Department of Electronics and Communication Engineering

Department of Electronics And Communication Engineering

Course File

ELECTROMAGNETIC FIELDS AND TRANSMISSION LINES

(Course Code: EC402PC)

II B.Tech II Semester

2023-24

Dr. PODILI RAMU
Assistant Professor

Ananthagiri, Kodad, Telangana 508 206, India.

Department of Electronics and Communication Engineering

Electromagnetic Fields and transmission lines

Check List

Anurag ENGINEERING COLLEGE (An Autonomous Institution)

Department of Electronics and Communication Engineering

Int. Marks:30 Ext. Marks:70 Total Marks:100

Electromagnetic Fields and transmission lines

COURSE CODE: (EC402PC)

II Year B.Tech. ECE II Semester

L	T / P / D	C
3	2 / 0 / 0	3

UNIT – I

Electrostatics: Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Energy Density. Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Capacitance — Parallel Plate, Coaxial, Spherical Capacitors.

UNIT – II

Magneto statics: Biot-Savart's Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law.

UNIT – III

Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Two Equations for Magneto static Fields, Maxwell's Two Equations for Electrostatic Fields Maxwell's Equations in Different Forms, Conditions at a Boundary Surface – Dielectric-Dielectric and Dielectric-Conductor Interfaces.

UNIT – IV

EM Wave Characteristics: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves — Definitions, Relation between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization. Reflection and Refraction of Plane Waves — Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Pointing Vector and Pointing Theorem.

UNIT – V

Transmission Lines: Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Equivalent Circuit, Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Lossless / Low Loss Characterization, Condition for Distortion less line, Minimum Attenuation, Loading - Types of Loading.SC and OC Lines, λ/4, λ/2, λ/8 Lines, Reflection Coefficient, VSWR Smith Chart — Configuration and Applications, Single Stub Matching.

TEXT BOOKS:

1. William H. Hayt Jr. and John A. Buck- Engineering Electromagnetics, 8 th Ed., McGraw Hill,2014

2. Matthew N.O. sadiku and S.V. Kulkarni - Principles of Electromagnetics, 6 th Ed., OxfordUniversity Press, Aisan Edition, 2015.

REFERENCE BOOKS:

1. JD. Kraus -Electromagnetics with Applications ,5th Ed., TMH

2. Umesh Sinha, Satya Prakashan -Transmission Lines and Networks, (Tech. IndiaPublications), New Delhi, 2001.

3. JD Ryder -Networks, Lines and Fields, 2 nd Ed., PHI, 1999

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Timetable

II B.Tech. I Semester – EMTL (A Sec)

Day/Hour	9.30-10.20	10.20-11.10	11.20-12.10	12.10-1.00	1.40-2.25	2.25-3.10	3.10-4.00
Monday							
Tuesday							
Wednesday			EMTL				EMTL
Thursday				EMTL			
Friday					EMTL		
Saturday		EMTL					

Department of Electronics and Communication Engineering

Vision of the Institute

To be a premier Institute in the country and region for the study of Engineering, Technology and Management by maintaining high academic standards which promotes the analytical thinking and independent judgment among the prime stakeholders, enabling them to function responsibly in the globalized society.

Mission of the Institute

To be a world-class Institute, achieving excellence in teaching, research and consultancy in cutting-edge Technologies and be in the service of society in promoting continued education in Engineering, Technology and Management.

Quality Policy

To ensure high standards in imparting professional education by providing world-class infrastructure, top-quality-faculty and decent work culture to sculpt the students into Socially Responsible Professionals through creative team-work, innovation and research

Vision of the Department

To impart technical knowledge and skills required to succeed in life, career and help society to achieve self sufficiency.

Mission of the Department

- To become an internationally leading department for higher learning.
- To build upon the culture and values of universal science and contemporary education.
- To be a center of research and education generating knowledge and technologies which lay groundwork in shaping the future in the fields of electrical and electronics engineering.

To develop partnership with industrial, R&D and government agencies and actively participate in conferences, technical and community activities

Department of Electronics and Communication Engineering

Program Educational Objectives (B.Tech. – ECE)
Graduates will be able to

PEO 1: Have a successful technical or professional career, including supportive and leadership roles on multidisciplinary teams.
PEO 2: Acquire, use and develop skills as required for effective professional practices.
PEO 3: Able to attain holistic education that is an essential prerequisite for being a responsible member of society.

Program Outcomes (B.Tech. – ECE)
At the end of the Program, a graduate will have the ability to

PO 1: Apply knowledge of mathematics, science, and engineering.
PO 2: Design and conduct experiments, as well as to analyze and interpret data.
PO 3: Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
PO 4: Function on multi-disciplinary teams.
PO 5: Identify, formulates, and solves engineering problems.
PO 6: Understanding of professional and ethical responsibility.
PO 7: Communicate effectively.
PO 8: Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
PO 9: Recognition of the need for, and an ability to engage in life-long learning.
PO 10: Knowledge of contemporary issues.
PO 11: Utilize experimental, statistical and computational methods and tools necessary for engineering practice.
PO 12: Demonstrate an ability to design electrical and electronic circuits, power electronics, power systems; electrical machines analyze and interpret data and also an ability to design digital and analog systems and programming them.

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COURSE OBJECTIVES

On completion of this Subject/Course the student shall be able to:

S.No	Objectives
1	Apply vector Calculus and different coordinates systems for Electro and Magnetic systems
2	Understand the knowledge OF the Basic Laws, Concepts and proofs related to Magneto static Fields, and apply them to solve physics and engineering problems
3	Understand the concept of static and time-varying fields, and understand the significance and utility of Maxwell's Equations and Boundary Conditions, and gain ability to provide solutions to communication engineering problems
4	To Analyse the characteristics of uniform plane waves, determine their propagation parameters and estimate the same for dielectric and dissipative media
5	To study the propagation, reflection and transmission of plane waves inbounded and unbounded media

COURSE OUTCOMES

The expected outcomes of the Course/Subject are:

S.No	Outcomes
1.	Solve the problems in different EM fields using Different Coordinates Systems
2.	Evaluate the Electric Field Density and Intensity for Different Charges
3.	Understand the Electromagnetic Relation using Maxwell Formulae
4.	Analyze the characteristics of uniform plane waves and propagation parameters
5.	Analyze and solve problems transmission lines and smith charts

Signature of faculty

Note: Please refer to Bloom's Taxonomy, to know the illustrative verbs that can be used to state the outcomes.

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GUIDELINES TO STUDY THE COURSE / SUBJECT

Course Design and Delivery System (CDD):

- The Course syllabus is written into number of learning objectives and outcomes.
- Every student will be given an assessment plan, criteria for assessment, scheme of evaluation and grading method.
- The Learning Process will be carried out through assessments of Knowledge, Skills and Attitude by various methods and the students will be given guidance to refer to the text books, reference books, journals, etc.

The faculty be able to –

- Understand the principles of Learning
- Understand the psychology of students
- Develop instructional objectives for a given topic
- Prepare course, unit and lesson plans
- Understand different methods of teaching and learning
- Use appropriate teaching and learning aids
- Plan and deliver lectures effectively
- Provide feedback to students using various methods of Assessments and tools of Evaluation
- Act as a guide, advisor, counselor, facilitator, motivator and not just as a teacher alone

Signature of HOD

Date:

Signature of faculty

Date:

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COURSE SCHEDULE

The Schedule for the whole Course / Subject is:

S. No.	Description	Duration (Date)		Total No. of Periods
		From	To	
1.	UNIT – I Electrostatics: Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Energy Density. Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Capacitance – Parallel Plate, Coaxial, Spherical Capacitors.	05.02.2024	23.02.2024	13
2.	UNIT – II Magneto statics: Biot-Savart's Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law.	24.02.2024	11.03.2024	10
3.	UNIT – III Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Two Equations for Magneto static Fields, Maxwell's Two Equations for Electrostatic Fields Maxwell's Equations in Different Forms, Conditions at a Boundary Surface – Dielectric-Dielectric and Dielectric-Conductor Interfaces.	12.03.2024	04.04.2024	13
4.	UNIT – IV EM Wave Characteristics: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definitions, Relation between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization. Reflection and Refraction of Plane Waves – Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Pointing Vector and Pointing Theorem	06.04.2024	01.05.2024	14
5.	UNIT – V Transmission Lines: Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Equivalent Circuit, Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Lossless / Low Loss Characterization, Condition for Distortion less line, Minimum Attenuation, Loading - Types of Loading.SC and OC Lines, λ/4, λ/2, λ/8 Lines, Reflection Coefficient, VSWR Smith Chart – Configuration and Applications, Single Stub Matching.	02.05.2024	12.06.2024	14

Total No. of Instructional periods available for the course: 64 Hours

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SCHEDULE OF INSTRUCTIONS - COURSE PLAN

Unit No.	Lesson No.	Date	No. of Periods	Topics / Sub-Topics	Objectives & Outcomes Nos.	References (Textbook, Journal)
1.	1	05.02.2024 & 06.0202024	2	Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions	1 1	Principles of Electromagnetics - Sadiku
	2	08.02.2024 & 09.02.2024	2	Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions	1 1	Principles of Electromagnetics - Sadiku
	3	12.02.2024	1	Electric Flux Density, Gauss Law and Applications	1	Principles of Electromagnetics – Sadiku
	4	13.02.2024	1	Electric Potential, Relations Between E and V	1	Principles of Electromagnetics - Sadiku
	5	15.02.2024	1	Energy Density, Convection and Conduction Currents	1 1	Principles of Electromagnetics - Sadiku
	6	16.02.2024	1	Dielectric Constant,	1	Principles of Electromagnetics - Sadiku
	7	17.02.2024	1	Isotropic and Homogeneous Dielectrics	1	Principles of Electromagnetics - Sadiku
	8	19.02.2024	1	Continuity Equation, Relaxation Time,	1	Principles of Electromagnetics - Sadiku
	9	20.02.2024 & 22.02.2024	2	Poisson's and Laplace's Equations, problems	1 1	Principles of Electromagnetics - Sadiku
	10	23.02.2024	1	Capacitance – Parallel Plate, Coaxial, Spherical Capacitors	1 1	Principles of Electromagnetics - Sadiku
2..	1	24.02.2024 & 26.02.2024	2	Magneto statics: Biot-Savart's Law,	2 2	Principles of Electromagnetics - Sadiku
	2	27.02.2024 & 28.02..2024	2	Ampere's Circuital Law and Applications, ,	2 2	Principles of Electromagnetics - Sadiku
	3	29.02.2024	1	Magnetic Flux Density	2 2	Principles of Electromagnetics - Sadiku
	4	01.03.2024 & 04..03.2024	2	Magnetic Scalar and Vector Potentialsic Fields	2 2	Principles of Electromagnetics - Sadiku
	5	05.03.2024 & 07.03.2024	2	Forces due to Magnetic Fields	2 2	Principles of Electromagnetics - Sadiku

	6	11.03.2024	1	Ampere's Force Law. Applications	2 2	Principles of Electromagnetics - Sadiku
3.	1	12.03.2024 & 14.03.2024	2	Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer EMF	3 3	Principles of Electromagnetics - Sadiku
	2	15.03.2024	1	Inconsistency of Ampere's Law and Displacement Current Density	3 3	Principles of Electromagnetics - Sadiku
	3	16.03.2024 & 16.03.2024	2	Maxwell's Two Equations for Magneto static Fields	3 3	Principles of Electromagnetics - Sadiku
	4	18.03.2024 & 19.03.2024	2	Maxwell's Two Equations for Electrostatic Fields Maxwell's Equations in Different Forms	3 3	Principles of Electromagnetics - Sadiku
	5	21.03.2024	1	Conditions at a Boundary Surface – Dielectric-Dielectric	3 3	Principles of Electromagnetics - Sadiku
	6	22.03.2024 & 26.03.2024	2	Conditions at a Boundary Surface – Dielectric-Dielectric	3 3	Principles of Electromagnetics - Sadiku
	7	27.03.2024 & 28.03.2024	2	Dielectric-Conductor Interfaces.	3 3	Principles of Electromagnetics - Sadiku
	8	30.03.2024 & 30.03.2024	2	Problems	3 3	Principles of Electromagnetics - Sadiku
	9	04.04.2024	1	Problems	3 3	Principles of Electromagnetics - Sadiku
4	1	06.04.2024 & 08.04.2024	2	wave equations for conducting and perfect dielectric media	4 4	Principles of Electromagnetics - Sadiku
	2	15.04.2024 & 16.04.2024	2	Uniform plane waves – definitions,	4 4	Principles of Electromagnetics - Sadiku
	3	19.04.2024 & 22.04.2024	2	Relation between E & H, Sinusoidal Variations	4 4	Principles of Electromagnetics - Sadiku
	4	23.04.2024 & 24.04.2024	2	Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization	4 4	Principles of Electromagnetics - Sadiku
	5	26.04.2024 & 27.04.2024	2	Wave Propagation in Good Conductors and Good Dielectrics, Polarization.	4 4	Principles of Electromagnetics - Sadiku
	6	27.04.2024 & 29.04.2024	2	Reflection and Refraction of Plane Waves – Normal and Oblique	4 4	Principles of Electromagnetics - Sadiku

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	7	30.04.2024	1	Incidences for both Perfect Conductor and Perfect Dielectrics,	4 4	Principles of Electromagnetics - Sadiku
	8	01.05.2024	1	Critical Angle and Total Internal Reflection, Pointing Vector and Pointing Theorem.	4 4	Principles of Electromagnetics - Sadiku
5	**1**	02.05.2024 & 06.05.2024	**2**	Transmission Lines: Types, Parameters, Transmission Line Equations	**5** **5**	Principles of Electromagnetics - Sadiku
	2	07.05.2024 & 08.05.2024	**2**	Primary & Secondary Constants and Equivalent Circuit	**5** **5**	Principles of Electromagnetics - Sadiku
	3	09.05.2024 & 10.05.2024	**2**	Characteristic Impedance, Propagation Constant	**5** **5**	Principles of Electromagnetics - Sadiku
	4	03.05.2024	**2**	Phase and Group Velocities, Lossless / Low Loss Characterization	**5** **5**	Principles of Electromagnetics - Sadiku
	5	04.06.2024	**2**	Condition for Distortion less line and Minimum Attenuatio	**5** **5**	Principles of Electromagnetics - Sadiku
	6	06.06.2024 & 08.02.2023	**2**	Loading - Types of Loading.SC and OC Lines and λ/4, λ/2, λ/8 Lines	**5** **5**	Principles of Electromagnetics - Sadiku
	7	10.02.2023 & 11.06.2024	**1**	Reflection Coefficient and VSWR	**5**	Principles of Electromagnetics - Sadiku
	8	12.06.2024	**1**	Smith Chart – Configuration and Applications and Single Stub Matching.	**5**	Principles of Electromagnetics - Sadiku
		10.06.2024	**1**	revison		

Signature of HOD **Signature of faculty**

Date: **Date:**

Note:

1. **Ensure that all topics specified in the course are mentioned.**
2. **Additional topics covered, if any, may also be specified in bold.**
3. **Mention the corresponding course objective and outcome numbers against each topic.**

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LESSON PLAN (U-I)

Lesson No: 01, 02 **Duration of Lesson: 2hr 30 min**

Lesson Title: Introduction to Electromagnetic Fields, Coulomb's law

Instructional / Lesson Objectives:

- **To make students understand Coulomb's Law and Electric Field Intensity**
- **To familiarize students on EFI due to point, line and surface and volume charge distributions**
- **To understand students the concept of Ampere's Circuital Law and Applications, and Magnetic Flux Density,**
- **To provide information on Forces due to Magnetic Fields and Ampere's Force Law.**

Teaching AIDS : PPTs, Digital Board
Time Management of Class :

5 mins for taking attendance **130 min for the lecture delivery** **15 min for doubts session**

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1,2,3,4 & 1,3..)

Refer assignment – I & tutorial-I sheets

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LESSON PLAN (U-I)

Lesson No: 03, 04 Duration of Lesson: 1hr30 MIN

Lesson Title: Electric Field Intensity-Electrical Field due to Point charge, Line, Surface Charge distributions

Instructional / Lesson Objectives:

- To make students understand Faraday's Law and Transformer EMF and Inconsistency of Ampere's Law
- To familiarize students on Maxwell's Two Equations for Electrostatic Fields Maxwell's Equations in Different Forms
- To understand students the concept of Wave Equations for Conducting and Perfect Dielectric Medium?
- To provide information on Critical Angle and Total Internal Reflection

Teaching AIDS : PPTs, Digital Board
Time Management of Class :

5 mins for taking attendance 15 for revision of previous class 55 min for lecture delivery 15 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1,2,3,4 & 1,3..)

Refer assignment – I & tutorial-I sheets

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LESSON PLAN (U-II)

Lesson No: 05, 06 Duration of Lesson: 1hr30 MIN

Lesson Title: Capacitance, Poison's & Laplace Equation

Instructional / Lesson Objectives:

- To make students understand the concept of Transmission Lines: Types, Parameters, Transmission Line Equations
- To familiarize students on Propagation Constant, Phase and Group Velocities
- To understand students the concepts of Loading and types of Loading
- To provide information on Smith Chart – Configuration and Applications

Teaching AIDS : PPTs, Digital Board
Time Management of Class :

5 mins for taking attendance 15 for revision of previous class 55 min for lecture delivery 15 min for doubts session

Assignment / Questions:
(Note: Mention for each question the relevant Objectives and Outcomes Nos.1,2,3,4 & 1,3..)

Refer assignment-II & tutorial-II sheets.

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ASSIGNMENT – 1

This Assignment corresponds to Unit No. 1

Question No.	Question	Objective No.	Outcome No.
1	What is Coulomb's law? Derive necessary expressions required	1	1
2	Derive the expression for Continuity Equation and Relaxation Time	1	1
3	Discuss the about Gauss's Law and Applications	1	1

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ASSIGNMENT – 2

This Assignment corresponds to Unit No. 2

Question No.	Question	Objective No.	Outcome No.
1	Discuss about Ampere's Force Law?	2	2
2	State stokes theorem. find H at (-4,5,0) due to a current element along X- axis	2	2
3	State Biot-Savart Law. Derive integral form of Biot-Savart Law for a differential element of a long current carrying conductor	2	2

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ASSIGNMENT – 3

This Assignment corresponds to Unit No. 3

Question No.	Question	Objective No.	Outcome No.
1	Discuss about Faraday's Law and Transformer EMF and Inconsistency of Ampere's Law and Displacement Current Density	3	3
2	Derive maxwell's equations from Maxwell's Two Equations for Electrostatic Fields Maxwell's Equations in Different Forms	3	3

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ASSIGNMENT – 4

This Assignment corresponds to Unit No. 4

Question No.	Question	Objective No.	Outcome No.
1	Discuss Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves?	4	4
2	Derive the Wave Propagation in Good Conductors and Good Dielectrics and Polarization?	4	4
3	Discuss about Pointing Vector and Pointing Theorem?	4	4

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ASSIGNMENT – 5

This Assignment corresponds to Unit No. 5

Question No.	Question	Objective No.	Outcome No.
1	Discuss about Primary & Secondary Constants of transmission lines	4	4
2	Derive Propagation Constant and Phase and Group Velocities?	4	4
3	Explain about Single Stub Matching?	4	4

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TUTORIAL – 1

This tutorial corresponds to Unit No. 1 (Objective Nos.: 1, Outcome Nos.: 1)

Q1. Coulomb is the unit of which quantity?
a) Field strength b) Charge c) Permittivity d) Force

Q2. Two charges 1C and -4C exists in air. What is the direction of force?
a) Away from 1C b) Away from -4C c) From 1C to -4C d) From -4C to 1C

Q3 the Coulomb law is an implication of which law?
a) Ampere law b) Gauss law c) Biot Savart law d) Lenz law

Q4. Divergence theorem is based on
a) Gauss law b) Stokes law c) Ampere law d) Lenz law

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TUTORIAL – 2

This tutorial corresponds to Unit No. 2 (Objective Nos.: 2, Outcome Nos.: 2)

Q 1. Coulomb is the unit of which quantity?
a) Field strength b) Charge c) Permittivity d) Force

Q2. Gauss law can be evaluated in which coordinate system?
a) Cartesian b) Cylinder c) Spherical d) Depends on the Gaussian surface

Q3. With Gauss law as reference which of the following law can be derived?
a) Ampere law b) Faraday's law c) Coulomb's law d) Ohm's law

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TUTORIAL SHEET – 3

This tutorial corresponds to Unit No. 3 (Objective Nos.: 3, Outcome Nos.: 3)

Q1. The benefit of Maxwell equation is that
a) Any parameter can be calculated b) Antenna can be designed
c) Polarisation of the wave can be calculated d) Transmission line constants can be found

Q2 Which of the following identities is always zero for static fields?
a) Grad (Curl V) b) Curl (Div V) c) Div.(Grad V) d) Curl(Grad V)

Q3. Which of the following properties distinguish a material as conductor, insulator and semiconductor?
a) Free electron charges b) Fermi level after doping c) Energy band gap d) Electron density

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TUTORIAL – 4

This tutorial corresponds to Unit No. 4 (Objective Nos.: 3, Outcome Nos.: 3)

Q1. Which of the following proves that electromagnetic waves are transverse?
A.Reflection B.Diffraction C. Interference D. Polarisation

Q2. The fact that electromagnetic waves are transverse in nature is demonstrated by?
Polarisation B. Interference C. Reflection D. Diffraction

Q3. Electromagnetic waves are generated by:

A.Charge in uniform motion B.Charge at rest C. Accelerated charge D. All of the above

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TUTORIAL SHEET – 5

This tutorial corresponds to Unit No. 5 (Objective Nos.: 5, Outcome Nos.: 5)

Q1. For a matched line, the input impedance will be equal to
a) Load impedance b) Characteristic impedance c) Output impedance d) Zero

Q2. The reflection coefficient lies in the range of
a) $0 < \tau < 1$ b) $-1 < \tau < 1$ c) $1 < \tau < \infty$ d) $0 < \tau < \infty$

Q3. The characteristic impedance of a transmission line is normally chosen to be
a) 50 b) 75 c) 50 or 75 d) 100

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EVALUATION STRATEGY

Target (s)

a. Percentage of Pass : 95%

Assessment Method (s) (Maximum Marks for evaluation are defined in the Academic Regulations)

a. Daily Attendance
b. Assignments
c. Online Quiz (or) Seminars
d. Continuous Internal Assessment
e. Semester / End Examination

List out any new topic(s) or any innovation you would like to introduce in teaching the subjects in this semester

Case Study of any one existing application

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COURSE COMPLETION STATUS

Actual Date of Completion & Remarks if any

Units	Remarks	Objective No. Achieved	Outcome No. Achieved
Unit 1	completed on 23.02.2024	1	1
Unit 2	completed on 11.03.2024	2	2
Unit 3	completed on 04.04.2024	3	3
Unit 4	completed on 01.05.2024	4	4
Unit 5	completed on 12.06.2024	5	5

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Mappings

1. Course Objectives-Course Outcomes Relationship Matrix

(Indicate the relationships by mark "X")

Course-Outcomes / Course-Objectives	1	2	3	4	5
1	H	M			
2		H			
3			H		
4				H	
5					H

2. Course Outcomes-Program Outcomes (POs) & PSOs Relationship Matrix

(Indicate the relationships by mark "X")

P-Outcomes / C-Outcomes	a	b	c	d	e	f	g	h	i	j	k	l	PSO 1	PSO 2
1	M			M									H	
2		M	H			M							M	M
3					H				M		M			H
4						M	M						M	
5										H				

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Rubric for Evaluation

Performance Criteria	Unsatisfactory	Developing	Satisfactory	Exemplary
	1	2	3	4
Research & Gather Information	Does not collect any information that relates to the topic	Collects very little information some relates to the topic	Collects some basic Information most relates to the topic	Collects a great deal of Information all relates to the topic
Fulfill team role's duty	Does not perform any duties of assigned team role.	Performs very little duties.	Performs nearly all duties.	Performs all duties of assigned team role.
Share Equally	Always relies on others to do the work.	Rarely does the assigned work - often needs reminding.	Usually does the assigned work - rarely needs reminding.	Always does the assigned work without having to be reminded
Listen to other team mates	Is always talking—never allows anyone else to speak.	Usually doing most of the talking-- rarely allows others to speak	Listens, but sometimes talks too much.	Listens and speaks a fair amount.

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NAAC

II B.TECH IV SEMESTER I MID EXAMINATIONS - APRIL 2024

Branch : B.Tech. (ECE) **Subject : Electromagnetic Fields and Transmission Lines,EC402PC** **Max. Marks: 30**
Date : 01.04.2024 **Time: 120 Minutes**

PART - A

ANSWER ALL QUESTIONS **10 X 1M = 10M**

Q.No	Question	CO	BTL
1.	Which of the following criteria is used to choose a coordinate system? ( ) (A). Distance (B). Intensity (C). Magnitude (D). Geometry	CO1	2
2.	Find the force between 2C and -1C separated by a distance 1m in air(in newton ( ) (A). 18×10^{6} (B). $8X\ 10^{6}$ (C). 18×10^{-6} (D). -18×10^{-6}	CO1	1
3.	define conduction current density ( )	CO1	1
4.	which of the following system is also called as Cartesian system ( ) (A). Circular coordinate system (B). Rectangular coordinate system (C). Space coordinate system (D). Spherical coordinate system	CO1	1
5.	find magnetic field is analogous to which law in electric field by Biot Savart law ? ( ) (A). Gauss law (B). Faraday law (C). Coulomb's law (D). Ampere law	CO2	2
6.	Find the magnetic flux density when a point from a finite current length element of curren: 0.5A and radius 100nm ( ) (A). 0 (B). 0.5 (C). 1 (D). 2	CO2	2
7.	Find the magnetic field intensity when the current density is 0.5 units for an area up to 20 units. ( ) (A). 10 (B). 5 (C). 20 (D). 40	CO2	2
8.	Write any two applications of amper's circuital law ( )	CO2	2
9.	Define the faradays law ( ) (A). MMF (B). EMF (C). Electric potential (D). Magnetic potential	CO3	3
10.	What is transformer EMF ( )	CO3	3

PART - B

ANSWER ANY FOUR **4 X 5 M = 20 M**

Q.No	Question	CO	BTL
11.	Explain about energy density in electrostatic fields?	CO1	2
12.	State and Prove gauss law and its applications	CO1	3
13.	Derive expressions for ampere's force law?	CO2	3
14.	Explain about application of ampere's law to ar. infinate sheet?	CO2	3
15.	Explain and write maxwell's equation for time varying fields?.	CO3	3
16.	Explain about fadays law and transformer EMF?	CO3	3

Department of Electronics and Communication Engineering

Anurag ENGINEERING COLLEGE — NAAC A+ GRADE

II B.TECH IV SEMESTER II MID EXAMINATIONS - JUNE 2024

Branch : B.Tech. (ECE) **Max. Marks : 30M**
Date : 18-Jun-2024 **Session : Afternoon** **Time : 120 Min**
Subject : Electromagnetic Fields and Transmission Lines,EC402PC

PART - A

ANSWER ALL THE QUESTIONS **10 X 1M = 10M**

Q.No	Question		CO	BTL
1.	Which component of the electric field intensity is always continuous at the boundary? (A). Tangential (B). Normal (C). Horizontal (D). Vetrical	( )	CO3	1
2.	Differential form of Gauss's law in magneto statics is ------- (A). div B = /o (B). div B = 0 (C). div B = -dB/dT (D). div B = J	( )	CO3	2
3.	Which of the following can be used to produce a propagating electromagnetic wave? (A). Charge moving at a constant speed (B). Chargeless particle (C). Stationary charge (D). An accelerating charge	( )	CO4	1
4.	In lossy dielectric, the phase difference between the electric field E and the magnetic field H is------- (A). 90 (B). 60 (C). 45 (D). 0	( )	CO4	2
5.	Brewster angle is valid for which type of polarisation? (A). Perpendicular (B). Parellel (C). S polarised (D). P polarised	( )	CO4	2
6.	a wave transmitted from a medium of permittivity 4 to a medium of permittivity 2 .Find the Brewster angle ? (A). 35.26 (B). 53.62 (C). 26.35 (D). 62.53	( )	CO4	1
7.	Find the characteristic impedance expression in terms of the inductance and capacitance parameters (A). Zo = (LC) (B). Zo = LC (C). Zo = (L/C) (D). Zo = L/C	( )	CO5	2
8.	The best stub selection for the transmission line will be (A). Series open (B). Series short (C). Shunt open (D). Shunt short	( )	CO5	1
9.	Find the receiving impedance of a transmission line having a voltage of 24V and a conduction current of 1.2A is---- (A). 25.2 (B). 22.8 (C). 28.8 (D). 20	( )	CO5	1
10.	The condition that holds good in a distortionless transmission line is (A). R/L = G/C (B). RL = GC (C). L/R = C/G (D). RG/LC	( )	CO5	1

PART - B

ANSWER ANY FOUR **4 X 5M = 20M**

Q.No	Question	CO	BTL
11.	Explain the boundary conditions between Dielectric-conductor interfaces?	CO3	3
12.	Derive equation of continuity for time vaying fields?	CO3	2
13.	Explain about Wave propagation characteristics in lossless and conducting medium?	CO4	4
14.	Expalin about pointing vector and poincing theorem and its applications ?	CO4	3
15.	what is loading ? Explain the different types of loading in transmission lines.	CO5	3

Department of Electronics and Communication Engineering

ANURAG Engineering College

(An Autonomous Institution)

Ananthagiri (V & M), Suryapet (Dt.), Telangana - 508206.

Electronics & Communication Engineering - A

II B.Tech II Semester Mid Marks List

Faculty: P.RAMU | **Subject: EMFTL**

S.No.	H.T.No.	Name of the Student	Mid - I Marks (30)	Mid - II Marks (30)	Avg of Mid-I & Mid-II (A)	Assignment - I (5)	Assignment - II (5)	Avg of Assg.-I & Assg.-II (B)	Viva Voce (5) (C)	Total (A+B+C)
1	22C11A0401	VANKA ADARSH REDDY	23	29	26	5	5	5	5	36
2	22C11A0402	PILLALAM ARRI AJAY	16	23	20	5	5	5	5	30
3	22C11A0404	THUNKOJU AKHIL	28	29	29	5	5	5	5	39
4	22C11A0405	GADDAM AKHILA	22	28	25	5	5	5	5	35
5	22C11A0407	AITHAGANI ANUSHA	29	30	30	5	5	5	5	40
6	22C11A0408	KARISHA ASHOK	14	24	19	5	5	5	5	29
7	22C11A0409	KILARU BHASWANTH KUMAR	22	28	25	5	5	5	5	35
8	22C11A0410	ERLA BHAVANA	28	30	29	5	5	5	5	39
9	22C11A0411	BANOTHU CHANDRA SHEKAR	16	25	21	5	5	5	5	31
10	22C11A0413	GUGULOTHU DIVYA	29	29	29	5	5	5	5	39
11	22C11A0414	KOTHAPALLI DIVYA JYOTHI	26	29	28	5	5	5	5	38

12	22C11A0415	THALLA GAYATHRI	27	30	29	5	5	5	5	39
13	22C11A0416	GODHUMALA GOPICHAND	30	30	30	5	5	5	5	40
14	22C11A0417	BHUKYA HARSHITHA	27	29	28	5	5	5	5	38
15	22C11A0418	REDDYMALLA JANAKI RAM REDDY	24	23	24	5	0	3	5	32
16	22C11A0419	SHAIK JASMINE	28	25	27	5	5	5	5	37
17	22C11A0420	JANAPATI JYOSHNA	28	29	29	5	5	5	5	39
18	22C11A0421	DHARAVATH KARTHIK	25	24	25	5	5	5	5	35
19	22C11A0422	JONNALA GADDA KAVYA	22	30	26	5	5	5	5	36
20	22C11A0423	JONNALA GADDA KAVYA SREE	26	29	28	5	5	5	5	38
21	22C11A0424	SHAIK KHATIJA	30	30	30	5	5	5	5	40
22	22C11A0425	KONDRU LAKSHMI	A	28	14	5	5	5	5	24
23	22C11A0426	BODA LIKHITHA	29	30	30	5	5	5	5	40
24	22C11A0427	KUNDURU LIKHITHA REDDY	28	30	29	5	5	5	5	39
25	22C11A0428	CHINTHAKUNTLA LOKESH REDDY	24	29	27	5	5	5	5	37
26	22C11A0429	KOLLURI MADHU	17	20	19	5	5	5	5	29
27	22C11A0430	GUJJULA MAMATHA	A	A	0	0	0	0	0	0
28	22C11A0431	MADASU MAMATHA	A	A	0	0	0	0	0	0

29	22C11A0432	CHINNAM MANASA	15	25	20	5	5	5	5	30
30	22C11A0433	NANNEBOINA MEGHANA	29	30	30	5	5	5	5	40
31	22C11A0434	BHUKYA MOKSHAGNA	26	28	27	5	5	5	5	37
32	22C11A0435	GUNDLA NANDINI	29	30	30	5	5	5	5	40
33	22C11A0436	AKULA NARESH	23	30	27	5	5	5	5	37
34	22C11A0437	KODI NAVEEN	22	29	26	5	5	5	5	36
35	22C11A0438	POLOJU NAVEEN	24	25	25	5	5	5	5	35
36	22C11A0439	VARRA NAVEEN REDDY	15	22	19	5	5	5	5	29
37	22C11A0440	MALLELA NAVYA	27	29	28	5	5	5	5	38
38	22C11A0441	PAGADALA NAVYA	30	30	30	5	5	5	5	40
39	22C11A0442	MADDURI NICHITHA	27	25	26	5	5	5	5	36
40	22C11A0443	KOVVURI NIKHIL	13	20	17	5	5	5	5	27
41	22C11A0444	GUDIPATI NIKHIL SAI KUMAR	24	27	26	5	5	5	5	36
42	22C11A0445	NAGIREDDY NIRANJAN REDDY	30	30	30	5	5	5	5	40
43	22C11A0446	ENUGURTHI NITHIN	15	24	20	5	5	5	5	30
44	22C11A0447	BANALA NITHIN VAMSHI	21	25	23	5	5	5	5	33
45	22C11A0448	UDARI NITHISH KUMAR	16	21	19	5	0	3	5	27
46	22C11A0449	AKARAPU POOJITHA	29	27	28	5	5	5	5	38
47	22C11A0450	BOLLAKA	29	20	25	5	5	5	5	35

		POOJITHA								
48	22C11A0451	YARAGANI PRAJVAL	27	26	27	5	5	5	5	37
49	22C11A0453	MAMIDI PRIYANKA	29	29	29	5	5	5	5	39
50	22C11A0454	THOKALA PURUSHOTHAM	18	20	19	5	5	5	5	29
51	22C11A0455	MOHAMMAD RAFI	25	24	25	5	5	5	5	35
52	22C11A0456	NUKALA RAJAGOPAL REDDY	29	30	30	5	5	5	5	40
53	22C11A0457	K RAJU	29	29	29	5	5	5	5	39
54	22C11A0458	PANGOTHRAM KUMAR	23	29	26	5	5	5	5	36
55	22C11A0459	SHEELAM RAMAKANTH	25	26	26	5	5	5	5	36
56	22C11A0460	BANOTHU RAVI	28	28	28	5	5	5	5	38
Signature of the Faculty										

Department of Electronics and Communication Engineering

ANURAG Engineering College

(An Autonomous Institution)

Ananthagiri (V & M), Suryapet (Dt.), Telangana - 508206.

Electronics & Communication Engineering - B

II B.Tech II Semester Mid Marks List

Faculty: P.RAMU **Subject:**

S.No.	H.T.No.	Name of the Student	Mid - I Marks (30)	Mid - II Marks (30)	Avg of Mid-I & Mid-II (A)	Assignment - I (5)	Assignment - II (5)	Avg of Assg.-I & Assg.-II (B)	Viva Voce (5) (C)	Total (A+B+C)
1	22C11A0461	KOTIKA RAVI KIRAN	29	28	29	5	5	5	5	39
2	22C11A0462	SHAIK RESHMA	28	28	28	5	5	5	5	38
3	22C11A0463	BADETI SAI	26	25	26	5	5	5	5	36
4	22C11A0464	SAMPATHARAO SAI KUMAR	25	27	26	5	5	5	5	36
5	22C11A0465	KALLA SAI MANOJKUMAR	29	27	28	5	5	5	5	38
6	22C11A0466	KANDULA SAIKIRAN	24	19	22	5	5	5	5	32
7	22C11A0467	SHAIK SAMEER	28	20	24	5	5	5	5	34
8	22C11A0469	ANANTHARAPU SANJAN	25	24	25	5	5	5	5	35
9	22C11A0470	PALLY SANTHOSH REDDY	20	25	23	5	5	5	5	33
10	22C11A0471	SHAIK SHAFIQ	27	24	26	5	5	5	5	36
11	22C11A0472	N SHARATH CHANDRA	30	30	30	5	5	5	5	40
12	22C11A0473	BATTULA SHARATH GOPAL	21	13	17	5	5	5	5	27

13	22C11A0474	KUMBHAM SHIRISHA	29	27	28	5	5	5	5	38
14	22C11A0475	PANUGOTH SHIVA	26	27	27	5	5	5	5	37
15	22C11A0476	BOLISETTY SHIVA SHANKAR	24	16	20	5	5	5	5	30
16	22C11A0477	CHENNAKESHAVA SHREYA	29	30	30	5	5	5	5	40
17	22C11A0478	BHUKYA SIDDU NAIK	24	23	24	5	5	5	5	34
18	22C11A0479	MEKALA SINDHU	29	30	30	5	5	5	5	40
19	22C11A0480	LAVORI SRAVANI	29	29	29	5	5	5	5	39
20	22C11A0481	LINGAM SRAVANI	25	26	26	5	5	5	5	36
21	22C11A0482	BODDU SREEJA	23	25	24	5	5	5	5	34
22	22C11A0483	EATUKURI SRI LAKSHMI	30	30	30	5	5	5	5	40
23	22C11A0484	KAVURI SRICHANDANA	27	28	28	5	5	5	5	38
24	22C11A0485	KUKKALA SRUJAN	21	22	22	5	5	5	5	32
25	22C11A0486	RAVELLA SURYA	21	18	20	5	5	5	5	30
26	22C11A0487	KUNCHALA TRIVENI	29	29	29	5	5	5	5	39
27	22C11A0488	PEDANATI UDAY SAINADH	15	A	8	0	0	0	0	8
28	22C11A0489	SIRAM SETTI UMAMAHESH	29	28	29	5	5	5	5	39
29	22C11A0490	BANOTHU USHA	29	29	29	5	5	5	5	39
30	22C11A0491	DHANIYAKULA USHASRI	24	28	26	5	5	5	5	36
31	22C11A0492	ATHKURI VAMSHI	28	27	28	5	5	5	5	38
32	22C11A0493	THAMMINENI VENNELA	23	25	24	5	5	5	5	34
33	22C11A0494	PALLA VIJAY KUMAR	A	A	0	0	0	0	0	0

34	22C11A0495	GUNNAM VIJAY SIMHA REDDY	20	22	21	5	5	5	5	31
35	22C11A0496	KASANI VINAY TEJA	25	25	25	5	5	5	5	35
36	22C11A0497	TELAGORLA VINAY	26	28	27	5	5	5	5	37
37	22C11A0498	DAMMALAPATI VINOD KUMAR	25	22	24	5	5	5	5	34
38	22C11A0499	KATIKAM VISHVA TEJA	17	21	19	5	5	5	5	29
39	22C11A04A0	BANOTHU YAMINI NAIK	24	26	25	5	5	5	5	35
40	22C11A04A1	BASANAKARRA YASHWANTH	22	19	21	5	5	5	5	31
41	22C11A04A2	REMIDALA YASHWANTH	25	23	24	5	5	5	5	34
42	22C11A04A3	SAYYAD YASIN	21	18	20	5	5	5	5	30
43	22C11A04A4	MACHIREDDY PRATHYUSHA	29	29	29	5	5	5	5	39
44	22C11A04A5	REDDIMALLA BHANU PRAKASH	24	19	22	5	5	5	5	32
45	23C15A0401	AKHILESHWARI SUDDALA	28	27	28	5	5	5	5	38
46	23C15A0402	ANJALI CHILAKAMARRI	23	28	26	5	5	5	5	36
47	23C15A0403	DURGA SAI ACHANTA	29	28	29	5	5	5	5	39
48	23C15A0404	HARINI SHANAGAPATI	28	28	28	5	5	5	5	38
49	23C15A0405	LAXMI GAYATHRI NERELLA	28	27	28	5	5	5	5	38
50	23C15A0406	MUKESH SIVAKAVI	28	25	27	5	5	5	5	37
51	23C15A0407	NAVYA SRI MADURI	27	26	27	5	5	5	5	37
52	23C15A0408	RAMARAO THODETI	28	28	28	5	5	5	5	38
53	23C15A040	SAMAD SHAIK	28	27	28	5	5	5	5	38

	9									
54	23C15A0410	SANDEEP ATHMAKURU	30	30	30	5	5	5	5	40
55	23C15A0411	VENKATA KRISHNA KARAMSETTI	25	27	26	5	5	5	5	36
Signature of the Faculty										

Department of Electronics and Communication Engineering

COURSE MATERIALS

WEB REFERENCES

YEAR/SEM:II B.TECH.II SEM ECE **CODE:EC402PC**

SUBJECT: ELECTROMAGNETIC FIELDS AND TRANSMISSION LINES

1) https://Electromagnetic Theory - Course (nptel.ac.in)
2) https://EMTL MAIN - COURSE MATERIAL ELECTROMAGNETIC THEORY & - Studocu
3) https://Electromagnetic-Thoery-and-Transmission-Lines.pdf (kgr.ac.in)
4) https://GSR_III-EMTL.pdf (biet.ac.in)
5) **https://www.google.co.in/search?q=University+of+Waterloo+-+Electromagnetic+Theory+Course**
6) https://ElectroMagnetic theory and Transmission Lines (EMTL) Notes and Textbook Download | HARISH POLA
7) **https:// nptel.ac.in/ /courses/108104087**
8) **https:// nptel.ac.in/ / /courses/108104087**
9) **https:// nptel.ac.in/ /** Electromagnetic Theory - Course (nptel.ac.in)

Anurag ENGINEERING COLLEGE (An Autonomous Institution)

Department of Electronics and Communication Engineering

LECTURE NOTES

YEAR/SEM:II B.TECH.II SEM ECE **CODE:EC402PC**

PPT LINKS

1. COULOMBS LAW | PPT (slideshare.net) /slideshow/coulombs-law-174888303/174888303
2. Electrostatics | PPT (slideshare.net)/ /slideshow/electrostatics-12892951/12892951
3. Maxwell's equation | PPT (slideshare.net)/ /preraktrivedi7/maxwells-equation-66910089
4. PPT - ELECTROMAGNETICS – TRANSMISSION LINES PowerPoint Presentation, free download - ID:2484207 (slideserve.com)
5. EMTL Class10.pptx (slideshare.net)/ /slideshow/emtl-class10pptx/253114178
6. Magentostatics for bsc | PPT (slideshare.net)/ /SrivarshaParasa/magentostatics-for-bsc
7. Ampere's law | PPT (slideshare.net)/ /slideshow/amperes-law-94869753/94869753
8. Biot savart law | PPT (slideshare.net)/ /slideshow/biot-savart-law-238555592/238555592
9. Ampere’s circuital law | PPT (slideshare.net)/ /slideshow/amperes-circuital-law/250298773
10. Maxwell's equation | PPT (slideshare.net)/ /slideshow/maxwells-equation-116130006/116130006
11. maxwells equation | PPT (slideshare.net)/ /slideshow/maxwells-equation-42916132/42916132
12. Electromagnetic waves | PPT (slideshare.net)/ /slideshow/electromagnetic-waves-65970456/65970456
13. Presentation on Electromagnetic Induction | PPT (slideshare.net)/ /slideshow/presentation-on-electromagnetic-induction/113666338