



## Partial Differential Equations

Course Code	Course Num.	Course Name	Credit Hours	Lec	Lab	Tut	Prerequisites
MAT	٤٣٤	Partial differential Equations	4	3	0	2	MAT 332

### Objectives:

The aim of this course is to introduce the students to the theory and applications of partial differential equations (PDEs), and to explore various methods of solution. On successful completion of this unit, students should be able to classify PDEs and solve them by using appropriate methods.

### Syllabus:

- **Introduction to PDEs:** Definition of a PDE; degree, linearity; homogeneous and inhomogeneous equations; First order partial differential equations; The method of characteristics.
- **Second-order equation:** Classification as Parabolic, Hyperbolic, and Elliptic equations.
- **Classical PDEs of mathematical physics and Boundary-Value Problems:** wave equation, heat equation, Laplace equation. Boundary Conditions; Definition of a Boundary-Value Problem. Dirichlet, Neumann, and Mixed BVP.
- **Analytic methods for solving PDEs:** Separation of variables method; Method of characteristics; Fourier series; Solution of PDEs by Fourier series; Fourier and Laplace transform; Solving PDEs using Fourier and Laplace transforms.

### References:

- **Partial Differential Equations of Mathematical Physics** R.B. Guenther & J.W. Lee. Prentice Hall/Dover publication
- **Partial Differential Equations Methods and Applications**, R. McOwen, Prentice Hall/Pearson Education.

