207004 ENGINEERING MATHEMATICS – III (2008 Course)

Teaching Scheme:
Lectures: 4 hrs./week

Examination Scheme:
Paper: 100 marks
Duration: 3 hrs.

Section I

Unit I: Linear Differential Equations (**LDE**) (09 Hours)

Solution of n^{th} order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's & Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE.

Unit II: Applications of DE (09 Hours)

Applications of LDE to chemical engineering problems involving batch reactions and mass spring systems.

Solution of Partial Differential Equations (**PDE**)

(1) $\partial u/\partial t = a^2 (\partial^2 u/\partial x^2)$, (2) $\partial^2 u/\partial t^2 = a^2 (\partial^2 u/\partial x^2)$ and (3) $(\partial^2 u/\partial x^2) + (\partial^2 u/\partial y^2) = 0$ by separating variables only. Applications of PDE to problems of Chemical and allied engineering.

Unit III: Fourier Transform (**FT**)

(09 Hours)

Fourier Integral theorem. Sine & Cosine Integrals. Fourier Transform, Fourier Cosine Transform, Fourier Sine Transforms and their inverses. Finite FT, Application of FT to problems on one and two dimensional heat flow problems.

Section II

Unit IV: Laplace Transform (**LT**)

(09 Hours)

Definition of LT, Inverse LT. Properties & theorems. LT of standard functions. LT of some special functions viz. error, 1^{st} order Bessel's, Periodic, Unit Step, Unit Impulse, ramp, jump, parabolic, Si(t) and Ei(t). Problems on finding LT & inverse LT.

Unit V: Vector Calculus

(09 Hours)

Physical Interpretation of Vector Differentiation. Radial, Transverse, Tangential & Normal components of Velocity and Acceleration. Vector differential operator. Gradient, Divergence & Curl. Directional derivative. Vector identities. Line, Surface & Volume integrals. Work done. Conservative, Irrotational & Solenoidal fields. Scalar potential. Green's Lemma, Gauss's Divergence and Stoke's Theorem.

Unit VI: Applications of Laplace Transforms & Vector Calculus

(09 Hours)

Applications of Vectors to problems in Fluid Mechanics, Continuity equations, Stream lines, Equations of motion, Bernoulli's equations.

Applications of LT for solving ordinary differential equations, liquid level systems, consisting of single tank and two tanks in series (interacting and non-interacting systems), second order systems (damped vibrator).

Text Books:

1. Advanced Engineering Mathematics by Peter V. O'Neil (Cengage Learning).
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).

Reference Books:

1. Engineering Mathematics by B.V. Raman (Tata McGraw-Hill).
2. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).
3. Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.)
4. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
5. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune).
6. Advanced Engineering Mathematics with MATLAB, 2e, by Thomas L. Harman, James Dabney and Norman Richert (Brooks/Cole, Thomson Learning).