Course Code	Course Num.	Course Name	Credit Hours	Lec.	Lab.	Tut.	Private study	Pre-requisites	Course Level
MAT	**236**	**Mathematical Methods for Engineers**	**3**	**3**	**0**	**2**	**8**	**MAT 207 MAT 228**	**4**

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, The Convolution Integral. (3 weeks)
- **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). (3 weeks)
- **Introduction to PDEs & Basic Concepts:** Definition of General PDEs, Order, Linear and nonlinear PDEs, homogeneous and nonhomogeneous PDEs, Classification as Parabolic, Hyperbolic, and Elliptic Equations. (2 weeks)
- **Boundary-Value Problems for Classical PDEs:** Initial conditions, Boundary Conditions (Dirichlet, Neumann, and Mixed conditions), Definition of a Boundary-Value Problem, Heat Equation, Wave Equation, and Laplace Equation. (2 weeks)
- **Fourier Series and PDEs:** Orthogonal Functions, Fourier Series, The Fourier Convergence Theorem, Fourier Cosine and Sine Series, Separation of Variables Method: Heat Conduction Problem, Vibrating String Problem, Laplace Equation. (4 weeks)

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.