SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

DEPARTMENT OF APPLIED MATHEMATICS	LP: MA22454
B.E/B.Tech : Computer science Engineering & Information Technology Regulation :2022	Rev. No: 00
PG Specialisation : -	Date:
Sub. Code / Sub. Name : MA22454 PROBABILITY AND QUEUING THEORY	29.01.2024
Unit I : Probability and Random Variables	

Unit Syllabus: Probability and Random Variables

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

Objective: To perform probability calculations for discrete and continuous random variables

Session No.	Topics to be covered	Ref	Teaching Aids
1	Probability-Basic concepts and axioms	R-3, pg.1.1-1.17	BB/PPT
2	Conditional probability and multiplication theorem	R-3, pg.1.4-1.5	BB/PPT
3	Baye's Theorem	R-3, pg.1.19-1.25	BB/PPT
4	Problems solving session	Work sheet	BB/PPT
5	Discrete and continuouss Random variables, Probability mass function & probability density function.	T-1,pg.63-70	BB/PPT
6	Cumulative distribution function -properties	Work sheet	BB/PPT
7	Problem solving session	T-1,pg.63-70	BB/PPT
8	Expectation and variance -Properties	T-1,pg.86-90	BB/PPT
9	Moments (raw moment and central moment)	T-1,pg.90	BB/PPT
10	Problem solving session	R-3,Ch-3,pg.126-128	BB/PPT
11	MGF -properties	R-3, pg.4.48-4.51	BB/PPT
12	Problem solving session	Work sheet	BB/PPT
Content beyond syllabus covered (if any): Applications of probability and random variable in real life problem			

* Session duration: 50 minutes

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Unit II- Special Distributions

Unit syllabus: Special Distributions

Discrete Distributions - Binomial, Poisson, Geometric, Hypergeometric Distributions; Continuous Distributions - Uniform, Exponential, Gamma, Weibull and Normal Distributions and their properties.
Objective: To categorize discrete and continuous distributions by learning their properties.

Session No	Topics to be covered	Ref	Teaching Aids
13	Discrete distributions introduction and applications	T-1, pg-113	BB/PPT
14	Binomial distribution- Mean, variance, moments and MGF	T-1, pg-113	BB/PPT
15	Poisson distribution- Mean, variance, moments and MGF	T-1, pg-130	BB/PPT
16	Geometric distribution- Mean, variance, moments and MGF	T-1, pg-116	BB/PPT
17	Hypergeometric Distributions - Mean, variance, moments and MGF	T-1, pg-126	BB/PPT
18	Problem solving session	Work sheet	BB/PPT
	FAT 1		
19	Uniform properties - Mean, variance, moments and MGF	T-1, pg-141	BB/PPT
20	Gamma Distribution - Mean, variance, moments and MGF	T-1, pg-133	BB/PPT
21	Exponential Distribution - Mean, variance, moments and MGF	T-1, pg-136	BB/PPT
22	Weibull Distribution - Mean, variance, moments and MGF	R1-5.42	BB/PPT
23	Normal Distribution - Mean, variance, moments and MGF	T-1, pg-147	BB/PPT
24	Problem solving session	Work sheet	BB/PPT
Content beyond syllabus covered (if any): Application of Correlation and Regression in real life problem			

* Session duration: 50 minutes

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Unit III- Two dimensional random variables

Unit syllabus: Two dimensional random variables

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

Objective: To compute and interpret correlation coefficient and regression describing association between two variables.

Session No	Topics to be covered	Ref	Teaching Aids
25	Joint distributions.	T-1, pg-167	BB/PPT
26	Marginal distributions.	T-1, pg-175,179,	BB/PPT
27	Conditional distributions.	T-1-180,182	BB/PPT
28	Problems based on Marginal and Conditional distributions	Work sheet	BB/PPT
29	Covariance. .	T-1, pg-184	BB/PPT
30	Correlation .	T-1, pg-184-186	BB/PPT
31	Properties, Problems on Correlation .	T-1, pg-184-186	BB/PPT
32	Linear Regression – properties.	R-3, pg-4.35,4.36	BB/PPT
33	Problems on regression.	Work sheet	BB/PPT
34	Transformation of random variables	R-3, pg-3.1,3.5,3.23	BB/PPT
35	Problems on Transformation of random variables	Work sheet	BB/PPT
36	Summarization of Unit-III.	Work sheet	BB/PPT
	FAT II		
Content beyond syllabus covered (if any): Application of Correlation and Regression in real life problem			

* Session duration: 50 mins

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Sub. Code / Sub. Name: MA22454 PROBABILITY AND QUEUEING THEORY

Unit V : Random Processes

Unit syllabus: Random Processes

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

Objective: To expose the fundamental concepts of random processes and related structures.

Session No	Topics to be covered	Ref	Teaching Aids
37	Random processes- Introduction, classification.	T-1, pg-3.1,3.5,3.23	BB/PPT
38	Poisson Process - Properties	R-3,pg-7.33, 7.38	BB/PPT
39	Poisson Process - Problems	R-3,pg-7.43, work sheet	BB/PPT
40	Markov Process	T-1, pg. 356,358,359,360,361	BB/PPT
41	Markov Chain	T-1, pg. 356,358,359,360,361	BB/PPT
42	Problems based on Markov Process.	T-1, pg. 356,358,359,360,361	BB/PPT
43	Problem solving session	Work sheet	BB/PPT
44	Chapman Kolmogorov equations	T-1, pg. 363	BB/PPT
45	Limiting distributions	T-1, pg. 366	BB/PPT
46	Birth and Death process	T-1, pg. 373	BB/PPT
47	Problem solving session	Work sheet	BB/PPT
48	Summarization of unit IV	Work sheet	BB/PPT
Content beyond syllabus covered (if any): Application of Random processes in signal processing			

* Session duration: 50 mins

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Unit IV : Queueing System

Unit syllabus: Queueing System

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 .

Objective: To describe various key features of queuing systems.

Session No	Topics to be covered	Ref	Teaching Aids
49	Queueing system – introduction	T-2, pg-2,3	BB/PPT
50	Little's Formula	T-2, pg-2,3	BB/PPT
51	Markovian Models.	T-2, pg-20-24	BB/PPT
52	M/M/1, Infinite Capacity	T-2, pg-53-66	BB/PPT
53	M/M/1, Finite Capacity	T-2, pg-53-66	BB/PPT
54	Problem solving session	Work sheet	BB/PPT
55	M/M/c, finite Capacity	T-2, pg-53-66	BB/PPT
56	Problem solving session	Worksheet	BB/PPT
57	Queue with finite waiting	T-2, pg-53-66	BB/PPT
58	Non Markovian queues	T-2, pg-219-253	BB/PPT
59	M/G/1 queue	T-2, pg-219-253	BB/PPT
60	Problem solving session	Work sheet	BB/PPT
	FAT III		
Content beyond syllabus covered (if any): Application of queuing models in real life problem			

* Session duration: 50 mins

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Course Outcome 1: Extend and formalize the knowledge of probability theory and random variables.
Course Outcome 2: Describe commonly used univariate discrete and continuous probability distributions and apply various distributions to solve real world problems.
Course Outcome 3: Identify various distribution functions and acquire skills in handling situations involving more than one variable.
Course Outcome 4: Analyse various classifications of Random Processes and characterize phenomena which evolve with respect to time in a probabilistic manner.
Course Outcome 5: Understand the basic characteristic features of a queuing system and acquire skills in analyzing queuing models.

Mapping CO – PO:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	3	2									2		
CO2	3	3	2									2		
CO3	3	3	2	2								2		
CO4	3	3	2	2								2		
CO5	3	3	2	2	2							2		

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.

REFERENCES:

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

	Prepared by	Approved by
Signature		
Name	Dr.R.UMADEVI	Dr. R. MUTHUCUMARASWAMY
Designation	Assistant Professor	Professor & Head
Date	29.01.2024	29.01.2024

Remarks *: This lesson plan could be followed for IV Sem Computer science Engineering Branches.

Remarks *: CO – PO mapping has to be modified according to CSE Department POs.

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD