هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**Mathematical Physics**
Course Code:	**252 Phys**
Program:	**Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Jazan University**
Version:	**2022**
Last Revision Date:	30 January 2023

Table of Contents:

A. General information about the course:

Course Identification					
1. Credit hours:	3				
2. Course type					
a.	University ☐	College ☐	Department☒	Track☐	Others☐
b.	Required ☒	Elective☐			
3. Level/year at which this course is offered: Level 6/Year2					
4. Course General Description The objective of this course is to provide the students with the necessary mathematical tools for formulating physics problems. Acquiring these tools is a must for any physics student.					
5. Pre-requirements for this course (if any): 201 MATH					
6. Co- requirements for this course (if any): NIL					
7. Course Main Objective(s) This course is designed to: ● Provide students with the fundamental mathematical tools to understand other physics courses. ● Develop their skills in problem solving and formulating physical problems. Apply the knowledge they acquire in this course to other physics related situations and identify their solutions.					

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	30	91%
2.	E-learning		
3.	Hybrid ● Traditional classroom ● E-learning		
4.	Distance learning		
5.	Blended	3	9%

2. Contact Hours (based on the academic semester)

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

5.	Others (specify)	
	Total	33

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	**Define** the complex numbers, Euler formula, matrix operation, determinant, Fourier series and integrals, Gamma, and beta functions.	**PLO1.1**	Lectures, blackboard and visualization, group and interactive guided discussion, Interactive discussion	**Direct** (formative and summative): In class interactive questioning, quizzes, written exams **Indirect**:student survey
1.2	**Describe** the required tools and various relevant equations needed to solve a physical problem and the conditions for the validity of such equations.	**PLO1.1**	Lectures, blackboard and diagram illustration, group discussion, Interactive illustrations-Student contribution	**Direct** (formative and summative): In class interactive questioning, quizzes, written exams **Indirect:** student survey
1.3	**Discuss** various concepts in complex numbers, linear algebra, Fourier analysis and gamma and beta functions.	**PLO1.2**	Lectures, blackboard and diagram illustration, group discussion, Interactive illustrations-Student contribution	**Direct** (formative and summative): In class interactive questioning, quizzes, written exams **Indirect:** student survey
2.0	Skills			
2.1	**Derive** the Euler formula, Cramer's rule, Fourier coefficients, and Gamma functions for simple cases.	**PLO2.1**	Lectures, blackboard, and visualization, brainstorming, group and interactive discussion, Interactive	**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
			illustration – Problem based learning	
2.2	**Solve** problems related to complex numbers, linear algebraic equations, Fourier Series, and some special functions.	**PLO2.2**	Lectures, blackboard, and visualization, brainstorming, group and interactive discussion, Interactive illustration – Problem based learning	**Direct** (formative and summative): In class interactive questioning, quizzes, written exams **Indirect**:student survey
2.3	**Develop** communication and critical thinking competencies during interactive discussions, group assignments, essays or web-based activities.	**PLO2.3**	Lectures, blackboard, and visualization, brainstorming, group and interactive discussion, Interactive illustration – Problem based learning	**Direct** (formative and summative): In class interactive questioning, quizzes, written exams **Indirect**: student survey
3.0	Values, autonomy, and responsibility			
3.1	**Develop** abilities of teamwork, bear individual responsibilities on assigned tasks	**PLO3.1**	Interactive and Group discussion, expository and discovery teaching	**Direct** (formative and summative): In class interactive questioning, quizzes, written exams **Indirect**: student survey

C. Course Content

No	List of Topics	Contact Hours
1.	**Complex numbers**: Complex plane, Complex algebra, Complex conjugate and absolute value of complex numbers, Complex equations, Graphs and physical applications of complex numbers, Elementary functions of complex numbers, and Exponential and trigonometric functions.	9
2.	**Linear Algebra**: The fundamental operation of matrices, Relation between matrices and linear equations, Cramer's rule, Vectors, lines and planes, Linear combination, linear functions and linear operators, Eigenvalue and eigenvector of transformations.	9
3	**Fourier series and Fourier integrals**: Periodic and non-periodic functions, Average value of a function, Fourier series, Complex form of Fourier series, Even and odd functions, Fourier transforms and Laplace transforms.	9
4	**Special functions**: The factorial function, The Gamma function and recursion relation. The Beta function and relation between the Gamma and Beta functions.	6
Total		33

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Assignment 1**	**3**	**2.5** (2.5%)
2.	**Assignment 2**	**4**	**2.5** (2.5%)
3.	**Quiz I**	**5**	**5** (5%)
4	**Mid-term exam**	**6**	**20** (20%)
5	**Others (Group work, Essay, Attendance, class discussion participations)**		**10** (10%)
6	**Assignment 3**	**8**	**2.5 (**2.5%**)**
7	**Quiz II**	**10**	**5** (5%)
8	**Assignment 4**	**11**	**2.5** (2.5%)
9	**Final Exam**	**13**	**50** (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, H Weber and F Harris Mathematical Methods for Physicists, Academic Press (2013). C Wong Introduction to Mathematical Physics, Oxford University Press (1991)
Supportive References	Mary L. Boas Mathematical Methods in the Physical Sciences; 3rd edition, John Wiley& Sons, USA, (2006).
Electronic Materials	http://mathworld.wolfram.com/Sine.html
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	COMPUTER ROOM
Technology equipment (Projector, smart board, software)	SOFTWARES, MATHEMATICA, MATLAB
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	Program assessment committee, students	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	DEPARTMENT BOARD
REFERENCE NO.	PHYS2304
DATE	28/2/2023