B.E./B.Tech. DEGREE EXAMINATIONS

Nov/Dec 2025 – Expected Question Paper

EC3452 – ELECTROMAGNETIC FIELDS

Regulation 2021

PART A – (10 × 2 = 20 Marks)

1. Define the curl of a vector field.

2. State and explain the divergence theorem.

3. State Coulomb's law.

4. Define electric potential.

5. State the principle of Ampere's law.

6. Define magnetic field intensity.

7. What is displacement current?

8. Define time-harmonic fields.

9. What is phase velocity of EM waves?

10. Define skin depth.

PART B – (5 × 13 = 65 Marks)

11. (a) Apply Gauss law to derive the electric field due to a uniformly charged sphere.
OR
(b) Convert the given vector from cylindrical to Cartesian coordinates.

12. (a) Determine electric flux crossing a given surface from D-field.
OR
(b) Solve Poisson/Laplace equation for the given potential region.

13. (a) Derive the magnetic field inside and outside a solid conductor carrying current density.
OR
(b) Find magnetic field due to a current-carrying wire at a given point.

14. (a) Derive Maxwell’s equations for static and time-varying fields.
OR
(b) Derive the EM wave equation in free space.

15. (a) Explain and derive Poynting theorem.
OR
(b) Derive phase constant, intrinsic impedance, and phase velocity.

PART C – (1 × 15 = 15 Marks)

16. (a) Using Biot–Savart law, derive the magnetic field at the centre of a circular loop carrying current.
OR
(b) Derive reflection and transmission coefficient for normal incidence at dielectric boundary.

TATA STRIVE | Right Skills Bright Future

TATA COMMUNICATIONS

Microsoft

CERTIFICATE

OF COMPLETION

AWARDED TO

Mr SAYYED RASSHEEDS

For successfully completing a 40-hour course in Cybersecurity for Beginners.

Unique ID : 235823-27180136-124

Date : 31 Oct 2024

Ameya Vanjari
Chief Operating Officer, Tata STRIVE

VELAMMAL COLLEGE OF ENGINEERING & TECHNOLOGY, MADURAI-625 009
(AUTONOMOUS)
DEPARTMENT OF MATHEMATICS
2025-2026 EVEN SEMESTER

COURSE PLAN

Degree & Branch	**B.E.**
Course Code-Title	**21MA206- PROBABILITY AND RANDOM PROCESSES**
Batch	**2024-2028**
Year/Semester/section	**II/ IV / A**
Course Component	**Inter Disciplinary**
Name of the Instructor	**Mr. K. Pitchaimani**

ion	Topic to be covered	Text / Reference Book Page No.	Mode of Delivery	Teaching Aid	No. of periods	Cumulative No. of periods
	UNIT I - PROBABILITY					
1.	Introduction		L+I	BB	1	1
2.	Axioms of Probability	T1 58-64	L+I	BB	1	2
3.	Conditional Probabilities,	T1 76-80	L+D+I	BB	1	3
4.	Total Probability , Baye's theorem	T1 80-82	L+D+ I	BB	2	5
5.	Random variables, Probability mass function Probability density function, Properties	T1 96-107 T1 142-144	L+D+ I	BB	2	7
6.	Moments, MGF and properties	T2 81-83	L+D+ I	BB	2	9
7.	Tutorial		T	-	3	12
	UNIT II – STANDARD DISTRIBUTIONS					
8.	Introduction		L+I		1	13
9.	Binomial and Poisson Distributions	T1 117-134	L+ I	BB	2	15
10.	Geometric and Uniform Distributions	T1 144-146	L+ I	BB	2	17
11.	Exponential and Gamma Distributions	T1 170-174	L+ I	BB	2	19
12.	Normal Distribution	T1 156-163	L+D+ I	BB	1	20
13.	Functions of a random variable	R1 3.1-3.3	L+D+ I	BB	1	21
14.	Tutorial		T	BB	3	24
	UNIT III - TWO DIMENSIONAL RANDOM VARIABLES					
15.	Introduction		L+ I	BB	1	25
16.	Joint Distributions-Marginal and Conditional Distributions	T1 199-212	L + I	BB	2	27
17.	Covariance and Correlation	T1 214-220	L+ I	BB	1	28
18.	Linear Regression	T1 488-490	L+ I	BB	2	30
19.	Transformations Of Random Variables	R1 3.3-3.5	L+ D+I	BB	1	31
20.	Central limit theorem(without proof)	T1 232	L+ D+I	BB	2	33

21.	Tutorial		T	BB	1
	UNIT IV - CLASSIFICATION OF RANDOM PROCESSES				
22.	Introduction	T2 179-181	L-I	BB	1
23.	Definition and examples		L-I	BB	1
24.	first order-second order-strictly stationary-wide sense stationary processes	T2 182-188	L-I-D	BB	2
25.	Ergodic processes	T2 189-192	L-I	BB	1
26.	Markov process	R1 7.45	L-I	BB	1
27.	Poisson and Normal processes	T2 201-206	L-I	BB	2
28.	Sine wave process	R1 7.14-7.16	L-D-I	BB	1
29.	Tutorial		T	BB	1
	UNIT V - CORRELATION AND SPECTRAL DENSITIES				
30.	Introduction		L-I-D	BB	1
31.	Auto correlation functions , Cross correlation functions , Properties	T2 194-197	L-I	BB	1
32.	Power spectral density , Cross spectral density , Properties	T2 230-234	L-I-D	BB	1
33.	Wiener – Khintchine relation, Relationship between cross power spectrum and cross correlation function	T2 234-236	L-I	BB	1
34.	Linear time invariant system, System transfer function , Linear systems with random inputs	R3 7.4-7.6	L-I	BB	2
35.	Auto correlation and cross correlation functions of input and output.	R3 7.8-7.9	L-D-I		2
36.	Tutorial		T	BB	1

Text Book:

T1.JAY.L. Devore, "Probability and Statistics for Engineering and the Science", 8th Edition, Cengage Learning India

T2. Peebles, P.Z., "Probability, Random Variables and Random Signal Principles ", 4th Edition, Tata McGraw Hill, New Delhi, 2012.

T3.Cooper. G.R., Mc Gillem. C.D., "Probabilistic Methods of Signal and System Analysis", 3rd Indian Edition, Oxford

Reference Book:

R1. Miller. S.L. and Childers. D.G., —Probability and Random Processes with Applications to Signal Processing and

2nd Edition, Academic Press, 2004.

R2.Sheldon M.Ross, "Introduction to Probability Models", 11th edition, Academic Press, 2014

R3.Yates. R.D. and Goodman. D.J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore

R4. Veerarajan T, "Probability, Statistics and Random Processes with queueing theory and queueing networks", 4th Edition, Tata McGraw Hill, 2002.

11/12/2017

Course In-Charge

11/12/2017

Course Coordinator

Module Coordinator

Velammal College of Engineering and Technology (Autonomous)
Madurai – 625 009

Department of Mathematics

rse Code-Title	21MA206 - PROBABILITY AND RANDOM PROCESSES (*ECE*)	L	T	P	C
		3	1	0	4

urse Objective	• To explain the basic concepts in probability and random variables. • To discuss the basics of random variables with emphasis on the standard discrete and continuous distributions. • To make use of the basic concepts of two dimensional random variables. • To use the basic concepts of random processes in engineering disciplines • To explain the concept of correlation and spectral densities.
urse Outcomes	At the end of the course, learners will be able to CO1: Identify the basic concepts of Probability and Random variables. CO2: Experiment the performance of random variables in terms of distributions. CO3: Calculate the correlation and regression of two dimensional random variables. CO4: Make use of random processes concept in engineering disciplines CO5: Apply the concept of correlation and spectral densities and the significance of linear systems with random inputs.

NIT I	PROBABILITY AND RANDOM VARIABLES	12

xioms of probability, Conditional probability, Total probability, Bayes theorem, Random ariables- Probability mass function- Probability density function-Properties-Moments- Moment enerating functions and their properties.

NIT II	STANDARD DISTRIBUTIONS	12

inomial -Poisson -Geometric – Uniform-Exponential –Gamma and Normal distributions and their roperties- Functions of a random variable.

NIT III	TWO DIMENSIONAL RANDOM VARIABLES	12

oint Distributions-Marginal And Conditional Distributions-Covariance-Correlation And Linear egression- Transformations Of Random Variables-Central limit theorem(without proof).

UNIT IV	CLASSIFICATION OF RANDOM PROCESSES	12

Definition and examples-first order-second order-strictly stationary-wide sense stationary and Ergodic processes-Markov process-Poisson and Normal processes-Sine wave process.

UNIT V	CORRELATION AND SPECTRAL DENSITIES	12

Auto correlation functions – Cross correlation functions – Properties – Power spectral density – Cross spectral density – Properties-Wiener – Khintchine relation- Relationship between cross power spectrum and cross correlation function- Linear time invariant system – System transfer function – Linear systems with random inputs – Auto correlation and cross correlation functions of input and output.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. JAY.L. Devore, "Probability and Statistics for Engineering and the Science", 8th Edition, Cengage Learning India Pvt. Ltd, 2012.
2. Peebles, P.Z., "Probability, Random Variables and Random Signal Principles ", 4th Edition, Tata McGraw Hill, 2002.
3. Cooper. G.R., Mc Gillem. C.D., "Probabilistic Methods of Signal and System Analysis", 3rd Indian Edition, Oxford University Press, New Delhi, 2012.

REFERENCES:

1. Miller. S.L. and Childers. D.G., —Probability and Random Processes with Applications to Signal Processing and Communications ", 2nd Edition, Academic Press, 2004.
2. Sheldon M.Ross, "Introduction to Probability Models". 11th edition, Academic Press, 2014
3. Yates. R.D. and Goodman. D.J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.

11/12/2023 11/12/2023 11/12/2023 11/12

Course In-charge Course Coordinator Module Coordinator HOD/Maths