



Course Specification

— (Postgraduate)

Course Title: Measure Theory I
Course Code: MATH642
Program: Master Program in Mathematics
Department: Mathematics
College: Science
Institution: University of Tabuk, KSA
Version: 2
Last Revision Date: 1/12/1443 H

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A. General information about the course:

Course Identification	
1. Credit hours:	3 H
2. Course type	
a.	University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Track <input type="checkbox"/> Others <input type="checkbox"/>
b.	Required <input type="checkbox"/> Elective <input checked="" type="checkbox"/>
3. Level/year at which this course is offered: Level-2 or higher	
4. Course general description Sigma-Algebras, Monotone Classes, Measure Basic Concepts, Outer Measure, Extension Theorems, Completion and Approximation Theorems, Lebesgue and Lebesgue-Stieltjes Measures, Distributions and Probability Measure, Measurable Functions, Integration with respect to a measure, Basic Theorems, Convergence of Measurable Functions.	
5. Pre-requirements for this course (if any): None	
6. Co-requirements for this course (if any): None	
7. Course Main Objective(s) Upon completion of the course students will be able to:	
a. Understand and apply basic concepts of measure and integration theory.	
b. Use abstract methods to solve problems.	
c. Use a wide range of references and critical thinking.	
c. Interpret, generalize and manipulate analysis concepts in the abstract framework of measure theory.	

1. Teaching mode (Mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	45	100 %
2.	E-learning		
3.	Hybrid <ul style="list-style-type: none"> • Traditional classroom • E-learning 		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	3 H /week
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	
5.	Others (specify)	
Total		45

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: The students will be able to:			
1.1	Recall the main concepts and theorems of measures and outer measures.	K1	Lectures, Group works, Presentations, Classroom discussion, Seminar, Case study, problem solving session	Exams, Quizzes, Research project, presentation, interactive discussion and participation, Survey
1.2	Prove in-depth knowledge of measurable functions and related theorems.	K2		
1.3	Enhance finite cases from infinite in measure theory.	K3		
2.0	Skills: The students will be able to:			
2.1	Solve and analyze problems using techniques and methods from measure theory.	S1	Lectures, Group works, Presentations, Classroom discussion, Seminar, Case study, problem solving session	Exams, Quizzes, Research project, presentation, interactive discussion and participation, Survey
2.2	Prove theorems and interpret results using measure theory.	S2		
2.3	Clearly and apply measure theory to solve concrete problems.	S3		
2.4				
3.0	Values, autonomy, and responsibility: The students will be able to:			
3.1	Work in teams/groups with great consideration of ethics.	V1	Lectures, Group works, Presentations, Classroom discussion, Seminar, Case study, problem solving session	Research project, presentation, interactive discussion and participation, Survey
3.2	Manage duties and time adequately.	V2		
...				

C. Course Content

No	List of Topics	Contact Hours
1	Measures: algebras, σ -algebras, positive measures,	3





2	Outer measures, Caratheodory's theorem.	3
3	Measures: extension of measures from algebras to σ -algebras,	3
4	Lebesgue, and Lebesgue-Stieltjes Measures	3
5	Measurable functions: approximation by step functions, modes of convergence of sequences of functions, Egoroff's theorem.	3
6	Definition and example of Measurable functions	3
7	Measurable functions: Distributions and Probability Measure	3
7	Mid-Exam #	-
8	Integration: integration of nonnegative functions.	3
9	Integration: Lebesgue monotone convergence theorem.	3
10	Integration: Fatou's lemma,	3
11	Lebesgue dominated convergence theorem, comparison with Riemann's integral	3
12	Product measures: construction of product measures, monotone classes.	3
13	Product measures: Tonelli's and Fubini's theorem,	3
14	The Lebesgue integral on R_n	3
15	Product measures: convergence types of measurable functions	3
16+17	Review & Final Exam	
Total		45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Home works and Assignments	Weekly basis	20%
2.	Mid-term exam	6th week	25%
3.	Presentation and discussion	During the semester	15%
4.	Final exam	At the end of the semester	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	Ammar Khanfer , Measure Theory and Integration, Springer Nature Singapore (2022).
Supportive References	Measure Theory, By Vladimir I. Bogachev, Springer 2007.
Electronic Materials	Saudi electronic library.
Other Learning Materials	None

2. Required facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Lecture room with capacity of 15 students at most and equipped with White Board, Library



Items	Resources
Technology equipment (projector, smart board, software)	Overhead projector and internet connection.
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Direct and Indirect
Effectiveness of students' assessment	Teacher	Direct
Quality of learning resources	Students	Indirect
The extent to which CLOs have been achieved	Teacher, Quality Committee	Direct and Indirect
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval Data

Council / Committee	Approval by the Department Council
Reference No.	DEPARTMENT COUNCIL NO (26)
Date	11/9/1444 H

