

MTH 221: Probability & Statistics

Programme: B.Tech. (ECE)
Course : Core/Math

Year: 2nd Year
Credits : 4

Semester : Even
Hours : 56

Course Context and Overview (100 words): This course has been designed as a compulsory course for Electronics and Communication Engineering ECE, CCE and CSE discipline students. The main objective of this course is to provide a foundation in the theory and applications of probability theory and statistics. The emphasis in this course is to teach the basic theoretical concepts and techniques to solve probabilistic and statistical problems arise in engineering and applied science. In this course, we introduce various types of probability models that are applicable in Electronics and Communication Engineering and Computer science.

Prerequisites Courses: Mathematics-I

Course outcomes(COs):

On completion of this course, the students will have the ability to:

CO1 Be familiar to the fundamentals of probability theory, random variables and random processes

CO2 Be understand the mathematical concepts related to probability theory and random processes.

CO3 Be analyze the given probabilistic model of the problem.

CO4 Be familiar with applications of Probability theory and random processes in science and engineering problems occurred in real world phenomena

CO5 Be prepare students for a wide range of courses in communications, signal processing, control and other areas of engineering in which randomness has an important role.

Course Topics:

Topics	Lecture Hours	
UNIT - I		
1. Topic Introduction to Probability Theory		
1.1 Introduction, Review of set theory, countable and uncountable sets, Sample Space; Events; Definition of Probability function, Properties of Probability function, continuity of probability function.		7
1.2 Conditional Probability; Total Probability Theorem; Bayes' Theorem, Independent Events; counting: permutation and combination		
UNIT - II		
2. Topic The Concept of random variable, Function(s) of random variable(s)		13

<p>2.1 Random Variable; Events generated by random variables, 2.2 Distribution function, probability density function (pdf), probability mass functions (pmf). Discrete uniform, Binomial, Poisson, Geometric, Normal, Exponential, Continuous uniform random variables. 2.3 Function of a random variable, distributions, pdf and pmf of function of random variable. 2.4 Expectation, Variance; Moments, 2.5 Joint distribution and joint density function, Function of two random variables. 2.6 Expected value and variance of function of random variables, Covariance, Correlation coefficient, Covariance matrix and its properties, 2.7 Conditional distributions, Conditional expectation,</p>		
<p>UNIT – III 3. Topic Probabilistic Inequalities, Characteristic Function, Limit Theorems</p>		
<p>Jensen’s Inequality, Markov’s Inequality, Chebyshev’s Inequality; Characteristic Function and it's properties. Weak and strong law of large numbers, central limit theorem;</p>		5
<p>UNIT - IV 4. Topic: Estimation</p>		
<p>Unbiased Estimates, minimum-variance unbiased estimators, Maximum likelihood estimation, confidence intervals,</p>		
<p>Testing Hypotheses, Neyman-Pearson Lemma, Likelihood Ratio Tests, Students’s t-distribution. Parametric test based on Chi-square, normal, t, F distributions. Simple Linear regression.</p>		15

Textbook references (IEEE format):

Text Book:

- A. Papoulis & S.U. Pillai, Probability, Random Variables and Stochastic Processes , Mc Graw Hill, 4th Edition, 2002.
- B. Sheldon M. Ross, Introduction to Probability & Statistics for Engineers and Scientists, Academic Press, 4th Edition, 2009

Reference books:

- 1. Sheldon M. Ross, Introduction to Probability Models, Academic Press, 10th Edition, 2010
- 2. Sheldon M. Ross, Introductory Statistics, Academic Press, 2nd Edition, 2010
- 3. Sheldon M. Ross, Probability Models for Computer Science, Academic Press, 2006
- 4. John Haigh, Probability Models, Springer Undergraduate Mathematics Series (SUMS), 2002.

Additional Resources (NPTEL, MIT Video Lectures, Web resources etc.):



Evaluation Methods:

Item	Weightage
Quiz1	20
Quiz2	
Midterm	30
Final Examination	50



Prepared By: Sunil Kumar Gauttam
Last Update: __18/9/2017__