

B.TECH. II YEAR AND I SEMESTER

Complex variables & Random process (23B53T03)
(For ECE only)

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Course Objectives:

- To familiarize the complex variables.
- This gives basic understanding of random variables and operations that can be performed on them.
- To know the Spectral and temporal characteristics of Random Process
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- To Learn the Basic concepts of Information theory Noise sources and its representation for understanding its characteristics

Course Outcomes: At the end of the course students will be able to

1. Apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic or not(L3)
2. Make use of the Cauchy residue theorem to evaluate certain integrals (L3)
3. Demonstrate the random variables and Define and manipulate distribution and density functions.
4. Perform operations on single and multiple Random variables.
5. Determine the Spectral characteristics of Random Signals.

Mr. B Sessa Rao Chairman	Dr. GVSR Deekshitulu University Nominee	Dr. G Venkata Rao Subject Expert-1	Dr. M Bala Prabhakar Subject Expert-2

BoS Members			
	Dr. NVSRC Murty Gamini	Mr. B Simhadri Rao	Mr. V Seshu Kumar
	Mrs. SNPG Vani	Mrs. A Sravani	Mr. KVNVS Prasad


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UNIT – I: Functions of a complex variable and Complex integration:

Introduction – Limits - Continuity – Differentiability – Analyticity – Cauchy-Riemann equations in Cartesian and polar coordinates – Harmonic and conjugate harmonic functions – Milne – Thompson method.

Complex integration: Line integral – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula (all without proofs) and problems on above theorems.

UNIT – II: Series expansions and Residue Theorem:

Radius of convergence – Expansion of function as a Taylor's series, Maclaurin's series and Laurent's series.

Types of Singularities: Isolated – Essential singularities – Pole of order m – Residues –

Residue theorem (without proof) – Evaluation of real integral of the types $\int_{-\infty}^{\infty} f(x)dx$ and $\int_0^{2\pi} f(\cos \theta, \sin \theta)d\theta$.

UNIT – III: Probability & Random Variables:

Conditional Probability & Total Probability, Bayes' Theorem, Independent Events.

Random variables(discrete and continuous), probability density functions, properties, mathematical expectation, variance. Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian distributions.

UNIT – IV: Operations on Random variables:

Moments-moments about the origin, Central moments, Variance and Skewness, Chebyshev's inequality, moment generating function, characteristic function.

Multiple Random Variables: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Interval conditioning, Statistical Independence.

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Chairman	University Nominee	Subject Expert-I	Subject Expert-2

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UNIT – V: Stochastic Processes-Spectral Characteristics:

The Power Spectrum and its Properties, Relationship between Power Spectrum and Auto correlation Function, the Cross-Power Density Spectrum and Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function. Spectral characteristics of system response: power density spectrum of response, cross power spectral density of input and output of a linear system.

Text Books:

1. **B. S. Grewal**, Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. Peyton Z. Peebles - Probability, Random Variables & Random Signal Principles, 4th Ed, TMH, 2001.
3. Taub and Schilling - Principles of Communication systems, TMH, 2008.

Reference Books:

1. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2. **B. V. Ramana**, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
3. Athanasios Papoulis and S. Unnikrishna Pillai - Probability, Random Variables and Stochastic Processes, 4th Ed., PHI, 2002.
4. B.P. Lathi - Signals, Systems & Communications, B.S. Publications, 2003.
5. S.P Eugene Xavier -Statistical Theory of Communication, New Age Publications,2003.
6. **Y Mallikarjuna Reddy**, Probability Theory and Stochastic Processes, University Press, 4th Edition.

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