

(Proposed from A.Y 2019-2020)

**NIRMA UNIVERSITY**  
**Institute of Technology**  
**Bachelor of Technology – Electronics and Communication Engineering**

**Semester III**

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|----------|----------|----------|----------|
| <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>3</b> | <b>1</b> | <b>0</b> | <b>4</b> |

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|---------------------|--|
| <b>Course Code</b>  | <b>MAXXXX</b>  |
| <b>Course Title</b> | <b>Vector Calculus, Complex Variables and Probability Distribution</b> |

**Course Learning Outcomes (CLO):**

At the end of the course, students will be able to-

1. comprehend and apply probability distribution and random process in engineering problems

2. apply function of complex variables in engineering field

3. use vector calculus in engineering field

**Syllabus:**

**Teaching hours:**

**Unit I**

**7**

**Vector Calculus:** Differentiation of Vectors, Scalars and vector fields, Gradient of a scalar function, Directional derivative, Divergence and Curl of a vector function and their physical meanings, Irrotational, Solenoidal and conservative vector fields

**Unit II**

**10**

**Function of Complex Variables:** Analytic function, Cauchy – Riemann equation (Cartesian and Polar forms), Harmonic functions, Conformal mappings, Complex integration, Cauchy's theorem and integral formula

**Unit III**

**5**

**Statistics:** Measure of Central Tendency and Dispersion, Correlation and Regression

**Unit IV**

**11**

**Theory of Probability and distributions:** Permutations & Combinations, Definition of probability, Application of permutations and combination, Conditional probability, Bayes' Theorem, Concept of random variable, Probability density and distribution functions, Mean and Variance, Moments, Probability distribution, Binomial, Poisson and normal probability distributions

**Unit V**

**6**

**Function of random variables:** The random variable  $g(X)$ , the distribution of  $g(X)$ , mean and variance, moments, characteristic functions, bivariate distribution, one function of two random variables, two functions of two random variables, joint moments, conditional distribution, and conditional expected values

**Random processes:** Definitions and classification of random processes, stationary and ergodic processes, discrete and continuous processes, Markov chain

**Tutorials:**

This shall consist of at least 8 tutorials based on the syllabus.

**Self-Study:**

Self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from the self-study contents.

**Suggested Readings<sup>^</sup>:**

1. A. Papoulis and S. Unnikrishna Pillai, Probability, Random variables and Random Processes, Tata McGraw Hill.
2. S C Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics: S Chand
3. Jay I. Devore, Probability and Statistics for Engineers and Scientists; Pearson
4. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications.
5. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern Publications.

L = Lecture, T = Tutorial, P = Practical, C = Credit

<sup>^</sup> this is not an exhaustive list