



Course Specification

(Bachelor)

Course Title: **Mathematical Physics 2**

Course Code: **PHYS 0273**

Program: **BSc in Physics and BSc in Physics of Renewable Energy and Environment**

Department: **Department of Physics**

College: **College of Science**

Institution: **Majmaah University**

Version: **I**

Last Revision Date: *Pick Revision Date.*



Table of Contents

A. General information about the course:	3
B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods	4
C. Course Content	5
D. Students Assessment Activities	6
E. Learning Resources and Facilities	6
F. Assessment of Course Quality	7
G. Specification Approval	7



A. General information about the course:

1. Course Identification

1. Credit hours: 3 (3,0,0)

2. Course type

A. University College Department Track Others
B. Required Elective

3. Level/year at which this course is offered: (4th Level / Year 2)

4. Course General Description:

- Provide a course on elementary mathematical techniques that are used in physical sciences courses. Prepare students for more advanced mathematical courses in physics. Develop mathematical skills and methods appropriate for students in the physical sciences.
 1. Complex numbers
 2. Functions of a complex variable
 3. Complex integration

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

PHYS 0171 Mathematical Physics 1

6. Co-requisites for this course (if any):

None

7. Course Main Objective(s):

Studying the complex numbers, functions of complex variables as well as on the application of complex integration methods.

2. 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 		



No	Mode of Instruction	Contact Hours	Percentage
	• 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 PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Knowledge of Complex numbers, analytic function, limits and continuity, analyticity, the Cauchy, and Riemann Equation.	K1	<ul style="list-style-type: none"> Lectures Group Discussion 	<ul style="list-style-type: none"> Mid Exams Final Exam H.W Quizzes
1.2	Knowledge of elementary Function, complex integration, contours, and independence of path.	K1	<ul style="list-style-type: none"> Lectures Group Discussion 	<ul style="list-style-type: none"> Mid Exams Final Exam H.W Quizzes
1.3	Knowledge of Cauchy integral theorem, Bounds for analytic functions Series representations for analytic functions, and Residue theory.	K1	<ul style="list-style-type: none"> Lectures Group Discussion 	<ul style="list-style-type: none"> Mid Exams Final Exam H.W Quizzes



Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.0	Skills			
2.1	Skill of calculating the main operations regarding the complex numbers.	S2	<ul style="list-style-type: none"> • Problem solving • Class discussion 	<ul style="list-style-type: none"> • Mid Exams • Final Exam • H.W • Quizzes
2.2	Skill of analysis and calculation the complex integration.	S2	<ul style="list-style-type: none"> • Problem solving • Class discussion 	<ul style="list-style-type: none"> • Mid Exams • Final Exam • H.W • Quizzes
2.3	Skill of Solving various mathematical problems.	S2	<ul style="list-style-type: none"> • Problem solving • Class discussion 	<ul style="list-style-type: none"> • Mid Exams • Final Exam • H.W • Quizzes
2.4	Skill of working effectively in groups as well as individuals.	S4	<ul style="list-style-type: none"> • Problem solving • Class discussion 	<ul style="list-style-type: none"> • Mid Exams • Final Exam • H.W • Quizzes
3.0	Values, autonomy, and responsibility			
3.1	Ability to orally communicate with teachers, ask questions, and solve problems.	V3	<ul style="list-style-type: none"> • Discussion with students • Making students aware about time management in completing their assignments. • Encourage students to help each other. • Group presentation. • Group assignments 	<ul style="list-style-type: none"> • H.W • Quizzes • Participations • Presentation

C. Course Content

No	List of Topics	Contact Hours
1.	Complex Numbers- Functions of Complex Variables- Imaginary Unit -Properties of Complex Numbers.	9
2.	Complex Functions.	3





3.	The Concept of Analytic Function. The Cauchy-Riemann Conditions -Analytic Functions -Cauchy-Riemann Conditions.	9
4.	The Cauchy Theorem.	3
5.	Cauchy Integral -Introductory Example Cauchy Integral Complex Series - Numerical Series.	9
6.	Functional Series, Power Series, Taylor and Lauren Series.	6
7.	Special functions- Gamma function - Beta function.	6
Total		45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Mid Exam1	7-8	15
2.	Mid Exam2	12-13	15
3.	Homework	Every 2weeks	10
4.	Quizes	3/Semester	10
5.	Presentation	8	10
6.	Final Exam	End of the semester	40
Total			100

*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	Murray R. Spiegel, Seymour Lipschutz, John J. Schiller, Dennis Spellman, Complex Variables with an introduction to CONFORMAL MAPPING and its applications. Second Edition, Mc Graw Hill publishers. 2009, ISBN: 978-0-07-161570-9
Supportive References	<ul style="list-style-type: none"> Boas, Mary L. Mathematical Methods in the Physical. John Wiley & Sons., Inc, 2006. Introduction to Mathematical Physics: Methods and Concepts, C. Wong, 1991, Oxford University Press Inc (November 30, 1991)
Electronic Materials	<ul style="list-style-type: none"> Saudi Digital Library (SDL) https://www.wikipedia.org/ Web of Knowledge Physics Today (web version) MIT Courseware www.eagle.co.uk/news/ppnews.html http://faculty.mu.edu.sa/mskhan





	<ul style="list-style-type: none"> • http://vlib.org/physics.html • http://dir.yahoo.com/science/physics • http://demonstrations.wolfram.com • http://askthephysicist.com • http://cyberphysics.co.uk
Other Learning Materials	<ul style="list-style-type: none"> • Mathematica • Excel software for drawing graphs. • MS Office for writing reports and presentations

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Lecture room with at least 25 seats. Auditorium of a capacity of not less than 100 seats for large lecture format classes.
Technology equipment (projector, smart board, software)	A smart board to write on and computer.
Other equipment (depending on the nature of the specialty)	Library, Seminar Room, and Wi-Fi internet connections, White board.

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Department	Survey
Effectiveness of Students assessment	Department	Course report
Quality of learning resources	Department	Survey
The extent to which CLOs have been achieved	Department	Q-gate
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Department Council
REFERENCE NO.	16
DATE	30/12/2024



