



Course Specification

(Bachelor)

Course Title: Differential Equations in Physics

Course Code: Phys 0272

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

Department: Physics

College: Science

Institution: Majmaah University

Version: 2024

Last 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: (Level 4/ Year 2)

4. Course general Description:

This course is an introductory course for the fundamental principles of differential equations. The student will learn the main concepts of: Ordinary differential equations (O.D.E.), different methods of solving O.D.E., Partial differential equations (P.D.E.), different methods of solving P.D.E.

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

Phys 0171 Mathematical Physics 1

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

7. Course Main Objective(s):

By the end of this course, the student will be able to:

1. Develop a clear understanding of the basic concepts of differential equations.
2. Classifies the differential equations with respect to their order and linearity.
3. Explains the meaning of a differential equation.
4. Able to solve first-order ordinary differential equations.
5. Solves exact differential equations.
6. Able to find solutions to higher-order linear differential equations.

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 • E-learning 		
4	Distance learning		





3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	15
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	Classifies the differential equations with respect to their order and linearity	K1	<ul style="list-style-type: none"> Lectures Group Discussion Exercises 	<ul style="list-style-type: none"> Mid Exams Bb discussions & participations Final Exam Homework
1.2	Explains the meaning of solution of a differential equation	K2		
2.0	Skills			
2.1	Correlate and understand the problem-solving techniques.	S2	<ul style="list-style-type: none"> Problem solving Class discussion 	<ul style="list-style-type: none"> Final Exam Homework Quizzes
2.2	Interpret/operate solving of differential equations.	S2		
3.0	Values, autonomy, and responsibility			
3.1	Work effectively in groups as well as individuals.	V3	<ul style="list-style-type: none"> Discussion with students 	<ul style="list-style-type: none"> Presentat ion





Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
3.2	Present a short report in a written form and orally using appropriate scientific language.	V1	<ul style="list-style-type: none"> 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"> Discussion and Homework
...				

C. Course Content

No	List of Topics	Contact Hours
1.	Ordinary Differential Equations: First Order Equations: Separable Differential Equations - Homogeneous Equation - Exact Differential Equation	3
2.	Linear Differential Equations - physical application for First Order Equations	6
3.	Second Order Equations: Homogeneous Linear Equations of Second Order	6
	Midterm 1	1
5	Second Order Homogeneous Equations with Constant Coefficients - physical application for Second Order Equations.	9
6	Partial Differential equation: Formation of Partial Differential equation- Linear and Non-Linear first-order equation	4
	Midterm 2	1
7	Standard forms, Linear Equation of higher order- Partial Differential Equations with Constant Coefficients	9
8	Equation of second order with variable coefficients- Wave & Heat equations, Particular solution with boundary and initial conditions.	6
Total		45



D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Written test	7	15
2.	Written test	12	15
3.	Written test	16	40
4.	HW	1-14	10
5.	Quizzes	3,8,10,13	10
6.	Presentations/E-Exams	13	10
...			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	An Introduction to Differential Equations and Their Applications, by Stanley J. Farlow, 2006.
Supportive References	Schaum's Outline of Differential Equations, Fifth Edition 5th Edition, <i>by Richard Bronson and Gabriel B. Costa, 2010.</i>
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://vlib.org/physics.html • http://dir.yahoo.com/science/physics
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Lecture room with at least 25 seats.
Technology equipment (projector, smart board, software)	Auditorium of a capacity of not less than 100 seats for large lecture format classes.



Items	Resources
Other equipment (depending on the nature of the specialty)	A smart board to write on and computer.

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Program	Indirect
Effectiveness of Students assessment	Students	Direct
Quality of learning resources	Program	Direct
The extent to which CLOs have been achieved	Course coordinator	Direct
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	DEPARTMENT COUNCIL
REFERENCE NO.	16
DATE	30/12/2024

