. 12. 15. 19. 21, 24,26,28	
2	2.2	Separable equations	1-7, 11, 15, 18, 23, 24, 25	
	2.3	Linear equations	1-6, 10, 13, 17, 18, 22	
	2.4	Exact equations	1, 2, 4, 6, 8, 13, 17, 19, 23, 29	
	2.5	Special integrating factors	2, 4, 6, 8, 10	
	2.6	Substitutions and transformations	1, 3, 5, 6, 8, 9, 11, 21, 22	
3	4.2	Homogeneous linear equations: the general solution	1, 2, 3, 6, 13, 18, 28, 29, 30	
	4.3	Auxiliary equations with complex roots	3, 9, 23, 24, 25	
	4.4	Undetermined Coefficients Method. Variation of parameters Method	1-8, 10, 12, 27, 31	
	4.5		1c, 5, 7, 9-16, 19, 29, 31-34	
	4.6		1, 7, 12, 17	
4	8.1	Power series	1, 6	
	8.2	Power series solutions to linear differential equations	9, 10	
	8.3		1, 2, 4	
5	9.4	Linear systems in normal form	1, 2, 3, 9	
	9.5	Homogeneous linear systems with constant coefficients	1,6,11,15	
	9.6		1,2,7,14	
	9.7	Nonhomogeneous Linear System, Undetermined Coefficients, Variation of parameters	1,3,5,9,14,15,21	
	9.8	The Matrix Exponential Function	1,6,10,12,17,23,24	

G. Laboratory Components

None.

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1: 4th or 5th week.**
- **Midterm 2: 8th or 9th week.**
- **Quizzes & Homework: During the trimester.**
- **Lab Exam(s)** (if any): **None.**
- **Final Exam: 12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 0%.**
Quizzes: 5%.	**Homework: 5%.**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☒ **Allowed** ☐ **Not allowed**

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية **1444_**

Regulations

للوائح والأنظمة

SYLLABUS
MAT 1225

Instructor:

Office Location:

Office Phone:

Email address:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	1225	Introduction of Number Theory	4	3	0	2	100	None	None	6	English

Program(s) offered for:

- Bachelor of Science in Applied Mathematics
- Bachelor of Science in Applied Statistics

B. . COURSE GENERAL DESCRIPTION:

This course describes the most important ideas, theoretical results, and examples of divisibility, factorizations and congruences. The course includes the essential fundamentals of these topics. The emphasis is on calculations, and some applications are mentioned.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1	**Knowledge and Understanding:**		
1.1	Recognize the concepts of divisibility, prime number, congruence and number theorems.	K1, K2	Midterm exam 1 – Final exam
1.2	Duplicate Euclid's algorithm, Fermat Theorem, Euler Theorem and Wilson's Theorem.	K1, K2	Oral questions - All exams
2	**Skills:**		
2.1	Solve some Diophantine equations and problems on selected applications of Number theory using Euclid's algorithm, Fermat Theorem, Euler Theorem and Wilson's Theorem.	S1, S2	Oral questions - All exams
2.2	Apply rigorously the quadratic reciprocity law in computing and proving some statements in number theory including questions	S4	Midterm exam 1 – Final exam

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
	about divisibility and primes.		
2.3	Use online solvers related to number theory applications.	S5	Midterm exam 2 – Final exam
2.4	Compute the order of integers and primitive roots modulo primes.	S3	Midterm exam 2 – Final exam
3	Values:		
3.1	Defend the ideas and axioms underpinning the mathematics	V1, V3	Oral questions - All exams
3.2	Engage in group discussions and critical interactions.	V1, V2	Team work - All exams

D. COURSE MATERIALS

- **Required Textbook:**

Elementary Number Theory, 7th Edition, David M. Burton, McGraw Hill, 2011. (Main Reference).

Other References:

- *Elementary Number Theory, 5th edition, K. Rosen, Addison-Wesley, 2004.*
- *An Introduction to Mathematical Reasoning: Numbers, Sets and Functions, P. Eccles, Academic Express, 1997.*
- *Elementary Theory of Numbers, W. Le Veque, Dover Publications, 1990.*

- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1.	Divisibility and factorizations: Divisibility properties, the division algorithm, representation of a number relative to arbitrary base, the binary digit system, Fundamental theorem of arithmetic, infinitude of prime numbers, greatest common divisors and least common multiple, Euclidean algorithm and Bezout's identity.	12	8	0
2.	Congruences: Congruence and modular arithmetic, Diophantine linear equation, Chinese Remainder Theorem and system of linear Diophantine equations. Wilson's Theorem, Little Fermat's Theorem, Euler phi function and Euler Theorem.	12	8	0
3.	Applications: divisibility tests, round-robin tournaments, pseudo primes, pseudorandom numbers, linear codes, Pythagorean triples and sum of two squares.	12	8	0
Total		36	24	0
		60		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
1	1.1	Introduction, Classical and strong mathematical inductions, well-ordering principle	1 (e),2, 5(g,h), 6 (b,d), 7(a,b,c), 10 (d,e), 11(b,c), 12(d)	
	1.2	Binomial theorem	1 (a,b,c,d,f), 2 (a,f), 3 (a,b,d),4 (a), 5(d), 6(b), 7(a,d), 8(e)	
2	2.1	The division algorithm, divisibility properties	1(a,c,f), 3 (a,h,f), 4(a,b,f), 12, 14	
	2.2	Greatest common divisor and least common multiple, Euclidean algorithm and Bezout's identity	1(a), 3,5(a,d),7, 12,17.	
	2.3	The fundamental theorem of arithmetic, the sieve of Eratosthenes, infinitude of prime numbers	1(a,d,e,f,g),3,9,12,15,17	
	2.4	Linear Diophantine equation	1(a,d),3(a,c), 5 (a,b),7(c,b), 9(b,c), 11, 13,15, 17,19	
3	3.1	Basic properties of congruences	1 (d), 3 (c), 5 (d),7 (c), 9(b), 11 (a,b), 13,15	
	3.2	Binary and decimal representations of integers, divisibility tests	1 (b), 3 (a), 5, 7(c,d), 9(a,b,f), 13(b,c), 14(a)	
	3.3	Linear congruences and Chinese Remainder Theorem	1 (a), 3 (a,b),5(c,d) 7(a,c), 8(c), 11(c), 13 (b), 15, 17	
	3.4	Fermat's Little Theorem, pseudoprimes, Wilson's Theorem	1,9,13,15	
4	4.1	Pythagorean triples	19(a,c,d), 21(a,b), 26(a,d).	
	4.2	Representations of integers as sum of two squares	2(b),8(a,b),9(a,c).	
	4.3	Introduction to cryptography	2(a,b,d),6(a,b), 8 (a,b,c).	

G. Laboratory Components

None

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1:** **4th or 5th week.**
- **Midterm 2:** **8th or 9th week.**
- **Quizzes & Homework:** **During the trimester.**
- **Lab Exam(s)** (if any): **None.**
- **Final Exam:** **12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 0%.**
Quizzes: 5%.	**Homework: 5%.**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☒ **Allowed** ☐ **Not allowed**

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية 1444_



Regulations

للوائح والأنظمة

SYLLABUS
MAT 1253

Instructor:

Office Location:

Office Phone:

Email address : username@imamu.edu.sa

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	1253	Operations Research	4	3	0	2	100	MAT 1223	None	6	English

Program(s) offered for:

- Bachelor of Science in Applied Mathematics
- Bachelor of Science in Applied Statistics

B. . 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.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	Identify a Linear Programming Problem and its formulation.	K1, K2	Midterm exam 1 – Final exam
1.2	Summarize techniques of operations research including Linear Programming, Assignment Problem. Integer programming, simplex, duality and sensitive analysis.	K1, K2	Oral questions - All exams
2.0	**Skills**		
2.1	Solve proposed real-life problems by applying the methodology and tools of Operations Research including Linear Programming,	S1, S2	Oral questions - All exams

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
	Assignment Problem. Integer programming, simplex, duality and sensitive analysis.		
2.2	**Model in mathematical language understandable operational research problems from the verbal description of the real system.**	**S4**	**Midterm exam 1 – Final exam**
2.3	**Use of TORA software to solve and online solver to solve some to solve the proposed models.**	**S5**	**TORA exam**
2.4	**Employ clearly, the best strategy Solve linear programming problems using appropriate techniques and optimization solvers.**	**S3**	**Midterm exam 2 – Final exam**
3.0	**Values, autonomy, and responsibility**		
3.1	**work individually.**	**V1, V3**	**Oral questions - All exams**
3.2	**Relate well to others and maintain good relationships;**	**V1, V2**	**Team work - All exams**

D. COURSE MATERIALS

- **Required Textbook:**

***Operations Research: An Introduction*,** H. Taha, Prentice Hall, 8th Edition, 2006. **(Main Reference)**

- **Other References:**

***Introduction to Operations Research*,** F. Hillier and G. Lieberman, 7th Edition, McGraw Hill, 2001.

- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1.	**Introduction to Linear programming:** Overview, Linear programming formulations, Graphical Linear Programming Solution, Graphical Sensitivity analysis.	5	3	0
2.	**The Simplex Method:** Standard Linear Programming, Determination of Basic Feasible Solutions; The Simplex Algorithm.	5	3	0
3.	**Special Cases of the Simplex:** Degeneracy, Alternative optimum, Unbounded solution, Infeasibility.	4	2	0
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.	7	3	0
5	**Special linear programming models:** The transportation model, The assignment model.	5	3	0
6	**Introduction to Integer Linear Programming:** Illustrative applications, Branch and Bound algorithm, Application to the Traveling Salesman Problem.	7	3	0
7	**Tora Software:** Use of TORA software to solve exercises and problems from all course chapters.	0	0	10
Total		33	17	10
		60		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
1	1.2	Linear Program	1, 2, 3, 4, 5	All exercises will be solved during TORA classes
		Objective Function		
		Constraint		
		Nonnegativity Constraint		
	1.3	Feasible Region	1, 2, 7, 11, 14, 16	
		Four Cases Solution		
2	2.1	Standard Form	1, 2, 3, 7, 15, 19, 26, 30, 31	
	2.2	Feasible Solution		
		Basic Feasible Solution		
	2.3	Simplex Algorithm		
		Gauss-Jordan Elimination Review		
3	3.1	Degeneracy		
	3.2-3.4	Simplex Four Cases Solution		
		Unsigned Variables Case		
4	4.1	Primal and Dual Problems	1, 2, 3, 14, 15	
	4.2	Complementary Slackness		
		Dual Simplex Algorithm		
	4.4	Sensitivity Analysis Cases		
5	5.1	Initial Basic Feasible Solution Algorithms	1, 2c, 2d, 2e, 2g, 4, 5	
		UV-method		
		Degeneracy		
		Unbalanced Case		
	5.2	Hungarian Algorithm	1, 2, 3, 5a, 5e, 7, 12	
		Two Cases Solution		
6	6.2	Integer Feasible Region	1, 2, 3	
		Branch and Bound Algorithm	1, 2, 3	

G. Laboratory Components

- Lab 1: **Introducing TORA software - Solving all exercises by using TORA (Part 1).**
- Lab 2: **Solving all exercises by using TORA (Part 2).**
- Lab 3: **Solving all exercises by using TORA (Part 3).**
- Lab 4: **TORA exam.**

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1: 4th or 5th week.**

- **Midterm 2: 8th or 9th week.**
- **Quizzes & Homework: During the trimester.**
- **Lab Exam(s)** (if any): **10th or 11th week.**
- **Final Exam: 12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 5%.**
Quizzes: 2.5%.	**Homework: 2.5%.**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☒ **Allowed** ☐ **Not allowed**

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية 1444_

Regulations

للوائح والأنظمة

SYLLABUS
MAT 1311

Instructor:

Office Location:

Office Phone:

Email address:

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	**311**	**Real Analysis**	**5**	**4**	**0**	**2**	**128**	**MAT 1203**	**None**	**7**	**English**

Program(s) offered for:

- Bachelor of Science in Applied Mathematics
- Bachelor of Science in Applied Statistics

B. . COURSE GENERAL DESCRIPTION:

This course describes the most important ideas, theoretical results, and examples of an introduction to introduction to real analysis. The course includes the essential fundamentals of the properties of the real number system lR, the treatment of sequences in IR and the associated limit concepts, limits of functions and continuous functions, which constitute the heart of this course. The basic theory of the derivative is given in the first part of Chapter 5.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	To explore the fundamental concepts real sequences and real functions of a single variable: continuity, limits, differentiation, and integration.	**K1, K2**	**Midterm exam 1 – Final exam**
1.2	To know the definition of the Derivative and its main applications such that MVT.	**K1, K2**	**Oral questions - All exams**
2.0	**Skills**		
2.1	Solve proposed problems in analysis by applying the methodology and tools of real analysis including lower and upper bounds, sequences, limits, continuity and derivatives	**S1, S2**	**Oral questions - All exams**

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
2.2	To communicate mathematics clearly and precisely both orally and in writing	S4	Midterm exam 1 – Final exam
2.3	To use Internet in searching for scientific information.	S5	TORA exam
2.4	To carry out calculations orally and mentally.	S3	Midterm exam 2 – Final exam
3.0	**Values, autonomy, and responsibility**		
3.1	work individually.	V1, V3	Oral questions - All exams
3.2	Relate well to others and maintain good relationships;	V1, V2	Team work - All exams

D. COURSE MATERIALS

- **Required Textbook:**

  Introduction to Real Analysis, 4th Edition;R. Bartle, D. Sherbert, Wiley,2011. ISBN: 978-0471433316. **(Main Reference)**

- **Other References:**

  1- Introduction to Real Analysis, William F. Trench, (Pearson Education)

  2- Real and Complex Analysis, W. Rudin, 3rd edition, McGraw-Hills, 1987.

  3- **Course Website:** Learning Management Systems (Blackboard)

4- COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1.	**Fundamentals:** Absolute value, *The least upper bound property - Completeness property,* Supremum property & applications, *Archimedean property- Density of Rational in the set of real numbers*	9	5	0
2.	**Sequence of real numbers***: Formal definition of the limit-* Limit theorems- Monotonic sequences- Subsequences & Bolzano-Weierstrass Theorem- Cauchy sequences, Completeness of R- Convergence & divergence	10	5	0
3.	**Limits:** *Formal definition of the limit- Limits of Functions-* Limit theorems	10	4	0
4.	**Continuity:** *Formal definition of the limit-* Limit theorems - Continuous functions- Uniform continuity	9	4	0
5.	**Differentiation** : Derivative - Mean value Theorem	10	6	0
Total		48	24	0
		72		

5- COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
1	2.2	Absolute value- Triangle inequality The least upper bound property Completeness property Supremum property & applications	Exercises for Section 2.2: 1, 2, 6, 7, 8	None
	2.3	Archimedean property	Exercises for Section 2.3: 1, 2, 3, 4, 5.	
	2.4	Density of Rational in the set of real numbers	Exercises for Section 2.4: 1, 2, 4(a).	
2	3.1	Formal definition of the limit	Exercises for Section 3.1: 1, 3, 5(a,c), 6(a,c).	
	3.2	Limit theorems	Exercises for Section 3.2: 1, 2, 3.	
	3.3	Monotonic sequences	Exercises for Section 3.3: 1, 2, 3, 4, 11, 12.	
	3.4	Subsequences & Bolzano-Weierstrass Theorem	Exercises for Section 3.4: 1, 4.	
	3.5	Cauchy sequences, Completeness of R	Exercises for Section 3.5: 1, 2, 3, 4.	
3	4.1	Formal definition of the limit	Exercises for Section 4.1: 3, 7, 8, 9(a,b), 14.	
	4.2-4.3	Limit theorems	Exercises for Section 4.2: 3, 4, 11	
4	5.1	Continuous functions	Exercises for Section 5.1: 10, 11, 12.	
	5.2, 5.3, 5.4	Uniform continuity	Exercises for Section 5.2: 1, 7, 8 Exercises for Section 5.4: 1, 2, 11	
5	6.1, 6.2,6.3,6.4	Derivative Mean value Theorem	Exercises for Section 6.1: 1, 2, 4, 10.	
	6.2		Exercises for Section 6.2: 5, 6, 7	

6- Laboratory Components

None

7- OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

8- EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1: 4th or 5th week.**
- **Midterm 2: 8th or 9th week.**
- **Quizzes & Homework: During the trimester.**
- **Lab Exam(s)** (if any): **None.**
- **Final Exam: 12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 0%.**
Quizzes: 5%.	**Homework: 5%.**	**Project(s): 0%.**	**Other: 0%.**

9- CALCULATOR INSTRUCTIONS

☒ **Allowed** ☐ **Not allowed**

10- THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

11- STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية 1444_

Regulations

للوائح والأنظمة

SYLLABUS
MAT1332

Instructor:

Office Location:

Office Phone:

Email address:

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	1332	Mathematical Methods	5	4	0	2	128	MAT 1203 MAT 1231	None	7	English

Program(s) offered for:

- **Bachelor of Science in Applied Mathematics**

B. . COURSE GENERAL DESCRIPTION:

This course covers a broad spectrum of mathematical techniques essential to the solution of advanced problems. Topics include Series Solutions of ODES, Vector Calculus, Fourier series and Fourier transform. Each topic is given a formal treatment and illustrated by examples of varying degrees of difficulty.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	Identify various techniques, including Power series method, Special functions, and Fourier series/transform, to solve differential equations.	K1, K2	Midterm exam 1 – Final exam
1.2	Distinguish advanced differential and integral calculus theory.	K1, K2	Oral questions - All exams
2.0	**Skills**		
2.1	Apply appropriately Fourier transform and their inverse real-life problems involving differential equations in the context of mathematical method	S1, S2	Oral questions - All exams
2.2	Communicate mathematics clearly and precisely both orally and in writing.	S4	Midterm exam 1 – Final exam
2.3	Use mathematical software and online solvers to solve differential equation in context of the course.	S5	MATLAB Quiz
2.4	Develop competency in mathematical presentation, written and verbal skills.	S3	Midterm exam 2 – Final exam

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
3.0	**Values, autonomy, and responsibility**		
3.1	**Demonstrate confidence in solving given mathematical problems.**	**V1, V3**	**Oral questions - All exams**
3.2	**Operate meaningfully and productively with others.**	**V1, V2**	**Team work - All exams**

D. COURSE MATERIALS

- **Required Textbook:**

***Elementary Differential Equations and Boundary Value Problems*, W. Boyce and R. DiPrima, 9th edition, New York: John Wiley & Sons, (2010) (Main Reference)**

- **Other References:**

***Advanced Engineering Mathematics*, E. Kreyszig, John Wiley & Sons, INC 10th ed. (2010).**

- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1.	Series solutions of differential equations: Power series solution of differential equations around ordinary points, Euler-Cauchy equations, Frobenius method for solving second order linear differential equations around regular singular points, Bessel's equations and Bessel's functions, Legendre's Equations. Special functions (Gamma and Beta functions).	**12**	**6**	**0**
2.	Vector Calculus: Vector-Valued Functions of one variable, Del operator: divergence, gradient, curl, and Laplacian, Line and Surface Integrals, conservative fields, Green's Theorem, Divergence Theorem, Stokes' Theorem, Vector operators in curvilinear coordinate systems, Some Physical Applications of Vector Calculus.	**12**	**6**	**0**
3.	Fourier Transforms: Review of Fourier Series, Convergence of Fourier Series, Fourier Integrals and their convergence, Complex Fourier series and Integrals. Fourier Transform, Inverse Fourier Transform, Time and frequency shifting. Properties and Applications of the Fourier transforms. Fourier Cosine and Sine transforms.	**12**	**6**	**0**
4.	Fourier transform: The Fourier Integral, Fourier Cosine Integral and Sine Integral, The Complex Fourier Integral, Fourier transforms, Properties and Applications of the Fourier transforms, Fourier Cosine and Sine Transforms, The Discrete Fourier Transform, The Fast Fourier transform.	**12**	**6**	**0**
Total		**48**	**24**	**0**
		72		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
5	5.1	Review of Power Series	2,5,13,16,18,20,22,27	Some MATLAB practice will be done
	5.2	Series Solutions Near an Ordinary Point	1, 3, 5, 8, 15, 21 (a)	
	5.4	Euler Equations; Regular Singular Points	1, 3, 4, 5, 8, 13, 15, 17, 23, 28	
	5.5	Series Solutions Near a Regular Singular Point	1, 3, 4, 7, 11, 12, 13	
	5.7	Bessel's Equation	1, 3, 4, 6	
6	6.1	Definition of the Laplace Transform	1, 4, 7, 8, 11, 12, 15, 17, 19, 26, 27	
	6.2	Solution of Initial Value Problems	1,2,3,4,5,7,10,11,13,14,18,24	
	6.3	Step Functions	1,2,3,6,8,10,11,13,17,18	
	6.4	Differential Equations with Discontinuous Forcing Functions	2,3,5,6,7,11,13	
	6.5	Impulse Functions	1,3,6,9,12	
	6.6	The Convolution Integral	4,5,7,8,9,10,14,16,17,26	
10	10.2	Fourier Series	1,2,4,5,7,10,13,15,18,19,20	
	10.3	The Fourier Convergence Theorem	1,2,4,5,7(a),10(a),11(a)	
	10.4	Even and Odd Functions	1,3,5,6,7,8,10,11,15,16,17,18,20	
14	14.1	The Fourier Integral	1, 3, 5, 6, 9	
	14.3	The Fourier Transform	2, 3, 4, 6, 11, 13, 16, 17, 19, 21, 23	
	14.4	Fourier Cosine and Sine Transforms	1,3,4	

G. Laboratory Components

None.

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1:** 4th or 5th week.
- **Midterm 2:** 8th or 9th week.
- **Quizzes & Homework:** During the trimester.
- **Lab Exam(s)** (if any): 10th or 11th week.
- **Final Exam:** 12th week.

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2:** 25%.	**Final Exam:** 40%.	**Lab Exam(s):** 5%.
Quizzes: 2.5%.	**Homework:** 2.5%.	**Project(s):** 0%.	**Other:** 0%.

J. CALCULATOR INSTRUCTIONS

☒ Allowed ☐ Not allowed

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية **1444_**

Regulations

للوائح والأنظمة

SYLLABUS
MAT 1321

Instructor:

Office Location:

Office Phone:

Email address:

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Weekly Privat estudy*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	**1321**	**Modern Algebra**	**5**	**4**	**0**	**2**	**128**	**MAT 1223, MAT 1225**	**None**	**8**	**English**

Program(s) offered for:

- Bachelor of Science in Applied Mathematics
- Bachelor of Science in Applied Statistics

B. . COURSE GENERAL DESCRIPTION:

This course is an introduction to the principles and concepts of modern algebra. Topics will include the theory of groups with their structures. It discusses also the theory of rings and their ideals, emphasizing Euclidean domains.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	**Identify fundamental structures of abstract algebra including groups, rings, fields, and integral domains by definitions and examples and non-examples**	**K1, K2**	**Midterm exam 1 – Final exam**
1.2	**Discuss the fundamental theorem of finite Abelian groups, integral domains and fields, principal ideal domains, and polynomial rings.**	**K1, K2**	**Oral questions - All exams**
2.0	**Skills**		
2.1	**Apply fundamental theorems of modern algebra such as Syllow**	**S1, S2**	**Oral questions - All exams**

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
	Theorem and isomorphism theorems, and Irreducibility criteria to solve problems in applied settings.		
2.2	**Write to communicate the topics of modern algebra using rigorous proof writing conventions, explanations, and correct mathematical notation.**	**S4**	**Midterm exam 1 – Final exam**
2.3	**Use information technology to algebraic structures in the context of modern algebra topics through consideration of examples.**	**S5**	**Homework**
2.4	**Analyze similarities and differences between algebraic structures including groups, rings, fields, and integral domains.**	**S3**	**Midterm exam 2 – Final exam**
3.0	**Values, autonomy, and responsibility**		
3.1	**Demonstrate a sense of self-worth**	**V1, V3**	**Oral questions - All exams**
3.2	**Relate well to others and maintain good relationships;**	**V1, V2**	**Team work - All exams**

D. COURSE MATERIALS

- **Required Textbook:**
- *A First Course in Abstract Algebra*, J. Farleigh, Pearson Education, 1st Indian edition, 2003. (Main Reference).
- *Abstract Algebra*, D. Dummit, R. Foote, John Wiley, 3rd Edition, 2004.
- *Contemporary Abstract Algebra*, J. Gallian, Houghton Mifflin Company; 5th Edition, 2001
- **Other References:**
- *Abstract Algebra: An Introduction*, **T. Hungerford, Brooks Cole; 2nd Edition, 1996.**
- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1.	**Group Theory:** Review, Definition of Group, Subgroups, Cyclic Groups, Euler's theorem, Cosets, Lagrange's theorem, Normal Subgroups, quotient Groups.	**12**	**6**	**0**
2.	**Structures of groups:** Isomorphism Theorems, Conjugacy, Group acting on Sets, Finite Abelian Groups, Sylow Theorems, Examples of Simple Groups.	**12**	**6**	**0**
3.	**Rings:** Basic definitions and examples, Ring Homomorphisms, Ideals. Quotient Ring, Principal Ideal Domains, Euclidean Domains, Fields.	**12**	**6**	**0**
4.	**Polynomial rings:** Definitions and basic property, Polynomial Rings over fields. Irreducibility criteria.	**12**	**6**	**0**
Total		**48**	**24**	**0**
		60		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
1		**Group Theory**	1, 2, 3, 4, 5,9,15,18.	None
	1.1	Review, Definition of Group, Subgroups	1, 2, 4, 5,6,8,10.	
	1.2	Cyclic Groups, Euler's theorem	2, 3, 5,7,8,15.	
	1.3	Cosets, Lagrange's theorem		
	1.4	Normal Subgroups,	1, 2,4, 7, 8,11, 14.	
	1.5	quotient Groups.	1, 2, 3, 5,6,8,12.	
2	2.1	**Structures of groups** Isomorphism Theorems, Conjugacy	1, 2, 3, 7, 15, 19, 28.	
	2.2	Group acting on Sets,	1, 2,3, 7, 9,11, 13.	
	2.3	Finite Abelian Groups	1, 3, 5,7,8,16.	
	2.4	Sylow Theorems,	1,2, 4, 5,7,11,18.	
	2.5	Examples of.Simple Groups		
3		**Rings:**	5,7,8,15,19.	
	3.1	Basic definitions and examples		
	3.2	Ring Homomorphisms		
4	4.1	Ideals	1, 2, 3, 4, 7,14, 15.	
	4.2	Quotient Ring	1, 2, 3, 5, 7, 13.	
	4.3	Principal Ideal Domains		
	4.4	Euclidean Domains		
5	5.1	Fields	1, 2, 3, 7, 9, 14, 15	
	5.2	**Polynomial rings**	1,2.5,7,8,15,19.	
	5.3	Definitions and basic property		
	5.4	Polynomial Rings over fields.		
	5.5	Irreducibility criteria	1, 2, 3, 5, 6, 7, 10	

G. Laboratory Components

None.

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1: 4th or 5th week.**
- **Midterm 2: 8th or 9th week.**
- **Quizzes & Homework: During the trimester.**
- **Lab Exam(s)** (if any): **None.**
- **Final Exam: 12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 0%.**
Quizzes: 5%.	**Homework: 5%.**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☐ **Allowed**	☒ **Not allowed**

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية **1444_**

Regulations

للوائح والأنظمة

SYLLABUS
MAT 1341

Instructor:

Office Location:

Office Phone:

Email address:

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Student Work Load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	1341	Numerical Analysis (1)	5	3	2	2	116	MAT 1231 CS 1249	None	8	English

Program(s) offered for:

- **Bachelor of Science in Applied Mathematics**

B. . COURSE GENERAL DESCRIPTION:

This course is an introduction to the numerical analysis. It presents the fundamental concepts and methods, and basic numerical analysis tools in the field. This course emphasizes not only numerical methods, but also the analysis of their convergence and convergence rates. It develops as well the basic understanding of numerical algorithms and skills to implement algorithms to solve mathematical problems on the computer.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	Recognize theories and concepts used in Numerical Analysis.	K1, K2	Midterm exam – Final exam
1.2	Identify the concept of finite difference, approximation by iteration, numerical differentiation and integration, error analysis.	K1, K2	Oral questions - All exams
2.0	**Skills**		
2.1	Apply elementary numerical techniques and rules, including Floating Point Representation, interpolation, Trapezoidal and Simpson Rules, Gaussian Quadrature, Newton Divided Difference, Euler method, Runge-Kutta methods, and matrix algebra tools to solve given real-life problems.	S1, S2	Oral questions - All exams
2.2	Write efficient, well-documented MATLAB code and present numerical results in an informative way.	S4	Oral questions – Final exam

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
2.3	**Implement some numerical methods using MATLAB software and CAS.**	**S5**	**MATLAB exam**
2.4	**Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.**	**S3**	**Midterm exam – Final exam**
3.0	**Values, autonomy, and responsibility**		
3.1	**work individually and in group**	**V1, V3**	**Oral questions - All exams**
3.2	**formulate a variety of alternative numerical methods to estimate the solutions of ODEs according to their setting.**	**V1, V2**	**Team work - All exams**

D. COURSE MATERIALS

- **Required Textbook:**

***Elementary Numerical Analysis*, 3rd Edition, Kendall Atkinson; Weimin Han, 2004. (Main Reference)**

- **Other References:**

***An Introduction to Numerical methods and Analysis*, James F. Epperson, Wiley, 2002.**

- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1.	**Introduction to data representation:** Numerical Errors; Floating Point Representation; Round-off; Significant Digit; Error Propagation.	6	4	0
2.	**Root Finding:** Bisection Method, Newton's Method, Secant Method.	6	4	4
3.	**Interpolation and Approximation:** Taylor polynomials, Approximation of order n, Polynomial Error, Linear and Quadratic Interpolation, Lagrange Interpolation, Newton Divided Difference Method, Error Evaluation.	6	4	4
4.	**Numerical Integration and Differentiation:** The Trapezoidal and Simpson Rules, Numerical Differentiation.	6	4	4
5	**Numerical Solution of Linear Systems:** Gauss Elimination, LU, Iterative Methods: Jacobi and Gauss-Siedel Methods, Error Analysis.	6	4	4
6	**Numerical solution of differential equations:** Euler method, Runge-Kutta methods. Error and convergence analysis.	6	4	4
7	**Software:** Use of Matlab software to solve exercises and problems from all course chapters.	0	0	4
Total		36	24	24
		84		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
1	1.1	Numerical Errors	1, 2, 3, 4, 5	All exercises will be solved during MATLAB classes
		Floating Point Representation		
		Round-off		
	1.2	Significant Digit		
		Error Propagation	1, 2, 7, 11, 14, 16	
2	2.1	Bisection Method	1, 2, 3, 7, 15, 19, 26, 30, 31	
	2.2	Newton's Method		
		Secant Method		
	2.3	Fixed Point Iterations		
3	3.1	Taylor polynomials, Approximation of order n		
	3.2	Polynomial Error		
	3.3	Linear and Quadratic Interpolation		
	3.4	Lagrange Interpolation		
	3.5	Newton Divided Difference Method,		
	3.6	Error Evaluation		
4	4.1	The Trapezoidal rule	1, 2, 3, 14, 15	
	4.2	The Simpson Rule		
		Gaussian Quadrature		
	4.4	Numerical Differentiation		
5	5.1	Gauss Elimination	1, 2c, 2d, 2e, 2g, 4, 5	
		LU and Cholesky Decompositions		
		Gauss-Jacobi Methods		
		Gauss-Siedel Methods		
	5.2	Error Analysis	1, 2, 3, 5a, 5e, 7, 12	
		Two Cases Solution		
6	6.1	Euler method, Runge-Kutta methods	1, 2, 3	
	6.2	Error and convergence analysis		

G. Laboratory Components

- Lab 1: **Introducing Matlab software - Solving all exercises by using Matlab (Part 1).**
- Lab 2: **Solving all exercises by using Matlab (Part 2).**
- Lab 3: **Solving all exercises by using Matlab (Part 3).**
- Lab 4: **Matlab exam.**

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1: 4th or 5th week.**
- **Midterm 2: 8th or 9th week.**
- **Quizzes & Homework: During the trimester.**
- **Lab Exam(s)** (if any): **10th or 11th week.**
- **Final Exam: 12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 5%.**
Quizzes: 2.5%.	**Homework: 2.5%.**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☒ **Allowed**	☐ **Not allowed**

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية 1444_

Regulations

للوائح والأنظمة

SYLLABUS
MAT 1371

Instructor:

Office Location:

Office Phone:

Email address: username@imamu.edu.sa

Office hours:

A. BASIC INFORMATION

Course Code	Course Num.	Course Name	Credit Hours	Lec.	Lab.	Tut.	Student Work Load	Pre-requisites	Co-requisites	Course Level	Teaching Language
MAT	1371	Financial Mathematics (1)	4	3	0	2	100	MAT 1102	None	8	English

Program(s) offered for:

- Bachelor of Science in Applied Mathematics

B. 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 the fundamental concepts as well such as cash flows, present value, and yield that form the basis for further advanced learning. More topics will also be covered.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	Recognize 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.	K1, K2	Oral questions - All exams
1.2	Describe the price, book value, amortization of premium, accumulation of discount, redemption value, par value/face value, yield rate, coupon.	K1, K2	Oral questions - All exams
2.0	**Skills**		
2.1	Solve real-life financial problems involving compound interest, present and future values, and annuities.	S1, S2	Oral questions - All exams
2.2	Apply logical thinking to problem solving in context to communicate results clearly and precisely both orally and in writing.	S4	Midterm exam 1 – Final exam
2.3	Use appropriate technology to aid problem solving.	S5	Mini-projects
2.4	Calculate appropriately the value(s) of money. the annual effective rate of interest, the loan amount or outstanding loan balance, the value of	S3	Midterm exam 2 – Final exam

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
	a stock.		
3.0	**Values, autonomy, and responsibility**		
3.1	**Work individually.**	**V1, V3**	**Oral questions - All exams**
3.2	**Relate well to others and maintain good relationships.**	**V1, V2**	**Team work - All exams**

D. COURSE MATERIALS

- **Required Textbook:**

Theory of Interest, 3rd Edition, Stephen Kellison, McGraw-Hill Education, 2009**. (Main Reference)**

- **Other References:**

An Introduction to Quantitative Finance, S. Blyth, Oxford University Press, 2013 (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.

- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
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.	**6**	**4**	**0**
2.	**Solution of problems in interest:** Introduction. The basic problem. Equations of value. Unknown time. Unknown rate of interest. Determining time periods. Practical examples.	**5**	**3**	**0**
3.	**Basic annuities:** Introduction. Annuity-immediate. Annuity-due. Annuity values on any date. Perpetuities. Unknown time. Unknown rate of interest. Varying interest.	**5**	**3**	**0**
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.	**4**	**3**	**0**
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.	**5**	**3**	**0**
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,	**5**	**3**	**0**
7	**Yield rates**: Introduction. Discounted cash flow analysis. Uniqueness of the yield rate. Reinvestment rates. Interest measurement of a fund. Time-	**4**	**3**	**0**

	weighted rates of interest. Portfolio methods and investment year methods.			
8	**Practical applications**: Introduction. Truth in lending. Automobile financing. Real estate mortgages. Approximate methods. Depreciation methods. Capitalized cost. Modern financial instruments.	2	2	0
Total		36	24	0
		60		

F. COURSE OUTLINE

Chapter (if any)	*Sections (if any)*	*List of Definitions, Theorems and Examples In the Lectures (if any)*	*List of Exercises for Tutorials (if any)*	*Laboratory Components (if any)*
1	1.1	Introduction		None
	1.2	Basics	1, 3	
	1.3	Rates of Interest	5, 8	
	1.4	Simple Interest	9, 10, 11	
	1.5	Compound Interest	13, 15	
	1.6	Present value	17, 19	
	1.7	Effective Rate of Discount	20, 21, 2	
	1.8	Nominal Rates	26, 28	
	1.9	Force of Interest (Discount)	34, 35	
2	2.1	Introduction		
	2.2	The basic problem		
	2.3	Equations of Value	2, 4	
	2.4	Unknown Time	9, 12	
	2.5	Unknown Rate of Interest	18	
	2.6	Determination of Time Periods	19	
3	3.0	Sum of a Geometric Sequence		
	3.1	Annuity Terminology		
	3.2	Annuity Immediate	2, 6	
	3.3	Annuity Due	8, 9	
	3.4	Annuities Evaluated at Other Points in Time	14	
	3.5	Perpetuities	19	
	3.6	Unknown Time	24	
	3.7	Unknown rate of interest	29	
	3.8	Varying interest	32, 33	
4	4.1	Introduction		
	4.2	Differing payment and interest conversion periods	1	
	4.3	Annuities Payable Less Frequently Than Interest Conversion	5, 6	
	4.4	Annuities Payable More Frequently Than Interest Conversion	11, 13	
	4.5	Continuous Payment Annuities	17, 18	
	4.5	Continuous Payment Annuities	21	
	4.7	Payments in Geometric Progression	28, 30	
5	5.1	Amortization		
	5.2	Outstanding Loan Balance	1, 2	
	5.3	Amortization Schedules	8, 10	
	5.4	Sinking funds	17, 19	

Chapter (if any)	*Sections (if any)*	*List of Definitions, Theorems and Examples In the Lectures (if any)*	*List of Exercises for Tutorials (if any)*	*Laboratory Components (if any)*
	5.5	Differing payment periods and interest conversion periods	25, 26	
	5.6	Varying payments periods and interest conversion periods	29, 30	
6	6.1	Introduction		
	6.2	Types of securities	1	
	6.3	The Price of a Bond	4, 5, 7	
	6.4	Premium and Discount	11, 12, 13	
	6.5	Valuation of a Bond Between Coupon Dates	17	
	6.6	Determining the Yield Rate of a Bond	20	
	6.7	Callable and Putable Bonds	24, 25	
	6.10	Other Securities	-	
7	7.1	Introduction		
	7.2	Discounted Cash Flow Analysis	1, 3	
	7.3	Uniqueness of the Yield Rate	9	
	7.4	Reinvestment Rates	10, 13	
	7.5	Interest Measurement of a Fund	19, 20	
	7.6	Time Weighted Rates of Interest	25, 27	
	7.7	Portfolio Method	32, 33	
8	8.1	Introduction		
	8.2	Truth in lending	2, 3	
	8.3	Automobile financing	10, 11	
	8.4	Real estate mortgages	17, 18	
	8.5	Approximate methods	25	
	8.6	Depreciation methods	33	
	8.7	Capitalized cost	42	
	8.8	Modern financial instruments		

G. Laboratory Components

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1:** 4th or 5th week.
- **Midterm 2:** 8th or 9th week.
- **Quizzes & Homework:** During the trimester.
- **Lab Exam(s)** (if any): None.
- **Final Exam:** 12th week.

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2:** 25%.	**Final Exam:** 40%.	**Lab Exam(s):** 0%.
Quizzes: 5%.	**Homework:** 5%.	**Mini-Project(s):** 0%.	**Other:** 0%.

J. CALCULATOR INSTRUCTIONS

☒ Allowed	☐ Not allowed

K. THE GRADING DISTRIBUTION

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

لائحة الدراسة والقواعد التنفيذية 1444

Regulations

للوائح والأنظمة

SYLLABUS
MAT1334

Instructor:

Office Location:

Office Phone:

Email address:

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	1334	Introduction to Partial Differential Equations	5	4	0	2	128	MAT 1231	None	9	English

Program(s) offered for:

- **Bachelor of Science in Applied Mathematics**

B. . COURSE GENERAL DESCRIPTION:

This course introduces students to the theory of boundary value and initial value problems for partial differential equations (Dirichlet, Neumann, and Mixed BVP). It emphasizes classification, characteristics, linear, elliptic, hyperbolic, and parabolic for first-order equations and second order equations. Topics covered include Laplace's equation, heat equation, wave equation and separation of variables method, Fourier series, Fourier and Laplace transforms for Solving PDEs.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	To recognize BVPs and IVPs for classical second-order PDEs describing physical processes such as heat and wave diffusions.	K1, K2	Midterm exam 1 – Final exam
1.2	To solve analytically PDEs via methods of separation of variables, of characteristics, and Fourier and Laplace transforms.	K1, K2	Oral questions - All exams
2.0	**Skills**		
2.1	To develop techniques of first and second-order PDEs.	S1, S2	Oral questions - All exams
2.2	To present basic PDE's methods clearly and precisely both orally and in writing.	S4	Midterm exam 1 – Final exam
2.3	To demonstrate some proofs of PDEs solving methods.	S3	Midterm exam 1 – Final exam
3.0	**Values, autonomy, and responsibility**		
3.1	To defend the formulated conclusions individually.	V1, V3	Oral questions - All exams

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
3.2	To operate meaningfully and productively with others.	V1, V2	**Team work - All exams**

D. COURSE MATERIALS

- **Required Textbook:**

– ***Partial Differential Equations: Theory and Completely Solved Problems, T. Hillen, I. E. Leonard, H. Van Roessel, Wiley 2012.***

– ***Linear Partial Differential Equations for Scientists and Engineers, Myint U. Debnath, North Holland, 2007.***

- **Other References:**

- Introduction to Partial Differential Equations; P. Olver, Springer, 2013.

- Partial Differential Equations of Mathematical Physics, R.B. Guenther & J.W. Lee, Prentice Hall/Dover publication, Mineola, 1996.

- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1.	**Introduction to PDEs and Basic concepts:** Definition of General PDEs; Order, Linear and nonlinear PDEs, homogeneous and nonhomogeneous PDEs, Solution of PDEs, Principle of Superposition. Classification of Second Order Linear PDEs as Parabolic, Hyperbolic, and Elliptic Equations.	12	6	0
2.	**Classical PDEs of mathematical physics:** Initial conditions; Boundary Conditions: Dirichlet, Neumann, and Mixed conditions; Definition of Boundary-Value Problems. Well-posedness of a BVP. Heat equation (conduction of heat in a rod), Wave equation (vibrating of a string), Laplace equation (Steady-state temperature distribution).	12	6	0
3.	**First order partial differential equations:** Definition of PDEs of first order, Linear and quasi-linear PDEs; The characteristics method for solving quasi-Linear equations.	12	6	0
4.	**Analytic methods for solving PDEs:** Review of Fourier Series. Separation of Variables Method. Solving PDEs using Fourier Transform. Solving PDEs using Laplace transform.	12	6	0
Total		48	24	0
		72		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
1	1.1	Definition of General PDEs;	Sheet 1	None
	1.2	Order, Linear and nonlinear PDEs, homogeneous and nonhomogeneous PDEs,		
	1.3	Solution of PDEs, Principle of Superposition.		
2	2.1	Boundary Conditions: Dirichlet, Neumann, and Mixed conditions;	Sheet 2	
	2.2	Initial conditions;		
	2.3	Definition of Boundary-Value Problems. Well-posedness of a BVP.		
3	3.1	Definition of PDEs of first order, Linear and quasi-linear PDEs;	Sheet 3	
	3.2	The characteristics method for solving quasi-Linear equations.		
4	4.1	Review of Fourier Series.	Sheet 4	
	4.2	Separation of Variables Method.		
	4.3	Solving PDEs using Fourier Transform.		
	4.4	Solving PDEs using Laplace transform.		

G. Laboratory Components

None.

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1: 4th or 5th week.**
- **Midterm 2: 8th or 9th week.**
- **Quizzes & Homework: During the trimester.**
- **Lab Exam(s)** (if any): **None.**
- **Final Exam: 12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 0%.**
Quizzes: 5%.	**Homework: 5%.**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☒ **Allowed** ☐ **Not allowed**

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية **1444_**



Regulations

للوائح والأنظمة



SYLLABUS
MAT 1353

Instructor:

Office Location:

Office Phone:

Email address:

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Student Work Load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	1353	Combinatorics and Graphs	4	3	0	2	100	MAT 1223	None	9	English

Program(s) offered for:

- Bachelor of Science in Applied Mathematics

B. . COURSE GENERAL DESCRIPTION:

This course serves to introduce the basic combinatorial techniques such as counting, recursion and linear recurrence equations with emphasis on pigeonhole principle, binomial coefficients, recursive functions, generating functions and homogeneous and non-homogeneous linear recurrences with constant coefficients. It will introduce also the students to graph theory, with emphasis on simple graphs, Euler and Hamiltonian graphs, trees, networks, paths and cycles, graph colorings, and planar graphs and graphs isomorphism.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	To recognize planar graphs, trees, shortest path problems, and Euler, Hamilton circuits.	K1, K2	Midterm exam 1 – Final exam
1.2	To use efficient methods of combinatorics.	K1, K2	Oral questions - All exams
2.0	**Skills**		
2.1	To develop techniques of enumeration problems.	S1, S2	Oral questions - All exams
2.2	To present basic theorems of graph theory clearly and precisely both orally and in writing.	S4	Midterm exam 1 – Final exam
2.3	To use Internet in searching for Hamiltonian problem algorithms	S5	Midterm exam 2- Final exam
2.4	To demonstrate some proofs of	S3	Midterm exam 2 – Final exam

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
	enumeration and graphs related problems.		
3.0	**Values, autonomy, and responsibility**		
3.1	To employ ethical concepts and rules to determine viable alternatives in any given situation.	V1, V3	**Oral questions - All exams**
3.2	To show findings and discuss the results with others.	V1, V2	**Team work - All exams**

D. COURSE MATERIALS

- **Required Textbook:**

***Discrete Mathematics and its Applications*, K. Rosen, McGraw-Hill, 6th Edition, 2006. (Main Reference)**

- **Other References:**

None

- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1.	**Counting:** Product rule, Sum rule, Inclusion-Exclusion principle, Tree diagrams; Pigeonhole principle, Binomial coefficients.	6	3	0
2.	**Recursion:** Recurrence definitions, Set defined recursively, Recursive functions. Recurrence relations, generating functions, multiplication of generating functions; generalized binomial theorem.	4	3	0
3.	**Linear recurrence equations:** Homogeneous and non-homogeneous linear recurrences with constant coefficients.	4	2	0
4.	**Introduction to Graph Theory:** Graph terminology, degree of a vertex, simple graphs, paths, cycles, subgraphs, isomorphism of graphs, adjacency matrix, incidence matrix.	5	2	0
5	**Euler & Hamiltonian graphs:** Euler cycle, characterization of Euler graphs. Hamiltonian cycle, properties, Traveling Salesman Problem.	2	2	0
6	**Planar graphs:** Euler's Formula, Kuratowski's theorem. Genus of a graph. Ringel-Youngs theorem.	2	2	0
7	**Graph colorings:** Vertex colorings. Greedy algorithm.	2	2	0
8	**Shortest path:** shortest path problems; Optimality principle, Djkstra's algorithm.	5	3	0
9	**Isomorphism of graphs:** Homomorphisms, embedding, and isomorphism of graphs, invariant properties.	2	2	0
10	**Trees:** Spanning trees, minimum spanning trees, Kruskal's algorithm, Prim's algorithm, Greedy algorithm.	2	2	0
11	**Networks flow:** Definitions, flow augmenting paths, cut sets, maximum flow, Ford-Fulkerson algorithm, Minimum cost capacities flow problem.	2	1	0
Total		**36**	**24**	**0**
		60		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
6	6.1	The Basics of Counting	2, 3,10, 16, 21, 22 (a, b, c, d, f), 28, 30, 34, 35, 48	**None**
	6.2	The Pigeonhole Principle	3, 4, 5, 9, 13, 15, 16.	
	6.3	Permutations and Combinations	1, 3, 5(a, c, e), 6(a, c, e), 7, 11, 13, 15, 16, 21, 24, 32, 34.	
	6.4	Binomial Coefficients and Identities	1, 3, 4, 6, 8, 10, 21, 22.	
8-10	8.1	Applications of Recurrence Relations	7,8,9,10,11,12,13,14,15	
	8.2	Solving Linear Recurrence Relations	1(a, b, e, g), 3(a, c, e), 12, 19, 21, 22, 26(a, e, f, g), 27, 28, 29, 30.	
	8.4	Generating Functions	(a, c, e, f), 5(a, b, d, e), 7(a, d, e, h), 9(a, b, d), 11(b, d, e), 32, 33, 34.	
	8.5	Inclusion–Exclusion .	1(all parts), 2, 3, 5(all parts), 7, 10, 13.	
	10.1	Graphs and Graph Models	3(all parts), 4, 6, 8.	
	10.2	**Graph Terminology and Special Types of Graphs.**	**1, 2, 3, 4, 5, 7, 8, 9, 20(a, b, c, d, e), 21, 23, 25, 26(a, b, c), 35(a, b, c, d), 53(a, b, c).**	
	10.3	**Representing Graphs and Graph Isomorphism**	**5, 6, 7, 8, 9(a, b, c, d, e), 10, 13, 15, 17, 20, 24, 34, 36, 38, 40.**	
	10.4	**Connectivity**	**2, 3, 4, 6, 11(a, c), 14(c), 19(a, b), 20, 26(b, c).**	

	10.5	**Euler and Hamilton Paths**	**1, 2, 4, 6, 8, 26, 30, 31, 32, 33, 34, 35, 36, 37, 39.**	
	10.6	**Shortest-Path Problems**	**2, 3, 4, 5, 6.**	
	10.7	**Planar Graphs**	**2, 3, 4, 5, 6, 7, 8, 9, 11, 12 ,23, 25.**	
	10.8	**Graph Coloring**	**5, 6, 7, 8, 9, 10, 11, 15, 21, 23, 26.**	
11	**11.1**	**Introduction to Trees**	**1(a, b, c, d, f), 2 (a, b, c, d, f)**	
	11.5	**Minimum Spanning Trees**	**1, 2, 3, 7, 9**	

G. Laboratory Components

None

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1: 4th or 5th week.**
- **Midterm 2: 8th or 9th week.**
- **Quizzes & Homework: During the trimester.**
- **Lab Exam(s)** (if any): **None**
- **Final Exam: 13th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 0%.**
Quizzes: 5%.	**Homework: 5%.**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☒ **Allowed** ☐ **Not allowed**

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is

defined by the University as spouse, grandparents, parents, brother, or sister).

- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية **1444_**

Regulations

للوائح والأنظمة

SYLLABUS
MAT 1412

Instructor:

Office Location:

Office Phone:

Email address: username@imamu.edu.sa

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	1412	Complex Variable	5	4	0	2	128	MAT 1311	None	10	English

Program(s) offered for:

- Bachelor of Science in Applied Mathematics

B. COURSE GENERAL DESCRIPTION:

This course is an introduction to the theory of functions of a complex variable. Topics include complex numbers and their properties, Cauchy-Riemann equations and analytic functions, harmonic functions, Cauchy's theorem, integral representation formulae, power series of analytic functions, zeros, isolated singularities, Laurent series, poles, residues, use of residue calculus to evaluate real integrals, and conformal mapping.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	To recognize complex functions and their properties: continuity, differentiation, Cauchy-Riemann equations, and analyticity.	K1, K2	Midterm exam 1 – Final exam
1.2	To outline line integrals, complex contour integrals, series, and residues.	K1, K2	Oral questions - All exams
2.0	**Skills**		
2.1	To develop techniques of integration by using residues.	S1, S2	Oral questions - All exams
2.2	To present Complex integral and its applications clearly and precisely both orally and in writing.	S4	Midterm exam 1 – Final exam

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
2.3	To use Internet in searching for complex sequences and series	S5	Midterm exam 1 – Final exam
2.4	To demonstrate some proofs of ODE solutions by using complex series.	S3	Midterm exam 2 – Final exam
3.0	**Values, autonomy, and responsibility**		
3.1	To work individually.	V1, V3	Oral questions - All exams
3.2	Develop personal values and attributes such as honesty, empathy and respect for others.	V1, V2	Team work - All exams

D. COURSE MATERIALS

- **Required Textbook:**
- **Ravi P. Agarwal, Kanishka Perera, and Sandra Pinelas**, *An introduction to Complex Analysis,* **Springer, 2011. (Main Reference)**
- **Other References:**
- **M. Ablowitz et al,** *Complex Variables: Introduction and Applications*, **2nd Edition, 2003.**
- **Dennis G. Zill, Patrick D. Shanahan**, *A First Course in Complex Analysis with Applications, (Jones and Bartlett Publishers Series in Mathematics: Complex) 2nd Edition, 2003*
- **R.V. Churchill and J.W. Brown,** *Complex Variables and applications*, **McGraw-Hill 5th Edition, 1989.**
- **David E. Blair,** *Inversion theory and conformal mapping,* **Student Mathematical Library 9, American Mathematical Society, 2000.**
- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1.	**Basics:** Euler formula and exponential form of a complex number, Basic topological properties, Functions of complex variable, Elementary functions, Limits, continuity and uniform continuity.	6	2	0
2.	**Continuity and differentiability:** Limits, Continuity and uniform continuity, Derivative of a complex function at a point, Cauchy-Riemann equations and differentiability of complex functions, Derivatives of elementary functions, Analytic function at a point, Singular points, Analytic function and harmonic functions, Hopital's rule.	11	6	0
3.	**Complex integral:** Line integral and complex integral, Complex form of Green's theorem, Cauchy's and Cauchy-Goursat theorems, Complex indefinite integral, Cauchy's integral formula, Argument, Rouche's, Liouville's, and modulus theorems.	10	6	0
4.	**Complex sequences and series:** Basic definitions, tests of series absolute convergence, power series and uniform convergence, circle of convergence, differentiation and integration of power series, Taylor's series and Laurent's series. Type of singular points, Picard's theorem.	10	6	0
5	**Residues:** Residues and the residue theorem with applications.	6	2	0
6	**Basic concepts of conformal mapping.**	5	2	0
Total		48	24	0
		72		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
1		Euler formula	Page 15: 3.1(g), 3.2(a,b,f,g,h), 3.5, 3.7, 3.12, 3.13 (a,c), 3.18(d), 3.19	None
		Exponential form of a complex number		
		Basic topological properties		
2		Functions of complex variable	Chap. 2: Page 33: 5.1(a,c), 5.4(b), 5.5(c,d), 5.6(a,b), 5.10, 5.11 Chap. 3: Page 46: 7.1(b), 7.2(a), 7.3(b,d), 7.4(b,c,e), 7.8, 7.10	
		Elementary functions		
		Limits, continuity and uniform continuity		
3		Derivative of a complex function at a point		
		Cauchy -Riemann equations		
		Derivatives of elementary functions		
		Analytic function		
		Analytic function and harmonic functions		
		L'Hopital's rule		
4		Line integral and complex integral	Page 87: 13.1 (b,d), 13.3, 13.4 Page 106: 16.2, 16.3(a,b,c), 16.4, 16.8 Page 120: 18.7, 18.9(a,b,c,d,e,f)	
		Complex form of Green's Theorem		
		Cauchy's and Cauchy-Goursat theorems		
		Complex indefinite integral		
		Cauchy's integral formula		
		Argument, Rouche's, Liouville's, and modulus theorems		
5		Basic definitions	Page 149: 22.1(a,b,c,d), 22.2 Page 155: 23.1(a,b), 23.2(a,b), 23.5 Page 163: 24.1(a,c,d), 24.3(a,c) Page 174: 25.1(a,b), 25.2(a,c,e), 25.4(a,b), 25.5	
		Tests of series absolute convergence		
		Power series and uniform convergence		
		circle of convergence		
		Differentiation and integration of power series		
		Taylor's series and Laurent's series		
		Type of singular points, Picard's theorem.		

6		Residues and the residue theorem	Page 212: 31.2(a,c,d,f), 31.4(a,c,f), 31.5 Page 224: 3.1(a,c), 33.2(a,c,e), 33.10(b,d)	
		Applications		

G. Laboratory Components

None

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1:** 4th or 5th week.
- **Midterm 2:** 8th or 9th week.
- **Quizzes & Homework:** During the trimester.
- **Lab Exam(s)** (if any): None
- **Final Exam:** 12th week.

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2:** 25%.	**Final Exam:** 40%.	**Lab Exam(s):** 0%
Quizzes: 5%.	**Homework:** 5%.	**Project(s):** 0%.	**Other:** 0%.

J. CALCULATOR INSTRUCTIONS

☐ Allowed ☒ Not allowed

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be

accepted.

Executive Rules for Study Regulations and Exams 1444

لائحة الدراسة والقواعد التنفيذية 1444



Regulations

للوائح والأنظمة



SYLLABUS
MAT 1442

Instructor:

Office Location:

Office Phone:

Email address:

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	1442	Numerical Analysis (2)	4	3	1	1	100	MAT 1334 MAT 1341	None	10	English

Program(s) offered for:

- Bachelor of Science in Applied Mathematics

B. . COURSE GENERAL DESCRIPTION:

This course is the continuation of Numerical Analysis I (MAT 341). It introduces numerical methods for approximating functions and data, evaluating integrals and solving ODEs and PDEs. It provides theoretical and practical aspects of best approximation and provides also theoretical analysis of the problems along with algorithms for their solution. Topics include Solving systems of linear equations, Approximating Eigenvalues, Boundary value problems for ordinary differential equations, Numerical solution to partial differential equations.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	To outline Least Squares, multistep, predictor-corrector methods, and some Iterative algorithms for eigenvalue problems	K1, K2	Midterm exam 1 – Final exam
1.2	To solve numerically PDE using finite difference methods.	K1, K2	Oral questions - All exams
2.0	**Skills**		
2.1	To develop advanced techniques of numerical solutions.	S1, S2	Oral questions - All exams
2.2	To present numerical methods of differential equations clearly and precisely both orally and in writing.	S4	Midterm exam 1 – Final exam
2.3	To use Internet in searching for different numerical methods of ODEs and PDEs	S5	Team work
2.4	To demonstrate some proofs of numerical ODEs and PDEs by using finite difference techniques.	S3	Midterm exam 2 – Final exam
3.0	**Values, autonomy, and responsibility**		

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
3.1	work individually and in group.	V1, V3	Oral questions - All exams
3.2	Relate well to others and maintain good relationships;	V1, V2	Team work - All exams

D. COURSE MATERIALS

- **Required Textbook:**

Numerical Analysis, **R. Burden and J. Faires, 8th Edition, Brooks/Cole, 2001. (Main Reference)**

- **Other References:**

Elementary Numerical Analysis, 3rd Edition, **Kendall Atkinson; Weimin Han; 2004. (Main Reference).**

- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1.	Advanced Numerical Linear Algebra: Least Squares Method, Matrix Eigenvalue Problems: Power Method, QR Factorization.	9	2	2
2.	Finite difference techniques: Difference equation replacement, Implicit and explicit finite difference method.	8	3	3
3.	Boundary Value Problems for ODEs: Multistep Methods, Finite Difference Methods for Systems of Differential Equations.	9	3	3
4.	Finite Difference Method for PDEs: Finite Difference Method for Boundary Value Problems, Numerical Solution of Elliptic PDEs, Numerical Solution of Parabolic PDEs, Numerical Solution of Hyperbolic PDEs.	10	4	4
Total		36	12	12
		60		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
8	8.1	Discrete Least Squares Approximation	Exercise set 8.1 (odd numbers)	Some applications from the exercises
		Linear Least Squares		
		Polynomial Least Squares		
		Exponential Least Square		
	8.2	Orthogonal Polynomials and Least Squares Approximation	Exercise set 8.2 (even numbers)	
9	9.3	Approximating Eigenvalues	Exercise set 9.3 (odd numbers)	
		The Power Method		
5	5.1	Initial-Value Problems for Ordinary Differential Equations	Exercise set 5.2, 5.4, 5.6	
	5.2	Euler's Method		
		Runge-Kutta Methods		
	5.6	Multistep Methods		
11		Boundary-Value Problems for Ordinary Differential Equations	Exercise set 11.3	
	11.3	Finite-Difference Methods for Linear Problems		
12		Numerical Solutions to Partial Differential Equations	Exercise set 12.1, 12.2, 12.3 (odd numbers)	
	12.1	Elliptic Partial Differential Equations		
	12.2	Parabolic Partial Differential Equations		
	12.3	Hyperbolic Partial Differential Equation		

G. Laboratory Components

Programing certain numerical methods using MATLAB

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1:** **4th or 5th week.**
- **Midterm 2:** **8th or 9th week.**
- **Quizzes & Homework:** **During the trimester.**
- **Lab Exam(s)** (if any): **10th or 11th week.**
- **Final Exam:** **12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 5%.**
Quizzes: 2.5%.	**Homework: 2.5%.**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☒ **Allowed** ☐ **Not allowed**

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية 1444_

Regulations

للوائح والأنظمة

SYLLABUS
MAT 1461

Instructor:

Office Location:

Office Phone:

Email address:

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	**1461**	**Introduction to Cryptography and Coding**	**4**	**3**	**0**	**2**	**100**	**MAT 1321**	**None**	**10**	**English**

Program(s) offered for:

- Bachelor of Science in Applied Mathematics

B. COURSE GENERAL DESCRIPTION:

The course is devoted to the fields of cryptography and coding theory. It gives an introduction, with proof, to the algebra and number theory used in coding and cryptography. Basic problems of cryptography and coding are discussed. Topics include classical ciphers, public key cryptosystems (RSA, Diffie-Hellman key exchange, ElGamal), digital signatures, codes, linear codes, perfect codes and cyclic codes.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	**To know the principles of cryptology and of cryptanalysis of historical ciphers.**	**K1, K2**	**Quiz 1, Midterm exam 1, Final exam, Assignments**
1.2	**To learn the theory and practice of coding and modern cryptographic systems.**	**K1, K2**	**Quiz 2, Midterm exam 2, Final exam, Assignments**
2.0	**Skills**		
2.1	**To provide students with the basic cryptology and coding skills.**	**S1, S2, S3**	**Oral questions, All exams**
2.2	**To develop techniques of problems solving in coding and cryptography.**	**S1, S2**	**Oral questions, Midterm exam 1, Final exam**

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
2.3	**To use cyclic codes.**	**S1, S2**	**Oral questions**
2.4	**To carry out calculations orally and mentally.**	**S2, S4**	**Oral questions, All exams**
2.5	**To work in groups.**	**S4**	**Homework assignments**
3.0	**Values, autonomy, and responsibility**		
3.1	**To work individually.**	**V1, V3**	**Oral questions, All exams**
3.2	**To communicate mathematics clearly and precisely both orally and in writing.**	**V1, V2**	**Team work, All exams**

D. COURSE MATERIALS

- **Required Textbook:**
  - ***Cryptography: Theory and practice,*** *Douglas R. Stinson, 3rd edition, 2006, Chapman and Hall/CRC. ISBN: 978-1584885085.* **(Main Reference)**
  - **Coding Theory: A First course,** San Ling and Chaoping Xing, Cambridge University Press, 2004. ISBN: 978-0521529235**. (Main Reference)**
- **Other References:**
  - ***Introduction to Modern Cryptography****, J. Katz, Y. Lindell, Chapman and Hall/CRC, 1st Edition, 2007.*
  - ***Making, Breaking Codes: An Introduction to Cryptology****, Paul Garrett, 2001, Prentice-Hall.*
  - ***A First Course in Coding Theory****, R. Hill, Oxford University Press, 1997*

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- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1.	**Classical Cryptography:** Introduction, Shift cipher, Substitution cipher, Affine cipher, Vigenere cipher, Permutation cipher, Hill cipher, Stream cipher, Introduction to cryptanalysis, cryptanalysis of classical systems.	**12**	**8**	**0**
2.	**Public-key cryptosystems:** RSA, Number Theory facts, Discrete logarithm, ElGamal cryptosystem, Massey-Omura cryptosystem, Diffie-Hellman key agreement.	**6**	**4**	**0**
3.	**Digital signatures:** RSA signature, ElGamal signature, Digital signature algorithm.	**6**	**4**	**0**
4.	**Introduction to Coding Theory:** Introduction to codes. Hamming distance, Error detection, error correction, information rate, Linear codes , Generator matrix and parity-check matrix. Perfect codes.	**9**	**6**	**0**
5	**Cyclic codes:** Cyclic codes, generator polynomials.	**3**	**2**	**0**
Total		**36**	**24**	**0**
		60		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
1		The Shift Cipher	1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7	None
		The Substitution Cipher		
		The Affine Cipher		
		The Vigenere Cipher		
		The Hill Cipher		
		The Permutation Cipher		
		Stream Ciphers		
		Cryptanalysis of the Affine Cipher		
		Cryptanalysis of the LFSR-based Stream Cipher		
2		Number Theory facts	4.1, 4.4, 4.5,	
		The RSA Cryptosystem		
		The El Gamal Cryptosystem		
		Massey-Omura cryptosystem		
		Diffie-Hellman key agreement		
3		RSA signature	6.1, 6.2, 6.3, 6.5,	
		ElGamal signature		
		Digital signature algorithm		
4		Hamming distance	2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8 4.2, 4.8, 4.14, 4.31, 4.32, 4.33, 4.39, 4.41, 4.47, 5.15	
		Error detection		
		error correction		
		information rate		
		Linear codes		
		Generator matrix and parity- check matrix		
		Perfect codes		
5		Cyclic codes	7.1, 7.6	
		Generator polynomials		

G. Laboratory Components

- There is no Lab for this course

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1:** 4th or 5th week.
- **Midterm 2:** 8th or 9th week.
- **Quizzes & Homework:** During the trimester.
- **Lab Exam(s)** (if any): None.
- **Final Exam:** 12th week.

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 0%.**
Quizzes: 5%.	**Homework: 5%.**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☒ **Allowed** ☐ **Not allowed**

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية 1444_

Regulations

للوائح والأنظمة

SYLLABUS
MAT 1415

Instructor:

Office Location:

Office Phone:

Email address:

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	1415	Introduction to Topology	5	4	0	2	128	MAT 1311	None	11	English

Program(s) offered for:

- Bachelor of Science in Applied Mathematics

B. . COURSE GENERAL DESCRIPTION:

The course starts with the topology of the real line and the topology of the plane. It then deals with metric spaces and all their properties. In particular continuity and uniform continuity of mappings between metric spaces are discussed in terms of sequences. The course also covers topological spaces, subspaces, and product of spaces together with the main properties. Homeomorphisms are also introduced in the general setting of topological spaces. However, the concepts of compact set and connected set are only introduced for the real line.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	To outline the fundamental concepts of metric and topological spaces.	K1, K2	Midterm exam 2 – Final exam
1.2	To define connected and compact spaces on the real line.	K1, K2	Midterm exam 1– Final exam
2.0	**Skills**		
2.1	To develop techniques of problem solving in the topology of the line.	S1, S2	Oral questions - All exams
2.2	To present basic theorems of topology for the real line clearly and precisely both orally and in writing.	S4	Midterm exam 1 – Final exam
2.3	To use Internet in searching for topological spaces.	S5	Oral questions
2.4	To demonstrate some proofs of theorems related to the topology of the real line.	S3	Midterm exam 1 – Final exam
3.0	**Values, autonomy, and responsibility**		

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
3.1	**To work individually.**	**V1, V3**	**Oral questions - All exams**
3.2	**Develop personal values and attributes such as honesty, empathy and respect for others.**	**V1, V2**	**Team work - All exams**

D. COURSE MATERIALS

- **Required Textbook:**
  Principles of Topology, Fred H. Croom, Thomson Learning Asia 2008. (Main Reference)
- **Other References:**
  - **Topology: A First Course, Munkres, J.R., Prentice-Hall, Englewood Cliffs, NJ, 1st Edition 1975.**
  - **Theory and Problems of General Topology, Seymour Lipschutz, Schaum's Outline Series, 1965.**
- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1.	**Topology of the line:** Open and closed sets, neighborhoods, interior points, limit points. Boundary points; closure of a set, dense sets, isolated points, cluster points. Nested intervals, Cantor's Nested Intervals Theorem, open cover of a set. Compact sets, the Heine-Borel Theorem, Bolzano-Weierstrass Theorem. Connected sets. Topology of the plane: Metrics, balls, open and closed sets in R^2, examples of other metric spaces.	**16**	**8**	**0**
2.	**Metric space:** Open and closed sets, neighborhoods, isolated, boundary, adherent and limit points, interior and closure of a set, dense sets, and separable spaces. Distance between a point and a set and between sets, diameter of a set. Sequences and limit of a sequence. Cauchy sequences and complete metric spaces. Continuous functions on metric spaces and their properties. Uniform continuity, isometric and homeomorphic spaces, equivalent metrics.	**16**	**8**	**0**
3.	**Topological space:** Open and closed sets, neighborhoods, interior points, adherent and limit points, boundary points; interior and closure of a set, dense sets. Basis, sub-basis, and equivalent bases. Continuous functions on topological spaces and their properties. Metrizable topological spaces, open and closed maps, homeomorphism; topological subspaces, Hausdorff spaces, product of topological spaces.	**16**	**8**	**0**
Total		**48**	**24**	**0**
		72		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
1	1.1	Open and closed sets, neighborhoods, interior points, limit points. Boundary points; closure of a set, dense sets, isolated points, cluster points	To be specified by Course Instructor	None
	1.2	Nested intervals, Cantor's Nested Intervals Theorem		
	1.3	open cover of a set. Compact sets, the Heine-Borel Theorem, Bolzano-Weierstrass Theorem		
	1.4	Connected sets		
	1.5	Topology of the Plane		
2	2.1	Open and closed sets, neighborhoods, isolated, boundary, adherent and limit points, interior and closure of a set, dense sets in metric spaces and separable spaces		
	2.2	Distance between a point and a set and between sets, diameter of a set. Sequences and limit of a sequence. Cauchy sequences and complete metric spaces		
	2.3	Continuous functions on metric spaces and their properties		
	2.4	Uniform continuity, isometric and homeomorphic spaces, equivalent metrics		
3	3.1	Open and closed sets, neighborhoods, interior points, adherent and limit points, boundary points; interior and closure of a set, dense sets in topological spaces		
	3.2	Basis, sub-basis, and equivalent bases		
	3.3	Continuous functions on topological spaces and their properties		
	3.4	Metrizable topological spaces, open and closed maps, homeomorphism		
	3.5	topological subspaces,		

		Hausdorff spaces, product of topological spaces		

G. Laboratory Components

None

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1: 4th or 5th week.**
- **Midterm 2: 8th or 9th week.**
- **Quizzes & Homework: During the trimester.**
- **Lab Exam(s)** (if any): **None.**
- **Final Exam: 12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 0%.**
Quizzes: 5%.	**Homework: 5%.**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☐ **Allowed** ☒ **Not allowed**

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية **1444_**

Regulations

للوائح والأنظمة

SYLLABUS
MAT1463

Instructor:

Office Location:

Office Phone:

Email address:

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	1463	Modeling and Simulation	4	3	1	1	100	MAT 1434	None	11	English

Program(s) offered for:

- **Bachelor of Science in Applied Mathematics**

B. . COURSE GENERAL DESCRIPTION:

This course describes the most important concepts about Mathematical Modeling and Simulation. The course includes different techniques for modeling with differential equations such as, Population dynamic; Electrical Circuits; Mechanical Systems; Biological Models; Modeling with Partial Differential Equations (Heat and Wave Equations). In addition, Modeling with Difference Equations, such as, Modeling with Data; Discrete Velocity Models; Continuous Vs. Discrete Models. Finally, Block-Diagrams; State-Space Model; Transfer Functions, State-space Vs. Transfer Function; Stability and Pole Locations; MATLAB\Simulink; Simulation of some Models and Analysis of Simulation Results.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	Identify various types methods about Mathematical modeling	K1, K2	Midterm exam 1 – Final exam
1.2	Describe different techniques Block-Diagrams; State-Space Model; Transfer Functions, State-space Vs. transfer function; Stability and pole locations; MATLAB\Simulink	K1, K2	Oral questions - All exams
2.0	**Skills**		
2.1	Know some Concept and Objectives about mathematical modeling.	S1, S2	Oral questions - All exams
2.2	Construct modeling with differential equations: Population dynamic; Electrical Circuits; Mechanical Systems; Biological models; Modeling with Partial Differential Equations (Heat and wave equations).	S4	Midterm exam 1 – Final exam
2.3	Learn modeling with difference equations; Modeling with data; Discrete Velocity Models; Continuous Vs. Discrete Models.	S5	MATLAB exam
2.4	Block-Diagrams; State-Space Model; Transfer Functions, State-	S3	Midterm exam 2 – Final exam

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
	space Vs. transfer function; Stability and pole locations; MATLAB\Simulink ; Simulation of some models and Analysis of Simulation results.		
3.0	**Values, autonomy, and responsibility**		
3.1	Demonstrate confidence in solving given mathematical problems.	V1, V3	Oral questions - All exams
3.2	Operate meaningfully and productively with others.	V1, V2	Team work - All exams

D. COURSE MATERIALS

- **Required Textbook:**
- *Mathematical Modeling and Simulation: Introduction for Scientists and Engineers*, **Kai Veltn, Wiley 2009. (Main Reference 1)**
- *Introduction to Simulink® with Engineering Applications*, **Steven T. Karris, Orchard Publications, 2006. (Main Reference 2)**
- *Introduction to mathematical biology: modeling, analysis, and simulation*, **C.S. Chou, A. Fridman, Springer, 2016.**
- **Other References:**
- *Simulation Modeling and Analysis with Expert fit Software*, **Averill Law, McGraw-Hill Science, 2007.**
- *A Concrete Approach to Mathematical Modelling*, **M. M. Gibbons, Wiley-Interscience, 2007.**
- *Topics in Industrial Mathematics*; **H. Neunzert, A. Siddiqui; Kluwer Academic Publishers, 2000.**
- *Mathematical Modeling Physical systems: An Introduction*; **D. Basmadjian, Oxford University Press, 2003.**
- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1.	Concept; Objectives; Methods and tools Mathematics is the natural modeling language; Definition of mathematical models.	8	3	3
2.	Modeling with Differential Equations: Population dynamic; Electrical Circuits; Mechanical Systems; Biological models (Lotka-Volterra systems, Predator-Prey systems). Modeling with Partial Differential Equations: Linear Temperature Diffusion; One-Dim. Hydrodynamic model; Mathematical problems for linear Wave model; Heat diffusion, Wave vibration).	10	3	3
3.	Modeling with difference equations; Modeling with data; Discrete Velocity Models; Continuous Vs. Discrete Models	8	3	3
4.	Block-Diagrams; State-Space Model; Transfer Functions, State-space Vs. transfer function; Stability and pole locations; Introduction to MATLAB\Simulink (Starting Simulink, Basic Elements, Building a System , Running Simulations); Simulation of some models (case study models) and Analysis of Simulation results.	10	3	3
Total		36	12	12
		60		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples in the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
1	1.1	Concept and Objectives	1, 3, 4, 7, 11, 12, 13	All exercises will be solved during MATLAB classes
	1.2	Methods and tools		
	1.3	Mathematics is the natural modeling language		
	1.4	Definition of mathematical models		
2	2.1	Population dynamic	1, 4, 7, 8, 11, 12, 15, 17	
	2.2	Electrical Circuits	1,2,3,4,5,7,10,11,13	
	2.3	Mechanical Systems	1,2,3,6,8,10,11,13,17,18	
	2.4	Biological models (Lotka-Volterra systems, Predator-Prey systems).	2,3,5,6,7,11,13	
	2.5	Linear Temperature Diffusion	1,3,6,9,12	
	2.6	One-Dim. Hydrodynamic model	4,5,7,8,9,10,14	
	2.7	Mathematical problems for linear Wave model; Heat diffusion, Wave vibration		
3	3.1	Modeling with data;	1,2,4,5,7,10,13,15,	
	3.2	Discrete Velocity Models	1,2,4,5,7(a),10(a),11(a)	
	3.3	Continuous Vs. Discrete Models	1,3,5,6,7,8,10,11	
4	4.1	Block-Digrams	1, 3, 5, 6, 9	
	4.2	State-Space Model	2, 3, 4, 6, 11, 13, 16, 17, 19, 23	
	4.3	Transfer Functions	1,3,4	
	4.4	State-space Vs. transfer function	1,6,8	
	4.5	Stability and pole locations	2,3,5,8	
	4.6	Starting Simulink, Basic Elements, Building a System , Running Simulations; Simulation of some models and Analysis of Simulation results.	1-6	

G. Laboratory Components

- Lab 1: **Introducing Matlab software - Solving all exercises by using Matlab (Part 1).**
- Lab 2: **Solving all exercises by using Matlab (Part 2).**
- Lab 3: **Solving all exercises by using Matlab (Part 3).**
- Lab 4: **Matlab exam.**

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1: 4th or 5th week.**
- **Midterm 2: 8th or 9th week.**
- **Quizzes & Homework: During the trimester.**

Lab Exam(s) (if any): **10th or 11th week.**

- **Final Exam: 12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 5%.**
Quizzes: 2.5%.	**Homework: 2.5%.**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☒ **Allowed** ☐ **Not allowed**

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams 1444

لائحة الدراسة والقواعد التنفيذية 1444

Regulations

للوائح والأنظمة

SYLLABUS
MAT 1444

Instructor:

Office Location:

Office Phone:

Email address : username@imamu.edu.sa

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab*	*Tut.*	*Weekly Private study*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	1444	Introduction to Numerical Optimization	4	3	0	2	100	MAT 1253 MAT 1341	None	9 or 11	English

Program(s) offered for:

- Bachelor of Science in Applied Mathematics

B. . COURSE GENERAL DESCRIPTION:

This course:

- **provides students a good understanding on constrained and unconstrained optimization.**
- **performs some algorithms and codes in order to deepen programming and numerical analysis tools used in this course. MATLAB software will be handled.**
- **allows students understanding of the above concepts through study.**

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	To outline the principles of optimization.	K1, K2	Midterm exam 1 – Final exam
1.2	To memorize various types of algorithms for solving optimization problems.	K1, K2	Oral questions - All exams
2.0	**Skills**		
2.1	To develop techniques of advanced optimization methods.	S1, S2	Oral questions - All exams
2.2	To present various numerical algorithms of optimization clearly and precisely both orally and in writing.	S4	Oral questions - Midterm exam 2 – Final exam

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
2.3	To use Internet in searching for new improvements of usual numerical algorithms of optimization.	S5	Homework
2.4	To compute orders and complexities of usual numerical optimization algorithms and their variants.	S3	Midterm exam 2 – Final exam
3.0	**Values, autonomy, and responsibility**		
3.1	Work individually.	V1, V3	Oral questions - All exams
3.2	Engage in group discussions and critical interactions	V1, V2	Team work - All exams

D. COURSE MATERIALS

- **Required Textbook:**

Numerical Optimization, J. Nocedal, S. J. Wright, edition 2, Springer 2006 **(Main Reference)**.

- **Other References:**

- ***An introduction to algorithms for non-linear optimization,*** N. Gould, S. Leyffer; Springer, 2003.
- ***Numerical Optimization with Applications***, 1st Edition, S. Chandra, Jayadeva, Aparna Mehra; Alpha Science Intl. Ltd., 2009.
- ***Genetic algorithms on search, optimization and machine learning,*** D. Goldberg; Addison-Wesley Professional, 1989.

- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1.	**Introduction:** Examples of optimization problem occurring in science, engineering and economics.	6	3	0
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, Fibonacci algorithm.	10	7	0
3.	**Unconstrained multivariate optimization:** Numerical algorithms for nonlinear multivariate optimization: Linear and superliner convergence, Steepest descent algorithm, Newton algorithm, Levenberg-Marquardt algorithm, Quasi-Newton's methods, Rank-one algorithm, Broyden-Fletcher-Goldfarb-Shanno (BFGS) algorithm.	10	7	0
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, Wolfe Dual.	10	7	0
Total		36	24	0
		60		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
1	1.1	Optimization Problem	Page 25: 1.1, 1.6 and 1.7	None
		Objective Function		
		Constraint		
		Feasible region		
2	2.1	Local and global minima	Page 60: 2.3, 2.4, 2.7, 2.9, 2.11, 2.13 and 2.17	None
		Gradient		
		Stationary points		
		Saddle point		
	2.2	Necessary and sufficient conditions		
		Closed algorithm		
		Convergent algorithm		
	2.3	Iterative numerical methods	Page 114: 4.1, 4.2 (a), 4.2 (b), 4.2(c), and 4.11	Some exercises will be also solved using MATLAB
		Order and ratio of an algorithm	Page 79: 3.1, 3.2, 3.3, 3.4	None
3	3.1	Linear and superlinear convergence	Page 140: 5.1, 5.2, 5.3, 5.4, 5.7, 5.9, 5.11, 5.13, 5.15, 5.20 and 5.22	Some exercises will be also solved using MATLAB
	3.2	Steepest descent algorithm		
	3.3	Newton algorithm		
	3.4	Levenberg-Marquardt algorithm		
	3.5	Quasi-Newton algorithms	Page 200: 7.1, 7.3, 7.5, 7.7, 7.8, 7.9, 7.10, 7.11, 7.12, 7.15, 7.17	
4	4.1	Jacobian	Page 312: 10.6(a), 10.9, 10.10, 10.11, 10.12, 10.13, 10.14, 10.15, 10.20, 10.21, 10.22, 10.23 and 10.24	None
	4.3	Lagrange multipliers		
		Lagrange function		
		Necessary and sufficient conditions		
	4.6	Wolfe Dual		

G. Laboratory Components None.

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1: 4th or 5th week.**
- **Midterm 2: 8th or 9th week.**
- **Quizzes & Homework: During the trimester.**
- **Lab Exam(s)** (if any): **None.**
- **Final Exam: 12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 0%.**
Quizzes: 5%.	**Homework: 5%.**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☒ **Allowed** ☐ **Not allowed**

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية 1444_

Regulations



[للوائح والأنظمة](#)

SYLLABUS
MAT 1465

Instructor:

Office Location:

Office Phone:

Email address : username@imamu.edu.sa

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	1465	Discrete Simulation	4	3	0	2	100	STA 1202	None	9 or 11	English

Program(s) offered for:

- Bachelor of Science in Applied Mathematics

B. . COURSE GENERAL DESCRIPTION:

This elective course makes students familiar with the most important elements of the Monte Carlo method applied to the statistical and Queuing models of discrete event in order to simulate and visualize the solutions. The course puts the theoretical basis of the random number's generators and its application in discrete simulation.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	To outline the basic Discrete Event Simulation Concept and language.	K1, K2	Regular Exams
1.2	To memorize the Monte Carlo method and its importance in finance as well as other areas.	K1, K2	Assignments Short Quizzes
2.0	**Skills**		
2.1	To develop basic techniques of discrete simulation.	S1, S2	Short Quizzes
2.2	To present Monte Carlo method clearly and precisely both orally and in writing.	S4	Participations
2.3	To use Internet in searching for Markov chains	S5	Short Quizzes
2.4	To demonstrate the efficiency of Queuing models.	S3	Participations

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
3.0	**Values, autonomy, and responsibility**		
3.1	**To listen to the teacher's explanation of Mathematics reasoning and illustration.**	**V1, V3**	**Participation**
3.2	**To show attitude of support the use of computers in learning/teaching mathematics.**	**V1, V2**	**Homework and Mini-projects**

D. COURSE MATERIALS

- **Required Textbook:**

Simulation Modeling and Analysis with Expert fit Software, **Averill Law, Averill M. Law & Associates, McGraw-Hill Science, 2007. (Main Reference**

- **Other References:**
- *Discrete-Event Simulation: A First Course, Lawrence M. Leemis, Stephen K. Park0, Prentice Hall, 2005.*
- *Simulation Model Design and Execution: Building Digital Worlds, Paul A. Fishwick, Prentice Hall, 1995.*
- *Monte Carlo Methods, J.M. Hammersley and D.C. Handscomb, Publisher: Chapman and Hall, 1983.*
- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1.	**Review of some probability and Statistics concepts:** Random variables, probability distribution, Estimation examples.	4	2	0
2	**Introduction to Simulation:** Random numbers, sequences of connected events, etc.	5	4	0
3	**Discrete Event Simulation Concept.**	4	2	0
4	**Monte Carlo simulation.**	5	4	0
5	**Statistical Models in Simulation**	5	4	0
6	**Analysis of Queuing Models.**	4	2	0
7	**Analysis of Simulation Data.**	5	4	0
8	**Markov chains Monte Carlo method.**	4	2	0
Total		36	24	0
		60		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
1	1.1	**Review of some probability and Statistics concepts:** Random variables, probability distribution, Estimation examples.	Not yet taught	None
2	2.1	**Introduction to Simulation:** Random numbers, sequences of connected events, etc.	Not yet taught	None
3	3.1	**Discrete Event Simulation Concept.**	Not yet taught	None
4	4.1	**Monte Carlo simulation.**	Not yet taught	None
5	5.1	**Statistical Models in Simulation**	Not yet taught	None
6	6.1	**Analysis of Queuing Models.**	Not yet taught	None
7	7.1	**Analysis of Simulation Data.**	Not yet taught	None
8	8.1	**Markov chains Monte Carlo method.**	Not yet taught	None

G. Laboratory Components None.

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1: 4th or 5th week.**
- **Midterm 2: 8th or 9th week.**
- **Quizzes & Homework: During the trimester.**
- **Lab Exam(s)** (if any): **None.**
- **Final Exam: 12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 0%.**
Quizzes: 5%.	**Homework: 5%.**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☒ Allowed	☐ Not allowed

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية 1444_

Regulations

للوائح والأنظمة

SYLLABUS
MAT 1472

Instructor:

Office Location:

Office Phone:

Email address : username@imamu.edu.sa

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	1472	Financial Mathematics (2)	4	3	0	2	100	MAT1371	None	9 or 11	English

Program(s) offered for:

- Bachelor of Science in Applied Mathematics

B. . COURSE GENERAL DESCRIPTION:

This course describes the most important ideas, theoretical results, and examples of simple market model, risk-free assets, risky assets, discrete time market models, portfolio management, forward and future contracts, and option pricing. The course includes the essential fundamentals of these topics. The emphasis is on calculations, and some applications are mentioned.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	To understand the fundamentals of the theory of one-period and multi-period financial models.	K1, K2	Regular Exams
1.2	To understand techniques and features of Market Models with both continuous time and discrete time.	K1, K2	Assignments Short Quizzes
2.0	**Skills**		
2.1	To develop techniques of problem solving.	S1, S2	Participations
2.2	To communicate mathematics clearly and precisely both orally and in writing.	S4	Short Quizzes
2.3	To use Internet in searching for scientific information	S5	Participations
2.4	To carry out calculations orally and	S3	Short Quizzes

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
	mentally.		
3.0	**Values, autonomy, and responsibility**		
3.1	**To work individually.**	**V1, V3**	**Participation**
3.2	**To work in groups.**	**V1, V2**	**Homework and Mini-projects**

D. COURSE MATERIALS

- **Required Textbook:**

Mathematics for Finance: An Introduction to Financial engineering, **2nd Edition. M. Capinski and T. Zastawniak, Springer Verlag, 2011. (Main Reference).** ISBN: 1852333308

- **Other References:**

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

- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1	**Introduction to a Simple Market Model:** Basic Notions and Assumptions, No-Arbitrage Principle, One-Step Binomial Model, Risk and Return, Forward Contracts, Call and Put Options, Managing Risk with Options.	**5**	**3**	**0**
2	**Risk-Free Assets:** Time Value of Money, Simple Interest, Periodic Compounding, Streams of Payments, Continuous Compounding, How to Compare Compounding Methods, Money Market, Zero-Coupon Bonds, Coupon Bonds, Money Market Account.	**5**	**3**	**0**
3	**Risky Assets:** Dynamics of Stock Prices, Return, Expected Return, Binomial Tree Model, Risk-Neutral Probability, Martingale Property, Other Models, Trinomial Tree Model, Continuous-Time Limit.	**6**	**6**	**0**
4	**Discrete Time Market Models:** Stock and Money Market Models, Investment Strategies, The Principle of No Arbitrage, Application to the Binomial Tree Model, Fundamental Theorem of Asset Pricing, Extended Models.	**5**	**3**	**0**
5	**Portfolio Management:** Risk, Two Securities, Risk and Expected Return on a Portfolio, Several Securities, Risk and Expected Return on a Portfolio, Efficient Frontier, Capital Asset Pricing Model, Capital Market Line, Beta Factor, Security Market Line.	**5**	**3**	**0**
6	**Forward and Futures Contracts:** Forward Contracts, Forward Price, Value of a Forward Contract, Futures, Pricing, Hedging with Futures.	**5**	**3**	**0**
7	**Option Pricing:** European Options in the Binomial Tree Model, One Step, Two Steps, General N-Step Model, Cox–Ross–Rubinstein Formula, American Options in the Binomial Tree Model, Black–Scholes Formula.	**5**	**3**	**0**
Total		**36**	**24**	**0**
		60		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
1	**1.1**	Basic Notions and Assumptions, No-Arbitrage Principle, One-Step Binomial Model, Risk and Return, Forward Contracts, Call and Put Options, Managing Risk with Options.	**Not yet taught**	**None**
2	**2.1**	Time Value of Money, Simple Interest, Periodic Compounding, Streams of Payments, Continuous Compounding, How to Compare Compounding Methods, Money Market, Zero-Coupon Bonds, Coupon Bonds, Money Market Account	**Not yet taught**	**None**
3	**3.1**	Dynamics of Stock Prices, Return, Expected Return, Binomial Tree Model, Risk-Neutral Probability, Martingale Property, Other Models, Trinomial Tree Model, Continuous-Time Limit	**Not yet taught**	**None**
4	**4.1**	Stock and Money Market Models, Investment Strategies, The Principle of No Arbitrage, Application to the Binomial Tree Model, Fundamental Theorem of Asset Pricing, Extended Models.	**Not yet taught**	**None**
5	**5.1**	Risk, Two Securities, Risk and Expected Return on a Portfolio, Several Securities, Risk and Expected Return on a Portfolio, Efficient Frontier, Capital Asset Pricing Model, Capital Market Line, Beta Factor, Security Market Line.	**Not yet taught**	**None**
6	**6.1**	Forward Contracts, Forward Price, Value of a Forward Contract, Futures, Pricing, Hedging with Futures	**Not yet taught**	**None**

7	**7.1**	European Options in the Binomial Tree Model, One Step, Two Steps, General N-Step Model, Cox–Ross–Rubinstein Formula, American Options in the Binomial Tree Model, Black–Scholes Formula.	**Not yet taught**	**None**

G. Laboratory Components None.

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1: 4th or 5th week.**
- **Midterm 2: 8th or 9th week.**
- **Quizzes & Homework: During the trimester.**
- **Lab Exam(s)** (if any): **None.**
- **Final Exam: 12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 0%.**
Quizzes: 5%.	**Homework: 5%.**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☒ **Allowed** ☐ **Not allowed**

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية **1444**

Regulations

للوائح والأنظمة

SYLLABUS
MAT 1474

Instructor:

Office Location:

Office Phone:

Email address : username@imamu.edu.sa

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	1474	Actuarial Mathematics	4	3	0	2	100	MAT 1371	None	9 or 11	English

Program(s) offered for:

- Bachelor of Science in Applied Mathematics

B. . COURSE GENERAL DESCRIPTION:

This course treats the economics of insurance, the future lifetime random variables (discrete and continuous), force of mortality, Life Tables: Select, Ultimate and Select and Ultimate, Annuities and Assurance in both discrete and continuous case, Commutation Functions. The emphasis is on calculations and some applications are mentioned.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	To outline the fundamentals of the interest rate related to Loan and Mortgage refinancing.	K1, K2	Regular Exams
1.2	To understand techniques and features of Market Models with both continuous time and discrete time.	K1, K2	Assignments Short Quizzes
2.0	**Skills**		
2.1	To develop techniques of life insurance.	S1, S2	Short Quizzes
2.2	To present methods of premium calculations clearly and precisely both orally and in writing.	S4	Participations

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
2.3	**To use Internet in searching for real insurance products**	**S5**	**Short Quizzes**
2.4	**To demonstrate the efficiency of some insurance techniques.**	**S3**	**Participations**
3.0	**Values, autonomy, and responsibility**		
3.1	**To work individually.**	**V1, V3**	**Participation**
3.2	**To work in groups.**	**V1, V2**	**Homework and Mini-projects**

D. COURSE MATERIALS

- **Required Textbook:**
- ***Actuarial Mathematics and Life-Table Statistics*, Eric V. Slud, CRC Press (Verlag), 2001.** (Main Reference). ISBN: 9781439861974
- **Other References:**
- ***Fundamentals of Actuarial Mathematics*, S. David Promislow, Wiley, 2010.**ISBN: 978-0-470-68411-5.
- ***Actuarial Mathematics*, by Newton L. Bowers, Hans U. Gerber, James C. Hickman, Donald A. Jones and Cecil J. Nesbitt (1997).** ISBN 10: 0938959468, ISBN 13: 9780938959465.
- ***Actuarial Mathematics for Life Contingent Risks, 2nd Edition, David C. M. Dickson, Mary R. Hardy and Howard R. Waters, Cambridge***
- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1.	**Basics of Probability & Interest:** Probability, Theory of Interest, Variable Interest Rates, Continuous-time Payment Streams.	**3**	**2**	**0**
2	**Interest & Force of Mortality:** More on Theory of Interest, Annuities & Actuarial Notation, Loan Amortization & Mortgage Refinancing, Illustration on Mortgage Refinancing, Coupon & Zero-coupon Bonds, Force of Mortality & Analytical Models, Comparison of Forces of Mortality.	8	**4**	**0**
3	**Risky Assets:** Dynamics of Stock Prices, Return, Expected Return, Binomial Tree Model, Risk-Neutral Probability, Martingale Property, Other Models, Trinomial Tree Model, Continuous-Time Limit.	9	**7**	**0**
4	**Expected Present Values of Payments:** Expected Payment Values, Types of Insurance & Life Annuity Contracts, Formal Relations among Net Single Premiums, Formulas for Net Single Premiums, Expected Present Values for $m = 1$, Continuous Contracts & Residual Life, Numerical Calculations of Life Expectancies.	9	**6**	**0**
5	**Premium Calculation:** m-Payment Net Single Premiums, Dependence Between Integer & Fractional Ages at Death, Net Single Premium Formulas | Case (i), Net Single Premium Formulas | Case (ii), Approximate Formulas via Case(i), Net Level Premiums, Benefits Involving Fractional Premiums.	7	**5**	**0**
Total		**36**	**24**	**0**
		60		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
1	**1.1**	**Basics of Probability & Interest:** Probability, Theory of Interest, Variable Interest Rates, Continuous-time Payment Streams.	**Not yet taught**	**None**
2	**2.1**	**Interest & Force of Mortality:** More on Theory of Interest, Annuities & Actuarial Notation, Loan Amortization & Mortgage Refinancing, Illustration on Mortgage Refinancing, Coupon & Zero-coupon Bonds, Force of Mortality & Analytical Models, Comparison of Forces of Mortality.	**Not yet taught**	**None**
3	**3.1**	**Probability & Life Tables:** Interpreting Force of Mortality, Interpolation between Integer Ages, Binomial Variables & Law of Large Numbers, Exact Probabilities, Bounds & Approximations, Simulation of Life Table Data, Expectation for Discrete Random Variables, Rules for Manipulating Expectations, Some Special Integrals.	**Not yet taught**	**None**
4	**4.1**	**Expected Present Values of Payments:** Expected Payment Values, Types of Insurance & Life Annuity Contracts, Formal Relations among Net Single Premiums, Formulas for Net Single Premiums, Expected Present Values for $m = 1$, Continuous Contracts & Residual Life, Numerical Calculations of Life Expectancies.	**Not yet taught**	**None**
5	**5.1**	**Premium Calculation:** m-Payment Net Single Premiums, Dependence Between Integer & Fractional Ages at Death, Net Single Premium Formulas | Case (i), Net Single Premium Formulas | Case (ii), Approximate Formulas via Case(i), Net Level Premiums, Benefits Involving Fractional Premiums.	**Not yet taught**	**None**

G. Laboratory Components None.

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1: 4th or 5th week.**
- **Midterm 2: 8th or 9th week.**
- **Quizzes & Homework: During the trimester.**
- **Lab Exam(s)** (if any): **None.**
- **Final Exam: 12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 0%.**
Quizzes: 5%.	**Homework: 5%.**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☒ **Allowed** ☐ **Not allowed**

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية **1444**

Regulations

للوائح والأنظمة

SYLLABUS
MAT 1482

Instructor:

Office Location:

Office Phone:

Email address : username@imamu.edu.sa

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	1482	Advanced Euclidean Geometry	4	3	0	2	100	MAT 1223	None	9 or 11	English

Program(s) offered for:

- Bachelor of Science in Applied Mathematics

B. . COURSE GENERAL DESCRIPTION:

Advanced Euclidean Geometry is an elective course. This is a senior level class which is a comprehensive study of geometry. It includes the historical development of geometry, abstract and concrete treatments of the subject, examples of various geometries, proving fundamental geometric theorems as of: Ceva, Stewart, Ptolemy and of Miquel.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	To outline a core set of geometric facts and relationships about triangles, quadrilaterals, circles, congruence, and similarity.	K1, K2	Midterm exam 1 – Final exam
1.2	To recognize the basics concepts and results related to Euclidean Geometry.	K1, K2	Oral questions - All exams
1.3	To memorize the principal theorems of this course as: Ceva's theorem, Menelaus's theorem, Ptolemy's theorem, and Stewart's theorem	K1, K2	Oral questions - All exams
2.0	**Skills**		
2.1	To develop techniques of Euclidean	S1, S2	Oral questions - All exams

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
	geometry problems.		
2.2	**To present main Euclidean geometry theorems clearly and precisely both orally and in writing.**	**S4**	**Oral questions - Midterm exam 2 – Final exam**
2.3	**To use Internet in searching for up-to-date results in Euclidean geometry.**	**S5**	**Homework**
2.4	**To demonstrate some proofs in advanced Euclidean geometry.**	**S3**	**Midterm exam 2 – Final exam**
3.0	**Values, autonomy, and responsibility**		
3.1	**To work individually.**	**V1, V3**	**Oral questions - All exams**
3.2	**To show findings and discuss the results with others.**	**V1, V2**	**Team work - All exams**

D. COURSE MATERIALS

- **Required Textbook:**

Geometry for College Students, I. Isaacs, Thomson Learning 2001 **(Main Reference)**.

- **Other References:**
- ***Advanced Euclidean Geometry***, A. Posamentier, Wiley 2008.
- ***Advanced Euclidean Geometry***, R. Johnson, Dover, 2007.
- ***Tropical Geometry: An approach to two different types of geometry with tropical geometry,*** T. von der Hoorn, Lambert Academic Publishing, Berlin, Germany, 2012, ISBN-13: 978-3-8473-1417-2.
- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1.	**Review:** basics and stating basic facts concepts and facts of the triangle geometry	5	4	0
2.	**Ceva's theorem:** Ceva's Theorem and its dual Menelaus's theorem and their applications. Simon's Line, The Butterfly, Theorem Pappus's Theorem.	9	6	0
3.	**Stewart's theorem and its applications:** Equiangular point, Property of Equilateral triangles, and a Minimum Distance Point.	7	5	0
4.	**Centers of Quadrilaterals:** Cyclic Quadrilaterals, and Ptolemy's Theorem and its applications.	5	4	0
5.	**Miquel's Theorem:** Euler distance formula. The nine points circle Theorem and its proof.	4	2	0
6.	**Axiomatic Systems and Finite Geometries**: Glimpse on hyperbolic geometry, elliptic geometry.	6	3	0
Total		36	24	0
		60		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
1	**1.1**	**Review:** basics and stating basic facts concepts and facts of the triangle geometry.	**Not yet taught**	**None**
2	**2.1**	**Ceva's theorem:** Ceva's Theorem and its dual Menelaus's.	**Not yet taught**	**None**
	2.2	**Ceva's theorem:** Applications. Simon's Line, The Butterfly, Theorem Pappus's Theorem.		
3	**3.1**	**Stewart's theorem and its applications:** Equiangular point.	**Not yet taught**	**None**
	3.2	**Stewart's theorem and its applications:** Property of Equilateral triangles, and a Minimum Distance Point.		
	3.3	**Centers of Quadrilaterals:** Cyclic Quadrilaterals, and Ptolemy's Theorem and its applications.	**Not yet taught**	
4	**4.1**	**Miquel's Theorem:** Euler distance formula. The nine points circle Theorem and its proof.	**Not yet taught**	**None**
	4.2	**Axiomatic Systems and Finite Geometries**: Glimpse on hyperbolic geometry, elliptic geometry.		

G. Laboratory Components **None.**

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1: 4th or 5th week.**
- **Midterm 2: 7th or 8th week.**
- **Quizzes & Homework: During the trimester.**
- **Lab Exam(s)** (if any): **None.**
- **Final Exam: 12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 0%.**
Quizzes: 5%.	**Homework: 5%.**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☒ **Allowed** ☐ **Not allowed**

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams 1444

لائحة الدراسة والقواعد التنفيذية 1444

Regulations



للوائح والأنظمة

SYLLABUS
MAT 1484

Instructor:

Office Location:

Office Phone:

Email address : username@imamu.edu.sa

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	**1484**	**Introduction to Differential Geometry**	**4**	**3**	**0**	**2**	**100**	**MAT 1203 MAT 1223**	**None**	**9 or 11**	**English**

Program(s) offered for:

- Bachelor of Science in Applied Mathematics

B. . COURSE GENERAL DESCRIPTION:

Introduction to Differential geometry is an elective course. It introduces the subject by focusing on those geometries which are easiest to visualize: curves and surfaces in three-dimensional space. Regarding surfaces, the course gives a detailed property which are intrinsic to the geometry of surfaces in the sense that they only depend on how distance is measured. Most of the properties will be local in nature (e.g., curvature) ultimately building up to the Gauss-Bonnet Theorem which relates those local properties to global characteristics of the surface.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	To acquire knowledge about geometry of curves and geometry of surfaces in R^n.	K1, K2	Midterm exam 1 – Final exam
1.2	To introduce geometry of geodesics and learn about global results about surfaces.	K1, K2	Oral questions - All exams
2.0	**Skills**		
2.1	To develop techniques of problem solving.	S1, S2	Oral questions - All exams

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
2.2	To communicate mathematics clearly and precisely both orally and in writing.	S4	Oral questions - Midterm exam 2 – Final exam
2.3	To use Internet in searching for scientific information	S5	Homework
2.4	To carry out calculations orally and mentally	S3	Midterm exam 2 – Final exam
3.0	**Values, autonomy, and responsibility**		
3.1	Work individually.	V1, V3	Oral questions - All exams
3.2	To work in groups.	V1, V2	Team work - All exams

D. COURSE MATERIALS

- **Required Textbook:**
  Differential Geometry of Curves and Surfaces, **Manfredo P. do Carmo, Prentice Hall, Inc., New Jersey, 1976 (Main Reference)**.
- **Other References:**
- *Differential Geometry of Curves and Surfaces*, **Thomas F. Banchoff, Stephen T. Lovett, CRC Press, 2010.**
- *Elementary Differential Geometry*, **Barret O'Neill, Academic Press, 1966.**
- *Lectures on Classical Differential Geometry*, **Dirk J. Struik, Dover Publ., 1988.**
- *Elementary Topics in Differential Geometry, John A. Thorpe, Springer, 2011.*
- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1.	**Geometry of curves:** parameterizations; arc length; curvature; torsion; Fernet equation; the local canonical form; global properties of curves in the plane.	9	6	0
2.	**Geometry of surfaces in R^n:** parameterizations; tangent plane; differential; first and second fundamental forms; the geometry of the Gauss map; curves in surfaces; tangent plane; tangent space and normal vectors.	9	6	0
3.	**Geometry of geodesics:** normal and geodesic curvature of curves; exponential map; geodesic polar coordinates; Fermi coordinates; properties of geodesics, Jacobi fields; convex neighborhoods.	9	6	0
4.	**Global results about surfaces:** The Gauss Theorem, The Gauss-Bonnet Theorem; Hopf-Rinow theorem; cut points and conjugate points; The Bonnet-Myers Theorem.	9	6	0
Total		36	24	0
		60		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
1	1.1	Parameterizations/ arc length	Not yet taught	None
	1.2	Curvature/torsion		
	1.3	Fernet equation/ the local canonical form		
	1.4	global properties of curves in the plane.		
2	2.1	Parameterizations	Not yet taught	None
	2.2	Tangent plane		
	2.3	Differential		
	2.4	First and second fundamental forms		
	2.5	The geometry of the Gauss map		
	2.6	Curves in surfaces		
	2.7	Tangent plane		
	2.8	Tangent space and normal vectors.		
3	3.1	Normal and geodesic curvature of curves	Not yet taught	None
	3.2	Exponential map		
	3.3	Geodesic polar coordinates		
	3.4	Fermi coordinates		
	3.5	Properties of geodesics		
	3.6	Jacobi fields/ convex neighborhoods		
4	4.1	The Gauss Theorem	Not yet taught	None
	4.2	The Gauss-Bonnet Theorem		
	4.3	Hopf-Rinow theorem		
	4.4	cut points and conjugate points		
	4.5	The Bonnet-Myers Theorem		

G. Laboratory Components **None.**

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1: 4th or 5th week.**

- **Midterm 2: 7th or 8th week.**
- **Quizzes & Homework: During the trimester.**
- **Lab Exam(s)** (if any): **None.**
- **Final Exam: 12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 0%.**
Quizzes: 5%.	**Homework: 5%.**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☒ **Allowed** ☐ **Not allowed**

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية 1444_

Regulations

للوائح والأنظمة

SYLLABUS
MAT 1491

Instructor:

Office Location:

Office Phone:

Email address : username@imamu.edu.sa

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	1491	Selected Topics in Applied Mathematics (1)	4	3	0	2	100	None	None	9 or 11	English

Program(s) offered for:

- Bachelor of Science in Applied Mathematics

B. . COURSE GENERAL DESCRIPTION:

This course:

- **This course is designed to enable students to study different special topics of interest, which are carefully, selected from advanced Applied Mathematics topics which may be changed from semester to semester.**
- **This course is designed to enable students to study different special topics of interest, which are carefully, selected from advanced Applied Mathematics topics which may be changed from semester to semester**
- **To learn topics those are not formally offered by the program and receive appropriate academic credit.**
- **To learn topics those are not formally offered by the program and receive appropriate academic credit**

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	Specific to each course of study.	K1, K2	Midterm exam 1 – Final exam
2.0	**Skills**		
2.1	To develop techniques of problem solving.	S1, S2	Oral questions - All exams
2.2	To communicate mathematics	S4	Oral questions - Midterm exam 2

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
	clearly and precisely both orally and in writing.		– Final exam
2.3	To use Internet in searching for scientific information	S5	Homework
2.4	To carry out calculations orally and mentally.	S3	Midterm exam 2 – Final exam
3.0	**Values, autonomy, and responsibility**		
3.1	To work individually.	V1, V3	Oral questions - All exams
3.2	To work in groups.	V1, V2	Team work - All exams

D. COURSE MATERIALS

- **Required Textbook:**

Course dependent.

- **Other References:**

Course dependent.

- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1	Course dependent.			
Total		36	24	0
		60		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
		Course dependent.		

G. Laboratory Components

None.

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1: 4th or 5th week.**
- **Midterm 2: 7th or 8th week.**
- **Quizzes & Homework: During the trimester.**
- **Lab Exam(s)** (if any): **None.**
- **Final Exam: 12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 0%.**
Quizzes: 5%.	**Homework: 5%.**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☒ **Allowed**	☐ **Not allowed**

K. THE GRADING DISTRIBUTION:

A^+	A	B^+	B	C^+	C	D^+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية 1444_

Regulations

للوائح والأنظمة

SYLLABUS
MAT 1493

Instructor:

Office Location:

Office Phone:

Email address : username@imamu.edu.sa

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	1493	Selected Topics in Applied Math (2)	4	3	0	2	100	None	None	9 or 11	English

Program(s) offered for:

- Bachelor of Science in Applied Mathematics

B. COURSE GENERAL DESCRIPTION:

The selected topics course will be described before the course delivery and the approbation of department.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	Specific to each course of study.	K1, K2	Midterm exam 1 – Final exam
2.0	**Skills**		
2.1	To develop techniques of problem solving.	S1, S2	Oral questions - All exams
2.2	To communicate mathematics clearly and precisely both orally and in writing.	S4	Oral questions - Midterm exam 2 – Final exam
2.3	To use Internet in searching for scientific information	S5	Homework
2.4	To carry out calculations orally and mentally.	S3	Midterm exam 2 – Final exam
3.0	**Values, autonomy, and responsibility**		
3.1	To work individually.	V1, V3	Oral questions - All exams

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
3.2	To work in groups.	V1, V2	Team work - All exams

D. COURSE MATERIALS

- **Required Textbook:**

  Course dependent.

- **Other References:**

  Course dependent.

- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
	Specific to each course of study			
Total		36	24	0
		60		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
Specific to each course of study				

G. Laboratory Components

None.

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1:** **4th or 5th week.**
- **Midterm 2:** **8th or 9th week.**
- **Quizzes & Homework:** **During the trimester.**
- **Lab Exam(s)** (if any): **None.**
- **Final Exam:** **12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 0%.**
Quizzes: 5%.	**Homework: 5%.**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☐ **Allowed** ☐ **Not allowed**

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية 1444_

Regulations

للوائح والأنظمة

SYLLABUS
STA 1203

Instructor:

Office Location:

Office Phone:

Email address:

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
STA	1203	Mathematical Statistics	4	3	0	2	100	STA 1202	None	9 or 11	English

Program(s) offered for:

- Bachelor of Science in Applied Statistics

B. . 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.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	To know the moment generating function, the joint probability mass functions, and joint probability density functions.	K1, K2	Midterm exam 1 – Final exam
1.2	Define the confidence intervals on the mean, variance, standard deviation and on a population proportion.	K1, K2	Midterm exam 1 – Final exam
2.0	**Skills**		
2.1	To develop techniques of problem solving.	S1, S2	Midterm exam 1 – Final exam
2.2	To communicate mathematics clearly and precisely both orally and in writing.	S4	Midterm exam 1 – Final exam
2.3	To carry out calculations orally and mentally.	S3	Midterm exam 2 – Final exam

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
3.0	**Values, autonomy, and responsibility**		
3.1	**To defend the formulated conclusions.**	**V1, V3**	**Oral questions - All exams**
3.2	**To operate meaningfully and productively with others.**	**V1, V2**	**Team work - All exams**

D. COURSE MATERIALS

- **Required Textbook:**

1) ***Probability and Statistics for Engineers, Sixth Edition; Douglas C. Montgomery and George C. Runger, Wiley. ISBN-13 9781118539712 (Main Reference).***
2) ***Probability and Statistical Inference, 9th Ed; Robert V. Hogg, Elliot A. Tanis, Dale L. Zimmerman, Pearson. ISBN 978-0-321-92327-1***
3) ***Introduction to Mathematical Statistics, 6th Ed; Robert V. Hogg, Joseph W. McKean, Allen T. Craig, Pearson. ISBN 13: 978-0-13-468699-8***

Other References:

4) ***Probability and Statistics for Engineers & Scientists, Eighth Edition; Walpole, Myers, Ye, Pearson International edition. ISBN 978-0-321-62911-1 (Essential Reference)***

- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1.	**Bivariate Probability Distribution:** Random vector, Two Discrete Random Variables, Two Continuous Random Variables, Joint probability Mass/density function, Joint cumulative distribution/density function, Marginal probability distribution, Conditional Probability distribution, Independence, Covariance and Correlation, Bivariate Normal Distribution.	**8**	**8**	**0**
2.	**Sampling distributions and the central limit theorem:** Sampling distributions, Sampling Distributions of the Means of single population, Sampling Distributions of the difference of Means from two populations; Sampling Distributions related to the Normal Distribution; The Central Limit Theorem; A proof of the Central Limit Theorem, The chi-square distribution, The t-distribution, The F-distribution.	**6**	**4**	**0**
3.	**Point estimation:** The Bias and Mean Square Error of Point Estimation; Some Common Point Estimators; Methods of Estimation: Moment's method and the Maximum Likelihood methods.	**6**	**4**	**0**
4.	**Properties of Point Estimators:** Evaluating the Goodness-of-fit for point estimators; Bias, Mean Squared Error; Relative Efficiency; Consistency; Sufficiency; Fisher-Neyman Factorization theorem; Rao-Blackwell Theorem and Minimum Variance Estimation.	**4**	**2**	**0**
5.	**Confidence Interval Estimation:** Confidence interval for the Mean when σ is Known; Confidence interval for the Mean when σ is Unknown; Confidence Intervals for Variance And standard Deviations. Confidence Intervals for Variance And standard Deviations. Estimation error and Sample Sizes for population mean and population Proportions.	**6**	**3**	**0**
6.	**Functions of Random Variables:** Finding the probability distribution of linear functions of random variable. General Function of a Discrete Random Variable, General Function of a Continuous Random Variable, the method of transformations, Using the Moment-Generating Functions	**6**	**3**	**0**
Total		**36**	**24**	**0**
		60		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
Ch.5 (Joint Probability Distributions) [Book Ref-1]	5.1.1	Joint Probability distribution	Examples: 5-1 till 5-12; 5-19 till 5-23; 5-27 till 5-29; 5-30 till 5-33; 5-34 and 5-35; 5-36 till 5-38 Exercises: 5-1 till 5-9; 5-11 till 5-32; 5-33 till 5-47; 5-48 till 5-61; 5-62 till 5-78; 5-79 till 5-90;	None
	5.1.2	Marginal probability distributions		
	5.1.3	Conditional Probability distribution		
	5.2	Covariance and Correlation		
	5.3	Bivariate Normal distribution		
	5.4	Linear Functions of Random variables		
	5.5	General functions of Random variables		
	5.6	Moment generating function		
Ch.7 (Point Estimation of Parameters and Sampling Distributions) [Book Ref-1]	7.1	Point Estimation	Examples: 7-1, 7-2, and 7-3 Exercises: 7-1 till 7-18	
	7.2	Sampling Distributions and the Central Limit Theorem		
	7.3	General Concepts of Point Estimation (Unbiased Estimators, Expectation and Variances of Estimators, Standard Error, Mean Squared Error (MSE) of an Estimator, Relative Efficiency, Optimal Estimator,	Examples: 7-4, 7-5 Exercises: 7-24 till 7-35	
	7.4	Methods of Point Estimation	Examples: 7-7 till 7-16 Exercises: 7-44 till 7-54	
Ch.8 (Statistical Intervals for a Single Sample) [Book Ref-1]	8.1	Confidence Interval on the Mean of a Normal Distribution, Variance Known	Examples: 8-1 till 8-5 Exercises: 8-1 till 8-23	
	8.2	Confidence Interval on the Mean of a Normal Distribution, Variance Unknown	Examples: 8-6 Exercises: 8-24 till 8-45	
	8.3	Confidence Interval on the Variance and Standard Deviation of a Normal Distribution	Examples: 8-7 Exercises: 8-46 till 8-58	
	8.4	Large-Sample Confidence Interval for a Population Proportion	Examples: 8-8 and 8-9 Exercises: 8-59 till 8-72	

	8.5	**Guidelines for Constructing Confidence Intervals**		
Ch.5 (Point Estimation) [Book Ref-2]	**5.9**	**Limiting Moment-generating function and Proofs of the Central Limit Theorem**	**Examples: 5.9.1, 5.9.2 and 5.9.3**	
Ch.6 (Point Estimation) [Book Ref-2]	**6.7**	**Sufficient Statistics**	**Examples: 6.7.1, 6.7.2, 6.7.3, 6.7.4, and 6.7.5**	
Ch.5 (Consistency and Limiting distributions) [Book Ref-3]	**5.1**	**Convergence in Probability**		
	5.1.1	**Consistent Statistic**	**Example: 5.1.1**	

G. Laboratory Components

None

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1: 4th or 5th week.**
- **Midterm 2: 8th or 9th week.**
- **Quizzes & Homework: During the trimester.**
- **Final Exam: 12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 0%**
Quizzes: 5%.	**Homework: 5%**	**Project(s): 0%**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☒ **Allowed** ☐ **Not allowed**

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend

class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444



لائحة الدراسة والقواعد التنفيذية **1444**_

Regulations



للوائح والأنظمة

SYLLABUS
STA 1321

Instructor:

Office Location:

Office Phone:

Email address : username@imamu.edu.sa

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
STA	1321	Introduction to Regression	4	3	0	2	100	STA 1203	None	9 or 11	English

Program(s) offered for:

- Bachelor of Science in Applied Mathematics
- Bachelor of Science in Applied Statistics

B. 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.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	To outline the concept of linear regression model and properties of model parameters for prediction purposes.	K1, K2	Midterm exam 1 – Final exam
1.2	To define regression analysis and its limitations.	K1, K2	Oral questions - All exams
2.0	**Skills**		
2.1	To summarize and explain the general procedures of statistical	S1, S2	Oral questions - All exams

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
	inference for linear regression models.		
2.2	**To differentiate the situation where linear regression is appropriate**	**S2**	**Midterm exam 1 – Final exam**
2.3	**To interpret estimates and diagnostic statistics.**	**S3, S4**	**Midterm exam 1 – Final exam**
2.4	**To construct and fit linear regression models with the appropriate software.**	**S5**	**Midterm exam 2 – Final exam**
2.5	**To design and implement advanced methods in regression analysis for applications.**	**S2, S3**	**Final exam**
3.0	**Values, autonomy, and responsibility**		
3.1	**To employ ethical concepts and rules to determine viable alternatives in any given situation.**	**V1, V2**	**Oral questions - All exams**
3.2	**To show findings and discuss the results with others.**	**V1, V3**	**Team work - All exams**

D. COURSE MATERIALS

- **Required Textbook:**

***Classical and Modern Regression with Applications*;** 2nd Edition, Raymond H. Myers, Duxbury Classic, 2000. ISBN-13: 978-0534380168. **(Main Reference).**

- **Other 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.

- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1.	**Introduction to Regression Analysis:** Regression Models. Formal uses of regression analysis. The data base.	**5**	**4**	**0**
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.	**9**	**5**	**0**
3.	**The Multiple Linear Regression Model:** Model description and assumptions; Estimation; Properties of the least square estimators; Various hypotheses tests; Multicollinearity in multiple data; Quality of fit and prediction.	**8**	**5**	**0**
4.	**Selection of Variables:** Contribution of a variable in the	**7**	**5**	**0**

	model; Forward selection and backward elimination; Stepwise procedure; All possible subsets and other techniques of selection variables.			
5	**Statistical diagnostics:** Analysis of residual; Diagnostic plots; Detection of outliers; Influence diagnostics.	**7**	**5**	**0**
Total		**36**	**24**	**0**
		60		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
Not yet taught				

G. Laboratory Components

None.

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1: 4th or 5th week.**
- **Midterm 2: 8th or 9th week.**
- **Quizzes & Homework: During the trimester.**
- **Lab Exam(s)** (if any): **None.**
- **Final Exam: 12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 0%.**
Quizzes: 5%.	**Homework: 5%.**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☐ **Allowed** ☐ **Not allowed**

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. (“Immediate family” is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444



لائحة الدراسة والقواعد التنفيذية **1444_**

Regulations



للوائح والأنظمة

SYLLABUS
STA 1351

Instructor:

Office Location:

Office Phone:

Email address : username@imamu.edu.sa

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
STA	**1351**	**Introduction to Stochastic Processes**	**4**	**3**	**0**	**2**	**100**	**STA 1202 MAT 1223**	**None**	**9 or 11**	**English**

Program(s) offered for:

- Bachelor of Science in Applied Mathematics
- Bachelor of Science in Applied Statistics

B. 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.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	**To describe the basics of stochastic modeling of real-world systems related to the physical sciences, computer science, and (possibly) finance.**	**K1, K2**	**Midterm exam 1 – Final exam**
1.2	**To define exponential distribution to model arrival times, the Poisson process, and outline its application to continuous time Markov chains**	**K1, K2**	**Oral questions - All exams**
1.3	**To state the concept of conditional probability, Markov chain,**	**K1, K2**	**Midterm exam 2 – Final exam**

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
	Branching process, Poisson process, and Birth and Death process.		
2.0	**Skills**		
2.1	**To use probability and matrix theory to solve stochastic models.**	**S1, S2**	**Oral questions - All exams**
2.2	**To evaluate stochastic process problems mathematically and using software.**	**S1, S2, S5**	**Midterm exam 1 – Final exam**
2.3	**To assess how sensitive stochastic models are to changes that might occur in model variables.**	**S2, S3, S4**	**Midterm exam 1 – Final exam**
2.4	**To interpret and explain the solution for a stochastic process application.**	**S3, S4**	**Midterm exam 2 – Final exam**
3.0	**Values, autonomy, and responsibility**		
3.1	**To work individually.**	**V1, V2**	**Oral questions - All exams**
3.2	**To show findings and discuss the results with others.**	**V1, V3**	**Team work - All exams**

D. COURSE MATERIALS

- **Required Textbook:**
- ***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)
- **Other References:**
- ***An Introduction to Stochastic Modeling,*** M. A. Pinsky and S. Karlin, 4th Edition, Academic Press Elsevier, 2011.
- ***Introduction to Probability,*** D. Bertsekas and J. Tsitsiklis, 2nd Edition; Athena Scientific, 2008.
- ***Fundamentals of Probability with Stochastic Processes,*** 3rd Edition; Saeed Ghahramani, Prentice Hall, 2004.
- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1.	**Basic probability:** Random variable, Limit Theorems, Stochastic Processes.	**5**	**3**	**0**
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.	**5**	**4**	**0**
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,	**7**	**5**	**0**

	Markov Chain Monte Carlo Methods, Markov Decision Processes, Hidden Markov Chains.			
4.	**The Exponential Distribution and the Poisson Process:** Introduction, The Exponential Distribution, The Poisson Process, Generalizations of the Poisson Process.	**7**	**4**	**0**
5	**Continuous-Time Markov Chains:** Introduction, Continuous-Time Markov Chains, Birth and Death Processes, The Transition Probability Function $P_{ij}(t)$, Limiting Probabilities.	**5**	**4**	**0**
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.	**7**	**4**	**0**
Total		**36**	**24**	**0**
		60		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
Not yet taught				

G. Laboratory Components

None.

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **Midterm 1: 4th or 5th week.**
- **Midterm 2: 8th or 9th week.**
- **Quizzes & Homework: During the trimester.**
- **Lab Exam(s)** (if any): **None.**
- **Final Exam: 12th week.**

Your course grade will be based on your trimester work as follows:

Midterm 1: 25%.	**Midterm 2: 25%.**	**Final Exam: 40%.**	**Lab Exam(s): 0%.**
Quizzes: 5%.	**Homework: 5%.**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☒ Allowed	☐ Not allowed

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية 1444_

Regulations

للوائح والأنظمة

SYLLABUS
MAT 1499

Instructor:

Office Location:

Office Phone:

Email address : username@imamu.edu.sa

Office hours:

A. BASIC INFORMATION

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Student Work load*	*Pre-requisites*	*Co-requisites*	*Course Level*	*Teaching Language*
MAT	1499	Research Project	4	-	-	-	112	Start Last Trimester	None	12	English

Program(s) offered for:

- Bachelor of Science in Applied Mathematics

B. COURSE GENERAL DESCRIPTION:

The selected topics course will be described before the course delivery and the approbation of department.

C. COURSE OUTCOMES AND ASSESSMENT PLAN

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
1.0	**Knowledge and understanding**		
1.1	To apply mathematical knowledge and skills to a specific research project.	K1, K2	First continuous evaluation Written report
1.2	To provide in-depth knowledge of currently active research areas in Mathematics.	K1, K2	Second continuous evaluation Written report
2.0	**Skills**		
2.1	To develop techniques of problem solving.	S1, S2	Written report Short talk
2.2	To communicate mathematics clearly and precisely both orally and in writing.	S4	Written report Short talk
2.3	To use Internet in searching for scientific information	S5	Written report Short talk
2.4	To carry out calculations orally and mentally.	S3	Written report

Code	Course Learning Outcomes	Aligned with PLOs	When Assessed (for example Midterm 1 Question 3, ..)
			Short talk
3.0	**Values, autonomy, and responsibility**		
3.1	**To work individually.**	**V1, V3**	**Written report**
3.2	**To work in groups.**	**V1, V2**	**Short Talk**

D. COURSE MATERIALS

- **Required Textbook:**

  Course dependent.

- **Other References:**

  Course dependent.

- **Course Website:** Learning Management Systems (Blackboard)

E. COURSE CONTENT

No	List of Topics	Contact Hours		
		Lectures	Tutorial	Lab
1.	**Specific to each course of study**	-	-	-
Total		-	-	-
		48		

F. COURSE OUTLINE

Chapter (if any)	Sections (if any)	List of Definitions, Theorems and Examples In the Lectures (if any)	List of Exercises for Tutorials (if any)	Laboratory Components (if any)
Specific to each course of study				

G. Laboratory Components

None.

H. OFFICE HOURS

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

I. EXAMS & GRADING SYSTEM

The semi-official dates of the exams for this course are:

- **First continuous evaluation (reported by the supervisor): 4th or 5th week.**
- **Second continuous evaluation (reported by the supervisor): 8th or 9th week.**
- **Written report in English (20-35 pages): During the trimester.**
- **Short talk in English language (oral presentation 15 minutes): 13th week.**

Your course grade will be based on your trimester work as follows:

Evaluation 1: 20%.	**Evaluation 2: 30%.**	**Final Report and Talk: 50%.**	**Lab Exam(s): 0%.**
Quizzes: 0%.	**Homework: 0%.**	**Project(s): 0%.**	**Other: 0%.**

J. CALCULATOR INSTRUCTIONS

☒ **Allowed** ☐ **Not allowed**

K. THE GRADING DISTRIBUTION:

A+	A	B+	B	C+	C	D+	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

L. STUDENT ATTENDANCE/ABSENCE

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

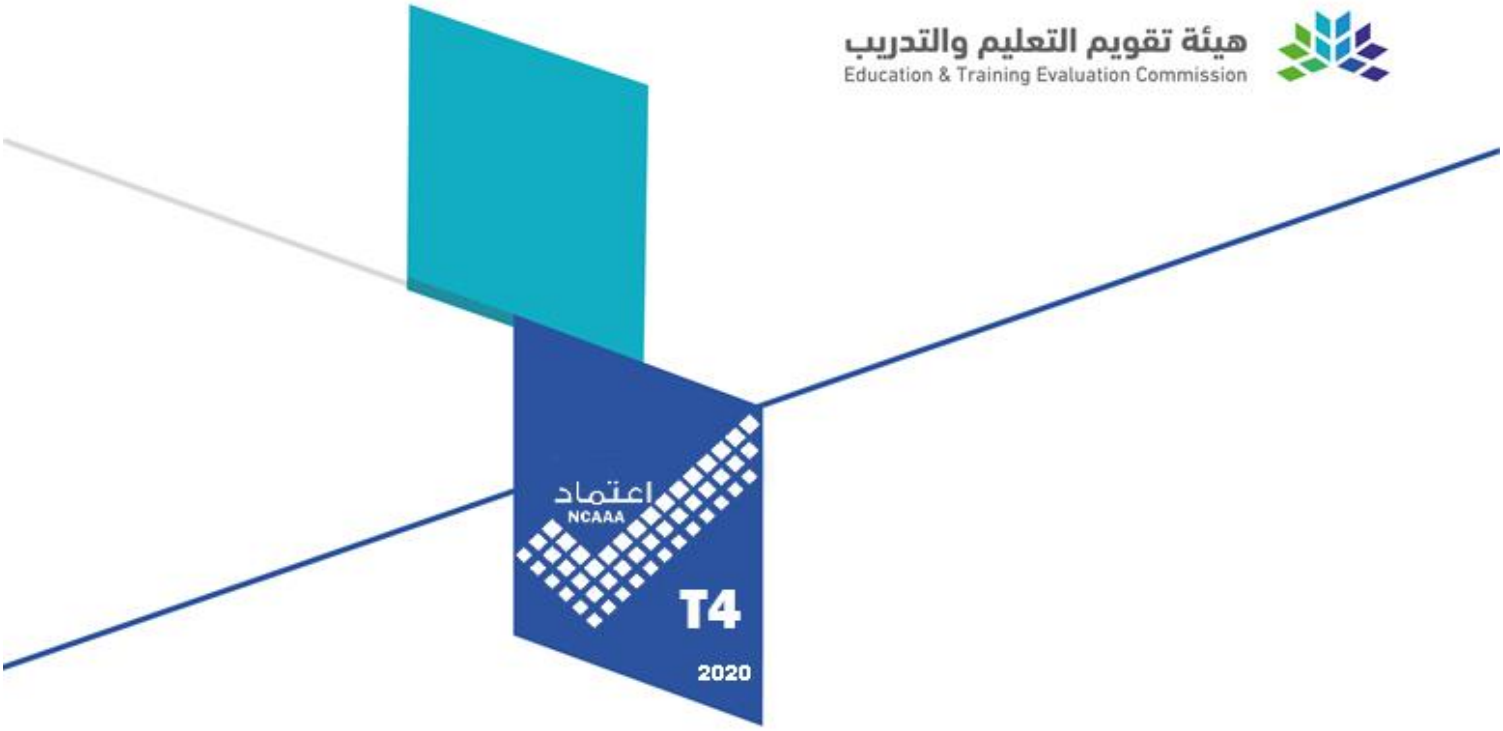
Executive Rules for Study Regulations and Exams_1444

لائحة الدراسة والقواعد التنفيذية **1444_**

Regulations_

للوائح والأنظمة_

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Course Specifications

Course Title:	**Field Training**
Course Code:	**MAT 1497**
Program:	**Bachelor of Science in Mathematics**
Department:	**Mathematics and Statistics**
College:	**College of Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

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A. Field Experience Identification

1. Credit hours: 4
2. Level/year at which this course is offered: 12/4 (last term of the program).
3. Dates and times allocation of field experience activities. • Number of weeks: **(12)** • Number of days: **(36)** • Number of hours: **(180)**
4. Pre-requisites to join field experience (if any)**:** **Student must complete at least 160 credit hours.**

B. Learning Outcomes, and Training and Assessment Methods

1. Field Experience Learning Outcomes

	CLOs Upon completion of this field training, students should be able to:	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**Demonstrate knowledge of the context of the professional career before graduation.**	**K1, K2**
1.2	**Explain professional interests in related fields of Mathematics program.**	**K1, K2**
1.3	**Identify a range of opportunities for learning, development and mentoring throughout the duration of the training.**	**K1, K2**
2	**Skills:**	
2.1	**Apply what has been learned in classroom to real-world situations.**	**S1**
2.2	**Build critical thinking and innovative problem-solving skills with confidence and rigor.**	**S1, S2**
2.3	**Proficiently communicate oral and written information in a manner that reflects professional social work skills.**	**S4**
2.4	**Confront the various pressures that he/she may face in the labor market.**	**S1**
2.5	**Proficiently interact with other professionals.**	**S4**
3	**Values:**	
3.1	**Develop discipline, self and social responsibility.**	**V1, V2**
3.2	**Apply ethic principles of the profession.**	**V1, V3**
3.3	**Enhance integrity and honesty.**	**V1**

2.Alignment of Learning Outcomes with Training Activities and Assessment Methods

Code	Learning Outcomes	Training Methods/Activities	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**Demonstrate knowledge of the context of the professional career before graduation.**	**participation with the field supervisor at work place.**	**Discussion** **Specific rubric**
1.2	**Explain professional interests in related fields of Mathematics program.**	**Subject-based study essays**	**Rubric of evaluation**

Code	Learning Outcomes	Training Methods/Activities	Assessment Methods
		written-short answer/long answer/report	
1.3	Identify a range of opportunities for learning, development and mentoring throughout the duration of the training.	Oral test Presentation Written report	Evaluate student's Discussion
2.0	Skills		
2.1	Apply what has been learned in classroom to real-world situations.	workplace performance; Oral Presentations	• Portfolio • Student's diary/journal.
2.2	Build critical thinking and innovative problem-solving skills with confidence and rigor.	Written research questions/ Reflection	Student portfolio
2.3	Proficiently communicate oral and written information in a manner that reflects professional social work skills.	Written tasks Discussion	Evaluation of Report and mails.
2.4	Confront the various pressures that he/she may face in the labor market.	participation with the field supervisor at workplace	Direct observation
2.5	Proficiently interact with other professionals.	participation with the field supervisor at workplace	Direct observation
3.0	Values		
3.1	Develop discipline, self and social responsibility	Discussion, behavior	Portfolio and direct observation
3.2	Apply ethic principles of the profession.	Discussion, behavior	Direct observation portfolio
3.3	Enhance integrity and honesty	Discussion, behavior	Direct observation

3. Field Experience Learning Outcomes Assessment

a. Students Assessment Timetable

#	*Assessment task**	*Assessment timing (Week)*	*Percentage of Total Assessment Score*
1	**Orientation session attendance.**	**First week**	**5% by the teaching staff advisor.**
2	**Site Visit**	**About Week 4 & week 8**	**10% by the teaching staff advisor.**
3	**Appreciation on student's performance (using supervisor's reports and student's weekly)**	**During the 12 weeks of the training.**	**10% by the teaching staff advisor.**
4	**Week log of activities**	**Weekly**	**10% by the teaching staff advisor and 5% by training advisor.**
5	**Demonstrate Learning Outcomes.**	**During the 12 weeks of the training.**	**50% by training advisor.**
6	**Student Field Performance Appraisal**	**Between Week 12 and week 13.**	**10% by student.**

***Assessment task** (i.e., Practical test, oral test, presentation, group project, essay, etc.)

b. Assessment Responsibilities

#	Category	Assessment Responsibility
1	**Teaching Staff**	**The teaching staff supervisor assesses:** • **the attendance and participation of the student in the orientation session,** • **the performance during the field visit,** • **student's performance by using supervisor's reports and student's weekly, which express the application of student's knowledge to actual practice.**
2	**Field Supervisor**	**The field supervisor assesses overall performance and progress of the student during the training.**
3	**Others** (specify)	**N.A.**

C. Field Experience Administration

1. Field Experience Locations

a. Field Experience Locations Requirements

Suggested Field Experience Locations	General Requirements*	Special Requirements**
Maaden **Saudi Aramco** **KACST**	**The workplace must be registered and approved by the competent Saudi instances.**	**The field experience location activities must be appropriate and consistent with the mission of Imam university**

The Zakat, Tax and Customs Authority (ZATCA) **Public School** **Private School** **General Authority for Statistics**	**Legal status as determined by the law in Saudi Arabia.** **Efficiency and safety.**	**and the requirements for field experience learning outcomes.**

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

b. Decision-making procedures for identifying appropriate locations for field experience

Before starting the process for field experience, 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 college of science website.
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 to determine an appropriate field supervisor.

2. Supervisory Staff

a. Selection of Supervisory Staff

Selection Items	Field Supervisor	Teaching Staff
Qualifications	**A permanent member of the training organization.**	**A member of the teaching staff at the department of Mathematics and Statistic is assigned authority and responsibility of supervising and evaluating the overall components of the field experience according the present specifications document.**
Selection Criteria	**depending to the training organization criteria.**	**• Ability to supervise a team, to establish priorities and manage competing deadlines for self and others.** **• Experience in the supervision and leadership of staff.** **• Well-developed oral and written communication skills.** **• Ability to build and maintain effective working relationships and act with diplomacy and discretion when dealing with sensitive and confidential issues** **• Ability to develop effective social and professional networks.**

b. Qualification and Training of Supervisory Staff

(Including the procedures and activities used to qualify and train the supervisory staff on supervising operations, implementing training activities, the follow-up and evaluation of students, etc.)

The field supervisor is able for supervising, training and evaluating the student throughout the training period., including the follow-up and monitoring. He should notify the

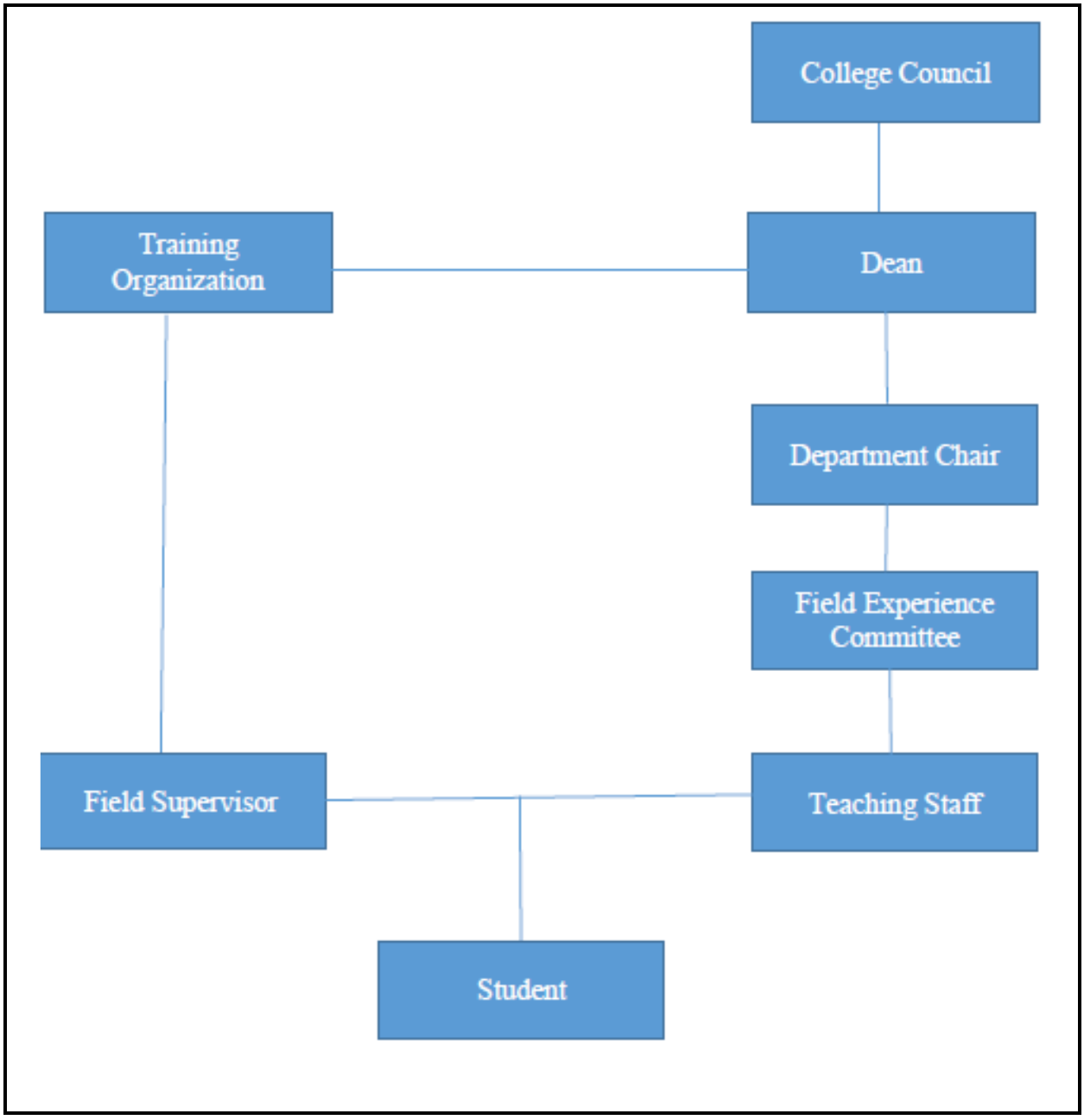
corresponding teaching staff of any concerns or problems. In addition, s/he has the following key skills and qualifications:

- **Scientific academic path.**
- **Leadership and team management skills.**
- **Attention to detail and problem-solving skills.**
- **Written and verbal communication skills**
- **Advanced expertise in a specific training organization activities**
- **Deep knowledge of training organization policies.**

3. Responsibilities

a. Field Experience Flowchart for Responsibility

including units, departments, and committees responsible for field experience, as evidenced by the relations between them.



b. Distribution of Responsibilities for Field Experience Activities

Activity	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, ...)		☑			☑
Follow up on student training activities		☑			☑
Adjusting attendance and leave		☑			☑
Assessment of learning outcomes		☑			☑
Evaluating the quality of field experience	☑	☑	☑	☑	☑
Others (specify)					

4. Field Experience Implementation

a. Supervision and Follow-up Mechanism

The mechanism used for supervision and follow-up student is essentially based on:

- Follow-up forms
- Interview follow-up
- Student portfolio
- Daily attendance record.
- Evaluation rubric

b. Student Support and Guidance Activities

- ✓ Session of orientation, necessary documentations (forms and rubrics, and guide manual).
- ✓ The workplace is expected to provide documents for student training (including internal policy manuals, electronic sources).
- ✓ The workspace is expected to provide also appropriate desk gadgets including printer/internet access with appropriate electronic devices and software.

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. Potential sources of harm and hazards should be identified. This issue should be discussed with Training Organization before starting the training	Basic safety rules and tips that need to be followed at the worksite. Safety guidelines must be established and maintained: safety procedures for laboratory investigations and field trips should be implemented.	• Respecting the last updated version of the booklet "Implementation of Risk Management and Safety Culture" published by The Ministry of Labor and Social development. • providing an understanding of how to deal with different types of work-training in order to help reduce exposure risks. • Offering short risk management training at the beginning of training.

G. 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. Student performance	Teaching staff	Indirect
Evaluation of the field Experience (workspace, Quality of learning resources, supervisory, achievements, skills, behavior, time)	Student	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	**Quality Unit Mathematics and Statistics Department**
Reference No.	**Department council No. 11**
Date	**22/11/1444**