هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA

2024
TP-153

Course Specification
— (Bachelor)

Course Title: **Foundations of Mathematics**

Course Code: **MAT 1152**

Program: **Bachelor of Science in Actuarial and Financial Mathematics**

Department: **Mathematics and Statistics**

College: **Science**

Institution: **Imam Mohammad Ibn Saud Islamic University**

Version: **2023 – V1**

Last Revision Date: **None**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:
3 (2 Lectures, 0 Lab, 2 Tutorial)

2. Course type

A.	☐University	☐College	☒ Program	☐Track	☐Others
B.	☒ Required			☐Elective	

3. Level/year at which this course is offered: Level 1 / Year 1

4. Course general Description:

This course describes the most important ideas, theoretical results, and examples of logic, set theory, methods of proof, relations, functions and basics of algebraic structures limit. The course includes the essential fundamentals of these topics. The emphasis is on step-by-step reasoning and mathematical thinking.

5. Pre-requirements for this course (if any):

None.

6. Co-requisites for this course (if any):

None.

7. Course Main Objective(s):

- To give students the rudiments of mathematical logic and set theory.
- To introduce the important concepts of relations, functions, and binary operations.
- To expose students to some abstraction by presenting the group concept and studying some of its elementary properties.
- To learn about vector calculus.

2. Teaching mode (mark all that apply)

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

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	0
3.	Field	0

4.	**Tutorial**	30
5.	**Others (specify)**	0
Total		**60**

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

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Recall proofs of basic set-theoretic identities involving unions, intersections, and Cartesian products.**	**K1**	2 lecture hours\week	**Direct: Regular Exams**
1.2	**Identify the concept of Logic including truth table logical statement, set theory, method of proofs and basics of algebraic structures.**	**K3**	• 2 tutorial hours\week • Self-study	**Direct: Short Quizzes**
2.0	**Skills**			
2.1	**Construct proofs using a variety of proof techniques including direct proofs, proofs by contraposition and contradiction, proofs by mathematical induction to solve a given problem.**	**S3**	• Self-study • Real-life problems	**Direct:** • **Participations** • **Short Quizzes**
2.2	**Implement the negation, converse, and contrapositive of a quantified implication, both linguistically and in Mathematical symbolic form.**	**S3**	Self-study	**Direct: Participations**

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

C. Course Content

No	List of Topics	Contact Hours
1.	**Logic:** Statements, Negation, and Compound Statements, Truth Tables and Logical Equivalences, Conditional and Biconditional Statements, Open Statements and Quantifiers.	**12**
2.	**Set Theory:** Sets and Subsets, Operations on Sets, Generalized Set Union and Intersection, Cartesian Product.	**8**
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.	**10**
4.	**Relations:** Binary Relations, Reflexive, Symmetric, antisymmetric, and Transitive Relations, Equivalence Relations, Equivalence Classes, and Partitions, The Order Relations.	**10**
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**
6.	**Basics of Algebraic Structures:** Binary operations; Semigroups and Groups; Subgroups and Cyclic Groups; Rings, Integral Domains and Fields.	**12**
	Total	**60**

D. Students Assessment Activities

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

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

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	1. *Introduction to Mathematical Proofs: A Transition*, C. Roberts; Champan & Hall/CRC 2010. **(Main Reference)** 2. *A Primer for Logic and Proof*, H. P. Hirst and J. L. Hirst, webdraft, (2011-2012 Ed.), 2012.
Supportive References	1. *Mathematical Thinking & Writing: A transition to Abstract Math*, R. Maddox, Academic Press, 2002. 2. Mathematical Proofs: *A Transition to Advanced Mathematics*, 3rd Edition, Gary Chartrand, Albert D. Polimeni, Ping Zhang, Pearson, 2014.
Electronic Materials	None
Other Learning Materials	None

2. Required Facilities and equipment

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

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**Students**	**During the semester and at the end of the course each student will complete two evaluation forms.**
Effectiveness of Students assessment	**Instructor**	**At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.**
Quality of learning resources	**Students**	**During the semester and at the end of the course each student will complete two evaluation forms.**
The extent to which CLOs have been achieved	**Instructor**	**At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.**
Other	**None**	

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**MATHEMATICS AND STATISTICS DEPARTMENT COUNCIL**
REFERENCE NO.	**8/1446**
DATE	**05/04/1446 (08/10/2024)**