

Module Code: MATH-402  
Module Title: **Partial Differential Equations**  
Module Rating: 3 Cr. Hours  
Pre-Requisite: Ordinary Differential Equations

### **Introduction**

- Review of ordinary differential equation in more than one variables
- Linear partial differential equations (PDEs) of the first order
- Cauchy's problem for quasilinear first order PDEs

### **PDEs of Second Order**

- PDEs of second order in two independent variables with variable coefficients
- Linear transformation from one equation to another equation
- Normal form
- Cauchy's problem for second order PDEs in two independent variables

### **Adjoint Equation**

- Adjoint operator
- Self adjoint equation and operator
- Linear PDEs in  $n$  independent variables
- Lagrange's identity
- Green's theorem for self adjoint operator

### **Boundary Value Problems**

- Laplace equation
- Dirichlet problem for a circle
- Poisson's integral for a circle
- Solution of Laplace equation in Cartesian, cylindrical and spherical coordinates
- The wave equation in one dimension
- The wave equation in higher dimensions
- The heat equation
- Axially symmetric solutions

### **Recommended Books**

1. I. N. Sneddon, *Elements of Partial Differential Equations* (Dover Publishing, Inc., 2006)
2. R. Dennemyer, *Introduction to Partial Differential Equations and Boundary Value Problems* (McGraw Hill Book Company, 1968)
3. M. Humi and W. B. Miller, *Boundary Value Problem and Partial Differential Equations* (PWS-Kent Publishing Company, Boston, 1991)
4. C. R. Chester, *Techniques in Partial Differential Equations* (McGraw Hill Book Company, 1971)
5. R. Haberman, *Elementary Applied Partial Differential Equations*, 2<sup>nd</sup> edition (Prentice Hall Inc., New Jersey, 1987)
6. E. Zauderer, *Partial Differential Equations of Applied Mathematics* (Wiley-Interscience, Englewood Cliff, New York, 2006)



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