Course Specification
(Bachelor)

Course Title:	**Mathematical Methods**
Course Code:	**433MATH-3**
Program:	**BSc in Mathematics**
Department:	**Mathematics**
College:	**Science**
Institution:	**Jazan University**
Version:	**2024**
Last Revision Date:	**9/2024**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:	03

2. Course type

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

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

Level 7 / Year 4

4. Course general 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).

5. Pre-requirements for this course (if any): Math 313

6. Co- requirements for this course (if any): None

7. Course Main Objective(s)

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.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	45	100%
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours

1.	Lectures	42
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	3
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			
1.1	Distinguish mathematical concepts relevant to Gamma and Beta functions, Fourier series, Fourier integration, Laplace transform Bessel Legendre.	K1	Lectures, Web based work, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
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	Lectures, Web based work, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
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	Lectures, Web based work, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
2.0	Skills			
2.1	Apply theoretical, computational or practical aspect relevant to Gamma	S1	Lectures, Web based work,	Written exam (Problem solve, MCQ, true/false,

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	and Beta functions, Fourier series, Fourier integration, Laplace transform Bessel-Legendre-Laguerre and Hermit Functions and their applications.		Classroom discussions.	Proof, Short answer), Quizzes, Assignments
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	Lectures, Web based work, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
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	Lectures, Web based work, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
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	Lectures, Web based work, Classroom discussions.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
3.0	Values, autonomy, and responsibility			
3.1	Realize the importance of responsibilities through different modes of practice, competition and related activities.	V2	Group work, problem solving, web based work	Group work, Assignments

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
3.2	Inculcating values and ethics in thought, expression and deed.	V3	Group work, problem solving, web based work	Group work.

C. Course Content

No	List of Topics	Contact Hours
1.	Gamma and Beta functions.	11
2.	Fourier series.	9
3.	Fourier integration.	9
4.	Laplace transforms.	9
5.	Bessel-Legendre-Laguerre and Hermit Functions.	7
Total		45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework and Quiz	3	5
2.	First exam	6	20
3.	Homework and Quiz	10	5
4.	Second exam	12	20
5.	Final exam	15	50

*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	- 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.
Supportive References	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. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms, Computer Lab.
Technology equipment (projector, smart board, software)	Data show; Smart Board..
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students, Peer and program leader	Indirect (Course Evaluation Survey)- Indirect peer evaluation
Effectiveness of students assessment	Students, Program assessment committee	Direct/ Indirect
Quality of learning resources	Instructor	Direct/Indirect
The extent to which CLOs have been achieved	Students, Faculty members	Indirect
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	**Board Of Mathematics Department**
REFERENCE NO.	**2417**
DATE	**29/03/1446 A. H.; 2/10/2024 A. D.**