MA22454 **PROBABILITY AND QUEUEING THEORY**

(Common to CS and IT)

L	T	P	C
3	1	0	4

OBJECTIVES

- To perform probability calculations for discrete and continuous random variables.
- To categorize discrete and continuous distributions by learning their properties.
- To compute and interpret correlation coefficient and regression describing association between two variables.
- To expose the fundamental concepts of random processes and related structures.
- To describe various key features of queuing systems.

UNIT I PROBABILITY AND RANDOM VARIABLES 9+3

Notion of Probability – Conditional Probability - Baye's Theorem - Random Variables - Discrete and Continuous Random Variables – Moments – Moment generating functions.

UNIT II SPECIAL DISTRIBUTIONS 9+3

Discrete Distributions - Binomial, Poisson, Geometric, Hypergeometric Distributions; Continuous Distributions - Uniform, Exponential, Gamma, Weibull and Normal Distributions and their properties.

UNIT III TWO - DIMENSIONAL RANDOM VARIABLES 9+3

Joint distributions – Marginal and Conditional distributions – Covariance – Correlation and Linear regression for two variables– Transformation of random variables – Central Limit Theorem.

UNIT IV RANDOM PROCESS 9+3

Definition - Classification – Poisson Process – Markov Process – Discrete parameter Markov Chain – Chapman Kolmogorov equations – Limiting distributions - Birth and Death Processes.

UNIT V QUEUEING SYSTEMS 9+3

Characteristics of queuing systems - Little's Formula - Markovian queues – Single and multiple server queueing models – Queues with finite waiting rooms - Finite source models – Non- Markovian queues - M/G/1 queue – Pollaczek Khinchin formula.

TOTAL (L:45 + T:15):60 PERIODS

OUTCOMES:

CO	CO statements Upon successful completion of the course, the students should be able to	RBT level
CO1	Extend and formalize the knowledge of probability theory and random variables.	3
CO2	Describe commonly used univariate discrete and continuous probability distributions and apply various distributions to solve real world problems.	3
CO3	Identify various distribution functions and acquire skills in handling situations involving more than one variable.	3
CO4	Analyse various classifications of Random Processes and characterize phenomena which evolve with respect to time in a probabilistic manner.	3
CO5	Understand the basic characteristic features of a queuing system and acquire skills in analyzing queuing models.	3

1- Remember, 2- Understand, 3- Apply, 4- Analyse, 5- Evaluate, 6- Create

TEXT BOOKS

1. Ibe. O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Edition Indian Reprint, 2010.
2. Gross. D. and Harris. C.M., "Fundamentals of Queueing Theory", Wiley Student edition, 2013.

REFERCENCES

1. Robertazzi, "Computer Networks and Systems: Queueing Theory and Performance Evaluation", Springer, 3rd Edition, Reprint 2011.
2. Taha H.A., "Operations Research", Pearson Education, Asia, 10th Edition, 2019.
3. Veerarajan. T, “Probability, Statistics and Random Processes”, McGraw Hill Publishers, 3rd Edition, 2013.
4. Hwei Hsu, "Schaum’s Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 2013.
5. Yates R.D. and Goodman. D. J., "Probability and Stochastic Processes", Wiley India Pvt. Ltd., Bangalore, 2nd Edition, 2012.

WEBLINKS:

1. https://www.analyticsvidhya.com/blog/2016/04/predict-waiting-time-queuing-theory/
2. https://www.informit.com/articles/article.aspx?p=1863432&seqNum=3