هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

Course Specifications

Course Title:	**Mathematical Methods**
Course Code:	**Math 433**
Program:	**B. Sc. in Mathematics**
Department:	**Mathematics**
College:	**Science**
Institution:	**Jazan University**

Table of Contents

A. Course Identification

1. Credit hours:	**03**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 7/Year 4**
4. Pre-requisites for this course (if any)**:**	**Math-313**
5. Co-requisites for this course (if any)**:**	**None**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	45	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	42
2	**Laboratory/Studio**	
3	**Tutorial**	3
4	**Others** (specify)	
	Total	45

B. Course Objectives and Learning Outcomes

1. Course Description

This course is designed to provide students with

- Fourier series and Fourier Integration.
- Laplace Transformation and its Applications.
- Special Functions (Gamma, Beta, Bessel, Legendre, Laguerre and Hermite functions).

2. Course Main Objective

After finishing the course, the student is expected to be familiar with the following:

- Importance of mathematical methods in different branches of science and engineering.
- To study Fourier series and integral transforms (Fourier and Laplace).
- Importance of mathematical methods in basic physical applications.
- Derivation of special functions (Gamma, Beta, Bessel, Legendre, Laguerre and Hermite) from different physical equations.
- Necessary skills to solve mathematical problems.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding:**	
1.1	Distinguish mathematical concepts relevant to Gamma and Beta functions, Fourier series, Fourier integration, Laplace transform Bessel Legendre.	K1
1.2	Identify background science, features and structure of mathematical problem in Gamma and Beta functions, Fourier series, Fourier integration, Laplace transform Bessel-Legendre-Laguerre and Hermit Functions and their applications.	K2
1.3	Explain notations and concepts required for the solution of Mathematical problem in Gamma and Beta functions, Fourier series, Fourier integration, Laplace transform Bessel-Legendre Laguerre and Hermit Functions and their applications.	K3
2	**Skills:**	
2.1	Apply theoretical, computational or practical aspect relevant to Gamma and Beta functions, Fourier series, Fourier integration, Laplace transform Bessel-Legendre-Laguerre and Hermit Functions and their applications.	S1
2.2	Compute numerical quantities for various parameters to approximate the solution in Gamma and Beta functions, Fourier series, Fourier integration, Laplace transform Bessel-Legendre-Laguerre and Hermit Functions and their applications.	S2
2.3	Apply various mathematical rules, techniques and theorems in Gamma and Beta functions, Fourier series, Fourier integration, Laplace transform Bessel Legendre-Laguerre and Hermit Functions and their applications.	S3
2.4	Solve mathematical problem using critical thinking in Gamma and Beta functions, Fourier series, Fourier integration, Laplace transform Bessel-Legendre-Laguerre and Hermit Functions and their applications.	S4
3	**Values:**	
3.1	Cultivate a mathematical attitude and nurture the interest.	V1
3.2	Realize the importance of responsibilities through different modes of practice, competition and related activities.	V2
3.3	Inculcating values and ethics in thought, expression and deed.	V3

C. Course Content

No	List of Topics	Contact Hours
1	Gamma and Beta functions.	9
2	Fourier series.	9
3	Fourier integration.	9
4	Laplace transforms.	9
5	Bessel-Legendre-Laguerre and Hermit Functions.	9
Total		45

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding:**		
1.1	Distinguish mathematical concepts relevant to Gamma and Beta functions, Fourier series, Fourier integration, Laplace transform Bessel Legendre.	Lectures, Web based work, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
1.2	Analysis structures and features of Mathematics problems in Gamma and Beta functions, Fourier series, Fourier integration, Laplace transform Bessel-Legendre-Laguerre and Hermit Functions and their applications.	Lectures, Web based work, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
1.3	Outline required notations and concepts in Gamma and Beta functions, Fourier series, Fourier integration, Laplace transform Bessel-Legendre Laguerre and Hermit Functions and their applications.	Lectures, Web based work, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
2.0	**Skills:**		
2.1	Apply aspects relevant to Gamma and Beta functions, Fourier series, Fourier integration, Laplace transform Bessel-Legendre-Laguerre and Hermit Functions and their applications.	Lectures, Web based work, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
2.2	Apply how to compute rates/quantities and Approximate Solutions in Gamma and Beta functions, Fourier series, Fourier integration, Laplace transform Bessel-Legendre-Laguerre and Hermit Functions and their applications.	Lectures, Web based work, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
2.3	Apply various math rules, techniques and theorems in Gamma and Beta functions, Fourier series, Fourier integration, Laplace transform Bessel Legendre-Laguerre and Hermit Functions and their applications.	Lectures, Web based work, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
2.4	Apply mathematical problems using critical thinking and problem solving in Gamma and Beta functions, Fourier series, Fourier integration, Laplace transform Bessel-Legendre-Laguerre and Hermit Functions and their applications.	Lectures, Web based work, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
3.0	**Values:**		
3.1	Cultivate a mathematical attitude and nurture the interest.	Group work, problem solving, web based work	Assignments, Group work.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
3.2	Realize the importance of responsibilities through different modes of practice, competition and related activities.	Group work, problem solving, web based work	Group work, Assignments
3.3	Inculcating values and ethics in thought, expression and deed.	Group work, problem solving, web based work	Group work.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Homework	3	5%
2	First exam.	6	20%
3	Second exam.	12	20%
4	Homework	14	5%
5	Final exam.	16	50%

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

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Each group of students assigned to a teaching staff that will be available for help and academic guidance office hours at specific hours on daily basis. At least be available 8 hours per week.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	- W.W. Bell, *Special Functions for Scientists and Engineers*, D. Van Nostrand Company, London. - Schaum's Outline of Theory and Problems of Fourier Analysis with Applications to Boundary Value Problems, Murray R. Spiegel, McGRAW Hill Book Company.
Essential References Materials	- Spiegel, Murray R. Advanced Mathematics for Engineers and Scientists, McGraw Hill Book Company.
Electronic Materials	Websites and software dedicated to Mathematical Methods.
Other Learning Materials	- Power point presentations and other hand outs posted on the course website or on Blackboard.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms, Computer Lab.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show; Smart Board..
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching	Students, Peer and program leader	Indirect (Course Evaluation Survey)- Indirect peer evaluation
Assessment	Students, Program assessment committee	Direct/ Indirect
Extent of achievement of course learning outcomes	Instructor	Direct/Indirect
Quality of learning resources	Students, Faculty members	Indirect

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	**Board Of Mathematics Department**
Reference No.	**12th Meeting Of The Board Of Mathematics Department 1441-1442**
Date	**14/6/1442 A. H.; 27/1/2021 A. D.**