Course Specification

(Postgraduate Programs)

Course Title:	**Mathematical Physics**
Course Code:	**PHYS600**
Program:	**Master of Science in Physics**
Department:	**Physical Sciences**
College:	**Science**
Institution:	**Jazan University**
Version:	*Course Specification Version Number*
Last Revision Date:	**20/4/2024**

Table of Contents

A. General information about the course: 3

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods: 4

C. Course Content: 7

D. Students Assessment Activities: 7

E. Learning Resources and Facilities: 7

F. Assessment of Course Quality: 8

G. Specification Approval Data: 8

A. General information about the course:

1. Course Identification:

1. Credit hours: (3)				
2. Course type				
A.	☐University	☐College	☒ Department	☐Track
B.	☒ Required		☐Elective	
3. Level/year at which this course is offered: (Level 1/ Year 1)				
4. Course general Description:				
This course is designed to provide a mathematical foundation for theoretically oriented research areas. It covers basic mathematical tools such as the eigenvalue problem, tensor analysis, transformations and solutions of partial differential equations.				
5. Pre-requirements for this course (if any): Non				
6. Co-requirements for this course (if any): Non				
7. Course Main Objective(s):				
The main objectives of this course are focused on the following: • **Perform calculations in vector calculus in different coordinates.** • **Solve eigenvalue problem.** • **Apply matrix theory and tensor analysis to solve problems with many variables.** • **Solve first-order and second-order partial differential equations using various techniques.** • **Apply special functions to carry out various integrations.** • **Perform calculations of complex valued functions and variables including integration.**				

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**	45
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: **Upon completing the course students will be able to**			
1.1	**Describe** basics ideas such as vector analysis in different coordinates, Matrix theory and tensor analysis, Eigenvalue problems and orthonormal functions, complex variables and functions, Laplace and Fourier transforms, Special functions, solution of partial differential and integral equations.	**PLO1.1**	Lectures, discussion	**Direct** (formative and summative): In class interactive questioning, quizzes, written exams **Indirect:** student survey

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.2	**Discuss** some essential processes such as vector analysis in different coordinates, Matrix theory and tensor analysis, Eigenvalue problems and orthonormal functions, complex variables and functions, Laplace and Fourier transforms, Special functions, solution of partial differential and integral equations.	**PLO1.2**	Lectures, discussion	**Direct** (formative and summative): In class interactive questioning, quizzes, written exams **Indirect:** student survey
…				
2.0	Skills: **Upon completing the course students will be able to**			
2.1	**Use** basic laws or equations such as the gradient of a dot product, curvy linear coordinates, orthogonal coordinates in R^3, solution of partial differential and integral equations, Cauchy's conditions, Cauchy's integral formula, residue, Fourier series and transforms, Laplace transform and some special functions.	**PLO2.1**	Lectures, discussion	**Direct** (formative and summative): In class interactive questioning, quizzes, written exams **Indirect:** student survey
2.2	**Apply** the required tools and various relevant equations needed to solve a physical problem and the conditions for the	**PLO2.1**	Lectures, discussion	**Direct** (formative and summative): In class interactive questioning,

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	validity of such equations.			quizzes, written exams **Indirect:** student survey
2.3	**Solve** some basic problems of interest such as problems related to vector analysis in different coordinates, Matrix theory, and tensor analysis, Eigenvalue problems and orthonormal functions, complex variables and functions, Laplace and Fourier transforms, Special functions, solution of partial differential and integral equations.	**PLO2.1**	Lectures, discussion	**Direct** (formative and summative): In class interactive questioning, quizzes, written exams **Indirect:** student survey
2.4	Communicate in a clear and concise manner when analyzing practical relevant problems and using IT for acquiring exact solutions and information.	**PLO2.3**	Lectures, discussion	**Direct** (formative and summative): In class interactive questioning, quizzes, written exams **Indirect:** student survey
3.0	Values, autonomy, and responsibility: **Upon completing the course students will be able to**			
3.1	**Take** responsibility for managing the professional development of individuals and groups.	**PLO3.3**	Expository and Discovery, and Interactive Discussions.	Group assignments, discussion
3.2				

C. Course Content:

No	List of Topics	Contact Hours
1	Vector analysis in different coordinates	5
2	Matrix theory + Tensor analysis + Eigen value problems and orthonormal functions	8
3	Complex variables and functions	8
4	Laplace and Fourier transforms	8
5	Special functions	8
6	Solution of partial differential + Integral equations.	**8**
Total		**45**

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1	**Mid-term exams and quizzes**	**6, 12**	**30**
2	**Activities (home-works, tests, class activities)**	**Over the semester**	**20**
3	**Final Exam**	**16**	**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	G. Arfken and H. J. Weber, Mathematical Methods for Physicists (Elsevier academic press, 2005).
Supportive References	Matthews and Walker, Mathematical Methods of Physics (W. A. Benjamin, Inc, 1970). P. Dennerey and A. Kryzwicki, Mathematics for Physicists (Dover,1996). George L. Trigg, Mathematical Tools for Physicists, (John Wiley&Sons, 2006).
Electronic Materials	
Other Learning Materials	

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Class room
Technology equipment (Projector, smart board, software)	Data show- 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, Peer and program leader	Indirect (CES)- Indirect peer evaluation
Effectiveness of student's assessment	Students, Program assessment committee	Direct/ Indirect
Quality of learning resources	Students, Faculty members	Indirect
The extent to which CLOs have been achieved	Instructor	Direct/Indirect
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	**Department Council**
REFERENCE NO.	**Psci2415**
DATE	**1/10/2024**