Semester	JAN 2022
Open to semester	8,12,14
Course code	**MTH424**
Course title	**Partial Differential Equations**
Credits	4 /
Course Coordinator & participating faculty (if any)	Mousomi Bhakta
Nature of Course	Lectures
Pre-requisites	Measure theory and integrations (MTH 421)
Objectives (goals, type of students for whom useful, outcome etc)	A solution of an ODE is typically specified by finitely many constants. In contrast, a solution to a PDE is typically specified by finitely many functions. Both initial conditions of time and boundary conditions of space play a decisive role. PDE theory is thus much vaster than the theory of ODEs. This course focuses on four primary PDEs arising from nature: the transport equation, Laplace's equation, heat equation, and wave equation, representing first order PDEs, second order elliptic, parabolic, and hyperbolic PDEs, respectively. Each of these leads to its own branch of mathematics that one could study for a lifetime. As well as being an engaging mathematical topic in its own right, PDE theory is essential for many topics in analysis, geometry, probability theory, mathematical physics, etc. Students of PDEs may go on to study topics like harmonic analysis, geometric analysis, operator theory, control theory, differential geometry, and the calculus of variations.
Course contents (details of topics /sections with no. of lectures for each)	Introduction and Classification of PDEs (1 lectures) Transport Equation: Initial Value Problem, Non-homogeneous problem (6 lectures) Laplace's Equation: Fundamental Solution, Mean Value Property, Maximum Principles, Properties of Harmonic functions, Green's function, Energy Methods (8 lectures) Heat Equation: Fundamental Solution, Mean Value Property, Maximum Principles, Properties of solutions, Energy Methods, (8 lectures)

	Wave Equation: Solution by Spherical Means, Non-homogeneous problem, Energy Methods. (8 lectures) Solution via Separation of Variables (2 lectures)
Evaluation /assessment	End-Sem Examination-35% Mid-Sem Examination-35% Others-Quiz-30%
Suggested readings (with full list of authors, publisher, year, edn etc.)	Text Book(s) 1. Partial Differential Equations: L. Evans (2010) Graduate Studies in Mathematics, AMS 2. An Introduction to Partial Differential Equations: Y. Pinchover and J. Rubinstein (2005) Cambridge