

UG  
Course Code: **CH306**  
Credit: **3**  
Version: **1**  
Prerequisite Course: **Nil**

Department: **Chemical Engineering**  
Course Name: **Mathematical Methods in Chemical Engineering**  
L-T-P: **3-0-0**  
Approved on:

**Ordinary differential equations (ODE)** – Solution of first order and second order differential equations, simultaneous ODEs. Solution by Laplace Transformation. Series solution method.

**Complex Algebra:** Introduction; The complex number; the Argand diagram; principle values; Algebraic operations on the Argand diagram; Conjugate numbers; De Moivre's theorem; the  $n$ th roots of unity; complex number series; Trigonometrical exponential Identities; Derivatives of a complex variable; Analytic functions; complex variable and Cauchy's theorem, Laurent's expansion, and theory of residues. Laplace inverse by Contour integration, Bromwich's integral formula.

**Functions and Definite Integrals:** Introduction, error function, gamma function, beta function, other tabulated functions defined by integrals; Definite integrals by contour integration.

**Vector Analysis:** Addition and Subtraction of vectors, Multiplication of vectors, Scalar triple product, Vector triple product, Differentiation of vectors, Partial differentiation of vectors, Divergence, Continuity equation, Curl of a vector, Line integral, Vector area and Surface integral, Gauss' Divergence theorem, Green's theorem. Spherical and Cylindrical coordinate systems. Stream function, Creeping flow around a sphere.

**Partial differential equations (PDE)-** Classifications of PDEs, Formulating PDEs, Separation of variables method, Orthogonal functions and Sturm-Liouville conditions, The Laplace transform method.

#### **Books**

1. Jenson, V.G. and Jeffreys, G.V., "*Mathematical Methods in Chemical Engineering*," 2<sup>nd</sup> ed., Academic Press, New York, 1977.
2. Rice, R. G. and Do, D. D., "*Applied Mathematics and Modeling for Chemical Engineers*," John Wiley & Sons, New York, 1995.
3. Varma, A. and Morbidelli, M., "*Mathematical Methods in Chemical Engineering*," Oxford University Press, New York, 1997.
4. Kreyszig, E., "*Advanced Engineering Mathematics*," 8<sup>th</sup> ed., John Wiley & Sons, 2000.
5. Mickley, H.S., Sherwood, T.K., and Reed, C.E., "*Applied Mathematics in Chemical Engineering*," McGraw-Hill, 1957.