

Detailed Course Description - Course Plan Development and Updating Procedures/ Mathematics Department	QF01/0408-3.0E
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Faculty	Faculty of Science and Information Technology	Department	Mathematics
Course number	0101374	Course title	معادلات تفاضلية جزئية Partial Differential Equations
Number of credit hours	3	Pre-requisite/co-requisite	Ordinary Differential Equations (1) 0101273

Brief course description

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, Applications: wave, heat, and Laplace equations.

Course goals and learning outcomes

Goal 1	Learn to solve linear and quasilinear pde's of the first order.
Learning outcomes	Students will be able to: 1.1 Classify types of Partial Differential Equations. 1.2 Eliminate the arbitrary constants and arbitrary functions 1.3 Solve linear and quasilinear first-order differential equations with and without initial conditions. 1.4 Find the Integral surfaces passing through a given curve.
Goal 2	Learn to solve nonlinear pde's of the first order.
Learning outcomes	Students will be able to: 2.1 Distinguish the types of solutions of nonlinear pde's of the first-order 2.2 Solve special types of nonlinear first order Partial Differential Equations. 2.3 Solve nonlinear first order Partial Differential Equations using Charpit's method.
Goal 3	Learn to solve linear second-order pde's.
Learning outcomes	Students will be able to: 3.1. Classify the second-order pde's as parabolic, elliptic, or hyperbolic. 3.2. Solve homogenous linear equations with constant coefficients. 3.3. Solve non-homogeneous linear equations with constant coefficients. 3.4. Solve linear pde's with variable coefficients.

Textbook	"Elements of Partial Differential Equations", By: Ian Sneddon, 1957, McGraw-Hill, Inc.
Supplementary references	1) "Introduction to Partial Differential Equations with Applications", By E.C. Zachmanoglou, and D.W. Thoe, 1976, Dover Publications. 2) Differential Equations with Applications and Historical Notes". By: G. Simmons, 2nd Edition, 1991. 3) Partial Differential Equations, Prasad, Phoolan, 2010, ISBN: 8122430684. 4) Ordinary & Partial Differential Equation, M D Raisinghania, S. Chand, 2006, ISBN: 8121908922.

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Course timeline			
Week	Number of hours	Course topics	Pages (textbook)
01	1	Review of the first order ode's.	1 – 23
	1	Def. of (pde's, order, solution).	
	1	Def. of quasilinear, almost linear, and linear pde's.	
02	1	Origin of first order pde's.	24 – 34
	1	Cauchy's problem of first order equations	
	1		
03	1	The general solution of the first order pde's.	35 – 44
	1	Lagrange's method for finding the general solution of the first-order pde's of the form $f z_x + g z_y = h$.	
	1		
04	1	Integral surfaces passing through a given curve.	44 – 56
	1	Surfaces orthogonal to a given system of surfaces	
	1		
05	1	One and two parameter systems.	57 – 111
	1	Types of solutions of nonlinear pde's of the first-order.	
	1		
06	1	Charpit's method for solving first order nonlinear pde's of the form $f(x, y, z, p, q) = 0$.	57 – 111
	1		
	1		
07	1	First Exam 20%	57 – 111
	1	Solving special types of first order nonlinear equations.	
	1		
08	1	Second order partial differential equations.	112 – 123
	1	Fundamental types of second order pde's.	
	1		
09	1	Basic theory of linear pde's with constant coefficients.	124 – 130
	1		
	1		
10	1	Complementary functions for $f(D_x, D_y)z = 0$ when the operator $f(D_x, D_y)$ is reducible or irreducible.	130 – 132
	1		
	1		
11	1	Short methods for obtaining the particular integral of the eqn. of the form	132 – 136
	1	$f(D_x, D_y)z = g(x, y)$	
	1		
12	1	Solving special types of pde's of second - order with variable coefficients.	137 – 142
	1	Second exam 20 %	
	1		
13	1	Laplace method for transforming second order pde's with variable coefficients to canonical forms.	143 – 152
	1		
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14	1 1 1	Deriving wave, heat, and Laplace equations and finding their solutions by using separation of variable method.	153 – 166
15	1 1 1	Deriving wave, heat, and Laplace equations and finding their solutions by using separation of variable method.	153 – 166
16	1 1 1	Final Exam 50%	

Theoretical course evaluation methods and weight	Participation = 10% First exam 20% Second exam 20% Final exam 50%	Practical (clinical) course evaluation methods	Semester students' work = 50% (Reports, research, quizzes, etc.) Final exam = 50%
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Approved by head of department		Date of approval	
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Extra information (to be updated every semester by corresponding faculty member)

Name of teacher	Amjed Zraiqat	Office Number	9356
Phone number (extension)		Email	amjed@zuj.edu.jo
Office hours	Sun., Tue., Th. : 9:00 – 10:00 Mon., Wed. : 11:0 – 12:30		