

Course Code	Course Num.	Course Name	Credit Hours	Lec.	Lab.	Tut.	Private study	Pre-requisites	Course Level
MAT	1236	Mathematical Methods for Engineers	5	4	0	2	10	MAT 1207 MAT 1228	6

Topics Outline

- Laplace Transforms:** Basic Definitions, Properties of Laplace Transforms, Inverse Laplace Transform, First shifting theorem, Unit-Step function, Second shifting theorem, Dirac Delta function, Solving Initial Values Problems using Laplace Transforms.
- Series Solutions of Differential Equations:** Review of Power Series, Series Solutions of Linear Equations: Solutions about Ordinary Points, Solutions about singular points, Frobenius Method, Special Functions (Bessel's Equation, Legendre's Equation).
- Introduction to PDEs & Basic Concepts:** Definition of General PDEs, Order, Linear and nonlinear PDEs, solution of PDEs, Classification of PDEs as Parabolic, Hyperbolic, and Elliptic Equations, Initial conditions, Boundary Conditions (Dirichlet, Neumann, and Mixed conditions), Classical PDEs and Boundary-Value Problems (Heat Equation, Wave Equation, and Laplace Equation).
- Analytic Methods for Solving PDEs:** Fourier Series, Fourier Cosine and Sine Series, Separation of Variables Method, Solving PDEs using Fourier and Laplace transforms.

Required Textbook

- **Linear Partial Differential Equations for Scientists and Engineers.** 4th Edition, Tyn Myint U., Lokenath Debnath, Springer 2007.
- **Advanced Engineering Mathematics**, E. Kreyszig, John Wiley & Sons, INC 10th Edition, 2011.

Other references:

- **Partial Differential Equations Theory and Completely Solved Problems**, by T. Hillen, I.E. Leonard, H. van Roessel; Wiley 2012.
- **Applied Partial Differential Equations with Fourier Series and Boundary Value Problems**, 5th Edition, Richard Haberman, Pearson 2012.
- **Mathematical methods in the physical sciences**, 3rd Edition, Boas, Mary L.; John Wiley & Sons, 2005.