

**SREENIVASA INSTITUTE of TECHNOLOGY and MANAGEMENT STUDIES  
(Autonomous) 2016-2017**

**II BTech II Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**16SAH221 MATHEMATICS-IV  
(Common to ECE, EEE)**

**Course Objectives**

- To develop logical thinking in solving various mathematical models
- To learn some special functions and their applications will be introduced.
- To introduce complex functions and their applications.
- To learn about analytical functions, complex integration, classification of singularities , conformal mappings

**Course Outcomes**

- Student will be able to evaluate the real integrals using special functions
- To know the properties of analytic and harmonic functions.
- Students will understand path and contour integrals
- Students will be able to apply different theorems of integral formulae.
- Students will be able to evaluate some standard integrals using contour integrals.

**UNIT - 1: Special Functions**

Beta and gamma functions - Properties - Evaluation of integrals (simple examples).  
Bessel Function - Generating function (without proof) - Recurrence Relations - Orthogonality.

**UNIT - 2: Complex Functions**

Functions of a complex variable - Elementary functions: Exponential - Trigonometric - Hyperbolic - Logarithmic functions and their properties - Principal value - Continuity - Differentiability - Analyticity - Properties - Cauchy-Riemann equations in cartesian and polar coordinates - Harmonic and conjugate harmonic functions - Milne-Thompson method.

**UNIT - 3: Complex Integration and Complex Power Series**

**Complex Integration:** Line integral - Evaluation along curves and closed contours - Cauchy's integral theorem - Cauchy's integral formula - Generalized Cauchy's integral formula.

**Complex Power Series:** Taylor's and Laurent series expansions of complex functions - Singular point - Isolated singular point - Pole of order m - Essential singularity.

**UNIT - 4: Residue Calculus**

Residue - Evaluation of residue by formula - Residue theorem - Evaluation of integrals using residue theorem - Evaluation of improper and real integrals of the type

$$(a) \int_{-\infty}^{+\infty} f(x)dx \quad (b) \int_c^{c+2\pi} f(\cos \theta, \sin \theta)d\theta \quad (c) \int_{-\infty}^{\infty} e^{imx} f(x)dx$$

**UNIT - 5: Argument Principle, Rouché's Theorem its applications and conformal mapping**

**Argument Principle, Rouché's Theorem its applications:** Argument principle - Rouché's theorem - Determination of number of zeros of complex polynomials - Maximum modulus principle - Fundamental theorem of algebra - Liouville's theorem.

**Conformal Mapping:** Definitions - Transformation by  $e^z$ ,  $\ln z$ ,  $z^2$ ,  $\sin z$ ,  $\cos z$  - Translation - Rotation - Inversion and Bilinear transformation - Fixed point - Cross ratio - Determination of bilinear transformation.

**Text Books:**

1. Engineering Mathematics – III, 2013, T.K.V. Iyengar, B. Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad, S. Chand and Company Publishers, New Delhi.
2. Higher Engineering Mathematics, 34/e, 1999, Dr. B. S. Grewal, Khanna Publishers, Delhi

**Reference Books:**

1. Engineering Mathematics for JNTU, 3/e, 2008, B.V. Ramana, Tata McGraw Hill Publishers, New Delhi.
2. Theory and Applications of Complex Variables, 1981, Murray R. Spiegel, Schaum's outline series, McGraw-Hill Book Company, Singapore.
3. Higher Engineering Mathematics, Dr. M. K. Venkata Ramana, National Pub & Co, Madras.
4. A Text Book of Engineering Mathematics, 2011, N.P.Bali, Laxmi publications(P)Ltd, New Delhi.
5. Engineering Mathematics, Volume – III, 2013, E. Rukmangadachari, E. Keshava Reddy, Pearson Education, Chennai.