

**2BS04: PROBABILITY AND NUMERICAL ANALYSIS**

**CREDITS - 4 (LTP:3,1,0)**

**2<sup>nd</sup> Year, B. Tech. (Electrical)**

**Course Objective:**

To introduce probability and numerical techniques used in engineering.

**Teaching and Assessment Scheme:**

Teaching Scheme (Hours per Week)			Credits	Assessment Scheme				Total Marks
L	T	P		C	Theory Marks		Practical Marks	
			ESE		CE	ESE	CE	150
3	1	0	4	60	40	20	30	

**Course Contents:**

Unit No.	Topics	Teaching Hours
1	<b>Basic Probability:</b> <ul style="list-style-type: none"> <li>• Orientation of Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables;</li> <li>• Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.</li> </ul>	12
2	<b>Continuous Probability Distributions:</b> Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.	4
3	<b>Bivariate Distributions:</b> Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.	4
4	<b>Numerical Methods – 1</b> Solution of polynomial and transcendental equations – Bisection method, Newton-Raphson method and Regula-Falsi method. Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae. Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.	12
5	<b>Numerical Methods – 2</b> Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. Runge-Kutta method of fourth order for solving first and second order equations. Milne's and Adam's predictor-corrector methods.	10
<b>Total</b>		<b>42</b>

**List of References:**

1. B.S. Grewal, "*Higher Engineering Mathematics*", Khanna Publishers, 35th Edition, 2000.
2. S. C. Gupta, V. K. Kapur, "*Fundamental of Statistics*", Sultan Chand & Sons, India,

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3. S. Ross, "*A first course in Probability*", Pearson Education India, 2002.
4. Richard A. Johnson, Miller and Freund's - Probability and Statistics for Engineers, Prentice Hall of India, 2011.
5. S. S. Sastry, "Introductory Methods of Numerical Analysis", 4th edition, Prentice Hall India Pvt., Limited, 2005.
6. Chapra S. and Canale R., "*Numerical Methods for Engineers*", 6<sup>th</sup> edition, Tata McGraw-Hill.
7. Jain M. K., Iyengar SRK and Jain R. K., "*Numerical Methods for Scientific & Engineering Computation*", 6th Edition, New Age International Publishers.

### **Course outcome:**

At the end of this course students will be able to

1. Understand the concepts and tools of Probability theory.
2. Analyze and solve various engineering problems through the probability theory.
3. Adapt tools of probability theory and apply them in engineering problems.
4. Examine, analyze, and compare Probability distributions.
5. Determine numerical solution of algebraic and transcendental equations and discuss different difference operators.
6. Use interpolation techniques for data analysis and numerically solve initial value problems.