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

Antennas and Propagation

Course Code – EC601PC

III B.Tech II-SEMESTER

A.Y.: 2022-2023

Prepared by

Mr.P.Krishna Rao
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	Antennas and Propagation
Course Code	EC601PC
Programme	B. Tech
Year & Semester	III year II-semester
Branch & Section	ECE-A
Regulation	R18
Course Faculty	Mr.P.Krishna Rao, Assistant Professor

Index of Course File

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 HYDERABAD
B.Tech. in ELECTRONICS AND COMMUNICATION ENGINEERING
III YEAR COURSE STRUCTURE AND SYLLABUS (R18)
Applicable From 2018-19 Admitted Batch

III YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	EC501PC	Microprocessors & Microcontrollers	3	1	0	4
2	EC502PC	Data Communications and Networks	3	1	0	4
3	EC503PC	Control Systems	3	1	0	4
4	SM504MS	Business Economics & Financial Analysis	3	0	0	3
5		Professional Elective - I	3	0	0	3
6	EC505PC	Microprocessors & Microcontrollers Lab	0	0	3	1.5
7	EC506PC	Data Communications and Networks Lab	0	0	3	1.5
8	EN508HS	Advanced Communication Skills Lab	0	0	2	1
9	*MC510	Intellectual Property Rights	3	0	0	0
		Total Credits	18	3	8	22

III YEAR II SEMESTER

S. No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	EC601PC	Antennas and Propagation	3	1	0	4
2	EC602PC	Digital Signal Processing	3	1	0	4
3	EC603PC	VLSI Design	3	1	0	4
4		Professional Elective - II	3	0	0	3
5		Open Elective - I	3	0	0	3
6	EC604PC	Digital Signal Processing Lab	0	0	3	1.5
7	EC605PC	e – CAD Lab	0	0	3	1.5
8	EC606PC	Scripting Languages Lab	0	0	2	1
9	*MC609	Environmental Science	3	0	0	0
		Total Credits	**18**	**3**	**8**	**22**

***MC - Environmental Science – Should be Registered by Lateral Entry Students Only.**

Note: Industrial Oriented Mini Project/ Summer Internship is to be carried out during the summer vacation between 6th and 7th semesters. Students should submit report of Industrial Oriented Mini Project/ Summer Internship for evaluation.

Professional Elective – I

EC511PE	Computer Organization & Operating Systems
EC512PE	Error Correcting Codes
EC513PE	Electronic Measurements and Instrumentation

Professional Elective – II

EC611PE	Object Oriented Programming through Java
EC612PE	Mobile Communications and Networks
EC613PE	Embedded System Design

EC601PC: ANTENNAS AND PROPAGATION

B.Tech. III Year II Semester

L	T	P	C
3	1	0	4

Prerequisite: Electromagnetic Theory and Transmission Lines

Course Objectives:

Course Objectives: The course objectives are:

1. To understand the concept of radiation, antenna definitions and significance of antenna parameters, to derive and analyze the radiation characteristics of thin wire dipole antennas and solve numerical problems.

2. To analyze the characteristics and design relations of UHF, VHF and Microwave Antennas.

3. To identify the antenna array requirements, to determine the characteristics of ULAs and estimate the patterns of BSA, EFA, and Binomial Arrays.

4. To understand the concepts and set-up requirements for microwave measurements, and familiarize with the procedure to enable antenna measurements.

5. To define and distinguish between different phenomenon of wave propagation (ground wave, space wave and sky wave), their frequency dependence, and estimate their characteristics, identifying their profiles and parameters involved.

Course Outcomes: Upon completing this course, the student will be able to explain the mechanism of radiation, definitions of different antenna characteristic parameters and establish their mathematical relations.

1. Characterize the antennas based on frequency, configure the geometry and establish the radiation patterns of VHF, UHF and Microwave antennas and also antenna arrays.

2. Specify the requirements for microwave measurements and arrange a setup to carry out the antenna far zone pattern and gain measurements in the laboratory.

3. Classify the different wave propagation mechanisms, determine the characteristic features of different wave propagations, and estimate the parameters involved.

UNIT - I

Antenna Basics: Basic Antenna Parameters – Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Effective Height.

Fields from Oscillating Dipole, Field Zones, Front - to-back Ratio, Antenna Theorems, Radiation, Retarded Potentials – Helmholtz Theorem

Thin Linear Wire Antennas – Radiation from Small Electric Dipole, Quarter Wave Monopole and Half Wave Dipole – Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beam Width, Directivity, Effective Area and Effective Height, Natural Current Distributions, Far Fields and Patterns of Thin Linear Centre-fed Antennas of Different Lengths. Loop Antennas - Small Loop, Comparison of Far Fields of Small Loop and Short Dipole, Radiation Resistances and Directivities of Small Loops (Qualitative Treatment).

UNIT - II

Antenna Arrays: Point Sources – Definition, Patterns, arrays of 2 Isotropic Sources - Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, Endfire Arrays, EFA with Increased Directivity, Derivation of their Characteristics and Comparison, BSAs with Non-uniform Amplitude Distributions – General Considerations and Binomial Arrays.

Antenna Measurements: Introduction, Concepts - Reciprocity, Near and Far Fields, Coordinate System, Sources of Errors. Patterns to be Measured, Directivity Measurement, Gain Measurements (by Comparison, Absolute and 3-Antenna Methods.

UNIT –III:

VHF, UHF and Microwave Antennas - I: Arrays with Parasitic Elements, Yagi-Uda Array, Folded Dipoles and their Characteristics, Helical Antennas – Helical Geometry, Helix Modes, Practical Design Considerations for Monofilar Helical Antenna in Axial and Normal Modes, Horn Antennas – Types, Fermat's Principle, Optimum Horns, Design Considerations of Pyramidal Horns.

UNIT - IV

VHF, UHF and Microwave Antennas - II: Microstrip Antennas – Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas – Geometry and Parameters, Characteristics of Microstrip Antennas. Reflector Antennas – Introduction, Flat Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, Pattern Characteristics, Feed Methods, Reflector Types – Related Features.

UNIT - V:

Wave Propagation - Definitions, Categorizations and General Classifications, Different Modes of Wave Propagation, Ray/Mode Concepts**,**

Ground Wave Propagation –Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections.

Space Wave Propagation –Field Strength Variation with Distance and Height, Effect of Earth's Curvature, Absorption, Super Refraction, M-Curves and Duct Propagation, Scattering Phenomena, Troposphere Propagation**.**

Sky Wave Propagation –Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and Skip Distance, Multi-hop Propagation**.**

TEXT BOOKS:

1. Antennas and Wave Propagation – J.D. Kraus, R.J. Marhefka and Ahmad S. Khan, TMH, New Delhi, 4th ed., (Special Indian Edition), 2010.

2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd ed., 2000.

REFERENCE BOOKS:

1. Antenna Theory - C.A. Balanis, John Wiley & Sons, 3rd Ed., 2005.

2. Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi, 2001.

3. Radio Engineering Handbook- Keith henney, 3rd edition TMH.
4. Antenna Engineering Handbook –John Leonidas Volakis, 3rd edition, 2007.

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COs and Mapping with PO/PSO

Course: ANTENNAS AND PROPAGATION (C321) **Class: III ECE-A**

Course Outcomes

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

C321.1: Investigate the different types of antennas like short dipole, half wave dipole, quarter Wave monopole and small loops. And its parameters with mathematical relations. (Analysis)

C321.2: Design and analysis of folded dipole, yagi uda, helical and horn antennas based on the Frequency with its radiation patter. (Synthesis)

C321.3: Design and analysis of micro strip rectangular patch antenna and parabolic reflector Antenna according to their relevant feed structure. (Synthesis)

C321.4: Perpetrate the Linear array analysis, estimate the array factor, characteristics and sketch the pattern for 2-element array, N-element BSA, EFA, modified EFA, Binomial arrays. (Application)

C321.5: Interpret the requirement of microwave measurement for antenna far zone pattern and Gain measurements. (Application)

C321.6: Classify the different wave propagation mechanisms, identify their frequency ranges, determine the characteristic features of ground wave, ionosphere wave, space wave, duct and troposphere propagations, and estimate the parameters involved. (Application).

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
C321.1	2	2	-	-	-	-	-	-	-	-	-	3	2	1
C321.2	2	2	3	2	-	-	-	-		-	2	2	2	1
C321.3	2	2	3	2	-	-	-	-	-	-	2		2	1
C321.4	2	2	-	-	-	-	-	-	-	-	3	2	1	-
C321.5	2	2	-	-	-	-	-	-	-	-	-	-	1	-
C321.6	2	2	-	-	-	-	-	-	-	-	-	-	2	2
AVG	**2**	**2**	**3**	**2**							**2.3**	**2.3**	**1.67**	**1.25**

CO- PO/PSO Mapping - Justification

Course: ANTENNAS AND PROPAGATION (C321) **Class: III 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.

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.

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.

CO-PO mapping Justification

C321.1*:* Investigate the different types of antennas like short dipole, half wave dipole, quarter Wave monopole and small loops. And its parameters with mathematical relations. (Analysis).

	Justification
PO1	Investigating and understanding the parameters of different antennas involve the application of mathematics, science, and engineering fundamentals. This knowledge is crucial for designing antennas that meet specific performance requirements in complex engineering

	problems. (Level-2)
PO2	The investigation of antennas and their parameters involves a systematic problem analysis approach, leveraging mathematical principles and engineering sciences to formulate, research, and analyze complex engineering problems related to antenna design and optimization.(Level-2)
PO12	Investigating antennas and staying informed about their parameters aligns with the principles of life-long learning. Engineers and professionals need to recognize the dynamic nature of technology and be prepared to engage in continuous learning to stay at the forefront of advancements in antenna design and communication systems.(Level-3)
PSO1	The investigation of antennas and their parameters involves a systematic problem analysis approach, leveraging mathematical principles and engineering sciences to formulate, research, and analyze complex engineering problems related to antenna design and optimization.(Level-2)
PSO2	Investigating and understanding the parameters of different antennas involve the application of mathematics, science, and engineering fundamentals. This knowledge is crucial for designing antennas that meet specific performance requirements in complex engineering problems.(Level-1)

C321.2: Design and analysis of folded dipole, yagi uda, helical and horn antennas based on the Frequency with its radiation pattern. (Synthesis)

	Justification
PO1	The design and analysis of folded dipole, Yagi-Uda, helical, and horn antennas involve the application of mathematics, science, and engineering fundamentals. This knowledge is essential for solving complex engineering problems related to antenna design and optimization. (Level-2)
PO2	The design and analysis of folded dipole, Yagi-Uda, helical, and horn antennas involve a systematic problem analysis approach. This approach, supported by the application of engineering knowledge, allows engineers to formulate, research, and analyze complex engineering problems related to antenna design and optimization.(level-2)
PO3	The design and analysis of folded dipole, Yagi-Uda, helical, and horn antennas are approached with a focus on developing solutions that not only meet technical specifications but also consider public health, safety, cultural diversity, societal needs, and environmental sustainability. This holistic approach ensures that the engineering solutions are well-rounded and contribute positively to the broader context in which they operate.(level-3)
PO4	The design and analysis of folded dipole, Yagi-Uda, helical, and horn antennas involve a rigorous process of conducting investigations using research-based knowledge and methods. This approach ensures that the antennas are designed and optimized based on a solid foundation of theoretical understanding and practical experimentation, leading to valid conclusions regarding their performance and capabilities.(level-2)
PO11	The design and analysis of folded dipole, Yagi-Uda, helical, and horn antennas benefit from the application of project management and finance principles. These principles ensure efficient use of resources, adherence to timelines, risk mitigation, and effective collaboration in multidisciplinary environments, ultimately contributing to the successful completion of antenna projects.(level-2)
PO12	Life-long learning is crucial in the design and analysis of folded dipole, Yagi-Uda, helical, and horn antennas. Engineers committed to continuous learning are better equipped to

	navigate technological changes, incorporate new research findings, and innovate in their antenna designs to meet evolving communication standards and requirements.(level-2)
PSO1	The design and analysis of folded dipole, Yagi-Uda, helical, and horn antennas involve a systematic problem analysis approach. This approach, supported by the application of engineering knowledge, allows engineers to formulate, research, and analyze complex engineering problems related to antenna design and optimization.(level-2)
PSO2	The design and analysis of folded dipole, Yagi-Uda, helical, and horn antennas benefit from the application of project management and finance principles. These principles ensure efficient use of resources, adherence to timelines, risk mitigation, and effective collaboration in multidisciplinary environments, ultimately contributing to the successful completion of antenna projects.(level-1)

C321.3: Design and analysis of micro strip rectangular patch antenna and parabolic reflector Antenna according to their relevant feed structure. (Synthesis)

	Justification
PO1	The design and analysis of microstrip rectangular patch antennas and parabolic reflector antennas involve the application of engineering knowledge across multiple domains. The use of mathematics, science, and engineering fundamentals is essential for addressing complex engineering problems related to antenna design, feed structures, and overall performance optimization.(level-2)
PO2	The design and analysis of microstrip rectangular patch antennas and parabolic reflector antennas involve a systematic problem analysis approach. This approach, supported by the application of engineering knowledge, allows engineers to formulate, research, and analyze complex engineering problems related to antenna design, feed structures, and overall performance optimization.(level-2)
PO3	The design and analysis of microstrip rectangular patch antennas and parabolic reflector antennas involve a holistic approach in the design/development of solutions. These solutions not only meet technical specifications but also consider public health and safety, cultural diversity, societal needs, and environmental sustainability, reflecting a commitment to responsible engineering practices.(level-3)
PO4	The design and analysis of microstrip rectangular patch antennas and parabolic reflector antennas necessitate the application of research-based knowledge and research methods. The investigation process involves a combination of theoretical understanding, experimental design, and data analysis to draw valid conclusions about the antennas' performance and optimize their design parameters.(level-2)
PO11	The design and analysis of microstrip rectangular patch antennas and parabolic reflector antennas benefit from the application of project management and finance principles. These principles ensure that the design process is not only technically rigorous but also well-managed, with efficient resource allocation, effective team collaboration, and adherence to project timelines and budgets.(level-2)
PSO1	The design and analysis of microstrip rectangular patch antennas and parabolic reflector antennas involve a holistic approach in the design/development of solutions. These solutions not only meet technical specifications but also consider public health and safety, cultural diversity, societal needs, and environmental sustainability, reflecting a commitment to responsible engineering practices.`(level-2)
PSO2	The design and analysis of microstrip rectangular patch antennas and parabolic reflector antennas involve the application of engineering knowledge across multiple domains. The use of mathematics, science, and engineering fundamentals is essential for addressing complex engineering problems related to antenna design, feed structures, and overall

	performance optimization.(level-1)

C321.4: Perpetrate the Linear array analysis, estimate the array factor, characteristics and Sketch the pattern for 2-element array, N-element BSA, EFA, modified EFA, Binomial arrays. (Application)

	Justification
PO1	The analysis of linear arrays, estimation of array factors, characteristics, and sketching of patterns for various types of arrays require a solid application of engineering knowledge, including mathematical principles and electromagnetic theory. This knowledge is essential for predicting and optimizing the performance of antenna arrays in different configurations and applications.(level-2)
PO2	The perpetration of linear array analysis, estimation of array factors, characteristics, and sketching of patterns for various arrays involves a systematic problem analysis approach. This approach, supported by the application of engineering knowledge, enables engineers to identify, formulate, research, and analyze complex engineering problems related to antenna array design and optimization.(level-2)
PO11	The perpetration of linear array analysis, estimation of array factors, characteristics, and sketching of patterns for various arrays benefits from the application of project management and finance principles. These principles ensure a structured and coordinated approach, effective collaboration, and optimized resource allocation, contributing to the successful execution of projects in the field of antenna array design.(level-3)
PO12	The perpetration of linear array analysis, estimation of array factors, characteristics, and sketching of patterns for various arrays is inherently linked to the principle of life-long learning. Engineers must recognize the need for continuous learning, be prepared to acquire new knowledge independently, and actively engage in life-long learning to adapt to the evolving landscape of antenna technology.(level-2)
PSO1	The perpetration of linear array analysis, estimation of array factors, characteristics, and sketching of patterns for various arrays involves a systematic problem analysis approach. This approach, supported by the application of engineering knowledge, enables engineers to identify, formulate, research, and analyze complex engineering problems related to antenna array design and optimization.(level-1)

C321.5: Interpret the requirement of microwave measurement for antenna far zone pattern and Gain measurements.(Application)

	Justification
PO1	Microwave measurements for antenna far zone pattern and gain are integral to antenna design and optimization. The application of engineering knowledge in mathematics, science, and fundamental principles ensures the accuracy and reliability of these measurements, enabling engineers to interpret results and make informed decisions for enhancing antenna performance(level-2)
PO2	The interpretation of microwave measurements for antenna far zone pattern and gain involves identifying, formulating, and analyzing complex engineering problems. A thorough literature review and the application of first principles in mathematics, natural sciences, and engineering sciences are essential for substantiating conclusions and ensuring accurate and reliable measurement outcomes.(level-2)
PSO1	Microwave measurements for antenna far zone pattern and gain are integral to antenna

	design and optimization. The application of engineering knowledge in mathematics, science, and fundamental principles ensures the accuracy and reliability of these measurements, enabling engineers to interpret results and make informed decisions for enhancing antenna performance(level-1)

C321.6: Classify the different wave propagation mechanisms, identify their frequency ranges, determine the characteristic features of ground wave, ionosphere wave, space wave, duct and troposphere propagations, and estimate the parameters involved.(Application).

	Justification
PO1	The classification of wave propagation mechanisms and identification of their frequency ranges, characteristic features, and parameter estimation involve the application.(level-2)
PO2	The classification of wave propagation mechanisms and the identification of their frequency ranges and characteristic features, coupled with the estimation of parameters, are justified through a problem analysis approach. This approach involves identifying, formulating, researching, and analyzing complex engineering problems using first principles of mathematics, natural sciences, and engineering sciences.(level-2)
PSO1	The classification of wave propagation mechanisms and identification of their frequency ranges, characteristic features, and parameter estimation involve the application.(level-2)
PSO2	This approach involves identifying, formulating, researching, and analyzing complex engineering problems using first principles of mathematics, natural sciences, and engineering sciences.(level-2)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

ACADEMIC CALENDAR 2022-23

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

I SEM

S. No	Description	Duration	
		From	To
1	Commencement of I Semester classwork	**09.09.2022**	
2	1st Spell of Instructions (including Dussehra Recess)	09.09.2022	10.11.2022 (9 Weeks)
3	Dussehra Recess	03.10.2022	08.10.2022 (1 Week)
4	First Mid Term Examinations	11.11.2022	17.11.2022 (1 Week)
5	Submission of First Mid Term Exam Marks to the University on or before	24.11.2022	
6	2nd Spell of Instructions	18.11.2022	12.01.2023 (8 Weeks)
7	Second Mid Term Examinations	16.01.2023	21.01.2023 (1 Week)
8	Preparation Holidays and Practical Examinations	23.01.2023	28.01.2023 (1 Week)
9	Submission of Second Mid Term Exam Marks to the University on or before	30.01.2023	
10	End Semester Examinations	30.01.2023	11.02.2023 (2 Weeks)

Note: No. of Working/ instructional days: 92

II SEM

S. No	Description	Duration	
		From	To
1	Commencement of II Semester classwork	**13.02.2023**	
2	1st Spell of Instructions	13.02.2023	08.04.2023 (8 Weeks)
3	First Mid Term Examinations	10.04.2023	15.04.2023 (1 Week)
4	Submission of First Mid Term Exam Marks to the University on or before	22.04.2023	
5	2nd Spell of Instructions (including Summer Vacation)	17.04.2023	24.06.2023 (10 Weeks)
6	**Summer Vacation**	15.05.2023	27.05.2023 (2 Weeks)
7	Second Mid Term Examinations	26.06.2023	01.07.2023 (1 Week)
8	Preparation Holidays and Practical Examinations	03.07.2023	08.07.2023 (1 Week)
9	Submission of Second Mid Term Exam Marks to the University on or before	08.07.2023	
10	End Semester Examinations	10.07.2023	22.07.2023 (2 Weeks)

Note: No. of Working/ instructional days: 90

REGISTRAR

SRI INDU INSTITUTE OF ENGINEERING AND TECHNOLOGY

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Class Timetable

CLASS: III-B.Tech ECE-A | A.Y:2022-23 | SEMESTER: II | LH: C-201

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	A&P	DSP LAB / e-CAD LAB			LUNCH	VLSID	ESD	LIB
TUE	IM	DSP	FAI	ESD		DSP(T)/VLSID(T)	A&P	SPORTS
WED	ESD	IM	A&P	A&P(T)/DSP(T)		FAI	DSP	COUN
THU	IM	DSP	VLSID	VLSID(T)/A&P(T)		e-CAD LAB / DSP LAB		
FRI	FAI	DSP	A&P	VLSID		ESD	CO-CU/DAA	
SAT	VLSID	ESD	VLSID(ADJUNCT)			SL LAB		A&P

*(T) – Tutorial Concern Faculty

Course Code	Course Name	Name of the Faculty	Course Code	Course Name	Name of the Faculty
EC601PC	A&P-Antennas and Propagation	P.Krishna Rao	EC604PC	DSP LAB-Digital Signal Processing Lab	Y.Raju/Dr.T.Ramakrishna/ Dr.S.Anjaneyulu
EC602PC	DSP-Digital Signal Processing	Y.Raju	EC605PC	e-CAD LAB-e – CAD Lab	S.Alekhya/P.Rajendra/P.Krishna
EC603PC	VLSID-VLSI Design	S.Alekhya	EC606PC	SL LAB-Scripting Languages Lab	D.Nagaraju/P.Krishna Rao/ K.Bhaskar Reddy
EC613PE	ESD-Embedded System Design(Professional Elective-II)	A.Vaani	-	FAI-Fundamentals of Artificaial Intelligence	P.Meena
VLSID (ADJUNCT)	VLSID(ADJUNCT)	G.Chandrasekhar	COUN	Counseling	Y.Raju/K.Padma/G.Swathi
MT600OE	IM-Industrial Management (Open Elective-I)	K.V.Nagamani	SPORTS	Sports	P.Srilatha/B.Ashwini
			CO-CU/DAA	Co-Curricular/Dept. Assoc.Activities	S.Alekhya/S.Naresh/K.Bhaskar Reddy
			LIB	Library	G.Nirmala/A.Swetha

Class Incharge | Head of The Department | Principal

Head of the Department
Electronics and Communication Engg. Dept
INSTITUTE OF ENGG & TECH.

Sri Indu Institute of Engineering & Tec
Sheriguda(Vill), Ibrahimpatnam

SRI INDU INSTITUTE OF ENGINEERING AND TECHNOLOGY

Accredited by NAAC with A+ Grade, Recognized under 2(f) of UGC Act 1956
(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/

LESSON PLAN

Programme: B.Tech	Academic Year: 2022-23
Year: III	Semester: II
Course Title: Antennas and Propagation	Course Code: EC601PC
Name of Faculty: Mr.P. Krishna Rao	

UNIT – I

Antenna Basics: Introduction, Basic Antenna Parameters – Patterns, Beam A ea, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Ape tu es, Effective Height, Illustrative Problems.

Fields from Oscillating Dipole, Field Zones, Front - to-back Ratio , Antenna Theorems, Radiation, Retarded Potentials – Helmholtz Theorem

Thin Linear Wire Antennas – Radiation from Small Electric Dipole, Quarter WaveMonopole and Half Wave Dipole – Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beam Width, Directivity, Effective Area and Effective Height, Natural Current Distributions, Far Fields and Patterns of Thin Linear Centre-fed Antennas of Different Lengths, Illustrative Problems. Loop Antennas - Introduction, Small Loop, Comparison of Far Fields of Small Loop and Short Dipole, Radiation Resistances and Directivities of Small Loops (Qualitative Treatment)

No. of Sessions Planned	Topics	Reference	Teaching Method/ Aids
	UNIT 1		
1	Antenna definition: Introduction	T1,T3	BB
1	Basic Antenna parameters:Patterns, Beam Area, Radiation Intensity, Beam Efficiency	T1,T3	BB
1	Directivity gain resolution, Antenna Aperture, Effective Height: Definitions	T1,T3	BB
1	Field from Oscillating Dipole:Field Zones, front to back ratio	T1,T3	BB
1	Antenna Theorems, Radiation, Retarded potentials Helmholtz Theorems	T3	BB
1	Tutorial – 1	T1	BB
1	Radiation from Small Electric Dipole- Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beam Width, Directivity, Effective Area and Effective Height	T1,R1,T3	BB
1	Quarter wave monopole - Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beam	T1,R1	PPT/BB

	Width, Directivity, Effective Area and Effective Height		
1	Half Wave Dipole -Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beam Width, Directivity, Effective Area and Effective Height	T1	BB
1	Natural Current Distributions, Far Fields and Patterns of Thin Linear Centre-fed Antennas of Different Lengths, Illustrative Problems.	T1,T3	BB
1	Loop Antennas - Introduction, Small Loop, Comparison of Far Fields of Small Loop and Short Dipole, Radiation Resistances and Directivities of Small Loops	T1,T2	BB
1	Tutorial – 2	T1,T2	BB
1	Tutorial – 3	T1	BB
Gap beyond syllabus(if any):			
Gap within the syllabus(if any)			
Course Outcome 1: Student would be able to Investigate the different types of antennas like short dipole, half wave dipole, quarter wave monopole and small loops and its parameters with mathematical relations. (Analysis)			

*Session Duration: 50minutes

*Total Number of Hours/Unit: 13

Unit-II Syllabus

VHF, UHF and Microwave Antennas - I : Arrays with Parasitic Elements, Yagi-UdaArray, Folded Dipoles and their Characteristics, Helical Antennas – Helical Geometry, Helix Modes, Practical Design Considerations for Mono filar Helical Antenna in Axial and Normal Modes, Horn Antennas –types, Fermat's Principle, Optimum Horns, Design Considerations of Pyramidal Horns, Illustrative Problems.

No. of Sessions Planned	Topics	Reference	Teaching Method/ Aids
	Unit II		
1	VHF,UHF and Microwave Antennas-1:Basic concepts, Array with parasitic Elements,	T1,T2	PPT/BB
1	Yagi Uda Array	T2,T3	PPT/BB
1	Design Folded dipoles and their Characteristics	T2	BB
1	Helical antennas	T1,T2	BB
1	Helical Geometry, helix modes, basic properties	T2,T3	BB
1	Practical design consideration for mono filar helical antenna in axial mode	T2,T3	BB
1	Tutorial-4	T1,T3	BB
1	Practical design consideration for mono filar helical antenna in normal mode	T2,T3	BB
1	Horn Antennas:Introduction	T2,T3	BB
1	Types of horn antennas, Fermat's principle,	T2	BB
1	Optimum Horns, Design Considerations of Pyramidal Horns	T2	BB
1	Tutorial-5	T1,R1	BB
1	Tutorial-6	T2	BB
Gap beyond syllabus(if any):			
Gap within the syllabus(if any):			
Course Outcome 2: Student would be able to Design and analysis of folded dipole, Yagi Uda, helical and horn antennas based on the frequency with its radiation pattern. (Synthesis)			

*Session Duration: 50minutes

*Total Number of Hours/Unit: 13

Unit-III Syllabus

VHF, UHF and Microwave Antennas - II: Micro strip Antennas – Introduction, Features,Advantages and Limitations, Rectangular Patch Antennas – Geometry and Parameters, Characteristics of Micro strip Antennas. Reflector Antennas – Introduction, Flar Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, Pattern Characteristics, Feed Methods, Reflector Types – Related Features, Illustrative Problems.

No. of Sessions Planned	Topics	Reference	Teaching Method/ Aids
	UNIT - III		
1	VHF,UHF and Microwave Antennas-II	T2	BB
1	Micro strip Antennas-Introduction.	T2,T3	BB
1	Features, Advantages, and Limitations of Micro strip Antennas	T2,T3	BB
1	Rectangular Patch Antennas	T2,T3	BB
1	Geometry and parameters, Characteristics of Micro strip Antennas.	T2,T3	BB
1	Tutorial-7	T2,T3	BB
1	Reflector Antennas: Introduction.	T1,T3	BB
1	Flar sheet and corner Reflectors	T1,T3	BB
1	Paraboloidal reflectors	T1,T3	BB
1	Geometry and pattern Characteristics, feed methods	T1,T3	BB
1	Reflector Types- Related Features.	T1,T3	BB
1	Tutorial-8	T1,T2	BB
1	Tutorial-9	T1,T3	BB
Gap beyond syllabus(if any):			
Gap within the syllabus(if any)			
Course Outcome 3: Student would be able to design and analysis of micro strip rectangular patch antenna and parabolic reflector antenna according to their relevant feed structure.(Synthesis)			

*Session Duration: 50minutes

*Total Number of Hours/Unit: 13

Unit-IV Syllabus

Antenna Arrays: Point Sources – Definition, Patterns**,** arrays of 2 Isotropic Sources - Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside arrays, End fire Arrays, EFA with Increased Directivity, Derivation of their Characteristics and Comparison, BSAs with Non-uniform Amplitude Distributions – General Considerations and Binomial Arrays, Illustrative Problems.

Antenna Measurements: Introduction, Concepts - Reciprocity, Near and Far Fields,Coordinate System, Sources of Errors. Patterns to be Measured, Directivity Measurement, Gain Measurements (by Comparison, Absolute and 3-Antenna Methods)

No. of Sessions Planned	Topics	Reference	Teaching Method/ Aids
	UNIT - IV		
1	Antenna arrays: Point sources-Definition, patterns	T1,T3	BB
1	Arrays of 2 isotropic sources-different cases	T1,T3	BB
1	Principle of pattern multiplication	T1,T3	BB
1	Uniform linear arrays- Broadside, End fire arrays	T1,T3	BB
1	EFA with increased Directivity	T1,T3	BB
1	Derivation of their characteristics and comparison	T1,T3	BB
1	Tutorial-10	T1,T3	BB
1	BSAs with non uniform amplitude distributions	T1,T3	BB
1	General considerations and Binomial arrays	T1,T3	BB
1	Antenna measurements: Introduction, concepts-reciprocity	T1,T2,T3	BB
1	Near and Far fields, Coordinate Systems, Sources of Errors	T2,T3	BB
1	Patterns to be measured, Directivity and Gain measurements	T2,T3	BB
1	Tutorial-11	T1,T3	BB
1.	Tutorial-12	T1,T2	BB
Gap beyond syllabus(if any):			
Gap within the syllabus(if any):			
Course Outcome 4: Student would be able to perpetrate the Linear array analysis, estimate the array factor, characteristics and sketch the pattern for 2-element array, N-element BSA, EFA, modified EFA, Binomial arrays. (Application) **Course Outcome 5:**Interpret the requirement of microwave measurement for antenna far zone pattern and gain measurements.(Application)			

*Session Duration:50minutes

*Total Number of Hours/Unit:14

Unit-V Syllabus

Wave Propagation–I: Introduction, Definitions, Categorizations and GeneralClassifications, Different Modes of Wave Propagation, Ray/Mode Concepts, Ground Wave Propagation (Qualitative Treatment) – Introduction, Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections. Space Wave Propagation – Introduction, Field Strength Variation with Distance and Height, Effect of Earth's Curvature, Absorption, Super Refraction, M-Curves and Duct Propagation, Scattering Phenomena, Tropospheric Propagation.

Wave Propagation – II: Sky Wave Propagation – Introduction, Structure of Ionosphere,Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and Skip Distance, Multi-hop Propagation.

No. of Sessions Planned	Topics	Reference	Teaching Method/ Aids
1	**Wave propagation-I**: Introduction, Definitions, Categorizations and General Classification	T3,R2	BB
1	Different Modes of Wave Propagation, Ray/Mode Concepts	T3,R2	BB
1	Ground wave propagation-Introduction, Plane earth reflections	T3,R2	PPT/BB
1	Space and surface waves, wave tilt, curved earth reflections	T3,R2	PPT/BB
1	Space wave Propagation: Introduction, field strength variation with distance and height	T3,R2	BB
1	Tutorial-13	T3,R2	BB
1	Effect of earth's curvature, absorption, super refraction	T3,R2	BB
1	M-curves and Duct propagation, Scattering phenomena, Tropospheric Propagation	T3,R2	PPT/BB
1	**Wave propagation-II:** Sky wave propagation Mechanism of propagation	T3,R2	PPT/BB
1	Reflection and refraction mechanisms	T3,R2	PPT/BB
1	Ray path, Critical frequency, MUF, LUF, OF	T3,R2	PPT/BB
1	Virtual height and skip distance	T3,R2	PPT/BB
1	Relation between MUF and skip distance	T3,R2	PPT/BB
1.	Multi – hop propagation	T3,R2	PPT/BB
Gap beyond syllabus(if any):			
Gap within the syllabus(if any)			

Course Outcome 6: Student would be able to classify the different wave propagation mechanisms, identify their frequency ranges, determine the characteristic features of ground wave, ionosphere wave, space wave, duct and troposphere propagations, and estimate the parameters involved.

*Session Duration:50minutes

*Total Number of Hours/Unit: 14

SUGGESTED BOOKS:

TEXT BOOKS:

1. Antennas for all applications-JohnD Kraus and Ronald J.Marhefka,3rd edition.TMHI 2003.
2. C.A.Balanis, 'Antenna Theory', 2nd edition, John Wiley& Sons, 2008.
3. Antennas and wave propagation-John D Kraus and Ronald J Marhefka,4th edition.SIE 2010,2006.

REFERENCE BOOKS:

1. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd ed., 2000.
2. Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi, 2001.

WEBREFERENCES:

1. https://www.tutorialspoint.com/antenna_theory/antenna_theory_fundamentals.htm
2. http://www.ece.rutgers.edu/~orfanidi/ewa/
3. https://www.tutorialspoint.com/antenna_theory/antenna_theory_micro_strip.htm
4. https://www.elprocus.com/antenna-array/
5. https://www.sciencedirect.com/topics/physics-and-astronomy/wave-propagation

Lecture notes

Unit-1:

https://drive.google.com/file/d/1lb3BUudMZeZY8xUGmvZgNE9fEPMbxLwN/view?usp=sharing

Unit-2:

https://drive.google.com/file/d/1Er5vESF7EitbkW1qvDsMhuKm16I105u7/view?usp=sharing

Unit-3:

https://drive.google.com/file/d/1tXVnAFtm_x2IMVSRJwRv68uE57r7ZZtB/view?usp=sharing

Unit-4:

https://drive.google.com/file/d/1EuE0BZxH5W7UB1rTRPJGiI6y375xUEGO/view?usp=sharing

Unit-5:

https://drive.google.com/file/d/1j-pkUND5O9HHGV92tJ88Noa87xqbsvC5/view?usp=sharing

Power point presentation

PPT link:

https://docs.google.com/presentation/d/1xhsfjGLpeBp-hplr0bNZQxTvny_xc5-l/edit?usp=sharing&ouid=115806571272910632527&rtpof=true&sd=true

CodeNo:156AF **R18**

JAWAHARLALNEHRUTECHNOLOGICALUNIVERSITY HYDERABAD
B.TechIIIYearIISemesterExaminations,August/September-2021 ANTENNAS AND PROPAGATION
(ElectronicsandCommunicationEngineering)

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

Answer any five questions
Allquestionscarryequalmarks

1.a) Developtheexpressionsforelectricandmagneticfieldcomponentsofquarter wavelength monopole antenna.
b) Draw andexplain theradiation patternofMonopole antennain principalplanes.[10+5]

2.a)Developtheexpressionsforelectric andmagnetic field componentsofhertz antenna.
b) Radiationintensityof particularantennaisgiven by$U=U_o\sin^2\theta$. Calculatedirectivity. [10+5]

3.a) Foranonuniformbroadsidelineararray derivetheexpressionforarrayfactorifthe array has (i) even number of elements and (ii) odd number of elements.
b) Explainthe proceduretomeasuredirectivityof antenna. [10+5]

4.a)Solve fordirectivityof End FireArray antenna.
b)Ifthetestantennaiscircularly polarized.Discusshowgainmeasurementis accomplishedusingthe gain-transfer method. [7+8]

5.a)Explain the characteristicsoffolded dipoles.
b) Briefouttheoperatingprinciple ofYagi-UdaAntenna. [10+5]

6.a)DiscusstheHelixmodesofHelical Antenna.
b)Consider an array of 2 Isotropic Sources. Find the resultant electric field and perform a case studyfordistance between elements d= $\lambda/2$, d=$\lambda/2$ when the antennasarefedwith currentsofsameamplitudeandphase. [8+7]

7.a) Explain the radiation mechanism in microstrip antenna using transmission line modelanalysis.
b)With the help of Cassegrain feed geometry, explain the operation of parabolic reflector antenna. [8+7]

8.a)Derivetheexpressionforskip distance.
b)Estimate the mechanism of space wave propagation over ideal flat earth with a neat sketch**.** [8+7]

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CodeNo:156AF **R18**

JAWAHARLALNEHRUTECHNOLOGICALUNIVERSITY HYDERABAD
B.TechIIIYearIISemesterExaminations,February/March-2022 ANTENNAS AND PROPAGATION
(ElectronicsandCommunicationEngineering)

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

Answer any five questions
Allquestionscarryequalmarks

1.a) Whatisbeam area?Defineandderivethebeam efficiencyof antenna.
b) ExplainaboutEffectiveareaandeffectiveheightoflinerwireantennas. [7+8]

2.a) Derivethe radiatingresistanceandradiatedpower ofQuarter-wavemonopole.
b) Writetheequations forfields from oscillatingdipole in detail. [7+8]

3.a) Write the Expression of principle of pattern multiplication and considering an array of four elements.
b) Derivetheequationfor fieldstrengthofauniformlinear array. [7+8]

4.a) WritethedifferencesbetweenNearandFarfieldmeasurementsof anantenna.
b) Discussabout theMeasurement ofantennapatterns in detail. [7+8]

5.a) Explaindesignand theoperationprincipleofhelical antennawithneat diagram.
b) Explainthe operationofYagi-udaantennaandwriteits applications. [8+7]

6.a) Theaperturedimensionsofapyramidal horn are12×6cm.Itisoperatingatafrequency of6GHz.Findthepower gainanddirectivity.
b) Explainaboutcornerreflectorandparabolicreflectorwithneatdiagrams. [6+9]

7. a) Explaintheprincipleandoperationofmicrostripantennaandwriteits applications.
b) DiscusstheMechanismofreflection andrefraction ofskywavesbyionosphere. [7+8]

8. Writeashort noteon:
a) Virtualheight
b) Critical frequency
c) MUF [5+5+5]

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CodeNo:156AF **R18**

JAWAHARLALNEHRUTECHNOLOGICALUNIVERSITY HYDERABAD
B.TechIIIYearIISemesterExaminations,February-2023 ANTENNAS AND PROPAGATION
(ElectronicsandCommunicationEngineering)

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

Note: i) QuestionpaperconsistsofPartA,Part B.
ii) PartAiscompulsory,whichcarries25marks. InPartA,Answer allquestions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART–A

(25 Marks)

	Defineeffective height.	[2]
b)	Whatis meant byradiationresistance?	[3]
c)	DefinePointsourceinantenna arrays.	[2]
d)	Whatis sourceof errors?	[3]
e)	WritetheapplicationsofHorn antenna.	[2]
f)	Whatismonofilarhelicalantenna?	[3]
g)	Definefeedmethodinreflector antennas.	[2]
h)	Whataredifferent typesofreflectors?	[3]
i)	Definespace andsurface wavesin groundwave propagation.	[2]
j)	Whatis multihop propagation?	[3]

PART–B

(50 Marks)

2.a)	Discussabout Retardedpotentials in antennas.	
b)	Explainabout Oscillating Dipole.	[4+6]
	OR	
3.a)	ExplainandderivetheequationofRadiationresistanceof Quarter-wavemonopole.	
b)	CompareFarfields ofsmallloop andshort dipole.	[6+4]
4.a)	Explaintheprincipleand operationofpatternofmultiplication.	
b)	DiscussaboutFieldstrengthofUniformlinear array.	[5+5]
	OR	
5.a)	Explainthe measurementofDirectivityin anymethod.	
b)	Howuni directionalpattern is obtainedin end-firearray?	[5+5]
6.a)	DrawandexplainthepyramidalHornAntenna.	
b)	Explainaboutfoldeddipolewith neatdiagramandwriteits applications.	[5+5]
	OR	
7.a)	ExplaintheprincipleandoperationofHelicalantennawithneat diagram.	
b)	Designathreeelement Yagi-Udaantennato operate ata frequencyof 172MHz.	[5+5]

8.a) Discussaboutrectangularpatch antennaandwrite its limitations.
b) Writethepatterncharacteristicsofreflector antenna. [6+4]

OR

9.a) Explainaboutparabolicreflectorantennawithneat diagram.
b) A parabolic reflector with a mouth diameter of 22 meters operates at 5 GHz frequency, efficiencyof0.6.Findthepowergain? [5+5]

10. a) Explainthereflectionofradiowavesbythesurfaceoftheearthingroundwave Propagation.
b) Discussabout effectof thecurvatureof theearth inspacewavepropagation. [5+5]

OR

11. Writeshort noteson:
a) MUF
b) Ray path
c) CharacteristicsofIonosphere
d) Duct Propagation. [10]

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CodeNo:156AF **R18**

JAWAHARLALNEHRUTECHNOLOGICALUNIVERSITY HYDERABAD
B.TechIIIYearIISemesterExaminations,August-2022 ANTENNAS AND PROPAGATION
(ElectronicsandCommunicationEngineering)

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

Answer any five questions
Allquestionscarryequalmarks

1.a) Obtaintherelations betweenthepotentials andtheir sources.
b) Writeashort note on loopantennas. [8+7]

2.a) Obtaintherelationshipbetweendirectivityandeffectiveaperture.
b) Defineradiationintensity?Iftheradiationintensity $U=A_0 Cos\theta$,determinedirectivity. [8+7]

3.a) Inalinear arrayof4isotropicelementsspaced $\lambda/2$ apartandwithequalcurrentsfed inphase, plotthe radiationpatternin polar coordinates.
b) Derivethe FourierTransformmethodofsynthesis. [7+8]

4.a) Describeamethodofmeasurementof radiationpatternwithneatmeasurementsetup.
b)What is polarization and describe polarization measurement by power measurement approach. [7+8]

5.a)Design log periodic antenna to operate over a frequency range of 125MHz to 500MHzto obtain a gain of 9 dB.
b) Deriveanexpression for theradiation resistanceof afolded dipole. [8+7]

6.a)Find the directivity, beam width and effective area of a paraboloidal reflector antennafor which the reflector diameter is 6 cm and the illumination efficiency is 65%. The frequency of operation is 10GHz.
b)Draw the diagram of pyramidal horn antenna and explain its operation, characteristics andapplications. [7+8]

7.a)Withthehelpofdiagramsandequivalentcircuits,explainfeedingmechanismsof micro strip antenna.
b)Design a rectangular micro strip antenna usinga substrate with dielectric constant of 2.2,h=0.1588cm soas toresonateat10 GHz. [8+7]

8.a)Deriveanexpressionforeffectivedielectricconstantandcriticalfrequencyof ionosphere layer.
b)Compute the effective dielectric constant of the E layer with $N=5\times10^5$ electrons/sec, if the frequencyof the waveis 25 MHZ. [8+7]

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Sri Indu Institute of Engineering & Technology

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

I - Mid Examinations, April - 2023

Set – I

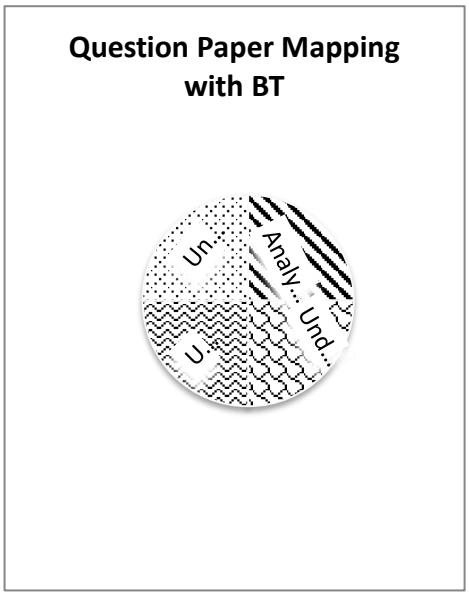
Year &Branch: III-II ECE-A&B&C Date: 10-04-2023 FN

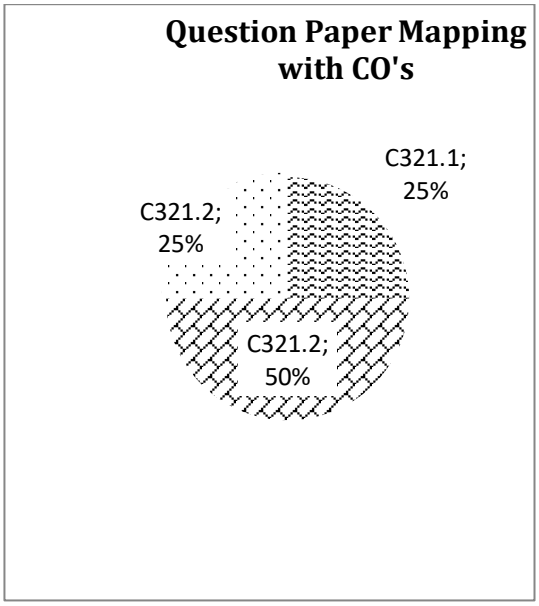
Subject: A&P Max. Marks: 10 Time: 60mins

Answer any two of the following question

Answer any two of the following question

1. (a) Derive the radiation resistance of a half- wave dipole antenna. **2M** (C321.1) **Analyze**
   (b) Derive the directivity of a half- wave dipole antenna. **3M** (C321.1) **Analyze**
2. (a) Define the following antenna parameters.(i).antenna resistance (ii).radiation pattern (iii).antenna efficiency (iv).directive gain (v).directivity **3M** (C321.1)**Understanding**
   (b) An antenna has radiation resistance of 72Ω loss resistance of 8Ω and a power gain of 12db.Determine the antenna efficiency and directivity. **Understanding** **2M** (C321.1)
3. Explain the operation of helical antenna in normal mode. **5M** (C321.2) **Understanding**
4. (a) Explain about principle of pattern multiplication with example. **2M** (C321.2) **Understanding**
   (b) Explain about binomial array. **3M** (C321.2) **Understanding**





Sri Indu Institute of Engineering & Technology

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

II - Mid Examinations

Set – I

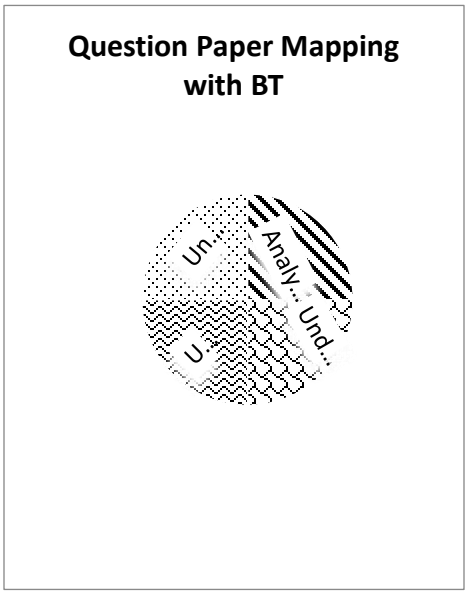
Year &Branch: III ECE A, B & C Date: 26.06.2023

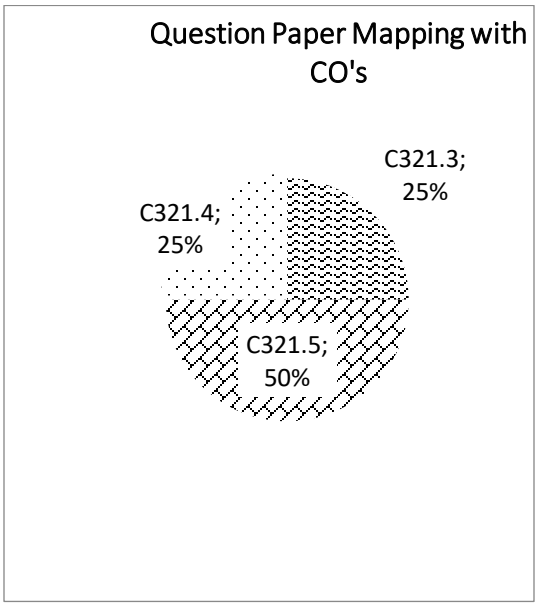
Subject: A&P Max. Marks: 10 Time: 60 mins

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

(This question paper is prepared with Course Outcome and BT's mapping)

1. Describe the parabolic reflector used at micro frequencies?	(5)	(C321.5)	(knowledge)
2. Explain the horn antenna with neat sketch?	(5)	(C321.4)	(Analysis)
3.Design the setup for gain measurement of antenna by gain comparison method?	(5)	(C321.3)	(Synthesis)
4. Judge the salient features of ground wave propagation?	(5)	(C321.5)	(Evaluation)





Sri Indu Institute of Engineering & Technology

Sheriguda (V), Ibrahimpatnam (M), R.R.Dist-501510

B-Tech I - Mid Examinations, April -2023

Objective Type Exam

Year & Branch: III–ECE A&B&C Date: 10/4/23

Subject: **A&P** Max. Marks: 10 Time: 20 mins

Name: ……..Roll No…….

Answer All Questions. All Questions Carry Equal Marks.

I. Choose the correct alternative:

1. The radiation resistance is 2 Ω and loss resistance is 8 Ω then the antenna efficiency is __ [ ]
   A) 5% B) 10%
   C) 20% D) 25%

2. HPBW of binomial array is_____than that of uniform linear array. [ ]
   A) less B) more C) Both D) None

3. In antenna array N=0 means _____lobe.
   [ ]
   A) First side B) second side
   C) Main D) None

4. Which property/ies of antenna is/are likely to be evidenced in accordance to Reciprocity theorem? [ ]
   A) Equality of impedances B) Equality of directional patterns
   C) Equality of effective lengths D) All above

5. Which mode of radiation occurs in an helical antenna due to smaller dimensions of helix as compared to a wavelength? [ ]
   A) Normal B) Axial C) Both a and b D) None

6. The directivity of half wave dipole antenna is_____ [ ]

   A) 1.64 B) 2.64 C) 3.64 D) 4.64

7. If AR=1, elliptical polarization becomes _____ polarizataion. [ ]

   A) horizontal B) vertical
   C) Circular D) None

8. In a Broadside array the radiation is along _____ [ ]

   A) X-direction B) Y-direction C) Both D) None

9. Helical antenna can be operated in _____ and _____ modes. [ ]
   A) Normal B) Axial C) Both D) None

10. The helix having the geometry of _____ [ ]

    A) straight wire B) Circle C) cylinder D) All

II. Fill in the blanks :

11. Radiation pattern is_____dimensional quantity.

12. _____kind of polarization provided by helical antennas.

13. _____is also called as 3-db bandwidth.

14. The radiation resistance of current element is given by_____
15. In axial mode, AR=_____

16. In Principle of pattern multiplication,the amplitudes will be_____and phase will be_____

17. In gain measurement,the SGA is generally_____antenna.

18. In a end-fire array the radiation is along _____

19. The advantage of binomial array, is that there will be no_____lobes.

20. Binomial array was invented by _____

-oOo-

Sri Indu Institute of Engineering & Technology

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

B-Tech II - Mid Examinations, JUNE-2023

Objective Type Exam

Year &Branch: III –ECE-A **Date: 26-06-2023(FN)**

Subject: A&P Max. Marks: 10 Time: 20 mins

Name:…… Roll No……

Answer All Questions. All Questions Carry Equal Marks.

I. Choose the correct alternative:

1. The widely used shape for patch antenna is __ [ ]
   A) Rectangular B) Circular
   C) Parabolic D) Elliptical

2. For square corner reflector the flaring angle is_____degrees. [ ]
   A) 30 B) 60 C) 90 D) 180

3. For large distances the earth can be considered as_____region. [ ]
   A) Flat B) Curved
   C) Conductor D) None

4. The line of sight distance is the distance travelled by _____wave. [ ]
   A) Reflected B) Direct C) Scattered D) None

5. The virtual height is always_____ than the actual height. [ ]
   A) Less B) More C) Both D) None

6. The frequency at which 50% to 85% of MUF is called_____ [ ]
   A) LUF B) MUF C) OWF D) None

7. In any dish antenna arrangement the parabolic reflector will acts as _____ antenna. [ ]
   A) Primary B) Secondary C) Both D) None

8. The disadvantage of parabolic reflector is _____ effect. [ ]
   A) Solar B) Spillover C) Random D) None

9. Ionospheric propagation is known as _____ [ ]
   A) Tropospheric B) Ground wave C) Sky wave D) None

10. _____ mode of propagation is adopted in HF antennas. [ ]
    A) Ground wave B) Tropospheric C) Ionospheric D) None

II. Fill in the blanks :

11. The efficiency of microstrip antenna is_____

12. The directivity of the paraboloid is _____

13. The parabolic antenna operates in the frequency range of_____

14. For small distances the earth can be considered as_____region.

15. The phenomenon of reduction of signal strength due to variation in refractive index is called_____

16. The relation between critical frequency and MUF is_____

17. The horizon of the earth, LOS distance is given by _____

18. In ground wave propagation the electric field at the receiving point is given by _____

19. The F2 layer of ionosphere exists between_____.

20. The highest frequency that returns from ionosphere other than vertical frequency is called _____

Sri Indu Institute of Engineering & Technology

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

B-Tech I - Mid Examinations, APRIL-2023

Year &Branch: III –ECE-A, B&C **Date: 10/04/23 (FN)**

Subject: A&P

ANSWER KEY

Descriptive paper key link:

https://drive.google.com/file/d/1QwGnDSMHWud6J4KPn8YmQ8rEN8ROt_ej/view?usp=sharing

Objective/Quiz Key Paper

I. Choose the correct alternative:

1.C

2.B

3.C

4.B

5.A

6.A

7.C

8.B

9.C

10.D

Fill in the blanks:

11.3

12.Clr

13.HPBW

14.$80\pi^2(dl/\lambda)^2$

15.1+1/2N

16.Null, $\lambda/2$

17.Horn

18.X-direction

19.Side lobes

20.Stone.

Sri Indu Institute of Engineering & Technology

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

B-Tech II - Mid Examinations, JUNE-2023

Year &Branch: III –ECE-A, B&C **Date: 26/06/23 (FN)**

Subject: A&P

ANSWER KEY

Descriptive paper key link:

https://drive.google.com/file/d/1elvsnUa_hQktpcBBqQppv9CZFIMIN2uu/view?usp=sharing

Objective/Quiz Key Paper

I. Choose the correct alternative:

1.A

2.C

3.B

4.B

5.B

6.C

7.B

8.B

9.C

10.A

Fill in the blanks:

11.80%

12.30db

13.10GHz

14. Flattering

15.Fading

16.Fmuf=Fc $sec\theta$

17.6378kms

18.Eg=Eo.A/d

19.220-800kms

20.Critical frequency

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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: ANTENNAS & PROPAGATION

1. Derive the radiation resistance of a half wave dipole antenna? (C321.1) Analysis
2. Derive the directivity of the half wave dipole.(C321.2)(Understanding)

3. An antenna has radiation resistance of 72Ω loss resistance of 8Ω and a power gain of 12db.Determine the antenna efficiency and directivity(C321.1) (Understanding)

4. Explain the operation of helical antenna in normal mode and axial mode.(C321.2) (Understanding)

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

ASSIGNMENT- 2

SUBJECT: ANTENNAS & PROPAGATION

1. Write a short note on parabolic reflector antenna. (C321.3)(Synthesis)
2. Judge the salient features of ground wave propagation. (C321.5)(Synthesis)
3. Explain about Structure of atmosphere.. (C321.4)(Application)
4. Write a short note on measurement of Gain by direct comparision method..

(C321.3)(Synthesis)

TUTORIAL TOPICS

SUBJECT: ANTENNAS & PROPAGATION

S.NO	Unit	TOPIC	Reference	Teaching method/Aids
1.	1	Directivity gain resolution, Antenna Aperture, Effective Height: Definitions, Field from Oscillating Dipole:Field Zones, front to back ratio	T1,T3	BB
2.		Antenna Theorems, Radiation, Retarded potentials Helmholtz Theorems	T1, T3	BB
3		Loop Antennas - Introduction, Small Loop, Comparison of Far Fields of Small Loop and Short Dipole, Radiation Resistances and Directivities of Small Loops	T1, T3	BB
4.	2	Helical antennas, Yagi Uda Array	T1, T3	BB
5.		Horn Antennas:Introduction	T3	BB
6		Types of horn antennas, Fermat's principle	T1, R1, T3	BB
7	3	VHF,UHF and Microwave Antennas-II, Micro strip Antennas-Introduction.	T1, T3	BB
8		Paraboloidal reflectors	T1, T3	BB
9		Reflector Types- Related Features.	T1	BB
10	4	Rectangular Patch Antennas	T2	BB
11		Paraboloidal reflectors	T1, T2	BB
12		Reflector Types- Related Features	T1, T3	BB
13		Arrays of 2 isotropic sources-different cases	T1	BB
14		BSAs with non uniform amplitude distributions	T1, T2	BB

15		Near and Far fields, Coordinate Systems, Sources of Errors	T1	BB
16	5	Space and surface waves, wave tilt, curved earth reflections	T1, T3	BB
17		Virtual height and skip distance	T1, T2	BB
18		Relation between MUF and skip distance, Multi – hop propagation	T1	BB

SUGGESTED BOOKS:
TEXT BOOKS:

1. Antennas for all applications-JohnD Kraus and Ronald J. Marhefka,3rd edition.TMHI 2003.
2. C.A.Balanis, 'Antenna Theory', 2nd edition, John Wiley& Sons, 2008.
3. Antennas and wave propagation-John D Kraus and Ronald J Marhefka,4th edition.SIE 2010,2006.

REFERENCE BOOKS:

1. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd ed., 2000.
2. Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, New. Delhi, 2001

Course Title	ANTENNAS & PROPAGATION
Course Code	EC601PC
Programme	B.Tech
Year & Semester	III year II-semester, A sec
Regulation	R18
Course Faculty	Mr.P.Krishna Rao Assistant Professor, ECE

Slow learners:

S No	Roll no	No of backlogs	Internal-I Status	Internal-II Status
1	20X31A0401	4	21	20
2	20X31A0403	5	14	14
3	20X31A0406	4	22	17
4	20X31A0407	3	22	19
5	20X31A0408	3	16	19
6	20X31A0410	5	14	14
7	20X31A0411	4	20	21
8	20X31A0412	5	20	18
9	20X31A0413	4	24	19
10	20X31A0418	8	14	14
11	20X31A0419	4	22	20
12	20X31A0423	3	23	15
13	20X31A0427	3	22	18
14	20X31A0428	4	21	19
15	20X31A0430	4	24	21
16	20X31A0431	5	16	18
17	20X31A0433	3	16	14
18	20X31A0435	3	20	19
19	20X31A0436	5	20	17
20	20X31A0440	4	22	22

22	20X31A0445	4	21	20
23	20X31A0447	3	24	23
24	20X31A0450	4	17	19
25	20X31A0453	4	22	19
26	20X31A0454	5	15	14
27	20X31A0455	4	20	16
28	20X31A0456	5	22	19
30	20X31A0458	3	23	20
31	20X31A0462	3	22	22

Advanced learners:

S.NO	ROLL.NO.	GATE MATERIAL
1	20X31A0404	Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Radiation from Small Electric Dipole, Quarter Wave Monopole and Half Wave Dipole – Current Distributions, , Folded Dipoles and their Characteristics, Helical Antennas – Helical Geometry, Helix Modes, Practical Design Considerations for Monofilar Helical Antenna, Different Modes of Wave Propagation, Ray/Mode Concepts, Ground Wave Propagation.
2	20X31A0409	
3	20X31A0415	
4	20X31A0416	
5	20X31A0420	
6	20X31A0421	
7	20X31A0422	
8	20X31A0425	
9	20X31A0432	
10	20X31A0434	
11	20X31A0437	
12	20X31A0438	
13	20X31A0439	
14	20X31A0442	
15	20X31A0444	
16	20X31A0449	
17	20X31A0452	
18	20X31A0459	
19	20X31A0460	

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

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

ACADAMIC YEAR	COURSE NAME	NUMBER OF STUDENTS		QUESTION PAPER SETTING		PASS%
		APPEARED	PASSED	INTERNAL	EXTERNAL	
2022-23	ANTENNA & PROPAGATION	62	34	COURSE FACULTY	JNTUH	54..83

ANTENNA& PROPAGATION (C321) RESULT ANALYSIS

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

REMEDIAL CLASSES TIME TABLE

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

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	EMF&W	LTNM	A&DC	LICA	ECA
II ECE-B	LICA	A&DC	EMF&W	ECA	LTNM
III ECE-A	DSP	VLSID	A&P	ESD	IM
III ECE-B	A&P	ESD	DSP	IM	VLSID
III ECE-C	IM	A&P	ESD	VLSID	DSP
IV ECE-A	WSN	ML	LPVLSID	-	-
IV ECE-B	ML	LPVLSID	WSN	-	-
IV ECE-C	LPVLSID	WSN	ML	-	-

HOD
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
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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 : P.Krishna Rao | Academic Year: 2022-2023

Branch & Section: ECE - A | Examination: I Internal

Course Name: A&P | Year: III | Semester: II

S.No	HT No.	Q1a	Q1b	Q2a	Q2b	Q3a	Q3b	Q4a	Q4b	Obj	A
Max. Marks ==>		5		5		5		5		10	5
1	20X31A0401			4				3		9	5
2	20X31A0402		5			4			2	9	5
3	20X31A0403	3								9	5
4	20X31A0404	5				1				9	5
5	20X31A0405	5						1	2	9	5
6	20X31A0406			5			3			9	5
7	20X31A0407	5				3				9	5
8	20X31A0408	3								9	5
9	20X31A0409			3	2			5		10	5
10	20X31A0410	3						3		3	5
11	20X31A0411	3						3		10	5
12	20X31A0412	3	2					1		9	5
13	20X31A0413	3	2			2	3			10	5
14	20X31A0414	3	2	5						10	5
15	20X31A0415	3	2	5						10	5
16	20X31A0416		3	3	2					10	5
17	20X31A0417	3	2	5						10	5
18	20X31A0418	5								4	5
19	20X31A0419	2	2					3	2	9	5
20	20X31A0420	3	2						2	10	5
21	20X31A0421	3	2					3		9	5
22	20X31A0422	3	2	3	2					9	5
23	20X31A0423	3	2			2	2			7	5
24	20X31A0424			3	2			2	2	3	5
25	20X31A0425	3	2				3			9	5
26	20X31A0426	3	2				4			9	5
27	20X31A0427			3	2		3			9	5
28	20X31A0428					3	2		3	9	5
29	20X31A0429			3	2			4		9	5
30	20X31A0430	3	2					3	2	10	5
31	20X31A0431	3								8	5
32	20X31A0432	3	2			2	2			9	5
33	20X31A0433	3								3	5
34	20X31A0434	3	2	5						10	5
35	20X31A0435			3	2	1				9	5
36	20X31A0436	3		3						9	5
37	20X31A0437	2	2			3	2			10	5
38	20X31A0438	3	2			5				9	5
39	20X31A0439	3	2			5				10	5
40	20X31A0440	2	2					2	2	10	5

41	20X31A0441	3	2			2	2			9	5
42	20X31A0442	3	2			2	3			9	5
44	20X31A0444			3	2	3	2			10	5
45	20X31A0445	3	2			2				8	5
46	20X31A0446			3	2			5		8	5
47	20X31A0447	3	2			5				9	5
48	20X31A0448			3	2	2	2			8	5
49	20X31A0449	3	2	5						10	5
50	20X31A0450	2	2	1						10	5
51	20X31A0451			3	2	3	2			9	5
52	20X31A0452			3	2	5				10	5
53	20X31A0453	3		3	2					4	5
54	20X31A0454	3		3						7	5
55	20X31A0455	3		3						9	5
56	20X31A0456	2	3	3						6	5
58	20X31A0458				3	2		4		9	5
59	20X31A0459			3	2		5			10	5
60	20X31A0460	3	3		4					10	5
61	20X31A0461	3	3		4					10	5
62	20X31A0462	3	2		3					9	5
Target set by the faculty		3.00	0.00	3.00	0.00	3.00	0.00	3.00	0.00	6.00	3.00
Number of students		38	31	25	18	10	15	10	8	55	60
Number of students attempted		43	31	26	18	20	15	14	8	60	60
Percentage of students scored more than target		88%	100%	96%	100%	50%	100%	71%	100%	92%	100%

CO Mapping with Exam Questions:

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

% Students Scored	88%	100%	96%	100%	50%	100%	71%	100%	92%	100%

CO Attainment based on Exam Questions:

CO - 1	88%						71%		92%	100%
CO - 2			88%						92%	100%
CO - 3					50%				92%	100%
CO - 4										
CO - 5										
CO - 6										

CO	**Subj**	obj	Asgn	Overall	Level
CO-1	80%	92%	100%	91%	3.00
CO-2	88%	92%	100%	93%	3.00

Attainment Level		
1	40%	
2	50%	

CO-3	50%	92%	100%	81%	3.00	3	60%	
CO-4								
CO-5								
CO-6								

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

SRI INDU INSTITUTE OF ENGINEERING AND TECHNOLOGY

Department of Electronics and Communication Engineering

Course Outcome Attainment (Internal Examination-1)

Name of the faculty : P.Krishna Rao
Academic Year: 2022-2023
Branch & Section: ECE - A
Examination: II Internal
Course Name: A&P
Year: III
Semester: II

S.No	HT No.	Q1a	Q1b	Q2a	Q2b	Q3a	Q3b	Q4a	Q4b	Obj4	A
Max. Marks ==>		5		5		5		5		10	5
1	20X31A0401			3				3		9	5
2	20X31A0402			3				2		9	5
3	20X31A0403							5		9	5
4	20X31A0404			4				3		9	5
5	20X31A0405			3				3		9	5
6	20X31A0406							3		9	5
7	20X31A0407			3				2		9	5
8	20X31A0408			2				3		9	5
9	20X31A0409	5						5		10	5
10	20X31A0410			6						3	5
11	20X31A0411	4						2		10	5
12	20X31A0412			4						9	5
13	20X31A0413							4		10	5
14	20X31A0414			4				3		10	5
15	20X31A0415			5				5		10	5
16	20X31A0416			4				2		10	5
17	20X31A0417			3				5		10	5
19	20X31A0418			5						4	5
20	20X31A0419			3				3		9	5
21	20X31A0420							3		9	5
22	20X31A0421							3		9	5
23	20X31A0422			5						9	5
24	20X31A0423							3		7	5
25	20X31A0424			6						3	5
26	20X31A0425			5				4		9	5
27	20X31A0426			4				5		9	5
28	20X31A0427			4				1		9	5
29	20X31A0428	3		3						9	5
30	20X31A0429	3		3						9	5
31	20X31A0430			4				2		10	5
32	20X31A0431			2				2		8	5
33	20X31A0432			5				3		9	5
34	20X31A0433			6				3		4	5
35	20X31A0434	4		4				3		10	5
36	20X31A0435			4				4		9	5
37	20X31A0436			2				4		9	5
38	20X31A0437			3				3		10	5
39	20X31A0438			5				5		9	5
40	20X31A0439			5				4		10	5
41	20X31A0440			3				4		10	5
42	20X31A0441			3				3		9	5
43	20X31A0442			5				4		9	5
44	20X31A0444	4		5			2			10	5
45	20X31A0445	4					2			8	5

46	20X31A0446	5					4			8	5
47	20X31A0447			5			4			9	5
48	20X31A0448			3			3			8	5
49	20X31A0449			5			3			10	5
50	20X31A0450			4						10	5
51	20X31A0451			4			5			9	5
52	20X31A0452	5		5						10	5
53	20X31A0453	2		2						10	5
54	20X31A0454			5						4	5
55	20X31A0455	1						2		7	5
56	20X31A0456			2				3		9	5
57	20X31A0458			3				3		9	5
58	20X31A0459			4				4		10	
59	20X31A0460			5				3		10	
60	20X31A0461			5				3		10	
61	20X31A0462			4				4		9	5
Target set by the faculty /			0.00	3.00	0.00	3.00	0.00	3.00	0.00	6.00	3.00
performed above the target		3.00	0	44	0	0	7	34	0	55	57
Number of students attempted		9	0	49	0	0	7	42	0	60	57
Percentage of students scored more than target		11		90%			100%	81%		92%	100%

CO Mapping with Exam 82%

CO - 1										
CO - 2										
CO - 3										
CO - 4							Y		Y	Y
CO - 5	Y		Y						Y	Y
CO - 6					Y				Y	Y
% Students Scored			90%			100%	81%		92%	100%

CO Attainment based on 82%

CO - 1									
CO - 2									
CO - 3									
CO - 4						81%		92%	100%
CO - 5	82%		90%					92%	100%
CO - 6								92%	100%

CO		obj	Asgn	Overall	Level
CO-1	**Subj**				
CO-2					
CO-3					
CO-4		92%	100%	96%	3.00
CO-5	81%	92%	100%	91%	3.00
CO-6	86%	92%	100%	92%	3.00
Attainment (					**3.00**

Attainment Level

1	40%
2	50%
3	60%

SRI INDU INSTITUTE OF ENGINEERING AND TECHNOLOGY

Department of Electronics and Communication Engineering

Course Outcome Attainment (University Examinations)

Name of the faculty : P.Krishna Rao A.Y: 2022-2023

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

Course Name: A&P

S.No	Roll Number	Marks Secured
1	20X31A0401	39
2	20X31A0402	56
3	20X31A0403	14
4	20X31A0404	51
5	20X31A0405	26
6	20X31A0406	37
7	20X31A0407	37
8	20X31A0408	51
9	20X31A0409	70
10	20X31A0410	20
11	20X31A0411	47
12	20X31A0412	25
13	20X31A0413	43
14	20X31A0414	55
15	20X31A0415	54
16	20X31A0416	48
17	20X31A0417	54
18	20X31A0418	14
19	20X31A0419	40

S.No	Roll Number	Marks Secured
36	20X31A0436	25
37	20X31A0437	52
38	20X31A0438	54
39	20X31A0439	51
40	20X31A0440	27
41	20X31A0441	34
42	20X31A0442	51
43	20X31A0444	51
44	20X31A0445	33
45	20X31A0446	39
46	20X31A0447	39
47	20X31A0448	29
48	20X31A0449	54
49	20X31A0450	22
50	20X31A0451	36
51	20X31A0452	51
52	20X31A0453	33
53	20X31A0454	15
54	20X31A0455	20

20	20X31A0420	38
21	20X31A0421	50
22	20X31A0422	71
23	20X31A0423	35
24	20X31A0424	39
25	20X31A0425	59
26	20X31A0426	52
27	20X31A0427	46
28	20X31A0428	49
29	20X31A0429	39
30	20X31A0430	58
31	20X31A0431	38
32	20X31A0432	53
33	20X31A0433	28
34	20X31A0434	58
35	20X31A0435	47
Max Marks		75

55	20X31A0456	26
56	20X31A0458	41
57	20X31A0459	61
58	20X31A0460	49
59	20X31A0461	39
60	20X31A0462	43

Class Average mark	53
Number of students performed above the target	1
Number of successful students	60
Percentage of students scored more than target	2%
Attainment level	**1**

Attainment Level	
1	40%
2	50%
3	60%

SRI INDU INSTITUTE OF ENGINEERING AND TECHNOLOGY

Department of Electronics and Communication Engineering

Course Outcome Attainment

Name of the faculty : P.Krishna Rao
Academic Year: 2022-2023
Branch & Section: ECE - A
Year: III
Course Name: A&P
Semester: II

Course Outcomes	1st Internal Exam	2nd Internal Exam	Internal Exam	University Exam	Attainment Level
CO1	3.00		3.00	1.00	1.50
CO2	3.00		3.00	1.00	1.50
CO3	3.00		3.00	1.00	1.50
CO4		3.00	3.00	1.00	1.50
CO5		3.00	3.00	1.00	1.50
CO6		3.00	3.00	1.00	1.50
Internal & University Attainment:			3.00	1.00	
Weightage			25%	75%	
CO Attainment for the course (Internal, University)			0.75	0.75	
CO Attainment for the course (Direct Method)			1.50		

Overall course attainment level **1.50**

SRI INDU INSTITUTE OF ENGINEERING & TECHNOLOGY

Department of Electronics and Communication Engineering

Program Outcome Attainment (from Course)

Name of Faculty:	P.Krishna Rao	Academic Year:	2022-2023
Branch & Section:	ECE - A	Year:	III
Course Name:	A&P	Semester:	II

CO-PO mapping

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C321.1	2	2	-	-	-	-	-	-	-	-	-	3	2	1
C321.2	2	2	3	2	-	-	-	-		-	2	2	2	1
C321.3	2	2	3	2	-	-	-	-	-	-	2		2	1
C321.4	2	2	-	-	-	-	-	-	-	-	3	2	1	-
C321.5	2	2	-	-	-	-	-	-	-	-	-	-	1	-
C321.6	2	2	-	-	-	-	-	-	-	-	-	-	2	2
AVG	**2**	**2**	**3**	**2**							**2.3**	**2.3**	**1.67**	**1.25**

CO	Course Outcome Attainment
CO1	1.50
CO2	1.50
CO3	1.50
CO4	1.50
CO5	1.50
CO6	1.50
Overall course attainment level	**1.50**

PO-ATTAINMENT

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO Attainment	**2**	**2**	**3**	**2**							**2.3**	**2.3**	**1.67**	**1.25**

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

ASSIGNMENTS AND REGISTERS

Assignment 1 script link:

https://drive.google.com/file/d/1AQp6G2gCcv_D6POW7f7lRhS6zl7yUdr8/view?usp=sharing

Assignment 2 script link:

https://drive.google.com/file/d/15rKsPwPJxa3Ptye0-qCFoetGZ7Zv1CA9/view?usp=sharing

Attendance register link:

https://drive.google.com/file/d/10THYZE0q0laVZxQLdTSo_XUixhMrdxR6/view?usp=sharing