Sri Indu Institute of Engineering & Technology

Recognized Under 2(f) of UGC Act 1956
Approved by AICTE, New Delhi
Affiliated to JNTUH, Hyderabad.

COURSE FILE

ON

PROBABILITY THEORY STOCHASTIC PROCESS

Course Code – EC305ES
II B.Tech I-SEMESTER

A.Y.: 2022-2023

Prepared by

Mr. T .NARESH
Assistant Professor

Head of the Department
Electronics and Communication Engg. Dept
SRI INDU INSTITUTE OF ENGG & TECH
Sheriguda(V), Ibrahimpatnam(M), R.R.Dist-501 510

PRINCIPAL
Sri Indu Institute of Engineering & Tech
Sheriguda(Vill), Ibrahimpatnam
R.R. Dist. Telangana-501 510.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Academic Year	2022-2023
Course Title	PROBABILITY THEORY AND STOCHASTIC PROCESS
Course Code	EC305ES
Programme	B.Tech
Year & Semester	II year I-semester
Branch & Section	ECE-A
Regulation	R18
Course Faculty	Mr. T.NARESH, Assistant Professor

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INSTITUTE VISION AND MISSION

Vision:

To become a premier institute of academic excellence by providing the world class education that transforms individuals into high intellectuals, by evolving them as empathetic and responsible citizens through continuous improvement.

Mission:

IM1: To offer outcome-based education and enhancement of technical and practical skills.

IM2: To Continuous assess of teaching-learning process through institute-industry collaboration.

IM3: To be a centre of excellence for innovative and emerging fields in technology development with state-of-art facilities to faculty and students' fraternity.

IM4: To Create an enterprising environment to ensure culture, ethics and social responsibility among the stakeholders.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DEPARTMENT VISION AND MISSION

Vision:

To become a recognized center in the field of Electronics and Communication Engineering by producing creative engineers with social responsibility and address ever-changing global challenges.

Mission:

DM1: To facilitate an academic environment that enables student's centric learning.

DM2: To provide state-of-the-art hardware and software technologies to meet industry requirements.

DM3: To continuously update the Academic and Research infrastructure.

DM4: To Conduct Technical Development Programs for overall professional caliber of Stake Holders.

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PROGRAM EDUCATIONAL OBJECTIVES

Program Educational objectives are to Promote:

PEO1: Graduates with a strong foundation in Electronics and Communication Engineering, Science and Technology to become successful in the chosen professional career.

PEO2: Graduates with ability to execute innovative ideas for Research and Development with continuous learning.

PEO3: Graduates inculcated with industry based soft-skills to enable employability.

PEO4: Graduates demonstrate with ability to work in interdisciplinary teams and ethical professional behavior.

PROGRAM SPECIFIC OUTCOMES

PSO 1: Design Skills: Design, analysis and development a economical system in the area of Embedded system & VLSI design.

PSO 2: Software Usage: Ability to investigate and solve the engineering problems using MATLAB, Keil and Xilinx.

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PROGRAM OUTCOMES

1. **ENGINEERING KNOWLEDGE**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **PROBLEM ANALYSIS**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **DESIGN/DEVELOPMENT OF SOLUTIONS**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **CONDUCT INVESTIGATIONS OF COMPLEX PROBLEMS**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **MODERN TOOL USAGE**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. **THE ENGINEER AND SOCIETY**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **ENVIRONMENT AND SUSTAINABILITY**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **ETHICS**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **INDIVIDUAL AND TEAM WORK**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **COMMUNICATION**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, give and receive clear instructions.

11. **PROJECT MANAGEMENT AND FINANCE**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **LIFE-LONG LEARNING**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABADB.Tech. in ELECTRONICS AND COMMUNICATION ENGINEERING COURSE STRUCTURE & SYLLABUS (R18)
Applicable From 2018-19 Admitted Batch

II YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	EC301PC	Electronic Devices and Circuits	3	1	0	4
2	EC302PC	Network Analysis and Transmission Lines	3	0	0	3
3	EC303PC	Digital System Design	3	1	0	4
4	EC304PC	Signals and Systems	3	1	0	4
5	EC305ES	Probability Theory and Stochastic Processes	3	0	0	3
6	EC306PC	Electronic Devices and Circuits Lab	0	0	2	1
7	EC307PC	Digital System Design Lab	0	0	2	1
8	EC308ES	Basic Simulation Lab	0	0	2	1
9	*MC309	Constitution of India	3	0	0	0
		Total Credits	**18**	**3**	**6**	**21**

II YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	MA401BS	Laplace Transforms, Numerical Methods & Complex Variables	3	1	0	4
2	EC402PC	Electromagnetic Fields and Waves	3	0	0	3
3	EC403PC	Analog and Digital Communications	3	1	0	4
4	EC404PC	Linear IC Applications	3	0	0	3
5	EC405PC	Electronic Circuit Analysis	3	0	0	3
6	EC406PC	Analog and Digital Communications Lab	0	0	3	1.5
7	EC407PC	IC Applications Lab	0	0	3	1.5
8	EC408PC	Electronic Circuit Analysis Lab	0	0	2	1
9	*MC409	Gender Sensitization Lab	0	0	2	0
		Total Credits	**15**	**2**	**10**	**21**

***MC – Satisfactory/Unsatisfactory**

EC305ES: PROBABILITY THEORY AND STOCHASTIC PROCESSES

B.Tech. II Year I Sem.

L	T	P	C
3	0	0	3

Pre-requisite: Nil

Course Objectives:

- This gives basic understanding of random signals and processes sing
- Utilization of Random signals and systems in Communications and Signal Processing areas.
- To know the Spectral and temporal characteristics of Random Process.
- To Learn the Basic concepts of Noise sources

Course Outcomes: Upon completing this course, the student will be able to

- Understand the concepts of Random Process and its Characteristics.
- Understand the response of linear time Invariant system for a Random Processes.
- Determine the Spectral and temporal characteristics of Random Signals.
- Understand the concepts of Noise in Communication systems.

UNIT - I

Probability & Random Variable: Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Joint Probability, Conditional Probability, Total Probability, Bay's Theorem, Independent Events, *Random Variable*- Definition, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Methods of defining Conditioning Event, Conditional Distribution, Conditional Density and their Properties.

UNIT - II

Operations on Single & Multiple Random Variables – Expectations: Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic and Non-monotonic Transformations of Continuous Random Variable, Transformation of a Discrete Random Variable.

Vector Random Variables, Joint Distribution Function and its Properties, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence.

Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, (Proof not expected). Unequal Distribution, Equal Distributions. Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT - III

Random Processes – Temporal Characteristics: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second- Order and Wide-Sense Stationarity, (N-Order) and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and Its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process. Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output.

UNIT - IV

Random Processes – Spectral Characteristics: The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function. Spectral

Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output.

UNIT - V

Noise Sources & Information Theory: Resistive/Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Average Noise Figure of cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise & its properties. Entropy, Information rate, Source coding: Huffman coding, Shannon Fano coding, Mutual information, Channel capacity of discrete channel, Shannon-Hartley law; Trade -off between bandwidth and SNR.

TEXT BOOKS:

1. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH, 4th Edition, 2001.
2. Principles of Communication systems by Taub and Schilling (TMH),2008

REFERENCE BOOKS:

1. Random Processes for Engineers-Bruce Hajck, Cambridge unipress,2015
2. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis and S. Unnikrishna Pillai, PHI, 4th Edition, 2002.
3. Probability, Statistics & Random Processes-K. Murugesan, P. Guruswamy, Anuradha Agencies, 3rd Edition, 2003.
4. Signals, Systems & Communications - B.P. Lathi, B.S. Publications, 2003.
5. Statistical Theory of Communication – S.P Eugene Xavier, New Age Publications, 2003

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CO'S AND CO PO MAPPING

Course: Probability Theory and Stochastic Processes (C215) **Class: II ECE-A**

Course Outcomes

After completing this course, the student will be able to:

C215.1: Attain the knowledge of Probability theory and random variables (Knowledge)

C215.2: Explain the Vector Random variables and joint distribution function (Comprehension)

C215.3: Understand the response of linear time Invariant system for a Random Processes.(Knowledge)

C215.4: Analyze the random variable and random process, its properties. (Analysis)

C215.5: Determine the Spectral and temporal characteristics of Random Signals. (Knowledge)

C215.6: Analyze the concepts of Noise in Communication systems. (Analysis)

Mapping of course outcomes with program outcomes:

High -3 Medium -2 Low-1

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C215.1	3	-	-	2	1	-	-	-	-	2	-	-	-	-
C215.2	-	2	3	-	-	1	-	-	-	3	-	3	-	-
C215.3	3	-	-	2	1	-	-	-	-	-	2	-	-	3
C215.4	2	3	-	1	-	-	-	-	-	-	-	-	-	2
C215.5	3	-	-	2	1	-	-	-	-	-	-	2	-	3
C215.6	2	3	-	1	-	-	-	-	-	-	3	-	-	-
C215	**2.6**	**2.6**	**3**	**1.6**	**1**	**1**	-	-	-	**2.5**	**2.5**	**2.5**	-	**2.6**

Course: Probability Theory and Stochastic Processes (C215) Class: II ECE-A

P01.ENGINEERING KNOWLEDGE: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

P02.PROBLEM ANALYSIS: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

P03. **DESIGN/DEVELOPMENT OF SOLUTIONS**: Design solutions for complex engineering problems and design system components or processes that meet t h e specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. CONDUCT INVESTIGATIONS OF COMPLEX PROBLEMS: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. MODERN TOOL USAGE: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6. THE ENGINEER AND SOCIETY: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO10. COMMUNICATION: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effectivereports and design documentation, make effective presentations, give and receive clear instructions.

PO11. PROJECT MANAGEMENT AND FINANCE: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. LIFE-LONG LEARNING: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PSO2: SOFTWARE USAGE: Ability to investigate and solve the engineering problems using MATLAB, Keil and Xilinx.

CO-PO mapping Justification

C215.1: Attain the knowledge of Probability theory and random variables (Knowledge)

	Justification
PO1	By applying the knowledge of probability theory and random variables, engineers can enhance their problem-solving capabilities, make more informed decisions, and design systems that are robust in the face of uncertainty.
PO4	A solid understanding of Probability theory and random variables is crucial for conducting investigations of complex problems. It provides the necessary tools and methodologies to design experiments.
PO5	By providing a robust framework for prediction, modeling, decision-making under uncertainty, reliability analysis, simulation, and statistical inference. These tools empower engineers to navigate the complexities of modern systems and make informed decisions within the limitations of the systems they are working on.
PO10	By providing a structured and precise way to express uncertainties, articulate risks, facilitate interdisciplinary communication, and present data-driven insights. Engineers equipped with a solid understanding of probability can communicate complex information more clearly and transparently to both the engineering community and society at large.

C215.2: Explain the Vector Random variables and joint distribution function (Comprehension)

	Justification
PO2	The use of vector random variables and joint distribution functions enhances problem analysis capabilities in engineering by providing a sophisticated framework to model, analyze, and draw substantiated conclusions about complex systems.
PO3	the use of vector random variables and joint distribution functions enhances the design and development of solutions in engineering by providing a systematic way to model and analyze complex systems with multiple interrelated variables
PO6	By incorporating probabilistic models, engineers can make informed decisions that demonstrate a sense of responsibility and consideration for the broader societal context in which their professional practice occurs.
PO10	a structured and transparent approach to conveying the complexities of interconnected variables and uncertainties. This enhances the effectiveness of communication in reports, design documentation, presentations, and instructions, ensuring that the engineering community and society at large can comprehend and engage with complex engineering activities more effectively.
PO12	By continually exploring and mastering advanced analytical tools, engineers can stay adaptable, enhance their problem-solving skills, and effectively address the evolving challenges in the broad context of technological change.

C215.3: Understand the response of linear time Invariant system for a Random Processes.(Knowledge)

	Justification
PO1	Applying the principles of linearity and time invariance to analyze the response of an LTI system to a random process involves using mathematical and scientific knowledge.
PO4	Engineers conduct thorough investigations to provide valid conclusions about the complex problem at hand, contributing to the advancement of knowledge in the field of systems and signal processing.

PO5	These tools are indispensable for predicting and modeling the behavior of complex systems, and engineers must be mindful of their limitations to ensure accurate and reliable results in the analysis of random processes within LTI systems.
PO11	The knowledge of the response of LTI systems to random processes contributes to effective project management and financial decision-making by applying engineering and management principles.
PSO2	Understanding the response of LTI systems to random processes aligns with PSO2 - Software Usage by highlighting the ability to use MATLAB for investigating and solving engineering problems related to randomness.

C215.4: Analyze the random variable and random process, its properties. (Analysis)

	Justification
PO1	The analysis of random variables and processes in engineering involves the application of mathematical, scientific, and engineering knowledge.
PO2	The analysis of random variables and processes in engineering aligns with P02 - Problem Analysis by requiring engineers to identify, formulate, and analyze complex problems related to randomness.
PO4	The analysis of random variables and processes aligns with by emphasizing the use of research-based knowledge and research methods, including the design of experiments, analysis and interpretation of data, and synthesis of information.
PSO2	These software tools provide engineers with a comprehensive set of capabilities for statistical analysis, mathematical modeling, and simulation of systems affected by random variables and processes.

C215.5: Determine the Spectral and temporal characteristics of Random Signals. (Knowledge)

	Justification
PO1	This process involves predicting and modeling signal behavior while maintaining an understanding of the limitations associated with the tools employed. Overall, the use of modern tools enhances the efficiency and accuracy of analyzing complex engineering activities related to random signals.
PO4	The determination of spectral and temporal characteristics of random signals aligns with by emphasizing the use of research-based knowledge and research methods, including the design of experiments, analysis and interpretation of data, and synthesis of information
PO5	The determination of spectral and temporal characteristics of random signals aligns with by highlighting the creation, selection, and application of appropriate techniques using modern engineering and IT tools.
PO12	Engineers in this field recognize the necessity of staying informed, prepared for independent exploration, and engaged in life-long learning to effectively contribute to the evolving landscape of signal processing.
PSO2	Determining the spectral and temporal characteristics of random signals aligns with Software Usage by emphasizing the ability to use MATLAB for efficient investigation and solution of engineering problems related to random signals

C215.6: Analyze the concepts of Noise in Communication systems. (Analysis)

	Justification
PO1	Engineers leverage this knowledge to comprehend, model, and address the challenges posed by noise, ultimately contributing to the effective design and operation of communication systems in real-world, noisy environments.
PO2	By emphasizing the comprehensive process of identifying, formulating, researching literature, and analyzing complex engineering problems related to noise.
PO4	The use of research methods, design of experiments, analysis and interpretation of data, and synthesis of information collectively contribute to conducting thorough investigations into the complexities posed by noise in communication systems.
PO11	Analyzing the concepts of noise in communication systems aligns with Project Management and Finance by emphasizing the application of engineering principles, management strategies, and leadership skills in addressing noise-related challenges within the context of communication projects.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

ACADEMIC CALENDAR 2022-23

B. Tech./B.Pharm. II YEAR I & II SEMESTERS

I SEM

S. No	Description	Duration	
		From	To
1	Commencement of I Semester classwork	**28.11.2022**	
2	1st Spell of Instructions	28.11.2022	21.01.2023 (8 Weeks)
3	First Mid Term Examinations	23.01.2023	30.01.2023 (1 Week)
4	Submission of First Mid Term Exam Marks to the University on or before	04.02.2023	
5	2nd Spell of Instructions	31.01.2023	29.03.2023 (8 Weeks)
6	Second Mid Term Examinations	31.03.2023	08.04.2023 (1 Week)
7	Preparation Holidays and Practical Examinations	10.04.2023	15.04.2023 (1 Week)
8	Submission of Second Mid Term Exam Marks to the University on or before	15.04.2023	
9	End Semester Examinations	17.04.2023	29.04.2023 (2 Weeks)

Note: No. of Working / Instructional Days: 93

II SEM

S. No	Description	Duration	
		From	To
1	Commencement of II Semester classwork	**01.05.2023**	
2	1st Spell of Instructions (including Summer Vacation)	01.05.2023	08.07.2023 (10 Weeks)
3	**Summer Vacation**	15.05.2023	27.05.2023 (2 Weeks)
4	First Mid Term Examinations	10.07.2023	15.07.2023 (1 Week)
5	Submission of First Mid Term Exam Marks to the University on or before	22.07.2023	
6	2nd Spell of Instructions	18.07.2023	11.09.2023 (8 Weeks)
7	Second Mid Term Examinations	12.09.2023	16.09.2023 (1 Week)
8	Preparation Holidays and Practical Examinations	19.09.2023	23.09.2023 (1 Week)
9	Submission of Second Mid Term Exam Marks to the University on or before	23.09.2023	
10	End Semester Examinations	25.09.2023	07.10.2023 (2 Weeks)

Note: No. of Working / Instructional Days: 92

24/11/22

REGISTRAR

SRI INDU INSTITUTE OF ENGINEERING AND TECHNOLOGY

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https://siiet.ac.in/

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Class Timetable

CLASS: II-B.Tech ECE-A **A.Y:2022-23** **SEMESTER: I** **LH: C-101**

TIME/ DAY	I 9:40-10:30	II 10:30 -11:20	III 11:20-12:10	IV 12:10-1:00	1:00-1:30	V 1:30-2:20	VI 2:20-3:10	VII 3:10-4:00
MON	EDC	COI	EDC LAB / DSD LAB		LUNCH	DSD	NATL	SPORTS
TUE	PTSP	NATL	DSD	COI		EDC	SS	DSD(T)/SS(T)
WED	SS	PTSP	DSD LAB / BS LAB			DSD	SS(T)/EDC(T)	EDC
THU	NATL	PTSP	COI	EDC(T)/DSD(T)		SS	DSD	COUN
FRI	SS	EDC	COI	PTSP		LIB	CO-CU/DAA	
SAT	EDC	DSD	SS	NATL		PTSP	BS LAB / EDC LAB	

*(T) – Tutorial Concern Faculty

Course Code	Course Name	Name of the Faculty	Course Code	Course Name	Name of the Faculty
EC301PC	EDC-Electronic Devices and Circuits	K.Rajender	EC306PC	**EDC LAB** - Electronic Devices and Circuits Lab	K.Rajender/B.Ashwini/M.Srilatha
EC302PC	NATL-Network Analysis and Transmission Lines	M.Nagaraju	EC307PC	**DSD LAB** - Digital System Design Lab	G.Anusha/T.Divya/P.Krishna Rao
EC303PC	DSD-Digital System Design	G.Anusha	EC308ES	**BS LAB** - Basic Simulation Lab	P.Rajendra/T.Naresh
EC304PC	SS-Signals and Systems	P.Rajendra	LIB	Library	B.Ashwini/Dr.K.Srinivasa Reddy
EC305ES	PTSP-Probability Theory and Stochastic Processes	T.Naresh	COUN	Counseling	K.Rajender/G.Anusha/G.Anitha
*MC309	COI-Constitution of India	S.Swapna	CO-CU/DAA	Co-Curricular/Dept.Assc.Act.	K.Rajender/T.Naresh/D.Aruna
			SPORTS	Sports	G.Anitha/P.Sumana

Class Incharge

Head of The Department

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LESSON PLAN

Programme: B. Tech	Academic Year: 2022-23
Year: II	Semester: I
Course Title:Probability Theory and Stochastic Processes	Course Code: EC305ES
Name of Faculty:T NARESH	Number of lectures per week:5

Unit-ISyllabus

Probability & Random Variable: Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Joint Probability, Conditional Probability, Total Probability, Bay's Theorem, Independent Events, Random Variable- Definition, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Methods of defining Conditioning Event, Conditional Distribution, Conditional Density and their Properties.

No. of Sessions Planned	Topics	Reference	Teaching Method/ Aids
1	Introduction to Probability & Random Variable	T1	Blackboard
2	Probability introduced through Sets and Relative Frequency	T2	Blackboard
3	Experiments and Sample Spaces	T2	Blackboard
4	Discrete and Continuous Sample Spaces	T1	Blackboard
5	Events	T2	Blackboard
6	Probability Definitions and Axioms	T2	Blackboard
7	Joint Probability	T1	Blackboard

8	Conditional Probability	T1	Blackboard
9	Total Probability	T1	Blackboard
10	Bay's Theorem	T2	Blackboard
11	Independent Events	T1	Blackboard
12	Introduction to Random Variable	T1	Blackboard
13	Conditions for a Function to be a Random Variable	T2	Blackboard
14	Discrete, Continuous and Mixed Random Variable	T2,W2	Blackboard
15	Distribution and Density functions	T1,W1	Blackboard
16	Properties, Binomial, Poisson	T2, W1	Blackboard
17	Uniform, Gaussian, Exponential	T2,W1	Blackboard
18	Rayleigh, Methods of defining Conditioning Event	T1,W1	Blackboard
19	Conditional Distribution	T2	Blackboard
20	Conditional Density and their Properties	T1	Blackboard

*Session Duration:50 minutes

*Total Number of Hours/Unit: 12

Course Title: PTSP	Course Code:EC305ES

Unit-II Syllabus

Operations On Single & Multiple Random Variables – Expectations: Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic and Non-monotonic Transformations of Continuous Random Variable, Transformation of a Discrete Random Variable. Vector Random Variables, Joint Distribution Function and its Properties, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence. Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, (Proof not expected). Unequal Distribution, Equal Distributions. Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables

No. of Sessions Planned	Topics	Reference	Teaching Method/ Aids
1	Operations On Single & Multiple Random Variables	T1, W2	Blackboard
2	Expectations: Expected Value of a Random Variable	T1,W1	Blackboard
3	Function of a Random Variable	T1	Blackboard
4	Variance and Skew	T1	Blackboard
5	Chebychev's Inequality	T1	Blackboard
6	Moment Generating Function	T1	Blackboard
7	Transformations of a Random Variable	T1	Blackboard
8	Monotonicand Non-monotonic Transformations of Continuous Random Variable	T1	Blackboard
9	Transformation of a Discrete Random Variable	T1	Blackboard
10	Vector Random Variables	T1	Blackboard
11	Joint Distribution Function and its Properties	T1	Blackboard
12	Marginal Distribution Functions	T1	Blackboard
13	Conditional Distribution and Density	T1, W1	Blackboard
14	Point Conditioning	T1	Blackboard
15	Conditional Distribution and Density	T1	Blackboard
16	Interval conditioning	T1	Blackboard
17	Statistical Independence	T1	Blackboard
18	Sum of Two Random Variables	T1	Blackboard
19	Sum of Several Random Variables	T1	Blackboard
20	Central Limit Theorem	T1	Blackboard
21	Unequal Distribution, Equal Distributions	T1, W1	Blackboard
22	Expected Value of a Function of Random	T1	Blackboard

	Variables		
23	Joint Moments about the Origin	T1	Blackboard
24	Joint Central Moments	T1	Blackboard
25	Joint Characteristic Functions	T1	Blackboard
26	Jointly Gaussian Random Variables	T1	Blackboard
27	Two Random Variables case	T1	Blackboard
28	N Random Variable case	T1	Blackboard
29	Transformations of Multiple Random Variables	T1	Blackboard
30	Linear Transformations of Gaussian Random Variables	T1	Blackboard

*Session Duration:50minutes

*Total Number of Hours/Unit: 15

Course Title: PTSP	Course Code: : EC305ES

Unit-III Syllabus

Random Processes – Temporal Characteristics: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second Order and Wide-Sense Stationarity, (N-Order) and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and Its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process. Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output.

No. of Sessions Planned	Topics	Reference	Teaching Method/ Aids
1	The Random Process Concept	T1	Blackboard
2	Classification of Processes	T1	Blackboard
3	Deterministic and Nondeterministic Processes	T1,W4	Blackboard
4	Distribution and Density Functions	T1	Blackboard
5	conceptofStationarityandStatisticaIndependence	T1	Blackboard
6	First-Order Stationary Processes	T1	Blackboard
7	SecondOrder and Wide-Sense Stationarity	T1	Blackboard
8	(N-Order) and Strict-Sense Stationarity	T1	Blackboard
9	Time Averages and Ergodicity	T1,W4	Blackboard
10	Mean-Ergodic Processes	T1,W4	Blackboard
11	Correlation-Ergodic Processes	T1	Blackboard
12	Autocorrelation Function and Its Properties	T1	Blackboard

13	Cross-Correlation Function and Its Properties,	T1	Blackboard
14	Covariance Functions	T1	Blackboard
15	Gaussian Random Processes	T1	Blackboard
16	Poisson Random Process	T1	Blackboard
17	System Response – Convolution	T1	Blackboard
18	Mean and Mean-squared Value of system response	T1	Blackboard
19	autocorrelation Function of Response	T1	Blackboard
20	Cross-Correlation Functions of Input and output	T1	Blackboard

*Session Duration:50minutes

*Total Number of Hours/Unit: 12

Course Title: PTSP	Course Code: : EC305ES

Unit-IV Syllabus

Random Processes – Spectral Characteristics: The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function. Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output.

No. of Sessions Planned	Topics	Reference	Teaching Method/ Aids
1	Spectral Characteristics	T1	Blackboard
2	The Power Spectrum: Properties	T1	Blackboard
3	Relationship between Power Spectrum and Autocorrelation Function	T1	Blackboard
4	The Cross-Power Density Spectrum, properties	T1	Blackboard
5	Relationship between Cross-Power Spectrum and Cross-Correlation Function	T1,W4	Blackboard
6	Spectral Characteristics of System Response	T1	Blackboard
7	Power Density Spectrum of Response	T1	Blackboard
8	Cross-Power Density Spectrums of Input and Output.	T1	Blackboard

*Session Duration:50minutes

*Total Number of Hours/Unit: 12

Course Title: PTSP	Course Code: EC305ES

Unit-V Syllabus

Noise Sources & Information Theory: Resistive/Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Average Noise Figure of cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise & its properties. Entropy, Information rate, Source coding: Huffman coding, Shannon Fano coding, Mutual information, Channel capacity of discrete channel, Shannon-Hartley law; Trade -off between bandwidth and SNR.

No. of Sessions Planned	Topics	Reference	Teaching Method/ Aids
1	Resistive/Thermal Noise Source	T1, W3	Blackboard
2	Arbitrary Noise sources	T1, W3	Blackboard
3	Effective Noise Temperature	T1	Blackboard
4	Noise equivalent bandwidth	T1	Blackboard
5	Average Noise Figures, Average Noise Figure of cascaded networks	T1	Blackboard
6	Narrow Band noise,	T1, W3	Blackboard
7	Quadrature representation of narrow band noise & its properties.	T1	Blackboard
8	Entropy, Information rate, Source coding	T1	Blackboard
9	Huffman coding, Shannon Fano coding,	T1,	Blackboard
10	Mutual information, Channel capacity of discrete channel	T1	Blackboard
11	Shannon-Hartley law; Trade -off between bandwidth and SNR.	T1	Blackboard

*Session Duration:50minutes

*Total Number of Hours/Unit: 10

T1:Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH, 4th Edition, 2001.

T2:Principles of Communication systems by Taub and Schilling (TMH),2008Digital Satellite Communications-Tri.T.Ha, 2nd Edition, 1990, Mc.Graw Hill.

Web References

W1: https://www.egwald.ca/statistics/samplemean.php

W2: http://www.egwald.ca/statistics/

W3: https://analog.intgckts.com/noise/thermal-noise-of-a-resistor/

W4: https://en.lntwww.de/Theory_of_Stochastic_Signals

Lecture notes

Unit 1 link:

https://drive.google.com/file/d/1nwCJIRKPBgtQSY_kLaCc4b4z-Ru3e0rS/view?usp=sharing

Unit 2 link:

https://drive.google.com/file/d/1O68MhL3-kgRnJ8gGehH3cyhBMx27oWZe/view?usp=sharing

Unit 3 link:

https://drive.google.com/file/d/16A9wKRe2umHyesR09B-kBIeEhBzntXtN/view?usp=sharing

Unit 4 link:

https://drive.google.com/file/d/1EAaJYBKfXCDuzWJ3KQBAHn72WOWhK_m1/view?usp=sharing

Unit 5 link:

https://drive.google.com/file/d/1jIH3nFrU3Gc9oNADa7OxSbkGctcBwQdK/view?usp=sharing

Power Point Presentation

PPT:

https://drive.google.com/file/d/1HwYG74Yc1Fepc6JbLQcw_s3WdbVcmX9T/view?usp=sharing

Code No: 123BT **R15**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, March - 2017
PROBABILITY THEORY AND STOCHASTIC PROCESSES
(Common to ECE, ETM)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART – A

(25 Marks)

1.a) Define Random variable. [2]
b) Write about the continuous and mixed random variables. [3]
c) Mention the difference between the Variance and Skew. [2]
d) Write about the Rayleigh density and distribution function. [3]
e) Explain the equal and unequal distributions. [2]
f) Write about linear transformations of Gaussian random variables. [3]
g) Mention the properties covariance. [2]
h) Show that $S_{xx}(\omega) = S_{xx}(-\omega)$. [3]
i) State wiener-Khinchin relation. [2]
j) Express the relationship between power spectrum and autocorrelation. [3]

PART - B

(50 Marks)

2.a) Discuss the mutually exclusive events with an example.
b) Define probability, set and sample spaces. [5+5]

OR

3. Write the classical and axiomatic definitions of Probability and for a three digit decimal number chosen at random, find the probability that exactly K digits are greater than and equal to 5, for $0< K < 3$. [10]

4.a) Obtain the relationship between probability and probability density function.
b) Find the moment generating function of the random variable whose moments are $m_r = (r + 1)!2^r$. [5+5]

OR

5.a) Write about Chebychev's inequality and mention about its characteristic function.
b) Determine the moment generating function about origin of the Poisson distribution. [5+5]

6.a) Differentiate between the marginal distribution functions, conditional distribution functions and densities.
b) Given the transformation y= cos x where x be a uniformly distributed random variable in the interval $(-\pi, \pi)$. Find $f_y(y)$ and E[y]. [5+5]

OR

7. Let X be a random variable defined, Find E [3X] and E[X^2] given the density function as

$$f_x(x) = \begin{cases} (\pi/16)\cos(\pi x/8), & -4 \le x \le 4 \\ 0, & \textit{elsewhere} \end{cases}$$ [10]

8.a) State and prove properties of cross correlation function.

b) If the PSD of X(t) is $S_{xx}(\omega)$. Find the PSD of dx(t)/dt. [5+5]

OR

9. A random process Y(t) = X(t)- X(t +τ) is defined in terms of a process X(t). That is at least wide sense stationary.

a) Show that mean value of Y(t) is 0 even if X(t) has a non Zero mean value.

b) If Y(t) = X(t) +X(t + τ) find E[Y(t)] and σY^2. [5+5]

10. The auto correlation function of a random process X(t) is $R_{XX}(\tau) = 3+2\exp(-4\tau^2)$.

a) Evaluate the power spectrum and average power of X(t).

b) Calculate the power in the frequency band $-1/\sqrt{2} \le \omega \le 1/\sqrt{2}$ [5+5]

OR

11. Derive the relation between PSDs of input and output random process of an LTI system. [10]

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Code No: 123BT **R15**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, April/May - 2018
PROBABILITY THEORY AND STOCHASTIC PROCESSES
(Common to ECE, ETM)

Time: 3 Hours **Max Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 Marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 Marks and may have a, b, c as sub questions.

PART - A

(25 Marks)

1.a) Write the conditions for a function to be a random variable. [2]
b) Explain the significance of mathematical model of experiments. [3]
c) Write short notes on Chebychev's inequality. [2]
d) Define Characteristic function and present generation of moments using it. [3]
e) State central limit theorem for the case of equal distributions. [2]
f) Write the properties of jointly Gaussian random variables. [3]
g) What is a WSS random process? [2]
h) Write short notes on Gaussian random process. [3]
i) Write the expression for power spectral density. [2]
j) Write any three properties of cross-power density spectrum. [3]

PART - B

(50 Marks)

2. A missile can be accidentally launched if two relays A and B both have failed. The probabilities of A and B failing are known to be 0.01 and 0.03, respectively. It is also known that B is more likely to fail (probability 0.06), if A has failed.
a) What is the probability of an accidental missile launch?
b) What is the probability that A will fail, if B has failed?
c) Are the events "A fails" and "B fails" statistically independent? [10]

OR

3. You (A) and two others (B and C) each toss a fair coin in a two-step gambling game. In step1 the person whose toss is not a match to either of other two is "odd man out". Only the remaining two whose coins match go on to step2 to resolve the ultimate winner.
a) What is the probability that you will advance to step2 after the first toss?
b) What is the probability you will be out after the first toss?
c) What is the probability that no one will be out after the first toss? [10]

4.a) Obtain the moment generating function of a uniformly distributed random variable.
b) Obtain the variance of Raleigh random variable. [5+5]

OR

5.a) A random variable X uniformly distributed in the interval $(0, \pi/2)$. Consider the transformation Y=sinx, obtain the pdf of Y.
b) Obtain the variance of Gaussian random variable. [5+5]

6.a) The joint characteristic function of two random variables is given by $\phi_{XY}(\omega_1,\omega_2) = \exp(-\omega_1^2 - 4\omega_2^2)$. Check whether X and Y are uncorrelated or not.

b) X and Y are statistically independent random variables and W = X+Y obtain the pdf of W. [5+5]

OR

7.a) Write the properties of joint distribution function.

b) Prove that the variance of weighted sum of N random variables equals the weighted sum of all their covariances. [5+5]

8. Define autocorrelation function of a random process. Write properties of auto correlation function of a WSS process and prove any three of them. [10]

OR

9.a) A random process $X(t) = A\cos(\omega_o t) + B \sin(\omega_o t)$ where ω_o is a constant and A, B are uncorrelated zero mean random variables with same variances. Check whether X(t) is WSS or not?

b) Classify random processes and explain. [5+5]

10. Derive the relationship between cross-power spectrum and cross-correlation function. [10]

OR

11.a) The autocorrelation function of a random process $R_{XX}(\tau) = 4\cos(\omega_o\tau)$, where ω_o is a constant. Obtain its power spectral density.

b) Obtain the average power in the random process $X(t) = A\cos(\omega_o t+\theta)$ where A, ω_o are real constants and θ is a random variable uniformly distributed in the range $(0, 2\pi)$. [5+5]

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Code No: 123BT **R15**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, November/December - 2016
PROBABILITY THEORY AND STOCHASTIC PROCESSES
(Common to ECE, ETM)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a) A discrete random variable can be defined on a continuous sample space. State whether it is true or false. Give an example to support your claim. [2]

b) Write the conditions to be satisfied by a function to be a random variable. [3]

c) Write the properties of probability density function. [2]

d) Determine whether the following function is a valid probability distribution function or not? Write the properties used. $G_X(x) = \frac{x}{a}[u(x-a) - u(x-2a)]$. [3]

e) Write two properties of joint distribution function of random variables. [2]

f) State Central limit theorem. [3]

g) Give an example of a deterministic random process. [2]

h) Auto correlation function of a stationary random process is $R_{XX}(\tau) = 25 + \frac{4}{1+6\tau^2}$. Find its variance. [3]

i) Check whether the function below is a valid power density spectrum or not.

$\frac{\omega}{j\omega^6 + \omega^2 + 3}$. [2]

j) Autocorrelation function of a random process is given by $R_{XX}(\tau) = 3\delta(\tau)$. Find and sketch its power density spectrum. [3]

PART-B

(50 Marks)

2.a) State and prove Bayes Theorem.

b) Define the terms outcome, event, sample space, mutually exclusive events. Consider the experiment of rolling of two fair dice simultaneously and represent its sample space. Also give examples of terms mentioned above related to this experiment. [5+5]

OR

3.a) Discuss the relative frequency approach and axiomatic approach of probability.

b) In a box there are 100 resistors whose resistances and tolerances are as shown in the table below. Let A be the event of drawing a 47Ω resistor, B be the event of drawing a resistor with 5% tolerance, and C be the event of drawing a 100Ω resistor. Find P(A/B), P(A/C) and P(B/C). [5+5]

Resistance (Ω)	Tolerance 5%	10%	Total
22	10	14	24
47	28	16	44
100	24	8	32
Total	62	38	100

4.a) Find the mean of Binomial random variable.

b) In a sports event javelin throw distances are well approximated by a Gaussian distribution for which mean is 30m and standard deviation is 5m. In a qualifying round, contestants must throw farther than 27m to qualify. In the main event the record throw is 44m.
i) What is the probability of being disqualified in the first round?
ii) In the main event what is the probability the record will be broken? [5+5]

OR

5.a) Obtain the characteristic function of Poisson random variable.

b) X and Y are two statistically independent random variables related to W as W= X + Y. Obtain the probability density function of Y in terms of probability density functions of X and Y. [5+5]

6.a) Obtain the expression for conditional density $f_X(X/B)$ where event B is defined as $\{ y_a \le Y \le y_b \}$.

b) Write short notes on jointly Gaussian random variables. [5+5]

OR

7.a) Two random variables X and Y have joint characteristic function $\varphi_{XY}(\omega_1,\omega_2) = \exp(-2\omega_1^2 - 8\omega_2^2)$. Show that X and Y are uncorrelated zero mean random variables.

b) Two statistically independent random variables X and Y have mean values E[X] = 2 and E[Y] = 4. They have second moments $E[X^2] = 8$ and $E[Y^2] = 25$. Find Variance of W = 3X-Y. [5+5]

8.a) A random process is defined as $X(t) = A\text{Cos}(\omega_o t + \Theta)$, where Θ is a uniformly distributed random variable in the interval $(0, \pi/2)$. Check for its wide sense stationarity? A and ω_o are constants.

b) Classify random processes and explain. [6+4]

OR

9.a) Define autocorrelation function of a random process. Write its properties and prove any two of them.

b) Explain the concept of time average and ergodicity. Write the conditions for a random process to be ergodic in mean and autocorrelation. [5+5]

10.a) Derive the expression for power density spectrum of a random process.

b) Write the properties of power spectral density. [6+4]

OR

11.a) Prove $S_{YY}(\omega) = |H(\omega)^2| S_{XX}(\omega)$. Where X(t) is input random process of an LTI system and Y(t) its output. $|H(\omega)|$ is the transfer function of the LTI system.

b) Define cross power density spectrum and write its properties. [5+5]

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Code No: 123BT **R15**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, November/December - 2017
PROBABILITY THEORY AND STOCHASTIC PROCESSES
(Common to ECE, ETM)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a) A box contains nine cards numbered through 1 to 9, and B contains five cards numbered through 1 to 5. If a box is chosen at random, and a card is drawn which even numbered, what is the probability for the card to be from box A. [2]

b) Let a die be weighted such that the probability of getting numbers from 2 to 6 is that number of times of probability of getting a1. When the die thrown, what is the probability of getting an even or prime number occurs. [3]

c) Find the CDF of a random variable X, uniform over (-3, 3). [2]

d) The density of a random variable X is given as $f(x)= K[U(x)-U(x-4)]+0.25\delta(x-2)$. Find the probability of $X \leq 3$. [3]

e) X and Y are discrete random variables and their joint occurrence is given as

X\Y	1	2	3
1	1/18	1/9	1/6
2	1/9	1/18	1/9
3	1/6	1/6	1/18

Find the Conditional Mean of X, given Y=2. [2]

f) X and Y are two uncorrelated random variables with same variance. If the random variables $U=X+ kY$ and $V=X+(\sigma x/\sigma y)Y$ are uncorrelated, find K. [3]

g) State and prove the Periodicity Property of Auto Correlation function of a Stationary Random Process. [2]

h) If X(t) is a Gaussian Random Process with a mean 2 and $\exp(-0.2|\tau|)$. Find the Probability of $X(1) \leq 1$. [3]

i) Verify that the cross spectral density of two uncorrelated stationary random processes is an impulse function. [2]

j) The output of a filter is given by $Y(t)=X(t+T)+X(t-T)$, where X(t) is a WSS process, power spectral density $S_{xx}(w)$, and T is a constant. Find the power spectrum of Y(t). [3]

PART-B

(50 Marks)

2.a) Consider the experiment of tossing two dice simultaneously. If X denotes the sum of two faces, find the probability for $X \leq 6$.

b) A fair coin is tossed 4 times. Find the probability for the longest string of heads appearing to be three as a result of the above experiment.

c) In certain college, 25% of the boys and 10% of the girls are studying Mathematics. The girls constitute 60% of the student body. If a student is selected at random and studying mathematics, determine the probability that the student is a girl. [3+3+4]

OR

3.a) Coin A has a probability of head =1/4 and coin B is a fair coin. Each coin is flipped four times. If X is the number of heads resulting from coin and Y denotes the same from coin B, what is the probability for X=Y?

b) A dice is thrown 6 times. Find the probability that a face 3 will occur at least two times. [6+4]

4.a) Find the Moment generating function of a uniform random variable distribute over (A, B) and find its first and second moments about origin, from the Moment generating function.

b) A random variable X has a mean of 10 and variance of 9. Find the lower bound on the probability of (5<X<15). [5+5]

OR

5.a) Find the Moment generating function of a random variable X with density function

$$f(x)=\begin{Bmatrix} x, & for\ 0\le x\le 1 \\ 2-x, & for\ 1\le x\le 2 \\ 0, & else\ where \end{Bmatrix}$$

b) If X is a Gaussian random variable N(m, σ^2), find the density of Y=PX+Q, where P and Q are constants. [5+5]

6.a) If $X_1, X_2, X_3, - - - - - X_n$ are 'n' number of independent and Identically distributed random variables, such that X_k = 1 with a probability 1/2; = -1 with a probability 1/2. Find the Characteristic Function of the random Variable $Y= X_1+X_2+X_3+ - - - + X_n$.

b) If Independent Random Variables X and Y both of zero mean, have variance 20 and 8 respectively, find the correlation coefficient between the random Variables X+Y and X-Y. [5+5]

OR

7.a) Let X=Cosθ and Y=Sinθ , be two random variables, where θ is also a uniform random variable over (0,2π). Show that X and Y are uncorrelated and not independent.

b) If X is a random variable with mean 3 and variance 2, verify that the random Variables 'X' and Y= -6X+22 are orthogonal. [6+4]

8.a) X(t) is a random process with mean =3 and Autocorrelation function $R_{xx}(\tau)$ =10.[exp(- 0.3|τ|)+2]. Find the second central Moment of the random variable Y=X(3)-X(5).

b) X(t)=2ACos(Wct+2θ) is a random Process, where 'θ' is a uniform random variable, over (0,2π). Check the process for mean ergodicity. [5+5]

OR

9.a) A Random Process X(t)=A.Cos (2π fc t) , where A is a Gaussian Random Variable with zero mean and unity variance, is applied to an ideal integrator, that integrates with respect to 't', over (0,t). Check the output of the integrator for stationarity.

b) A random Process is defined as X(t)=3.Cos(2πt+Y), where Y is a random Variable with p(Y=0)=p(Y=π)=1/2.Find the mean and Variance of the Random Variable X(2). [5+5]

10.a) Find and plot the Autocorrelation function of (i) Wide band white noise
(ii) Band Pass White noise.

b) Derive the expression for the Cross Spectral Density of the input Process X(t) and the output process Y(t) of an LTI system in terms of its Transfer function. [5+5]

OR

11.a) Compare and contrast Auto and cross correlations.

b) If $Y(t) = A.Cos(w_0t+\theta)+N(t)$, where '$\theta$' is a uniform random variable over $(-\pi,\pi)$, and N(t) is a band limited Gaussian white noise process with PSD=K/2. If 'θ' and N(t) are independent, find the PSD of Y(t). [4+6]

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Sri Indu Institute of Engineering & Technology

Sheriguda (V), Ibrahimpatnam (M), R.R.Dist-501 510

I - Mid Examinations, JAN -2023

Set -II

Year & Branch: II –ECE(A,B,C) Date: 23/01/23(FN)

Subject:**PT&SP** Max. Marks: 10 Time: 60 mins

Answer any **TWO** Questions. All Question Carry Equal Marks 2*5=10 marks

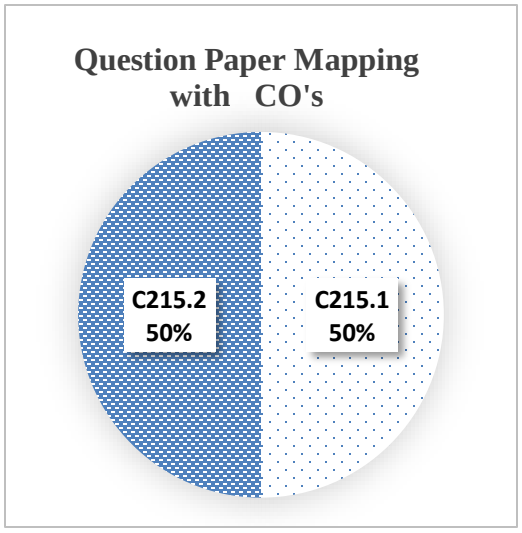
1. A Continuous Random Variable X has the distribution function
   $F(x) = 0$ if $x \leq 1$,
   $= k(x-1)^4$ if $1 < x \leq 3$,
   $=1$ if $x>3$; then find k and f(x) C215.1 (Knowledge)
2. A Random variable X has the following probability distribution

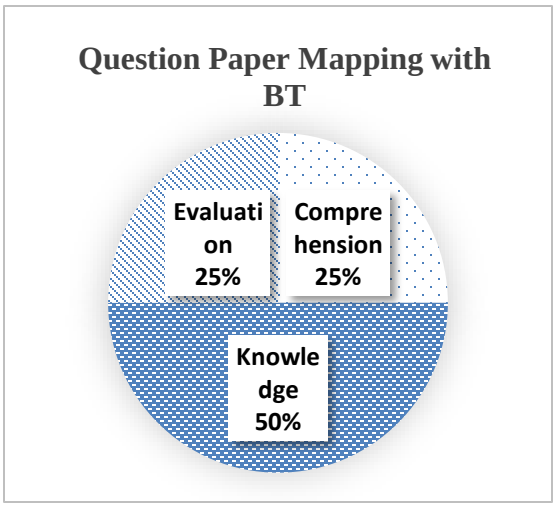
X	0	1	2	3	4	5	6	7
P(X=x)	0	K	2K	2K	3K	K^2	$2K^2$	$7K^2+K$

   i)Determine k ii) Evaluate $P(X<6)$, $P(X\geq6)$, $P(0<X<5)$ and $P(0\leq X\leq4)$

   C215.1 (Knowledge)

3. Define Binominal Distribution, obtain its mean and variance. C215.2 (Comprehension)
4. The Random variables X has the characteristic function and is given by
   $\Phi(t)= 1- |t|, |t| \leq 1$
   $= 0, |t|>1$
   Find the density function of the Random variable X. C215.2 (Evaluation)





Sri Indu Institute of Engineering & Technology

Sheriguda (V), Ibrahimpatnam (M), R.R.Dist-501 510

II- Mid Examinations, APR-2023

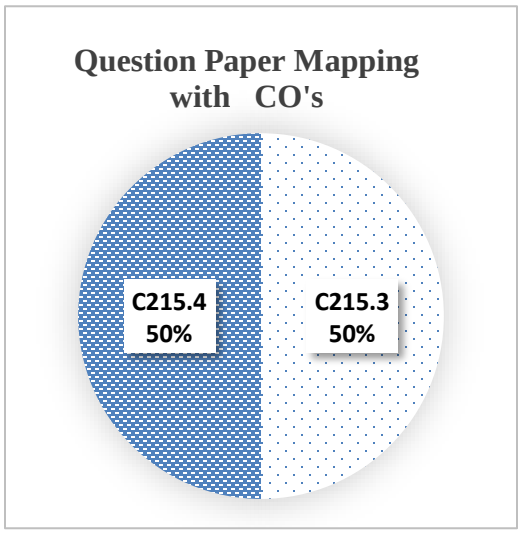
Set– I

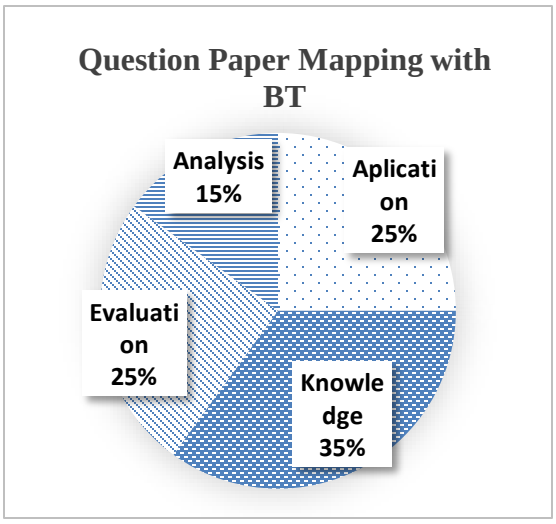
Year &Branch: II ECE(A&B)

Subject: PTSP Max. Marks: 10 Time: 60 mins

Answer any **TWO** Questions. All Question Carry Equal Marks 2*5=10 marks

1	Define cross power density spectrum and write its properties	5	C215.4	(Evaluation)
2	Obtain the average power in the random process X(t) = Acos(ωot+θ) where A, ωo are real constants and θ is a random variable uniformly distributed in the range (0, 2π).	**5**	C215.4	(Application)
3	a) Define Gaussian random process and explain.	**2**	C215.3	(Knowledge)
	b)Define poisson random process and explain	**3**	C215.3	(Knowledge)
4	a)Define strict sense stationary process and explain	**2**	C215.3	(Knowledge)
	b) Define joint wide sense stationary process and explain	**3**	C215.3	(Analysis)





Sri Indu Institute of Engineering & Technology

Shereguda (V), Ibrahimpatnam (M), R.R.Dist-501 510

B-Tech I - Mid Examinations, JAN-2023

Year & Branch: II –ECE-A, B&C Date: 23 -01-2023 (FN)

Subject: PTSP Max. Marks: 10 Time: 20 mins

Name: ……..Roll No……

I.Choose the correct alternative:

1) The conditional probability of event A, given B is expressed as [ ]

(a)P(A∩B)/P(A) (b)P(AUB)/P(A) (c) P(AUB)/P(B) (d) P(A∩B)/P(B)

2) P(S) = [ ]

a) 0 b) 1 c) Both a & b d) none

3) P (A) =1, P (B) =3 Then P(AUB) if A and B are independent [ ]

a) 1 b) 0 c) 4 d) 5

4) F(∞)= [ ]

a)0 b) 1 c) 2 d) 3

5)If two dice are thrown then the probability of getting a sum as 7 [ ]

a) 1/6 b) 5/36 c) 7/36 d) none

6) The PDF fx(x) is defined as [ ]

(a) Integral of CDF (b) Derivative of CDF (c) Equal to CDF (d) Partial derivative of CDF

7) For n = 1, 2,…N P(Bn / A) = [ ]

a)P (Bn/A)P(A)/ P(A/B1)P(B2) +...+P(A)P(B) b)P (An/Bn)P(Bn)/P(A/Bn).P(B1) + ….. + P(B)

c)P(A/Bn)P(An)/P(A/B1)P(B1) + ……+P (A/B)P(B) d)P(A/Bn).P(Bn)/P (A/B1).P (B1)+…..+P(A/Bn).P(Bn)

8) A transformation T is called monotonically decreasing if [ ]

(a) T(X1) > T(X2) for X1<X2 b) T(X1) = T(X2) for X1<X2 c) T(X1) < T(X2) for X1=X2

d) T(X1) < T(X2) for X1<X2

9)probability of getting either a queen or king card from the pack of playing cards is [ ]

a)2/13 b) 2/26 c) 5/52 d) None

10) The mean and variance of a binomial distribution are 2 and 8/5 respectively then n= [ ]

a) 16 b) 10 c) 2 d) None

Fill in the blanks:

1. If n and p are parameters of binomial distribution then the standard deviation of ----------
2. The probability of getting 2 heads in tossing 5 coins is ----------
3. E(X+a)= ----------.
4. The uniform probability density function in the range { a, b } can be expressed as _____
5. Characteristic function is defined as ----------
6. If X and Y are independent random variables, then E(XY) = _____
7. if $\omega=0$, $\phi x(\omega)=$
8. COV (X,Y)= _____
9. If y=ax+b, the covariance of x and y is ……
10. The distribution function of Gaussian RV is_____

SRI INDU INSTITUTE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF ECE
B.Tech II Year I Sem II Mid –Term Examination, April-2023
PROBABILITY THEROY AND STOCHASTIC PROCESS
(Objective Exam)
TIME: 20 Min **MAX.MARKS: 10**

NAME : **ROLL NO:** **MARKS:**

I.Choose The Correct Answers

1. The mean square value for the poission process x(t) with parameter λt is [ ]
a) λt b). $(\lambda t)^2$ c) $\lambda t + (\lambda t)^2$ d). $\lambda t - (\lambda t)^2$

2. The cross spectral density Syx (ω) = [ ]
a) $S_{XY}(\omega)$ b) $S_{XY}(-\omega)$ c) $S_{yx}(-\omega)$ d) $-Syx(\omega)$

3. If x and y are two independent random variables , then $\Phi_{X+Y}(\omega)$ is [ ]
a). $\Phi_{xy}(\omega)$b). $\Phi_x(\omega)\Phi_y(\omega)$c). $\Phi_x(\omega)+\Phi_y(\omega)$d). $\Phi_{yx}(\omega)$

4 For PSD which of the following is not correct [ ]

a. PSD is a real b. PSD is even c.PSD is always positive d. PSD is odd

5 For a random process we can calculate [ ]

a. time averages b. Ensemble averages

c. Co-relation functions d. All of these

6. E[X(t1).X(t2)] gives [ ]

a. cross co-relation function b. Product of random process

c. auto co-relation function d. Average value of random process

7.The Averagre power of the random process having psd $\mathbf{S_{xx}}(\omega)$is P_{xx} [ ]

a)$\int_{-\infty}^{\infty} \mathbf{Sxx}(\omega)d\omega$ b) $2\pi \int_{-\infty}^{\infty} \mathbf{Sxx}(\omega)d\omega$

c)$1/2\pi \int_{-\infty}^{\infty} \mathbf{Sxx}(\omega)d\omega$ d)0

8.The PSD of WSS is always [ ]

a)negative b)non-negative c)finite d)0

9.The mean square value of a WSS process equals [ ]

a) the area under the graph of the PSD

b) the area under the graph of the Autocorrelation

c)0 d)mean of the process

10.Information rate equal to R= [ ]

a)rH b)IH c)HH d)None of the above

II.Fill In The Blanks:

11The time average of the product x(t) and x(t+τ) is called _____of x(t)
.

12If x(t) is periodic , then its autocorrelation function is _____

3. IM[S_{xy}(w)] is an _____function.
4. Re[S_{xy}(w)] is an _____function.

5. The autocorrelation function of a WSS random process is used to study _____Characteristics.

6. The expected value of a time function is called the _____ of that function.

7. Wide sense stationary process is also called stationary process _____

8.Poisson random process formula _____

9. gaussian random process formula _____

10.entropy formula _____

Sri Indu Institute of Engineering & Technology

Sheriguda (V), Ibrahimpatnam (M), R.R.Dist-501 510

B-Tech I - Mid Examinations, JAN-2023

Year &Branch: II –ECE-A, B&C **Date: 23-01-2023(FN)**

Subject: PTSP

ANSWER KEY

Descriptive paper key link:

https://drive.google.com/file/d/1sSnmXQWr5Icw3EGlrpnAf3daVW7FwuaB/view?usp=sharing

Objective Key Paper

I. Choose the correct alternative:

1.D
2.B
3.A
4.B
5.A
6.B
7.D
8.D
9.A
10.B

FILL THE BLANKS

11.$\sqrt{npq}$
12.$32c_2\ (1/2)^2(1/2)^{30}$
13E[X]+a
14.1/b-a
15.$E[e^{jwx}]$
16.E[X]E[Y]
17.1
18.E[XY]- E[X]E[Y]
19.a cov(x)
20. $1/\sigma\sqrt{2\pi}\exp\{-(x-\mu)22\sigma2\}$.

Sri Indu Institute of Engineering & Technology

Sheriguda (V), Ibrahimpatnam (M), R.R.Dist-501 510

B-Tech II - Mid Examinations, APR-2023

Year &Branch: II –ECE-A, B&C

Subject: PTSP

ANSWER KEY

Descriptive paper key link:

https://drive.google.com/file/d/1Q33XVKXSbCBj4L02YmOc5bzeXiIADDJu/view?usp=sharing

Objective/Quiz Key Paper

I. Choose the correct alternative:

1.C

2.B

3.B

4.C

5.D

6.C

7.C

8.B

9.C

10.A

Fill in the blanks:

11.AUTO CORRELATION

12.PERIODIC

13.ODD

14.EVEN

15.TEMPORIAL

16.AVERAGE MEAN

17.WEAK SENSE STATIONARY

18. $P(z) = 1\ 2\ \pi\ \sigma\ e - (z - \mu)\ 2 / 2\ \sigma\ 2$

19. $f(x) = (e^{-\lambda}\ \lambda^{x})/x!$

20.$H=P_I LOG_2(1/P_I)$

SRI INDU INSTITUTE OF ENGINEERING AND TECHNOLOGY

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(Approved by AICTE, New Delhi and Affiliated to JNTUH, Hyderabad)
Khalsa Ibrahimpatnam, Sheriguda (V), Ibrahimpatnam (M), Ranga Reddy Dist., Telangana – 501 510
Website: https://siiet.ac.in/

ASSIGNMENT- 1 **SUBJECT: Probability Theory and Stochastic Processes**

1. A Random variable X has the probability distribution ? C215.1 (Evaluation)

x:	0	1	2	3	4	5	6
p(x)	k	3k	5k	7k	9k	11k	13k

I)Find k II) Evaluate $P(X<4)$,$P(X\geq 5)$ and $P(3<X\leq 6)$
III)What is the smallest value of x for which $p(X\leq x)>1/2$

2.Given the following table C215.1 (Knowledge)

X=x	-3	-2	-1	0	1	2	3
p(x)	0.05	0.1	0.3	0	0.3	0.15	0.1

Compute i) E(X) ii) E(4X + 5) iii) $E(X^2)$ iv) Var(X) v) Var(2X + 3)

3. Define PDF and write its properties? C215.2 (Comprehension)

4. State and prove Baye's theorem of probability? C215.2 (Knowledge)

5.A Continuous Random Variable X has the distribution function

$F(x) = 0$ if $x\leq 1$,
$= k(x-1)^4$ if $1<x\leq 3$,
$=1$ if $x>3$; then find k and f(x) C215.1 (Knowledge)

6.A Random variable X has the following probability distribution

X	0	1	2	3	4	5	6	7
P(X=x)	0	K	2K	2K	3K	K^2	$2K^2$	$7K^2+K$

i)Determine k ii) Evaluate $P(X<6)$, $P(X\geq 6)$, $P(0<X<5)$ and $P(0\leq X\leq 4)$

C215.1 (Knowledge)

7.Define Binominal Distribution, obtain its mean and variance. C215.2 (Comprehension)

8.The Random variables X has the characteristic function and is given by

$\Phi(t)= 1- |t|, |t| \leq 1$
$= 0 , |t|>1$

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Website: https://siiet.ac.in/

ASSIGNMENT- 2 **SUBJECT: Probability Theory and Stochastic Processes**

1. Define weak sense stationary process and explain C215.3 (Knowledge)

2. Define PDF, CDF and explain C215.3 (Knowledge)

3. A random process is defined as $X(t) = ACos(\omega ot + \Theta)$, where Θ is a uniformly distributed random variable in the interval (0, Pi/2). Check for its wide sense stationarity? A and ωo are constants C215.4 (Evaluation)

4. Derive the relationship between cross-power spectrum and cross-correlation function.. C215.4 (Comprehension)

5. Derive the relationship between cross-power spectrum and auto-correlation function C215.4 (Knowledge)

6. The autocorrelation function of a random process $RXX(\tau) = 4\cos(\omega o\tau)$, where ωo is a constant. Obtain its power spectral density. C215.4 (Evaluation)

7. Define cross power density spectrum and write its properties C215.5 (Knowledge)

8. Define Gaussian random process and explain.. C215.5 (Evaluation)

9. Define poisson random process and explain.. C215.5 (Evaluation)

10. Define strict sense stationary process and explain C215.5 (Knowledge)

11. Define joint wide sense stationary process and explain C215.6 (Evaluation)

Course Title	PROBABILITY THEORY AND STOCHASTIC PROCESS
Course Code	EC305ES
Programme	B.Tech
Year & Semester	II year I-semester, A sec
Regulation	R18
Course Faculty	T. NARESH, Assistant Professor, ECE

Slow learners:

S No	Roll no	No of backlogs	Internal-I Status	Internal-II Status
1	21X31A0402	3	20	14
2	21X31A0403	3	20	15
3	21X31A0408	3	18	19
4	21X31A0409	4	14	14
5	21X31A0412	3	18	14
6	21X31A0414	3	18	14
7	21X31A0417	3	15	18
8	21X31A0422	3	21	17
9	21X31A0433	3	22	16
10	21X31A0435	3	18	16
11	21X31A0436	3	14	17

Advanced learners:

S.NO	ROLL.NO.	GATE MATERIAL
1	21X31A0401	Probability and Statistics: Mean, median, mode and standard deviation ;combinatorial probability, probability distribution functions - binomial, Poisson, exponential and normal; Joint and conditional probability; Correlation and regression analysis. Random processes: autocorrelation and power spectral density, properties of white noise, filtering of random signals through LTI systems;
2	21X31A0405	
3	21X31A0410	
4	21X31A0413	
5	21X31A0415	
6	21X31A0418	
7	21X31A0420	
8	21X31A0421	
9	21X31A0423	
10	21X31A0424	
11	21X31A0426	
12	21X31A0427	
13	21X31A0429	
14	21X31A0431	
15	21X31A0432	
16	21X31A0434	
17	21X31A0437	

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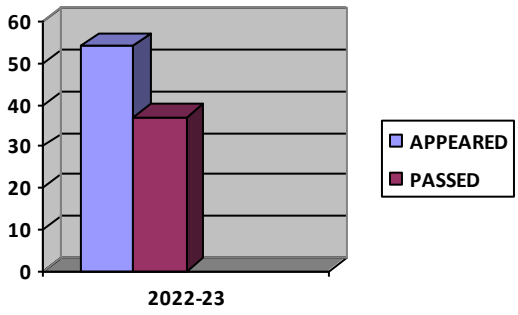
Website: https://siiet.ac.in/

BATCH ECE-II BTECH I SEM ECE-A RESULT ANALYSIS

ACADAMIC YEAR	COURSE NAME	NUMBER OF STUDENTS		QUESTION PAPER SETTING		PASS%
		APPEARED	PASSED	INTERNAL	EXTERNAL	
2022-23	PROBABILITY THEORY AND STOCHASTIC PROCESS	54	37	COURSE FACULTY	JNTUH	68.51

PROBABILITY THEORY AND STOCHASTIC PROCESS (C215) RESULT ANALYSIS



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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

REMEDIAL CLASSES TIME TABLE

A.Y 2022-23 **SEMESTER-I**

BRANCH/ SEC	MON 4.00 PM-5.00 PM	TUE 4.00 PM-5.00 PM	WED 4.00 PM-5.00 PM	THUR 4.00 PM-5.00 PM	FRI 4.00 PM-5.00 PM
II ECE-A	EDC	NATL	DSD	PTSP	SS
II ECE-B	NATL	DSD	PTSP	SS	EDC
III ECE-A	MPMC	DCCN	CS	BEFA	EMI
III ECE-B	DCCN	CS	BEFA	EMI	MPMC
III ECE-C	CS	BEFA	EMI	MPMC	DCCN
IV ECE-A	MW&OC	DIP	PPLE	NS&C	JAVA
IV ECE-B	DIP	PPLE	NS&C	JAVA	MW&OC
IV ECE-C	PPLE	NS&C	JAVA	MW&OC	DIP

HOD Department
Head of the Department
Electronics and Communication Engg. Dept.
SRI INDU INSTITUTE OF ENGG & TECH,
Sheriguda(V), Ibrahimpatnam(M), R.R.Dist-501 510.

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Sri Indu Institute of Engineering & Tech.
Sheriguda(Vill), Ibrahimpatnam,
R.R. Dist. Telangana -501 510.

SRI INDU INSTITUTE OF ENGINEERING AND TECHNOLOGY

Department of Electronics and Communication Engineering

Course Outcome Attainment (Internal Examination-1)

Name of the faculty : THEDDU NARESH Academic Year: 2022-23

Branch & Section: ECE - A Examination: I Internal

Course Name: PTSP Year: II Semester: I

S.No	HT No.	Q1a	Q1b	Q2a	Q2b	Q3a	Q3b	Q4a	Q4b	Obj1	A1
Max. Marks ==>		5		5		5		5		10	5
1	21X31A0401	5		5		3				5	5
2	21X31A0402	4				2				7	5
3	21X31A0403	4		4		3				7	5
4	21X31A0404	4		4		3		4		6	5
5	21X31A0405	4		3		1				8	5
6	21X31A0406	5		5		3				8	5
7	21X31A0407	4				2				7	5
8	21X31A0408	4		1		2				7	5
9	21X31A0409	5								4	5
10	21X31A0410	4		3		2				6	5
11	21X31A0412	4				3				6	5
12	21X31A0413	4		3		2				7	5
13	21X31A0414	4		1				2		7	5
14	21X31A0415	3				2				7	5
15	21X31A0416	5								4	5
16	21X31A0417			2						8	5
17	21X31A0418	3		2						10	5
18	21X31A0420	5				3		5		10	5
19	21X31A0421	5				3				9	5
20	21X31A0422			5		3				8	5
21	21X31A0423	4		2		2		5		6	5
22	21X31A0424	5		1		1		4		6	5
23	21X31A0425	4		2		2				6	5
24	21X31A0426	4		2		1		3		6	5
25	21X31A0427	4						3		10	5
26	21X31A0428	4		2				3		6	5
27	21X31A0429	4				3				10	5
28	21X31A0431	5								8	5
29	21X31A0432	3								7	5
30	21X31A0433	5				3		2		9	5
31	21X31A0434	4		2		4		4		8	5
32	21X31A0435	5		2						6	5
33	21X31A0436	1								8	5
34	21X31A0437	2								7	5
35	22X35A0401	4						4		10	5
36	22X35A0402	3						5		10	5
37	22X35A0403	5				2		4		10	5
38	22X35A0404	3		3						9	5
39	22X35A0405	4						2		9	5
40	22X35A0406	4						4		9	5

41	22X35A0407	4						4		9	5
42	22X35A0408	4				3				9	5
43	22X35A0409	5				2		3		9	5
44	22X35A0410	5				2		5		9	5
45	22X35A0411	4						4		8	5
46	22X35A0412	4						3		8	5
47	22X35A0413	5						5		9	5
48	22X35A0414	4				3				9	5
49	22X35A0415	3		4						9	5
50	22X35A0416			5				4		9	5
51	22X35A0417	4				3				8	5
52	22X35A0418	4						4		9	5
53	22X35A0419	4						4		9	5
54	22X35A0420	5				4		5		9	5
Target set by the faculty / HoD		3.00	0.00	3.00	0.00	3.00	0.00	3.00	0.00	6.00	3.00
Number of students performed above the target		49	0	12	0	15	0	22	0	51	54
Number of students attempted		51	0	23	0	29	0	25	0	54	54
Percentage of students scored more than target		96%		52%		52%		88%		94%	100%

CO Mapping with Exam Questions:

CO - 1	**Y**						**Y**		**Y**	**Y**
CO - 2			**Y**		**Y**				**Y**	**Y**
CO - 3										
CO - 4										
CO - 5										
CO - 6										

% Students Scored >Target %	96%		52%		52%		88%		94%	100%

CO Attainment based on Exam Questions:

CO - 1	96%						88%		94%	100%
CO - 2			52%		52%				94%	100%
CO - 3										
CO - 4										
CO - 5										
CO - 6										

CO	Subj	obj	Asgn	Overall	Level
CO-1	92%	94%	100%	95%	3.00
CO-2	52%	94%	100%	82%	3.00
CO-3					
CO-4					
CO-5					
CO-6					

Attainment Level	
1	40%
2	50%
3	60%

Attainment (Internal 1 Examination) = **3.00**

SRI INDU INSTITUTE OF ENGINEERING AND TECHNOLOGY

Department of Electronics and Communication Engineering

Course Outcome Attainment (Internal Examination-2)

Name of the faculty : THEDDU NARESH Academic Year: 2022-23

Branch & Section: ECE - A Examination: II Internal

Course Name: PTSP Year: II Semester: I

S.No	HT No.	Q1a	Q1b	Q2a	Q2b	Q3a	Q3b	Q4a	Q4b	Obj2	A2
Max. Marks ==>		5		5		2	3	2	3	10	5
1	21X31A0401	4				1	3			8	5
2	21X31A0402	5								4	5
3	21X31A0403			2						8	5
4	21X31A0404			2						8	5
5	21X31A0405	4								5	5
6	21X31A0406	5						1	3	9	5
7	21X31A0407	5								4	5
8	21X31A0408			2				1	2	9	5
9	21X31A0409	1								7	5
10	21X31A0410	3		1						8	5
11	21X31A0412	4								5	5
12	21X31A0413			4			3	1	2	8	5
13	21X31A0414			1						8	5
14	21X31A0415	3		3						7	5
15	21X31A0416	4								5	5
16	21X31A0417	3		3						7	5
17	21X31A0418			5						4	5
18	21X31A0420	4		3						8	5
19	21X31A0421	3		4						7	5
20	21X31A0422	3		3						6	5
21	21X31A0423	4								9	5
22	21X31A0424	3								8	5
23	21X31A0425			4		2	1			9	5
24	21X31A0426	3		3						9	5
25	21X31A0427	5		5						9	5
26	21X31A0428	3		3						9	5
27	21X31A0429					2		2	2	8	5
28	21X31A0431	3				1	2			6	5
29	21X31A0432	3		2						6	5
30	21X31A0433	4								7	5
31	21X31A0434	4				2	1			6	5
32	21X31A0435	4								7	5
33	21X31A0436	3		3						6	5
34	21X31A0437	4								7	5
35	22X35A0401	5				2	2			7	5
36	22X35A0402	3				2	2			7	5
37	22X35A0403	3				2				7	5
38	22X35A0404	1								6	5
39	22X35A0405	2								6	5
40	22X35A0406	3				2				7	5
41	22X35A0407	3								7	5
42	22X35A0408					2				7	5
43	22X35A0409					2				7	5
44	22X35A0410	5				2	3			7	5

45	22X35A0411					2	2			8	5
46	22X35A0412	5				2	2			7	5
47	22X35A0413	5				2	3			8	5
48	22X35A0414	5						2	2	8	5
49	22X35A0415			3				1	1	8	5
50	22X35A0416	5						2	2	8	5
51	22X35A0417					2	2	1	2	7	5
52	22X35A0418			5		2	2			8	5
53	22X35A0419	4				2	2			8	5
54	22X35A0420	4				2	3			8	5
Target set by the faculty / HoD		3.00	0.00	3.00	0.00	1.20	1.80	1.20	1.80	6.00	3.00
Number of students performed above the target		37	0	14	0	17	13	3	7	48	54
Number of students attempted		40	0	20	0	19	15	8	8	54	54
Percentage of students scored more than target		93%		70%		89%	87%	38%	88%	89%	100%

CO Mapping with Exam Questions:

CO - 1										
CO - 2										
CO - 3	y								y	y
CO - 4			**y**						y	y
CO - 5					**y**	**y**	**y**	**y**	y	y
CO - 6									y	y

CO Attainment based on Exam Questions:

CO - 1										
CO - 2										
CO - 3	93%								89%	100%
CO - 4			70%						89%	100%
CO - 5					89%	87%	38%	88%	89%	100%
CO - 6									89%	100%

CO	**Subj**	obj	Asgn	Overall	Level
CO-1					
CO-2					
CO-3	93%	89%	100%	94%	3.00
CO-4	70%	89%	100%	86%	3.00
CO-5	75%	89%	100%	88%	3.00
CO-6		89%	100%	94%	3.00

Attainment Level	
1	40%
2	50%
3	60%

Attainment (Internal Examination-2) = **3.00**

SRI INDU INSTITUTE OF ENGINEERING AND TECHNOLOGY

Department of Electronics and Communication Engineering

Course Outcome Attainment (University Examinations)

Name of the faculty : THEDDU NARESH Academic Year: 2022-23

Branch & Section: ECE - A Year / Semester: II / I

Course Name: PTSP

S.No	Roll Number	Marks Secured
1	21X31A0401	47
2	21X31A0402	22
3	21X31A0403	27
4	21X31A0404	47
5	21X31A0405	62
6	21X31A0406	52
7	21X31A0407	28
8	21X31A0408	34
9	21X31A0409	14
10	21X31A0410	60
11	21X31A0412	42
12	21X31A0413	57
13	21X31A0414	23
14	21X31A0415	44
15	21X31A0416	40
16	21X31A0417	34
17	21X31A0418	46
18	21X31A0420	52
19	21X31A0421	54
20	21X31A0422	30
21	21X31A0423	53
22	21X31A0424	47
23	21X31A0425	63
24	21X31A0426	48
25	21X31A0427	70
26	21X31A0428	31
27	21X31A0429	55
28	21X31A0431	45
29	21X31A0432	46
30	21X31A0433	28
31	21X31A0434	49
32	21X31A0435	29
33	21X31A0436	30
34	21X31A0437	32
35	22X35A0401	30
Max Marks		75

S.No	Roll Number	Marks Secured
36	22X35A0402	29
37	22X35A0403	11
38	22X35A0404	20
39	22X35A0405	14
40	22X35A0406	38
41	22X35A0407	31
42	22X35A0408	10
43	22X35A0409	26
44	22X35A0410	34
45	22X35A0411	26
46	22X35A0412	29
47	22X35A0413	26
48	22X35A0414	33
49	22X35A0415	26
50	22X35A0416	44
51	22X35A0417	31
52	22X35A0418	16
53	22X35A0419	13
54	22X35A0420	37

Class Average mark	32
Number of students performed above the target	29
Number of successful students	54

Attainment Level	% students
1	40%
2	50%

Percentage of students scored more than target	54%
Attainment level	**2**

3	60%

SRI INDU INSTITUTE OF ENGINEERING AND TECHNOLOGY

Department of Electronics and Communication Engineering

Course Outcome Attainment

Name of the faculty THEDDU NARESH
Branch & Section: ECE - A
Course Name: PTSP

Academic Year: 2022-23
Examination: I Internal
Year: II
Semester: I

Course Outcomes	1st Internal Exam	2nd Internal Exam	Internal Exam	University Exam	Attainment Level
CO1	3.00		3.00	2.00	2.25
CO2	3.00		3.00	2.00	2.25
CO3		3.00	3.00	2.00	2.25
CO4		3.00	3.00	2.00	2.25
CO5		3.00	3.00	2.00	2.25
CO6		3.00	3.00	2.00	2.25
Internal & University Attainment:			3.00	2.00	
Weightage			25%	75%	
O Attainment for the course (Internal, Universi			0.75	1.50	
CO Attainment for the course (Direct Method)			2.25		

Overall course attainment level **2.25**

SRI INDU INSTITUTE OF ENGINEERING & TECHNOLOGY

Department of Electronics and Communication Engineering

Program Outcome Attainment (from Course)

Name of Faculty:	THEDDU NARESH	Academic Year:	2022-23
Branch & Section:	ECE - A	Year:	II
Course Name:	PTSP	Semester:	I

CO-PO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	2	1	-	-	-	-	2	-	-	-	-
CO2	-	2	3	-	-	1	-	-	-	3	-	3	-	-
CO3	3	-	-	2	1	-	-	-	-	-	2	-	-	3
CO4	2	3	-	1	-	-	-	-	-	-	-	-	-	2
CO5	3	-	-	2	1	-	-	-	-	-	-	2	-	3
CO6	2	3	-	1	-	-	-	-	-	-	3	-	-	-
Course	2.6	2.6	3	1.6	1	1				**2.5**	**2.5**	**2.5**		**2.6**

CO	**Course Outcome Attainment**
CO1	2.25
CO2	2.25
CO3	2.25
CO4	2.25
CO5	2.25
CO6	2.25
Overall course attainment level	**2.25**

PO-ATTAINMENT

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO Attainment	**1.95**	**1.95**	**2.25**	**1.20**	**0.75**	**0.75**				**1.88**	**1.88**	**1.88**		**1.95**

CO contribution to PO - 33%, 67%, 100% (Level 1/2/3)

ASSIGNMENTS

Assignment 1 script link:

https://drive.google.com/file/d/1bQRsw82okpQ3U5wEd3jvY4CiYFR6ZPjH/view?usp=sharing

Assignment 2 script link:

https://drive.google.com/file/d/1qtq5XiKWTixKcYoevreAE9haYypeOJwo/view?usp=sharing

Attendance Register link:

https://drive.google.com/file/d/1wMYzHMMR6yhorUvS-HVa_VqWPdpcJxXU/view?usp=sharing