



# Indraprastha College for Women

## University of Delhi

Course Name:	B.Sc.(H) Mathematics
Paper Title:	Partial Differential Equations
Unique Paper Code:	
Semester:	V
Faculty(s):	Dr. Chander Shekhar
Year:	2024

<b>Work Plan</b>			
Period	Unit No.	Learning Objective	Topics to be Covered
1 <sup>st</sup> Aug -3 <sup>rd</sup> Aug	I	First Order Partial Differential Equations	Basic concepts, classification, construction,
5 <sup>th</sup> Aug-10 <sup>th</sup> Aug			geometrical interpretation of first-order PDEs.
12 <sup>th</sup> Aug-17 <sup>th</sup> Aug			Method of characteristics and general solutions
19 <sup>th</sup> Aug-24 <sup>th</sup> Aug			Cauchy problem for a first-order PDE, Canonical forms of first-order linear equations; Method of separation of variables.
26 <sup>th</sup> Aug-31 <sup>st</sup> Aug			Charpit's method for solving non-linear PDEs.
2 <sup>nd</sup> Sep-7 <sup>th</sup> Sep	II	Classification and Solutions of Second-Order Linear PDEs	Classification (hyperbolic, parabolic, and elliptic), reduction to canonical forms,
9 <sup>th</sup> Sep-14 <sup>th</sup> Sep			general solutions of second-order linear PDEs
16 <sup>th</sup> Sep-21 <sup>st</sup> Sep			Higher order linear partial differential equations with constant coefficients.
23 <sup>rd</sup> Sep-28 <sup>th</sup> Sep	III	Application of Partial Differential Equations	: Mathematical models: The vibrating string, vibrating membrane,
30 <sup>th</sup> Sep-5 <sup>th</sup> Oct			conduction of heat in solids, the gravitational potential, conservation laws and the Burgers equation,
7 <sup>th</sup> Oct-12 <sup>th</sup> Oct			Traffic flow.
14 <sup>th</sup> Oct-19 <sup>th</sup> Oct			Cauchy problem and wave equations: Solutions of

21 <sup>st</sup> Oct-26 <sup>th</sup> Oct			homogeneous wave equations with initial boundary-value problems
28 <sup>th</sup> Oct-2 <sup>nd</sup> Nov	III		MID SEMESTER BREAK
4 <sup>th</sup> Nov-9 <sup>th</sup> Nov			non-homogeneous boundary conditions,.
11 <sup>th</sup> Nov-16 <sup>th</sup> Nov			Cauchy problem for nonhomogeneous wave equations
18 <sup>th</sup> Nov-23 <sup>rd</sup> Nov			REVISION
25 <sup>th</sup> Nov-27 <sup>th</sup> Nov			REVISION
28 <sup>th</sup> Nov	DISBERSAL OF CLASSES		

<b>SYLLABUS</b>	
<b>Unit</b>	<b>TOPICS</b>
I	<p><b>First Order Partial Differential Equations</b></p> <p>Basic concepts, classification, construction, and geometrical interpretation; Method of characteristics and general solutions, Cauchy problem for a first-order PDE, Canonical forms of first-order linear equations; Method of separation of variables; Charpit's method for solving non-linear PDEs.</p>
II	<p><b>Classification and Solutions of Second-Order Linear PDEs</b></p> <p>Classification (hyperbolic, parabolic, and elliptic), reduction to canonical forms, and general solutions of second-order linear PDEs; Higher order linear partial differential equations with constant coefficients.</p>
III	<p><b>Applications of Partial Differential Equations</b></p> <p>Mathematical models: The vibrating string, vibrating membrane, conduction of heat in solids, the gravitational potential, conservation laws and the Burgers equation, Traffic flow; Cauchy problem and wave equations: Solutions of homogeneous wave equations with initial boundary-value problems, and non-homogeneous boundary conditions, Cauchy problem for non-homogeneous wave equations.</p>
<b>S. No.</b>	<b>Name of Authors/Books/Publishers</b>
1.	Myint-U, Tyn & Debnath, Lokenath. (2007). Linear Partial Differential Equations for Scientists and Engineers (4th ed.). Birkhäuser. Indian Reprint.
2.	2 Sneddon, Ian N. (2006). Elements of Partial Differential Equations, Dover Publications. Indian Reprint
3.	Abell, Martha & Braselton, J.P. (2004) Differential Equations with Mathematica, Elsevier, Academic Press, Third Edition.
4.	Stavroulakis, Ioannis P & Tersian, Stepan A. (2004). Partial Differential Equations: An Introduction with Mathematica and MAPLE (2nd ed.). World Scientific.