DHANALAKSHMI SRINIVASAN ENGINEERING COLLEGE
(AUTONOMOUS)
(Approved by AICTE & Affiliated to Anna University, Chennai)
Re-Accredited with 'A' Grade by NAAC, Accredited by TCS
Accredited by NBA – BME, ECE & EEE
PERAMBALUR - 621 212. Tamil Nadu.
website : www.dsengg.ac.in

COURSE PLAN

Name of the Faculty				
Designation/Department	ASSISTANT PROFESSOR/ MATHEMATICS			
Course Code/Name	U23MAT34/RANDOM PROCESS AND LINEAR ALGEBRA			
Year/Section/Department	II/A&C/ECE			
Credits Details	L: 3	T: 1	P: 0	C: 4
Total Contact Hours Required	60			

Syllabus:

UNIT I/PROBABILITY AND RANDOM VARIABLES	**12**
Axioms of probability – Conditional probability – Baye's theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions - Functions of a random variable	
UNIT II /TWO - DIMENSIONAL RANDOM VARIABLES	**12**
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).	
UNIT III/ RANDOM PROCESSES	**12**
Classification – Stationary process – Markov process - Poisson process - Discrete parameter Markov chain – Chapman Kolmogorov equations (Statement only) -Limiting distributions.	
UNIT IV/ VECTOR SPACES	**12**
Vector spaces – Subspaces – Linear combinations and linear system of equations – Linear independence and linear dependence – Bases and dimensions.	
UNIT V/ LINEAR TRANSFORMATION AND INNER PRODUCT SPACES	**12**
Linear transformation - Null spaces and ranges - Dimension theorem - Matrix representation of a linear transformations - Inner product - Norms - Gram Schmidt orthogonalization process - Adjoint of linear operations – Least square approximation.	

Objective:

The main learning objective of this course is to prepare the students for:
CO 1: To understand the basic concepts of probability, one and two Dimensional random variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon.
CO 2: To introduce the basic concepts of two dimensional random variables
CO 3: To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems in communication engineering.
CO 4: To introduce the basic notions of vector spaces which will then be used to solve related problems
CO 5: To introduce the basic concept of linear transformation, inner product space and orthogonalization.
CO6 **:** To introduce the Least sqaure approximation method allow the analyst to determine the way of fitting a curve of a chart of data points.

Text Book:

T1: Gross,D., Shortle, J.F, Thompson ,J.M and Harris. C.M., "Fundamentals of Queueing Theory", Wiley Student 4th Edition , 2014.
T2: Ibe, O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier ,1 st Indian Reprint, 2007.
T3: Friedberg. A.H., Insel. A.J. and Spence. L., "Linear Algebra", Prentice Hall of India, New Delhi , 4th Edition , 2004.

Reference Book:

R1: Hsu, "Schaum's Outline of Theory and Problems of Probability , Random Variables and Random Processes" , Tata McGraw Hill Edition, New Delhi , 2004.
R2: Yates, R.D. and Goodman. D.J., "Probability and Stochastic Processes", 2nd Edition , Wiley India Pvt. Ltd., Bangalore, 2012.
R3: Kolman. B. Hill. D.R., "Introductory Linear Algebra" , Pearson Education , New Delhi , First Reprint, 2009.
R4: Kumaresan. S., "Linear Algebra – A Geometric Approach", Prentice – Hall of India, New Delhi, Reprint, 2010.
R5: Strang. G., "Linear Algebra and its applications", Thomson (Brooks/Cole), New Delhi , 2005.

Website:

W1:https://www.slideshare.net/slideshow/ma3355random-processes-and-linear-algebra739353433ecema3355rpla-question-bankpdf/264848810
W2: https://www.stuffsector.org/2023/01/blog-post_08.html
W3: https://www.poriyaan.in/paper/random-process-and-linear-algebra-41/
W4: https://www.gbalajipublishers.com/product/random-processes-and-linear-algebra/

Online Mode of Study:

W1: https://youtu.be/qvu2j8PGaEo?si=rBsFO_HVsjsj7mcY
W2: https://youtu.be/Ja_88DojhP8?si=cHmn0fX4kPtWO66_
W3: https://youtu.be/C4h8slIY87s?si=5K5BuKfQk8LpCDCj
W4: https://youtu.be/1XlT3Y2oyAU?si=ttlGj0w8Fbw2Q05o
W5: https://youtu.be/93hQGeeVh8M?si=6YKk9oiVvaYjsG9h

Course Plan:

Topic Number	Topic	Reference Detail	Page Number	Mode of teaching	Number of Periods Required	Cumulative Period
UNIT I - PROBABILITY AND RANDOM VARIABLES						
1	Introduction to random variable	T1	59-61	BB	1	1
2	Probability Mass Function and Probability Density Function	T1	62-75	BB	2	3
3	Moments	T1	85-87	BB	1	4
4	Problem based on MGF	T1	88-101	BB	1	5
5	Binomial distribution	W1	-	BB	1	6
6	Poisson distribution	T1	130-132	BB	1	7
7	Geometric distribution	T1	116-120	BB	1	8
8	Uniform distribution	T1	141-143	BB	1	9
9	Exponential distribution	T1	133-136	BB	1	10
10	Gamma distribution	T1	126-128	BB	1	11
11	Normal distribution	T1	144-147	BB	1	12

Outcome of Unit I:

At the end of the Unit, Students should be able to

CO1: Understand the fundamental concepts of probability with a thorough knowledge of standard distributions that can describe certain real-life phenomenon.

UNIT II - TWO DIMENSIONAL RANDOM VARIABLES						
12	Joint distribution and Marginal distribution	T1	167-173	BB	2	14
13	Conditional distribution	T1	178-182	BB	1	15
14	Problem based on marginal and conditional distribution	T1	173-175	BB	2	17
15	Covariance	T1	184-185	BB	1	18
16	Properties , problems on correlation	W2	-	BB	2	20
17	Linear regression-properties	R1	418-422	BB	2	22
18	Transformation of random variables	T1	197-215	BB	1	23
19	Problems on transformation of random variable	T1	197-215	BB	1	24
Outcome of Unit II: **At the end of the unit, students should be able to** **CO2:** Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.						
UNIT III - RANDOM PROCESSES						
23	Introduction, classification	T1	267-273	BB	1	25
24	Stationary process-wide sense stationary	TI	275-278	BB	1	26
25	Strict sense stationary	T1	278-282	BB	1	27
26	Markov process	R3	309-316	BB	3	30
27	Markov chain	W3	-	BB	1	31
28	Problem based on	TI	364-368	BB	2	33

	markov process					
29	Transition probabilities	T1	369-376	BB	2	35
30	Poisson process-problem	TI	342-356	BB	1	36
31	Introduction, classification	T1	267-273	BB	1	37
Outcome of Unit III: **At the end of the unit, students should be able to** **CO3:** Apply the concept of random processes in engineering disciplines.						
UNIT IV – VECTOR SPACES						
32	Vector spaces	T1	4.1-4.24	BB	1	38
33	Subspaces	T1	4.25-4.50	BB	1	39
34	Linear combinations and system of linear equations	T1	4.51-4.63	BB	2	41
35	Linear dependence	T1	4.64-4.77	BB	1	42
36	linear independence	T1	4.77-4.85	BB	1	43
37	Bases and Dimension	T1	4.85-4.105	BB	1	44
38	Finite dimensional vector space	T1	4.105-4.112	BB	1	45
39	Lagrange interpolation formula	T1	4.113-4.14	BB	1	46
Outcome of Unit IV: **At the end of the unit, students should be able to** **CO4:** Understand the concept of Vector spaces, subspaces, bases and dimensions.						
UNIT V – LINEAR TRANSFORMATION AND INNER PRODUCT SPACE						
40	Linear transformation null spaces and ranges	T1	5.1-5.62	BB	3	49
41	The matrix representation of a	T1	5.63-5.85	BB	2	51

	linear transformation					
42	Inner product space	T1	5.86-5.121	BB	2	53
43	The Gram-Schmidt orthogonalization process and orthogonal complements	T1	5.121-5.131	BB	2	55
44	Inner product space-matrices	T1	5.132-5.172	BB	4	59
45	The adjoint of a linear operator	T1	5.172-5.196	BB	1	60

Outcome of Unit V:
At the end of the unit, students should be able to

CO5: Understand the relationship between a linear transformation and its matrix representation.

CO6: Understand Least sqaure approximation method allow the analyst to determine the way of fitting a curve of a chart of data points.

Course Outcome:

At the end of course: Students should be able to do:

CO1: Understand the fundamental concepts of probability with a thorough knowledge of standard distributions that can describe certain real-life phenomenon.

CO2: Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.

CO3: Apply the concept of random processes in engineering disciplines.

CO4: Understand the concept of Vector spaces, subspaces, bases and dimensions.

CO5: Understand the relationship between a linear transformation and its matrix representation.

CO6: Understand Least square approximation method allow the analyst to determine the way of fitting a curve of a chart of data points.

Course Outcome Vs Program Outcome Mapping:

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	0	0	0	0	0	0	3	0	0	2	0	0
CO2	3	3	0	0	0	0	0	0	3	0	0	2	0	0
CO3	3	3	0	0	0	0	0	0	3	0	0	2	0	0
CO4	3	3	0	0	0	0	0	0	3	0	0	2	0	0
CO5	3	3	0	0	0	0	0	0	3	0	0	2	0	0
CO6	3	3	0	0	0	0	0	0	3	0	0	2	0	0
AVG	3	3	0	0	0	0	0	0	3	0	0	2	0	0

Content beyond Syllabus:

- Identify and set up relevant random experiments to apply tail inequalities.
- Comprehend and use the properties of random process in real world situations.
- Define and apply various concepts of probability theory.
- Use linear algebraic methods to perform computational tasks.
- Be able to identify and comprehend linear algebraic structures that appear in various areas of computer science.

Internal Evaluation Components:

Webportal	Assignment	Components	Topic Number with Topic / Unit Details	Relevance to CO
Webportal 1	**--**	**Assessment – I (60)**	**Unit I and II**	**CO 1 & CO2**
	1	**Assignment – Handwritten (20)**	1.Binomial distributions 2.Poisson distributions 3.Exponential distributions	**CO 1**
	2	**Assignment – Poster Presentation / PPT (20)**	1.Correlation co-efficients 2.Regression lines 3.Poisson distribution	**CO 2**
Webportal 2	**--**	**Assessment – II (60)**	**Unit III and IV**	**CO3 & CO4**
	3	**Seminar (20)**	1.Strictly sense stationary 2.Wide sense stationary	**CO3**
	4	**Case Study Report (20)**	1.Vector spaces 2.Subspaces	**CO4**
Webportal	**--**	**Model Exam (75)**	**Unit I to V**	**CO1 to**

3				**CO6**
	5	**MCQ (15)**	**Unit I to V**	**CO1 to CO6**
	-	**Course Attendance (10)**		

Submission Details:

Phase 1(Before AT 1)		**Phase 2 (Before AT 2)**		**Phase 3 (Model)**
Assignment 1	**Assignment 2**	**Assignment 3**	**Assignment 4**	**Assignment 5**

Google Class Code Details:

Class Name: ECE A (zsbetde) &

Class Name: ECE B (t2wdtzw)

PLAN OF ASSESSMENT TEST –DISTRIBUTION OF MARKS:

TEST	**CO- MARK WISE DISTRIBUTION**						**BLOOM'S LEVEL MARK WISE DISTRIBUTION**					
AT-1	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**	**BTL1**	**BTL2**	**BTL3**	**BTL4**	**BTL5**	**BTL6**
			-	-	-	-			-	-	-	-
AT-2	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**	**BTL1**	**BTL2**	**BTL3**	**BTL4**	**BTL5**	**BTL6**
	-	-			-	-						
MODEL	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**	**BTL1**	**BTL2**	**BTL3**	**BTL4**	**BTL5**	**BTL6**

Prepared By **Verified By**

Approved By
(PRINCIPAL)