

**OBJECTIVE**

The aim of the course is to make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems, acquaint with the concepts of vector calculus, needed for problems in all engineering disciplines, develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current, also make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

**UNIT – I      DIFFERENTIAL EQUATIONS      9+3**

Method of variation of parameters – Method of undetermined coefficients – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients.

**UNIT – II      VECTOR CALCULUS      9+3**

Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral and volume integral – Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

**UNIT – III      ANALYTIC FUNCTION      9+3**

Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions  $w = z + c, az, 1/z, z^2$ ? Bilinear transformation.

**UNIT – IV      COMPLEX INTEGRATION      9+3**

Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

**UNIT – V      LAPLACE TRANSFORMS      9+3**

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems – Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem — Transform of periodic functions – Application to solution of linear ordinary differential equations with constant coefficients.

**TOTAL: 60**

**TEXT BOOKS:**

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 40<sup>th</sup> Edition, 2007.
2. Ramana, B.V. "Higher Engineering Mathematics", Tata McGraw Hill, New Delhi, 2010.

**REFERENCES:**

1. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, New Delhi, 2007.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3<sup>rd</sup> Edition, 2007.
3. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7<sup>th</sup> Edition, 2009.
4. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.