جامعة الزيتونة الأردنية

Al-Zaytoonah University of Jordan

Course Syllabus

According to JORDAN National Qualification Framework (JNQF)

Course Name: Partial Differential Equations

Course Number: 0101374

General Course Information:

Course Title	Partial Differential Equations
Course Number	0101374
Credit Hours	3 credit hours
Education Type	Blended learning
Prerequisites/Co-requisites	Ordinary Differential Equations (1)
Academic Program	Mathematics
Program Code	
Faculty	Faculty of Science and Information Technology
Department	Mathematics
Level of Course	3
Academic Year /Semester	2023/2024 1st Semester
Awarded Qualification	BS'c
Other Department(s) Involved in Teaching the Course	-
Language of Instruction	English
Date of Production	2021-2022
Date of Revision	October 2023

Course Coordinator:

Coordinator's Name	N/A
Office No.	
Office Phone Extension Number	
Office Hours	
E-mail	

Other Instructors:

Instructor Name	
Office No.	
Office Phone Extension Number	
Office Hours	
Email	

Course Description *(English/Arabic)*:

English	This course aims to give student a simple glance on: Partial differential equations of the first-order, Nonlinear PDE's of the first–order, Linear PDE's with constant coefficients, Linear PDE's with variable coefficients, wave, heat, and Laplace equations.
Arabic	هذا المساق يهدف الى اعطاء الطالب لمحة بسيطة في: المعادلات التفاضلية الجزئية من الدرجة الأولى، المعادلات التفاضلية غير الخطية من الدرجة الأولى، المعادلات التفاضلية الخطية ذات المعاملات الثابتة، المعادلات التفاضلية الخطية ذات المعاملات المتغيرة، معادلات الموجة والحرارة ولابلاس.

Textbook: *Author(s), Title, Publisher, Edition, Year, Book website.*

Ian Sneddon, Elements of Partial Differential Equations, Dover Publications, inc. 2006.

References: *Author(s), Title, Publisher, Edition, Year, Book website.*

1. E.C. Zachmanoglou, and D.W. Thoe, Introduction to Partial Differential Equations with Applications, Dover Publications, 1976.
2. G. Simmons, Differential Equations with Applications and Historical Notes, 2nd Edition, 1991.
3. Prasad, Phoolan, Partial Differential Equations, ISBN: 8122430684, 2010.
4. M D Raisinghania, S. Chand, 2006S.I. Grossman, Ordinary & Partial Differential Equation, 1987.

Course Educational Objectives (CEOs):

CEO1	Demonstrate a comprehensive understanding of the fundamental concepts of partial differential equations, including classification, order, and basic solution techniques.
CEO2	Apply analytical methods to solve various types of partial differential equations, including separation of variables, Fourier series, Laplace transforms, and other appropriate techniques.
CEO3	Understand and apply numerical methods for solving partial differential equations, including finite difference, finite element, and spectral methods, to obtain approximate solutions.

Intended Learning Outcomes (ILO's):

Intended learning outcomes (ILOs)		Relationship to CEOs	Contribution to PLOs	Bloom Taxonomy Levels*	JNQF Descriptors**
K	Knowledge and Understanding				
ILO1-k	Classify types of Partial Differential Equations.	CEO 1	PLO2-k	Understanding	K
ILO2-k	Find the Integral surfaces passing through a given curve	CEO 1, CEO 2	PLO4-k	Applying	K
S	Intellectual skills				
ILO3-s	Solve linear, quasi linear and nonlinear first-order differential equations with and without initial conditions	CEO 2	PLO6-s	Applying	S
C	Subject specific skills				
ILO4-c	Cooperate and work effectively in collaborative work tasks that are carried out through groups.	CEO 3	PLO11-c	Evaluating	C
D	Transferable skills:				
ILO5-d					

*Bloom Taxonomy Levels:

Level #	1	2	3	4	5	6
Level Name	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating

** Descriptor (National Qualification Framework Descriptors): K: Knowledge, S: Skill, C: Competency.

Program Learning Outcome (PLOs):

	(PLOs)	JNQF Descriptors**		
		K	S	C
1.	Knowledge of the main concepts in pure mathematics.	√		
2.	Knowledge of the main concepts in applied mathematics.	√		
3.	Explain concepts, principles and theories in the fields of probability and statistics.	√		
4.	Possession of technological culture related to the fields of mathematics and its applications.	√		
5.	Making use of mathematical logic in practical life.	√		
6.	Engaging scientific methodology as a way of thinking and as a tool in facing problems.		√	
7.	Applying mathematical software packages in problem solving.		√	
8.	Being capable of data analysis.		√	
9.	Capability of teaching according to modern educational techniques.		√	
10.	Develop creative and innovative methods of teaching mathematics.			√
11.	Showing the ability to work under ethical and professional standards within teams.			√
12.	Gaining critical thinking and scientific research skills.			√

**** Descriptors according to the national qualifications framework (K: knowledge, S: skill, C: Competency)**

Weekly Schedule *(please choose the type of teaching)*

- ☐ Face to Face (F2F)
- ☒ **Hybrid** *(One – To - One)*
- ☐ Online

Schedule of Simultaneous and their Topics:

Week	First Lecture (F2F)	Activity	ILOs	PLOs	JNQF Descriptors*
1	Review of the first order ode's. Def. of (PDE's, order, solution).	Video about the definition of quasi linear, almost linear, and linear PDE's	ILO1-k	PLO1-k	K
2	Origin of first order PDE's	Homework about Cauchy's problem of first order equations	ILO1-k	PLO2-k	K
3	The general solution of the first order PDE's	Video about Lagrange's method for finding the solution of the first-order PDE's	ILO1-k ILO2-k	PLO4-k	K
4	Integral surfaces passing through a	Video about the surfaces orthogonal	ILO3-s	PLO7-s	S

	given curve	to a given system of surfaces			
5	One and two parameter systems	Quiz about the types of solutions of nonlinear PDE's of the first-order	ILO1-k	PLO3-k	K
6	Charpit's method for solving first order nonlinear PDE's of the form f(x,y,z,p,q)=0.	Homework about solving special types of first order nonlinear equations	ILO3-s	PLO6-s	S
7	Second order partial differential equations	Quiz + Revision	ILO4-c	PLO11-c	C
Midterm Exam (30%)					
9	Fundamental types of second order PDE's	Video about the basic theory of linear PDE's with constant coefficients	ILO3-s	PLO6-s	S
10	Complementary functions for f (Dx, Dy)=0 when the operator f(Dx, Dy) is reducible or irreducible	Video about the short methods for obtaining the particular integral of the eqn. of the form f (Dx,Dy)z=g(x,y)	ILO4-c	PLO11-c	C
11	Solving special types of PDE's of second-order with variable coefficients	Video and quiz about Laplace method for transforming second order PDE's with variable coefficients to canonical forms	ILO2-k	PLO2-k	K
12	Deriving wave, equations	Video about deriving heat equations	ILO3-s	PLO8-s	S
13	Deriving Laplace equations	Homework about finding the solutions of wave equations by using separation of variable method.	ILO3-s	PLO9-s	S
14	Finding the solutions of heat equations by using separation of variable method.	Quiz and Homework about finding the solutions of Laplace equations by using separation of variable method.	ILO3-s	PLO7-s	S
15	**Projects Discussion**				
16	**Final Exam**				

* **K: Knowledge, S: Skills, C: Competency**

Teaching Methods and Assignments:

Development of ILOs is promoted through the following teaching and learning methods:

- Lecture.
- Learning through problem solving.

Course Policies:

A- Attendance policies:
The maximum allowed absences is 15% of the lectures.
B- Absences from exams and handing in assignments on time:
Midterm exam can be retaken based on approval of excuse by the instructor's discretion.
Not handing assignment on time will incur penalties.
C- Academic Health and safety procedures
D- Honesty policy regarding cheating, plagiarism, and misbehaviour:
Cheating, plagiarism, misbehaviour will result in zero grade and further disciplinary actions may be taken.
E- Grading policy:

- All homework is to be posted online through the e-learning system.
- Exams will be marked within 72 hours and the marked exam papers will be handed to the students.
- Online Activities (Course Videos, Homeworks, Quizzes) **20%**
- Midterm 30**%**
- Final Exam 50**%**

F- Available university services that support achievement in the course: **E-Learning Platform, Labs, Library.**

Required Equipment:

- PC / Laptop with webcam and mic
- Internet Connection
- Access to the ZUJ E-Learning Platform at https://exams.zuj.edu.jo/
- E-learning plan

Assessment Tools Implemented in the Course:

- Final Exam
- Midterm Exam
- Quizzes
- Homework
- Periodic reports for learning assessment

Responsible Persons and their Signatures:

Course Coordinator	Hamza Alzaareer	**Completed Date**	**Oct / 2023**
		Signature	
Received by (Department Head)		**Received Date**	/ /
		Signature	