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POORNIMA
COLLEGE OF ENGINEERING

COURSE FILE

- **Name of faculty:** **Dr. Gaurav Jain**
- **Class- Sem:** **B.Tech – III Sem**
- **Branch:** **Electrical Engineering**
- **Course Code:** **3EE4-08**
- **Course Name:** **Electricomagnetic Fields**
- **Session:** **2023-24**

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

DEPARTMENT OF ELECTRICAL ENGINEERING

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

SYLLABUS

2nd Year - III Semester: B. Tech. (Electrical Engg.)

3EE4-08: Electromagnetic Fields

Credit: 2 **Max. Marks: 100 (IA: 30, ETE:70)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1.	**Review of Vector Calculus** Vector algebra- addition, subtraction, components of vectors, scalar and vector multiplications, triple products, three orthogonal coordinate system (rectangular, cylindrical and spherical). Vector calculus differentiation, partial differentiation, integration, vector operatordel, gradient, divergence and curl; integral theorems of vectors. Conversion Of a vector from one coordinate system to another.	6
2.	**Static Electric Field** Coulomb's law, Electric field intensity, Electrical field due to point charges. Line, Surface and Volume charge distributions. Gauss law and its applications. Absolute Electric potential, Potential difference, Calculation of potential differences for different configurations. Electric Dipole, Electrostatic Energy and Energy density.	6
3.	**Conductors, Dielectrics and Capacitance** Current and current density, Ohms Law in Point form, Continuity of current, Boundary conditions of perfect dielectric materials. Permittivity of dielectric materials, Capacitance, Capacitance of a two wire line, Poisson's equation, Laplace's equation, Solution of Laplace and Poisson's equation, Application of Laplace's and Poisson's equations.	6
4.	**Static Magnetic Fields** Biot-Savart Law, Ampere Law, Magnetic flux and magnetic flux density, Scalar and Vector Magnetic potentials. Steady magnetic fields produced by current carrying conductors.	6
5.	**Magnetic Forces, Materials and Inductance** Force on a moving charge, Force on a differential current element, Force between differential current elements, Nature of magnetic materials, Magnetization and permeability, Magnetic boundary conditions, Magnetic circuits, inductances and mutual inductances.	6

6.	**Time Varying Fields and Maxwell's Equations** Faraday's law for Electromagnetic induction, Displacement current, Point form of Maxwell's equation, Integral form of Maxwell's equations, Motional Electromotive forces. Boundary Conditions.	**6**
7.	**Electromagnetic Waves** Derivation of Wave Equation, Uniform Plane Waves, Maxwell's equation in Phasor form, Wave equation in Phasor form, Plane waves in free space and in a homogenous material. Wave equation for a conducting medium, Plane waves in loss dielectrics, Propagation in good Conductors, Skin effect. Poynting theorem.	**6**
	TOTAL	**42**

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

DEPARTMENT OF ELECTRICAL ENGINEERING

ABC Analysis

Course: B. Tech. **Class/Section: III SEM** **Date: 10.08.2023**
Name of Faculty: GAURAV JAIN **Name of Subject: EMFT** **Subject Code: 3EE4-08**

Module	Easy	Medium	Hard
MODULE 1: Review of Vector Calculus	Vector algebra-addition, subtraction, components of vectors, scalar and vector multiplications, triple products	Three orthogonal coordinate systems rectangular, cylindrical and spherical), Conversion of a vector from one coordinate system to another.	Vector calculus differentiation, partial differentiation, integration, vector operator del, gradient, divergence and curl; integral theorems of vectors.
MODULE 2: Static Electric Field	Coulomb's law, Electric field intensity, Electrical field due to point charges. Line, Surface and Volume charge distributions.	Gauss law and its applications. Absolute Electric potential, Potential difference, Calculation of potential differences for different configurations.	Electric dipole, Electrostatic Energy and Energy density.
MODULE 3: Conductors, Dielectrics and Capacitance	Current and current density, Ohms Law in Point form, Continuity of current,	Boundary conditions of perfect dielectric materials. Permittivity of dielectric materials, Capacitance, Capacitance of a two wire line,	Poisson's equation, Laplace's equation, Solution of Laplace and Poisson's equation, Application of Laplace's and Poisson's equations.
MODULE 4: Static Magnetic Fields	Biot-Savart Law, Ampere Law,	Magnetic flux and magnetic flux density, Scalar and Vector Magnetic potentials.	Steady magnetic fields produced by current carrying conductors.
MODULE 5: Magnetic Forces, Materials and Inductance	Magnetic circuits, inductances and mutual inductances.	Force on a moving charge, Force on a differential current element, Force between differential current elements,	Nature of magnetic materials, Magnetization and permeability, Magnetic boundary conditions,
MODULE 6: Time Varying Fields and Maxwell's Equations	Point form of Maxwell's equation, Integral form of Maxwell's equations,	Faraday's law for Electromagnetic induction, Displacement current,	Motional Electromotive forces. Boundary Conditions.
MODULE 7: Electromagnetic Waves	Derivation of Wave Equation, Uniform Plane Waves,	Wave equation for a conducting medium, Plane waves in lossy dielectrics, Propagation in good conductors, Skin effect. Poynting theorem.	Maxwell's equation in Phasor form, Wave equation in Phasor form, Plane waves in free space and in a homogenous material.

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

INSTITUTE VISION AND MISSION

VISION

To create knowledge based society with scientific temper, team spirit and dignity of labor to face the global competitive challenges.

MISSION

To evolve and develop skill based system for effective delivery of knowledge so as to equip young professionals with dedication & commitment to excellence in all spheres of life.

ELECTRICAL DEPARTMENT VISION AND MISSION

VISION

To be a model of excellence in Professional Education and Research by creating electrical engineers who are prepared for lifelong engagement in the rapidly changing fields and technologies with the ability to work in team.

MISSION

- To provide a dynamic environment of technical education wherein students learn in collaboration with others to develop knowledge of basic and engineering sciences.
- To identify and strengthen current thrust areas based upon informed perception of global societal issues in the electrical and allied branches.
- To develop human potential with intellectual capability who can become a good professional, researcher and lifelong learner.

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

DEPARTMENT OF ELECTRICAL ENGINEERING

PROGRAM EDUCATIONAL OBJECTIVES (PEO'S)

- **PEO 1**: Graduates will have the ability to formulate, analyze and apply design process using the basic knowledge of engineering and sciences to solve complex electrical engineering problems.
- **PEO 2**: Graduates will exhibit quality of leadership, teamwork, time management, with a commitment towards addressing societal issues of equity, public and environmental safety using modern engineering tools.
- **PEO 3**: Graduates will possess dynamic communication and have successful transition into a broad range of multi-disciplinary career options in industry, government and research as lifelong learner.

PROGRAMME SPECIFIC OUTCOMES (PSO'S)

- **PSO1:** Graduate possesses the ability to apply fundamental knowledge of basic sciences, mathematics and computation to solve the problems in the field of electrical engineering for the benefit of society.
- **PSO2:** Graduate possesses the ability to professionally communicate and ethically solve complex electrical engineering problems using modern engineering tools.
- **PSO3:** Graduate possesses sound fundamental knowledge to be either employable or develop entrepreneurship in the emerging areas of renewable and green energy, electric and hybrid vehicles and smart grids and shall be susceptive to life- long learning.

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

DEPARTMENT OF ELECTRICAL ENGINEERING

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

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, review 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 modeling 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, and 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.

MAPPING OF KEY PHRASES OF THE INSTITUTES MISSION STATEMENT WITH THE KEY PHRASES OF INSTITUTES VISION STATEMENT
(Institution Mission Vs Institute Vision)

Key Phrases of the Mission Statement of the Institute	**Key Phrases of the Vision Statement of the Institute**		
	IV_1: To create knowledge based society with scientific temper	**IV_2:** Team spirit	**IV_3:** To face the global competitive challenges
IM_1: Skill based systems for effective delivery of knowledge	**2**	**3**	**2**
IM_2: To equip young professionals with dedication		**1**	**1**
IM_3: Excellence in all spheres of life	**1**		**3**

MAPPING OF KEY PHRASES OF THE DEPARTMENTS VISION STATEMENT WITH THE KEY PHRASES OF INSTITUTES MISSION STATEMENT
(Department Vision Vs Institution Mission)

Key Phrases of the Vision Statement of the Department	**Key Phrases of the Mission Statement of the Institute**		
	IM_1: Skill based systems for effective delivery of knowledge	**IM_2:**To equip young professionals with dedication	**IM_3:** Excellence in all spheres of life
DV_1: To be a model of excellence in Professional Education	**3**	**3**	**3**
DV_2: Lifelong engagement in the rapidly changing fields	**3**		**3**
DV_3: The ability to work in team		**3**	**3**

MAPPING OF KEY PHRASES OF THE DEPARTMENTS MISSION STATEMENT WITH THE KEY PHRASES OF DEPARTMENTS VISION STATEMENT (Department Mission Vs Department Vision)

Key Phrases of the Mission Statement of the Department	**Key Phrases of the Vision Statement of the Department**		
	DV_1: To be a model of excellence in Professional Education	**DV_2:** Lifelong engagement in the rapidly changing fields	**DV_3:** The ability to work in team
DM_1: **D**ynamic environment of Technical Education, Collaborative learning	**3**	**2**	**2**
DM_2: Current thrust areas based on global societal needs	**3**	**2**	
DM_3: Good professional, researcher and lifelong learner	**2**	**2**	

MAPPING OF PEOS WITH KEY PHRASES OF DEPARTMENTS MISSION STATEMENT (PEO Vs Department Mission)

PEO Statements	**Key Phrases of the Mission of the Department**		
	DM1: Dynamic environment of Technical Education, Collaborative learning	**DM2:** Current thrust areas based on global societal needs	**DM3:** Good professional, researcher and lifelong learner
Graduates will have the ability to formulate, analyze and apply design process using the basic knowledge of engineering and sciences to solve complex electrical engineering problems.	**3**		**3**
Graduates will exhibit quality of leadership, teamwork, time management, with a commitment towards addressing societal issues of equity, public and environmental safety using modern engineering tools.	**3**	**2**	**2**
Graduates will possess dynamic communication and have successful transition into a broad range of multi-disciplinary career options in industry, government and research as lifelong learner.	**2**	**2**	**1**

MAPPING OF PSO WITH KEY PHRASES OF DEPARTMENTS MISSION STATEMENT

(PSO Vs Department Mission)

PSO Statements	Key Phrases of the Mission of the Department		
	DM1: Dynamic environment of Technical Education, Collaborative learning	**DM2:** Current thrust areas based on global societal needs	**DM3:** Good professional, researcher and lifelong learner
PSO1: Graduate possesses the ability to apply fundamental knowledge of basic sciences, mathematics and computation to solve the problems in the field of electrical engineering for the benefit of society.	**3**	**1**	
PSO2: Graduate possesses the ability to professionally communicate and ethically solve complex electrical engineering problems using modern engineering tools.	**1**	**2**	**2**
PSO3: Graduate possesses sound fundamental knowledge to be either employable or develop entrepreneurship in the emerging areas of renewable and green energy, electric and hybrid vehicles and smart grids and shall be susceptive to life- long learning.	**1**	**1**	**1**

MAPPING OF PEO WITH KEY PHRASES OF PO (PEO Vs PO)

PO/PEO	1. Engineering knowledge:	2. Problem analysis:	3. Design/development of solutions:	4. Conduct investigations of complex problems:	5. Modern tool usage:	6. The engineer and society:	7. Environment and sustainability:	8. Ethics:	9. Individual and team work:	10. Communication:	11. Project management and finance:	12. Life-long learning:
PEO 1: Graduates will have the ability to formulate, analyze and apply design process using the basic knowledge of engineering and sciences to solve complex electrical engineering problems.	**3**	**3**	**3**	**2**								**2**
PEO 2: Graduates will exhibit quality of leadership, teamwork, time management, with a commitment towards addressing societal issues of equity, public and environmental safety using modern engineering tools.					**3**	**3**	**3**	**2**	**3**		**3**	**2**
PEO 3: Graduates will possess dynamic communication and have successful transition into a broad range of multi-disciplinary career options in industry, government and research as lifelong learner.									**2**	**3**	**2**	**3**

MAPPING OF PSO WITH PEO (PSO Vs PEO)

PSO/PEO	PSO1: Graduate possesses the ability to apply fundamental knowledge of basic sciences, mathematics and computation to solve the problems in the field of electrical engineering for the benefit of society.	PSO2: Graduate possesses the ability to professionally communicate and ethically solve complex electrical engineering problems using modern engineering tools.	PSO3: Graduate possesses sound fundamental knowledge to be either employable or develop entrepreneurship in the emerging areas of renewable and green energy, electric and hybrid vehicles and smart grids and shall be susceptive to life-long learning.
PEO 1: Graduates will have the ability to formulate, analyze and apply design process using the basic knowledge of engineering and sciences to solve complex electrical engineering problems.	3		2
PEO 2: Graduates will exhibit quality of leadership, teamwork, time management, with a commitment towards addressing societal issues of equity, public and environmental safety using modern engineering tools.		3	1
PEO 3: Graduates will possess dynamic communication and have successful transition into a broad range of multi-disciplinary career options in industry, government and research as lifelong learner.		3	2

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

DEPARTMENT OF ELECTRICAL ENGINEERING

Campus: Poornima College of Engineering **Class/Section: 2nd Year/ Sec - A** **Date: 10 Aug 2023**
Course: B.Tech.
Name of Faculty: Dr. Gaurav Jain **Name of Subject: EMFT** **Code: 3EE4-08**

COURSE OUTCOMES

After completion of course,

3EE4-08.1 (CO1) - Demonstrate the laws and theorems of electric field, magnetic field and time varying fields. [Apply]

3EE4-08.2 (CO2) - Debate the Charge distribution, boundary conditions, Laplace, Poisson and Maxwell's equations in search of a solution. [Analyze]

3EE4-08.3 (CO3)- Analyze the behavior of dielectric and conductive material in electromagnetic fields by using electric or magnetic motive force conditions. [Analyze]

3EE4-08.4 (CO4)- Estimate the capacitance, inductance, mutual inductance, electronic wave, electric field intensity, electric flux density, magnetic flux density and Plane wave conditions for real time problem. [Evaluate]

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MAPPING OF CO WITH PO AND PSO

	After completion of course,	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	1. Demonstrate the laws and theorems of electric field, magnetic field and time varying fields. [Apply]	3	2											2		
CO 2	2. Students will be able to apply the Vector Calculus, Laplace, Poisson and Maxwell's equations in search of a solution.	3	2													
CO 3	3. Analyze the behavior of dielectric and conductive material in electromagnetic fields by using electric or magnetic motive force conditions. [Analyze]	3	2													
CO 4	4. Estimate the capacitance, inductance, mutual inductance, electronic wave, electric field intensity, electric flux density, magnetic flux density and Plane wave conditions for real time problem. [Evaluate]	3	3													

PO Strongly Mapped:

PO1: Engineering knowledge: Apply the knowledge of mathematics, Science, Engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO Moderately Mapped:

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO Low Mapped:

Nil

PSO Strongly Mapped:

Nil

PSO Moderately Mapped:

PSO1: Graduate possesses the ability to apply fundamental knowledge of basic sciences, mathematics and computation to solve the problems in the field of electrical engineering for the benefit of society.

PSO Low Mapped:

Nil

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RULES FOR CO/LO ATTAINMENT LEVELS: (TARGETS)

Course Code	Level 3	Level 2	Level 1
6EE4-04	60 % of students getting > 60% marks	50-60 % of students getting > 60% marks	40-50 % of students getting > 60% marks

END TERM RTU COMPONENT: CO ATTAINMENT LEVELS

Course Code	Level 3	Level 2	Level 1
6EE4-04	50 % of students getting > 60% marks	40-50 % of students getting > 60% marks	30-40 % of students getting > 60% marks

S. No.	Course Type	Attainment Level=1	Attainment Level=2	Attainment Level=3
1	Mid Semester Exams	CO1, CO2	CO3, CO4	CO4
2	University Exam			
4	OBT	CO2, CO3	CO1, CO2	CO3,CO4
5	Class Test	CO1, CO2	CO3	CO4
6	Quiz	CO1	CO2, CO3	CO4

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Course: B.Tech.
Name of Faculty: Dr. Gaurav Jain **Name of Subject: EMFT** **Code: 3EE4-08**

CO WISE ASSESSMENT ACTIVITIES (AS MENTIONED IN SESSION PLAN)

CO	Class Test	Quiz 1	OBT	Mid 1	Mid 2
CO1	Y	Y	Y	Y	Y
CO2	Y	Y	Y	Y	Y
CO3	Y	Y	Y	Y	Y
CO4	Y	Y	Y	Y	Y

CO-PO/PSO MAPPING AND TARGETS SESSION 2023-234

CO	PO												Avg.	PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	CO Targets	PSO1	PSO2	PSO3
CO 1	3	2	-	-	-	-	-	-	-	-	-	-	2.5	2	-	-
CO 2	3	2	-	-	-	-	-	-	-	-	-	-	2.5	-	-	-
CO 3	3	2	-	-	-	-	-	-	-	-	-	-	2.5	-	-	-
CO 4	3	3	-	-	-	-	-	-	-	-	-	-	3	-	-	-
CO 5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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ACTIVITY WISE ASSESSMENT TOOLS SESSION 2023-24

Sr. No.	Activity	Assessment Method	Tools	Weightage Marks	Recommendation
1.	Class Test	Direct	Marks	20	For CO1-CO4
2.	Open Book Test	Direct	Marks	20	For CO1-CO4
3.	Quiz	Direct	Marks	20	For CO1-CO4
4.	Mid Term 1	Direct	Marks	60	For CO1-CO4
5.	Mid Term 2	Direct	Marks	60	For CO1-CO4

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

DEPARTMENT OF ELECTRICAL ENGINEERING

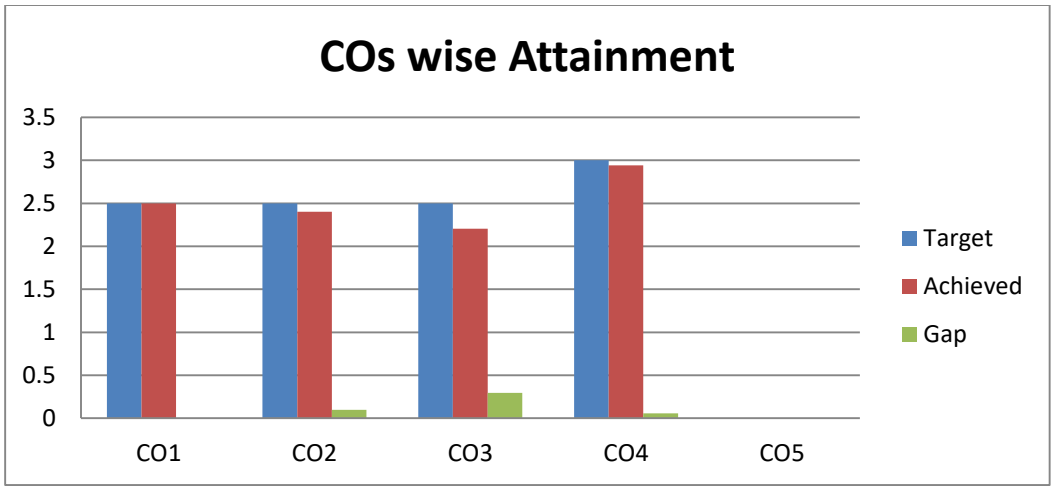
Campus: Poornima College of Engineering **Class/Section: 2nd Year/ Sec - A** **Date: 15 Dec 2023**
Course: B.Tech.
Name of Faculty: Dr. Gaurav Jain **Name of Subject: EMFT** **Code: 3EE4-08**

CO-GAP IDENTIFICATIONS

(SEC A)				
COs	CO 1	CO 2	CO 3	CO4
Target	**2.5**	**2.50**	**2.50**	**3.00**
Achieved	**2.50**	**2.40**	**2.21**	**2.94**
Gap	**0.00**	**0.10**	**0.29**	**0.06**

OVERALL CO ATTAINMENT TABLE

COs	CO1	CO2	CO3	CO4	CO5
Attainment level as per rules	**2.50**	**2.40**	**2.21**	**2.94**	-
Average CO attainment through internal assessment	**2.51**				



Gaps Identified:

1. Lack of basic engineering knowledge observed in students.
2. Inability to relate fundamental principles of engineering to the real problems
3. Technical communication was lacking among the students

Activities Decided to Bridge the Gap:

1. Imparting basic engineering knowledge through a practical approach needs to be focused more.
2. Video lectures and other resources for improving technical skills are to be shared on a common platform.
3. Language lab-related activities will be increased

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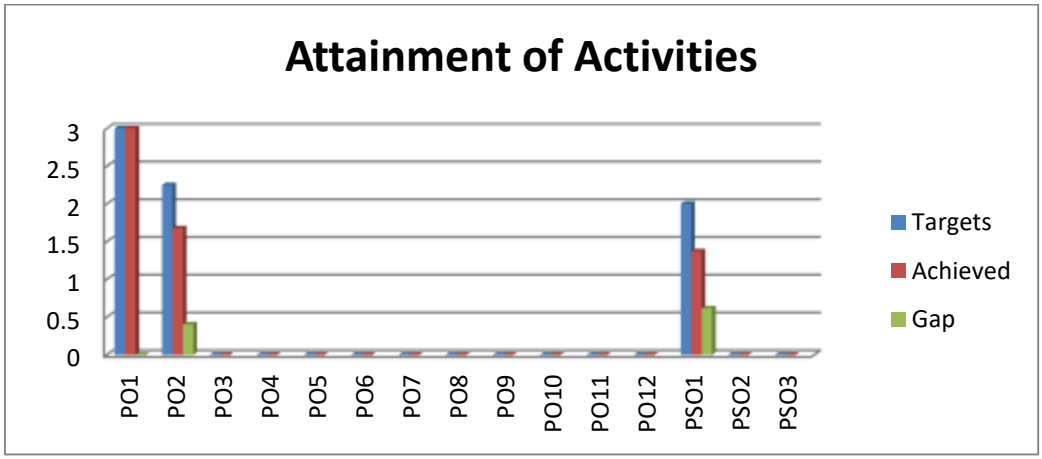
ATTAINMENT OF POS & PSO1

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Obtain Average-PO/PSO Targets	3	2.25											2		

PO GAP IDENTIFICATION (SEC A)

	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Targets	3	2.25											2		
Achieved	3	1.67											1.37		
Gap	0	0.40											0.62		



Gaps Identified:

Describe what the reasons for gap (for PO) are.

1. Some students showed less interest in application-based engineering because of a lack of imagination.
2. Unable to relate theory to real-life problems.
3. Lack of awareness to the real-time problems of industry and process to design and develop the solution, considering public health & safety and cultural, societal and environmental considerations

Activities decided to Bridge the Gap:

1. Extra lectures on different types of problem analysis techniques need to be taken for improvement.
2. Practical will be performed on analysis-based topics.
3. Online course materials and lectures regarding modern tools will be focused on.

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ATTAINMENT OF CO THROUGH MIDTERM -I COMPONENT

CO: 3EE4-08: EMFT	
Target	**3.00**
Achieved	**2.55**
Gap	**0.45**

Gaps for CO attainment through I Midterm Component:

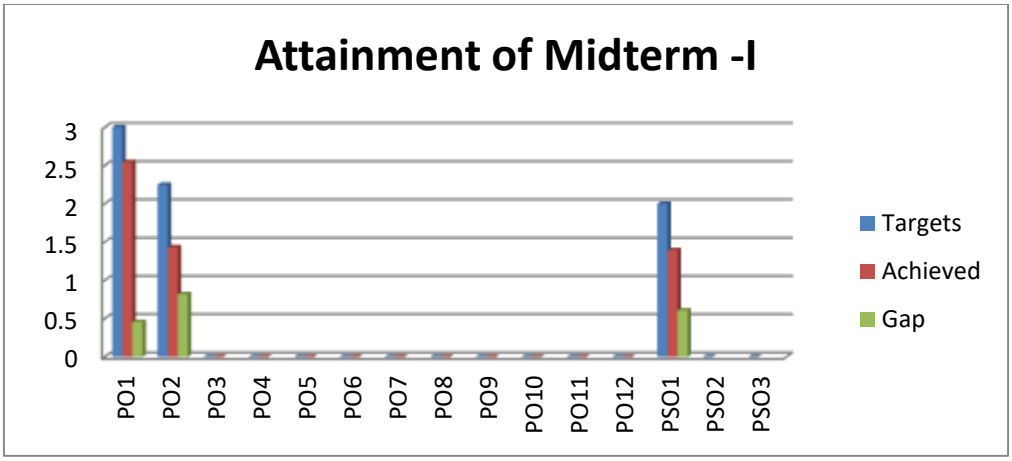
1. Problem-solving capability of students is not up to the Mark
2. Lack of thorough approach of analysis observed.
3. Students did not realize the importance of the environment and its sustainability for the future generation.

Action to be taken:

1. Theory teaching will be focused more on complex problems.
2. Workshop and training programs will be arranged to improve the contribution of engineers to society.
3. Students were encouraged to actively participate in webinars, NPTEL online course

ATTAINMENT OF PO THROUGH CO (MIDTERM-I) COMPONENT

Attainment of PO through CO(MIDTERM-I) Component															
3EE4-08	**PO**												**PSO**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
Targe	**3**	**2.25**											**2**		
Achieved	**2.55**	**1.43**											**1.39**		
Gap	**0.45**	**0.82**											**0.61**		



Gaps Identified:

Describe what the reasons for gaps are

1. Students did not realize the importance of the environment and its sustainability for the future generation

Activities decided to bridge the gap

1. Students were encouraged to actively participate in webinars, NPTEL online course
2. Theory teaching will be focused more on complex problems

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Name of Faculty: Dr. Gaurav Jain **Name of Subject: EMFT** **Code: 3EE4-08**

ATTAINMENT OF CO THROUGH MIDTERM -II COMPONENT

CO: 3EE4-08: EMFT	
Target	**3.00**
Achieved	**2.38**
Gap	**0.62**

Gaps for CO attainment through MIDTERM-II Component:

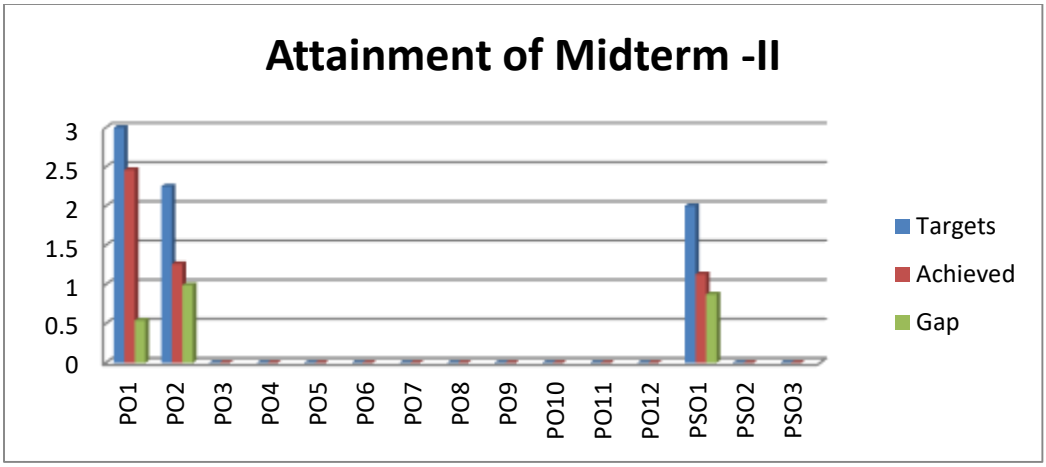
1. Problem-solving capability of students is not up to the Mark
2. Unable to relate theory to real-life problems.

Action to be taken:

1. Extra lectures on different types of problem analysis techniques need to be taken for improvement.

ATTAINMENT OF PO THROUGH CO (MIDTERM-II) COMPONENT

	Attainment of PO through CO(MIDTERM-II) Component														
3EE4-08	**PO**												**PSO**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
Targe	**3**	**2.25**											**2**		
Achieved	**2.46**	**1.26**											**1.13**		
Gap	**0.54**	**0.99**											**0.87**		



Gaps Identified:

Describe what the reasons for gaps are

1 Absence of Basic Knowledge of Design and analysis of any given problem among the students

2 Inadequacy in implementing the concept of design and analysis of the Electrical component

Activities decided to bridge the gap

1. Complex Design and analysis based Problems need to be given for the practice.
2. Industrial visits need to be increased.

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

DEPARTMENT OF ELECTRICAL ENGINEERING

Campus: Poornima College of Engineering **Class/Section: 2nd Year/ Sec - A** **Date: 15 Dec 2023**
Course: B.Tech.
Name of Faculty: Dr. Gaurav Jain **Name of Subject: EMFT** **Code: 3EE4-08**

ATTAINMENT OF CO THROUGH RTU COMPONENT

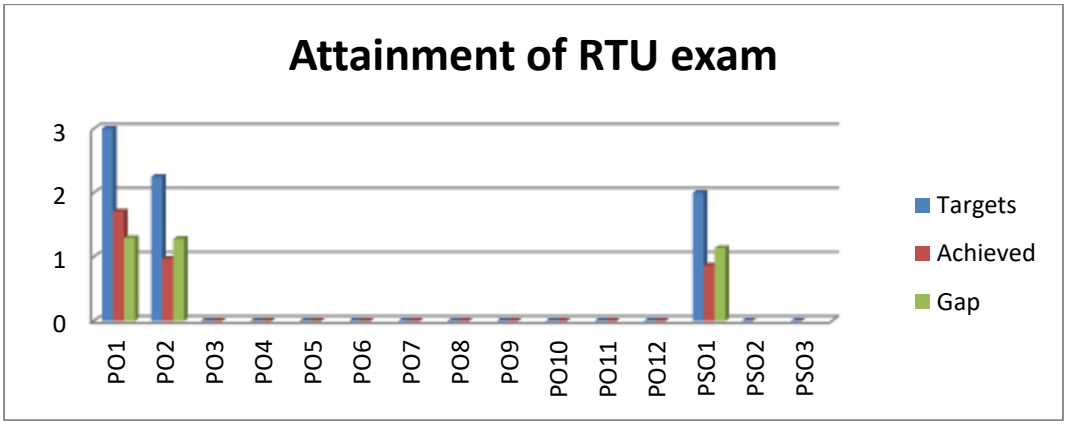
CO: 3EE4-08: EMFT	
Target	**3.00**
Achieved	**1.71**
Gap	**1.29**

Gaps for CO attainment through RTU Component:

1. Problem-solving capability of students is not up to the Mark
2. Unable to relate theory to real-life problems.

Action to be taken:

1. Extra lectures on different types of problem analysis techniques need to be taken for improvement.



Gaps Identified:

Describe what the reasons for gaps are

1. Students did not realize the importance of the environment and its sustainability for the future generation.

Activities decided to bridge the gap

1. Workshop and training programs will be arranged to improve the contribution of engineers to society.

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

DEPARTMENT OF ELECTRICAL ENGINEERING

Campus: Poornima College of Engineering **Class/Section: 2nd Year/ Sec - A** **Date: 10 Aug 2023**
Course: B.Tech.
Name of Faculty: Dr. Gaurav Jain **Name of Subject: EMFT** **Code: 3EE4-08**

PERSONAL TIME TABLE

Poornima College of Engineering							
Department of Electrical Enginering							
Time Table(Dr. Gaurav Jain)							
Day/Time	**8:00-9:00**	**9:00-10:00**	**10:00-11:00**	**11:00-11:50**	**11:50-12:50**	**12:50-1:50**	**1:50-2:50**
Monday				L U N C H			
Tuesday							
Wednesday						EMFT, 3EE4-08,GJ	
Thursday							
Friday						EMFT, 3EE4-08,GJ	
Saturday						EMFT, 3EE4-08,GJ	

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

DEPARTMENT OF ELECTRICAL ENGINEERING

Campus: PCE Course: B.Tech.-EE Class/Section: 2nd year/ Sec-A Date: 10 Aug 2023
Name of Faculty: Gaurav Jain Name of Subject: EMFT Code: 3EE4-08

COURSE PLAN –BLOWN UP

S.NO	SYLLABUS TOPIC AS PER UNIVERSITY	BLOWN UP TOPICS
0.	Zero Lecture	(1) Introduction of self. (2) Introduction of subject and its significance (3) Introduction of student
1.	**MODULE- 1** **Review of Vector Calculus**	
1.1	Vector Algebra	1.1.1 Scalar and vector quantities 1..1.2 Vector addition & subtraction 1.1.3 Position & distance vector 1.1.4 Vector Multiplication 1.1.5 Component of a vector 1.1.6 Triple products 1.1.7 Numericals
1.2	Coordinate system & Transformation	1.2.1 Cartesian coordinate system 1.2.1 Cylindrical coordinate system 1.2.3 Spherical coordinate system 1.2.4 Conversion of a vector from one coordinate system to another. 1.2.5 Numericals
1.3	Line, surface & volume integral & Differential	1.3.1 Differential elements for Cartesian coordinate system 1.3.2 Differential elements for Cylindrical coordinate system 1.3.3 Differential elements for Spherical coordinate system 1.3.4 Numericals
1.4	Del operator	1.4.1 Concept of del operator 1.4.2 Relation for Cartesian coordinate system 1.4.3 Relation for circular coordinate system 1.4.4 Relation for spherical coordinate system

		1.4.5 Numericals
1.5	Gradient of a scalar	1.5.1 Concept of Gradient 1.5.2 Relation for Cartesian coordinate system 1.5.3 Relation for circular coordinate system 1.5.4 Relation for spherical coordinate system 1.5.5 Numericals
1.6	Divergence & Divergence theorem	1.6.1 Concept of divergence 1.6.2 Statement of divergence theorem 1.6.3 Proof of divergence 1.6.4 Numericals
1.7	Curl of a vector	1.7.1 Concept of curl of a vector 1.7.2 Derivation for curl of a vector 1.7.3 Numericals
1.8	Stokes theorem & Green theorem	1.8.1 Statement of theorems 1.8.2 Proof of theorem 1.8.3 Numericals
1.9	Laplacian of a scalar	1.9.1 Concept of laplacian operator 1.9.2 Derivation of relation for laplace operator 1.9.3 Numericals
2.	**MODULE II**	
2.1	**Static Electric Field** Electric field intensity(E) & flux density(D)	2.1.1 Coulomb's Law 2.1.2 Statement of coulomb law 2.1.3 Proof of statement of coulomb's law 2.1.4 Relation for electric field intensity 2.1.5 Concept of electric flux density 2.1.6 Relation for flux density 2.1.7 Numericals
2.2	Electric field due to various charge configurations	2.2.1 Derivation of relation of electric field for line charge distribution 2.2.2 Derivation of relation of electric field for surface charge distribution 2.2.3 Derivation of relation of electric field for volume charge distribution 2.2.4 Numericals
		2.3.1 Statement of Gauss Law 2.3.2 Proof of Gauss's Law 2.3.3 Maxwell's equation in differential and integral form 2.3.4 Applications of Gauss law

2.3	Gauss's Law	2.3.4.1 Derivation for point charge 2.3.4.2 Derivation for infinite line charge 2.3.4.3 Derivation for uniform charged sphere 2.3.5 Numericals
2.4	Electric potential (V)	2.4.1 Concept of electric potential 2.4.2 Analysis and mathematical relation of electric potential for (a) Line charge (b) Surface charge (c) Volume charge 2.4.3 Relation between E and V
2.5	Electric Dipole	2.5.1 Definition of Dipole 2.5.2 Derivation of relation for dipole moment 2.5.3 Derivation of relation for electric field due to dipole 2.5.4 Numericals
2.6	Electrostatic Energy & Density	2.6.1 Concept of electrostatic energy 2.6.2 Concept of electrostatic density 2.6.3 Relation of electrostatic energy and density for (a) Line charge (b) Surface charge (c) Volume charge
3.0	**Module III** **Conductors, Dielectrics and Capacitance**	
3.1	Current and current density	3.1.1 concept of current and its density 3.1.2 Numericals
3.2	Uniqueness theorem	3.2.1 Statement of theorem 3.2.2 Derivation of relation for theorem 3.2.3 Problems
3.3	Continuity equation	3.3.1 Derivation of continuity equation 3.3.2 Significance of continuity equation
		3.4.1 Derivation of laplace equation 3.4.2 Derivation of poisson's equation 3.4.3 Importance of equations 3.4.4 Problems
		3.5.1 Concept of electrostatic energy 3.5.2 Relation of electrostatic energy for (a) Line charge

		(b) Surface charge (c) Volume charge
3.4	Poisson's and Laplace's equation	
		3.6.1 Concept of capacitance 3.6.2 Derivation of electric field in (a) Parallel plate capacitor (b) Coaxial capacitor
3.5	Uniqueness theorem Continuity equation	
		3.7.1 Concept of boundary condition 3.7.2 Significance of boundary conditions in problem solving 3.7.3 Analysis of Dielectric-Dielectric boundary conditions
3.6	Electrostatics energy & capacitance	3.7.4 Analysis of Conductor –Dielectric boundary conditions
		3.8.1 Analysis of Conductor- Free space boundary conditions.
3.7	Boundary conditions	3.8.2 Explanation of method for solving problem 3.8.3 Problems
		4.1.1 Definition of field intensity 4.1.2 Relation for magnetic field intensity
3.8	Boundary Conditions	4.1.3 Numericals
		4.2.1 Definition of flux density 4.2.2 Relation for flux density 4.2.3 Relation for different surfaces
	Module IV **Static Magnetic fields**	4.3.1 Definition and relation for magnetization
4.1	Magnetic field intensity	4.3.2 Concept of magnetic dipole 4.3.3 Relation for magnetic dipole moment 4.3.4 Numericals
		4.4.1 Statement of faraday's law
4.2	Magnetic flux density	4.4.2 Relation from faraday's law 4.4.3 Numericals
		4.5.1 Statement of Bio-Savart's law
4.3	Magnetization	4.5.2 Derivation for the relation from law 4.5.3 Numericals
		4.6.1 Statement of Ampere's Law 4.6.2 Relation for Ampere's Law

4.4	Faraday's Law	4.6.3 Application of Ampere's law 4.6.3.1 For infinite line current 4.6.3.2 For infinite sheet of current.
4.5	Bio-Savart's law	
4.6	Ampere's law	5.1.1 Concept of magnetic potential 5.1.2 Relation for scaler and vector potential. 5.1.3 Relation for line, surface and volume current. 5.1.4Numerical
	Module V **Magnetic forces, materials and Inductors**	5.2.1 Definition and relation. 5.2.2 Numericals
5.1	Magnetic scalar and vector potential	5.3.1 Concept of electrostatic energy 5.3.2 Relation of electrostatic energy 5.3.3 Numericals
	Self & Mutual inductance	5.4.1. Concept of Boundary conditions 5.4.2 Solution for normal & tangential component 5.4.3 Numericals
5.2	Energy stored in magnetic field	5.5.1 Comparison between electric and magnetic field
5.3	Boundary conditions	
5.4	Analogy between electric and magnetic field.	6.1.1 Explanation of the required concept 6.1.2 Derivation of required relation 6.1.3 Numericals
5.5	**Module VI** **TIME VARYING FIELDS AND MAXWELL's EQUATIONS**	6.2.1 Explanation of the required concept 6.2.2 Derivation of required relation 6.2.3 Numericals
6.1	Displacement currents	6.3.1Explaination of the required concept 6.3.2 Derivation of required relation in differential & integral form 6.3.3 Numerical 6.4.1 numerical

	Equation of continuity.	
6.2	Maxwell's equations,	7.1.1 Explanation of wave propagation 7.1.2 Derivation of relation between E and H
6.3	Boundary Conditions	7.1.3 Intrinsic impedance 7.2.1 Description of the concept. 7.2.2 Derivation for the depth of penetration 7.2.3 Numerical
6.4	**Module VII** **Electromagnetic Waves** Uniform plane wave in free space, dielectrics and conductors,	7.3.1 Description of concept 7.3.2 Derivation of required relation
7.1	Skin effect	7.4.1 Defination 7.4.2 Derivation of relations 7.4.3 Numericals
7.2	Maxwell's equation in Phasor form, Wave equation in Phasor form	7.5.1 Defination 7.5.2 Derivation of relations 7.5.3 Numericals
7.3	Plane waves in free space and in a homogenous material.	7.6.1 PoyntingTheorm 7.6.2 Poynting Vector (a) Instantaneous (b) Average (c) Complex
7.4	Wave equation for a conducting medium, Plane waves in lossy dielectrics	7.6.3 Power flow and energy stored relations
7.5	Pointing vector and power considerations.	
7.6		

Gaurav Jain
Associate Professor

DEPARTMENT OF ELECTRICAL ENGINEERING

Campus: PCE Course: B.Tech.-EE **Class/Section: 2nd year/ Sec-A** **Date: 10 Aug 2023**
Name of Faculty: Gaurav Jain **Name of Subject: EMFT** **Code: 3EE4-08**

COURSE PLAN (Deployment)

S.No.	TOPIC AS PER BLOWNUP SYLLABUS	LECT. NO.	Target Date of Coverage	ACTUAL DEL. DATE	CO/LO	REF. / TEXT BOOK WITH PAGE NO.
1	**ZERO LECTURE** • Introduction • Basic knowledge about subject • Syllabus, REF. / TEXT BOOKS • RTU Question Paper • Conclusion	L-0			CO1	
	UNIT-I					
2	**MODULE- 1** **Review of Vector Calculus** Vector Algebra 1.1.1 Scalar and vector quantities 1..1.2 Vector addition & subtraction 1.1.3 Position & distance vector 1.1.4 Numericals	L-1			CO1	T1
3	**Vector Algebra** 1.2.1 Vector Multiplication 1.2.2 Component of a vector 1.2.3 Triple products 1.2.4 Numericals	L-2			CO1	T1
4	**Coordinate system** 1.3.1 Cartesian coordinate system 1.3.2 Cylindrical coordinate system 1.3.3 Spherical coordinate system 1.3.4 Numericals	L-3			CO1	T1
5	**Coordinate System transformations** 1.4.1 Conversion of a vector from one coordinate system to another.	L-4			CO2	T1

	1.4.2 Numericals					
6	**Line, surface & volume integral & Differential** 1.5.1 Differential elements for Cartesian coordinate system 1.5.2 Numericals	L-5			CO2	T1
7	**Line, surface & volume integral & Differential** 1.6.1 Differential elements for Cylindrical coordinate system 1.6.2 Numericals	L-6			CO2	T1
8	**Line, surface & volume integral & Differential** 1.7.1 Differential elements for Spherical coordinate system 1.7.2 Numericals	L-7			CO2	T1,T2
9	**Del operator** 1.8.1 Concept of del operator 1.8.2 Relation for Cartesian coordinate system 1.8.3 Relation for circular coordinate system 1.8.4 Relation for spherical coordinate system 1.8.5 Numericals	L-8			CO2	T1,T2
10	**Gradient of a scalar** 1.9.1 Concept of Gradient 1.9.2 Relation for Cartesian coordinate system 1.9.3 Relation for circular coordinate system 1.9.4 Relation for spherical coordinate system 1.9.5 Numericals	L-9			CO3	T1,T2
11	**Divergence & Divergence theorem** 1.10.1 Concept of divergence 1.10.2 Statement of divergence theorem 1.10.3 Proof of divergence 1.10.4 Numericals	L-10			CO4	T1,T2

12	**Curl of a vector** 1.11.1 Concept of curl of a vector 1.11.2 Derivation for curl of a vector 1.11.3 Numericals	L-11			CO3	T1,T2
13	**Stokes theorem & Green theorem** 1.12.1 Statement of theorems 1.12.2 Proof of theorem 1.12.3 Numericals	L-12			CO2	T1,T2
14	**Laplacian of a scalar** 1.13.1 Concept of laplacian operator 1.13.2 Derivation of relation for laplace operator 1.13.3 Numericals **<u>OBT Test</u>**	L-13			CO2	T1,T2
	UNIT-II					
15	**Static Electric Fields** **Electric field intensity(E) & flux density(D)** 2.1.1 Coulomb's Law 2.1.2 Statement of coulomb law 2.1.3 Proof of statement of coulomb's law	L-14			CO2	T1,T2
16	**Electric field intensity(E) & flux density(D)** 2.2.1 Relation for electric field intensity 2.2.2 Concept of electric flux density 2.2.3 Relation for flux density 2.2.4 Numericals	L-15			CO2	T1,T2
17	**Electric field due to various charge configurations** 2.3.1 Derivation of relation of electric field for line charge distribution 2.3.2 Derivation of relation of electric field for surface charge distribution 2.3.3 Numericals	L-16			CO2	T1,T2

18	**Electric field due to various charge configurations** 2.4.1 Derivation of relation of electric field for volume charge distribution 2.4.1 Numericals	L-17			CO3	T1,T2
19	**Gauss's Law** 2.5.1 Statement of Gauss Law 2.5.2 Proof of Gauss's Law 2.5.3 Maxwell's equation in differential and integral form 2.5.4 Applications of Gauss law	L-18			CO3	T1,T2
20	**Derivations of Gauss's Law** 2.6.1 Derivation for point charge 2.6.2 Derivation for infinite line charge 2.6.3 Numericals	L-19			CO2	T1,T2
21	**Electric potential (V)** 2.7.1 Concept of electric potential 2.7.2 Analysis and mathematical relation of electric potential for (a) Line charge (b) Surface charge 2.7.3 Analysis and mathematical relation of electric potential for Volume charge 2.7.4 Relation between E and V	L-20			CO3	T1,T2
22	**Electric Dipole** 2.8.1 Definition of Dipole 2.8.2 Derivation of relation for dipole moment 2.8.3 Numericals	L-21			CO2	T1,T2
23	**Electrostatic Energy & Density** 2.9.1 Concept of electrostatic energy 2.9.2 Concept of electrostatic density 2.9.3 Relation of electrostatic energy and density for (a) Line charge (b) Surface charge 2.12.4 Numericals	L-22			CO2	T1,T2
24	**I Mid Term Exam**					

	UNIT-III **Conductors, Dielectrics and Capacitance**					
25	**Current and current density** 3.1.1 concept of current and its density 3.1.2 Numericals	L-23			CO3	T1,T2
26	**Uniqueness theorem** 3.2.1 Statement of theorem 3.2.2 Derivation of relation for theorem 3.2.3 Problems Continuity equation 3.3.1 Derivation of continuity equation 3.3.2 Significance of continuity equation	L-24			CO3	T1,T2
27	**Poisson's and Laplace's equation** 3.4.1 Derivation of laplace equation 3.4.2 Derivation of poisson's equation 3.4.3 Importance of equations 3.4.4 Problems	L-25			CO3	T1,T2
28	**Continuity equation** 3.5.1 Concept of electrostatic energy 3.5.2 Relation of electrostatic energy for Line charge 3.5.3 Relation of electrostatic energy for (a) Surface charge (b) Volume charge	L-26			CO3	T1,T2
29	**Electrostatics energy & capacitance** 3.6.1 Concept of capacitance 3.6.2 Derivation of electric field in (a) Parallel plate capacitor (b) Coaxial capacitor	L-27			CO3	T1,T2
30	**Boundary conditions** 3.7.1 Concept of boundary condition 3.7.2 Significance of boundary conditions in problem solving 3.7.3 Analysis of Dielectric-Dielectric boundary conditions 3.7.4 Analysis of Conductor –Dielectric boundary conditions Boundary Conditions	L-28			CO4	T1,T2

31	**Problem Solving Class** 3.8.1 Explanation of method for solving problem 3.8.2 Problems **Class Test**	L-29			CO4	T1,T2
	UNIT-IV					
32	**Magnetic Static Fields** Magnetic field intensity 4.1.1 Definition of field intensity 4.1.2 Relation for magnetic field intensity 4.1.3 Numericals	L-30			CO3	T1,T2
33	**Magnetic flux density** 4.2.1 Definition of flux density 4.2.2 Relation for flux density 4.2.3 Relation for different surfaces 4.2.4 Numericals	L-31			CO1	T1,T2
34	**Magnetization** 4.3.1 Definition and relation for magnetization 4.3.2 Concept of magnetic dipole 4.3.3 Relation for magnetic dipole moment 4.3.4 Numericals	L-32			CO2	T1,T3
35	**Magnetic scalar and vector potential** 4.4.1 Concept of magnetic potential 4.4.2 Relation for scalar and vector potential. 4.4.3 Relation for line, surface and volume current. 4.4.4 Numericals	L-33			CO4	T1,T3
	UNIT-V **Magnetic Forces, Materials and Inductance**	L-34			CO3	T1,T3
36	**Faraday's Law** 5.1.1 Statement of faraday's law 5.1.2 Relation from faraday's law 5.1.3 Numericals					
37	**Bio-Savart's law** 5.2.1 Statement of Bio-Savart's law 5.2.2 Derivation for the relation from law 5.2.3 Numericals	L-35			CO4	T1,T3

38	**Ampere's law** 5.3.1 Statement of Ampere's Law 5.3.2 Relation for Ampere's Law 5.3.3Application of Ampere's law for infinite line current	L-36			CO3	T1,T3
39	**Self & Mutual inductance** 5.3.1 Definition and relation. 5.3.2 Numericals	L-37			CO3	T1,T3
40	**Energy stored in magnetic field** 5.4.1 Concept of electrostatic energy 5.4.2 Relation of electrostatic energy 5.4.3 Numericals	L-38			CO4	T1,T3
41	**Boundary conditions** 5.5.1. Concept of Boundary conditions 5.5.2 Solution for normal & tangential component 5.5.3 Numericals	L-39			CO4	T1,T3
42	**Analogy between electric and magnetic field.** 5.6.1 Comparison between electric and magnetic field **Lecture Conclusion**	L-40			CO4	T1,T3
	UNIT-VI **TIME VARYING FIELDS AND MAXWELL's EQUATIONS**					
43	**Displacement currents** 6.1.1 Explanation of the required concept 6.1.2 Derivation of required relation 6.1.3 Numericals	L-41			CO1	T1,T3
44	**Equation of continuity** 6.2.1 Explanation of the required concept 6.2.2 Derivation of required relation 6.2.3 Numericals	L-42			CO2	T1,T3
45	**Maxwell's equations** 6.3.1Explaination of the required concept	L-43			CO2	T1,T3

	6.3.2 Derivation of required relation in differential & integral form 6.3.3 Numericals					
46	**Quiz Test** **Video Lecture** **PPT**					
	Module VII **Electromagnetic Waves**					
47	**Uniform plane wave in free space, dielectrics and conductors,** 7.1.1 Explanation of wave propagation 7.1.2 Derivation of relation between E and H 7.1.3 Intrinsic impedance	L-44			CO4	T1,T3
48	**Skin effect** 7.2.1 Description of the concept. 7.2.2 Derivation for the depth of penetration 7.2.3 Numerical	L-45			CO4	T1,T3
49	**Maxwell's equation in Phasor form, Wave equation in Phasor form** 7.3.1 Description of concept 7.3.2 Derivation of required relation	L-46			CO3	T1,T3
50	**Plane waves in free space and in a homogenous material.** 7.4.1 Definition 7.4.2 Derivation of relations 7.4.3 Numericals	L-47			CO3	T1,T3
51	**Wave equation for a conducting medium, Plane waves in lossy dielectrics** 7.5.1 Defination 7.5.2 Derivation of relations 7.5.3 Numericals	L-48			CO4	T1,T3
52	**Pointing vector and Power considerations.** 7.6.1 PoyntingTheorem 7.6.2 Poynting Vector (a) Instantaneous	L-49			CO3	T1,T3

	(b) Average (c) Complex 7.6.3 Power flow and energy stored relations **Second Mid Term Exam**					

S. No.	Title of Book	Authors	Publisher	No. of books in Library
Text Books				
T1	PRINCIPLES OF ELECTROMAGNETICS	MATTHEW N.O. SADIKU	MG-McGRAW HILL INTERNATIONAL EDITIONS	50
T2	ELECTROMAGNETIC FIELD THEORY	U.A.BAKSHI, A.V.BAKSHI	TECHNICAL PUBLICATION PUNE	50
T3	ELECTROMAGNETIC FIELD THEORY	H.P.TIWARI	ASHIRWAD PUBLICATION JAIPUR	50

Campus: PCE Course: B.Tech.-EE **Class/Section: 2nd year/ Sec-A** **Date: 10 Aug 2023**
Name of Faculty: Gaurav Jain **Name of Subject: EMFT** **Code: 3EE4-08**

Zero Lecture

1) Name of Subject with Code : **ELECTROMAGNETIC FIELD (3EE4-08)**
Course Nature (Compulsory/Elective): Compulsory

2). Self-Introduction:

a). Name : Dr. Gaurav Jain
b). Qualification: B.Tech, M.Tech, MBA and PhD
c). Designation: Associate Professor
d). Research Area: Power System
e). E-mail Id: gaurav.jain@poornima.org
f). Other details:

1. Areas of proficiency/expertise:
    - 1.1 Subjects taken:
        - 1.1.1 Power Systems
        - 1.1.2 Electrical Machines
    - 1.2 Laboratories Taken
        - 1.2.1 Basic Electrical and Electronics Lab
        - 1.2.2 MATLAB
        - 1.2.3 Power System Lab
    - 1.3 Academic Proficiency
        - 1.3.1 English
        - 1.3.2 Hindi
    - 1.4 Book Authored
        - 1.4.1 Electrical Machine Ashirwad Publications

3). Introduction of Students:

a) Students will be asked to introduce them covering the following points:

- Name
- Place to which he/she belongs
- Academic merit
- Percentage of marks in XII
- Merit in AIEEE
- Co-curricular activity
- Day scholar/Hosteller
- Medium in class XII: English/Hindi
- Why he/she wants to become an Engineer.

b*). Records of students in 12th*

Sr. No.	Average result of 12th	Name of student scored highest marks	Marks 60% above (No. of students)	Marks between 40%-60% (No. of students)	English Medium Students (No.)	Hindi Medium Students (No.)	No. of Hostellers	No. of Day Scholar

c). Achievement of students in previous years

Sr. No.	Section	Name	Year	Result %
1				
2				
3				
4				

d). Targets and Attainments

Academic Year	2021-22	2022-23	2023-24
Target	**3.0**	**3.0**	**3.0**
Attainment	**2.55**	**2.19**	

d). Methods of Evaluation

(i) I & II Mid-Term Examination.
(ii) Assignment / Tutorials / Lab Records.
(iii) Quiz (Objective) / Viva-Voce
(iv) OBT
(v) OET
(vi) Google Classroom

4). Instructional Language: - 100 % English

Introduction to subject: -

a). Relevance to Branch: The subjects deals with basic phenomena of electromagnetic waves. Generation of EM waves, propagation phenomena, operations and orientations. field intensity model will be discussed in detail.

b). Relevance to Society: Everyone is using mobile phone, TV broadcasting, internet services in daily life. These all services are based on electromagnetic waves for transmission and reception purpose, so this subject covers basic of EM waves and their mathematical models

c). Relevance to Self: This subject moves us to the depth of knowledge. My specialization is wireless sensors & communication and the basic principle of wireless communication is based on electromagnetic field theory. Mobile , TV and internet services are based on propagation of electromagnetic waves .

d). Relation with Laboratory: This subject is quite easily understandable if it is accompanied by the industrial visit. In the lab we are able to show how actually working principle of antenna and beneficial for industry purpose.

e). Connection with previous year and next year: In the previous semesters you had studied electronics devices and circuit .In these subject we only studied about behavior of EM waves in different coordinates systems . Vector operations of electromagnetics.

f). Connection with Poornima Mission for becoming English Proficient Institution (PMEPI): Technical proficiency blended with proper use of English shall prove to be very beneficial for the undergraduates. This shall instigate confidence among them to move ahead in the market with more confidence.

g) Significance of Gate: GATE is the key to move into any prestigious govt. organization including public sector units, Post-Graduation from IITs, NITs, IISC. GATE requires the understanding of concepts of engineering core subjects.

h) Gate Syllabus: Electrostatics; Maxwell's equations: differential and integral forms and their interpretation, boundary conditions, wave equation, Pointing vector; Plane waves and properties: reflection and refraction, polarization, phase and group velocity, propagation through various media, skin depth.

f). Pre- Requisites (Connection with previous year): -

1. Electrical and Electronics Engg (1FY08)
2. Physics (1FY03)
3. Power Electronics –I (3EE4-01)

In the previous year we had studied conventional electrical technology, machine and power electronics. Now we'll study further electric drives and their control.

5). Syllabus of Rajasthan Technical University, Kota

a). ABC analysis (RGB method) of unit & topics:

Module	Easy	Medium	Hard	Preparedness for Hard Topics
MODULE 1: Review of Vector Calculus	Vector algebra-addition, subtraction, components of vectors, scalar and vector multiplications, triple products	Three orthogonal coordinate systems rectangular, cylindrical and spherical), Conversion of a vector from one coordinate system to another.	Vector calculus differentiation, partial differentiation, integration, vector operator del, gradient, divergence and curl; integral theorems of vectors.	Lecture, Test
MODULE 2: Static Electric Field	Coulomb's law, Electric field intensity, Electrical field due to point charges. Line, Surface and Volume charge distributions.	Gauss law and its applications. Absolute Electric potential, Potential difference, Calculation of potential differences for different configurations.	Electric dipole, Electrostatic Energy and Energy density.	Lecture, QUIZ
MODULE 3: Conductors, Dielectrics and Capacitance	Current and current density, Ohms Law in Point form, Continuity of current,	Boundary conditions of perfect dielectric materials. Permittivity of dielectric materials, Capacitance, Capacitance of a two wire line,	Poisson's equation, Laplace's equation, Solution of Laplace and Poisson's equation, Application of Laplace's and Poisson's equations.	Lecture, Quiz
MODULE 4: Static Magnetic Fields	Biot-Savart Law, Ampere Law,	Magnetic flux and magnetic flux density, Scalar and Vector Magnetic potentials.	Steady magnetic fields produced by current carrying conductors.	Lecture, PPT
MODULE 5:	Magnetic circuits,	Force on a moving charge,	Nature of magnetic	Lecture, Quiz

Magnetic Forces, Materials and Inductance	inductances and mutual inductances.	Force on a differential current element, Force between differential current elements,	materials, Magnetization and permeability, Magnetic boundary conditions,	
MODULE 6: Time Varying Fields and Maxwell's Equations	Point form of Maxwell's equation, Integral form of Maxwell's equations	Faraday's law for Electromagnetic induction, Displacement current,	, Motional Electromotive forces. Boundary Conditions.	Lecture, Video lecture
MODULE 7: Electromagnetic Waves	Derivation of Wave Equation, Uniform Plane Waves,	Wave equation for a conducting medium, Plane waves in lossy dielectrics, Propagation in good conductors, Skin effect. Poynting theorem.	Maxwell's equation in Phasor form, Wave equation in Phasor form, Plane waves in free space and in a homogenous material.	Lecture, Video lecture

RED: HARD **BLUE: MODERATE** **GREEN: EASY**

b) Use of Keywords

Unit No.	Syllabus	Keywords
I	Vector algebra- addition, subtraction, components of vectors, scalar and vector multiplications, triple products, three orthogonal coordinate systems (rectangular, cylindrical and spherical). Vector calculus differentiation, partial differentiation, integration, vector operatordel, gradient, divergence and curl; integral theorems of vectors. Conversion of a vector from one coordinate system to another.	Vector multiplications, triple products, integral theorems of vectors. Conversion of a vector from one coordinate system to another.
II	Coulomb's law, Electric field intensity, Electrical field due to point charges. Line, Surface and Volume charge distributions. Gauss law and its applications. Absolute Electric potential, Potential difference, Calculation of potential differences for different configurations. Electric dipole, Electrostatic Energy and Energy density.	Electrical field due to point charges. Line, Surface and Volume charge
III	Current and current density, Ohms Law in Point form, Continuity of current, Boundary conditions of perfect dielectric materials. Permittivity of dielectric materials, Capacitance, Capacitance of a two wire line, Poisson's equation, Laplace's equation, Solution of Laplace and Poisson's equation, Application of Laplace's and Poisson's equations.	Poisson's equation, Laplace's equation, Solution of Laplace and Poisson's equation
IV	Biot-Savart Law, Ampere Law, Magnetic flux and magnetic flux density, Scalar and Vector Magnetic potentials. Steady magnetic fields produced by current carrying conductors.	Scalar and Vector Magnetic potentials

V	Force on a moving charge, Force on a differential current element, Force between differential current elements, Nature of magnetic materials, Magnetization and permeability, Magnetic boundary conditions, Magnetic circuits, inductances and mutual inductances.	Magnetic boundary conditions, Magnetic circuits, inductances and mutual inductances
VI	Faraday's law for Electromagnetic induction, Displacement current, Point form of Maxwell's equation, Integral form of Maxwell's equations, Motional Electromotive forces. Boundary Conditions.	Integral form of Maxwell's equations, Motional Electromotive forces.
VII	Derivation of Wave Equation, Uniform Plane Waves, Maxwell's equation in Phasor form, Wave equation in Phasor form, Plane waves in free space and in a homogenous material. Wave equation for a conducting medium, Plane waves in lossy dielectrics, Propagation in good conductors, Skin effect. Poynting theorem.	Wave equation in Phasor form, Plane waves in free space and in a homogenous material.

c) Recent Technologies & Publication:

Topic	Trends	Publication
Review of Vector Calculus	Calculation of the different vector condition using different ratio	IEEE, Journal of mathematics
Static Electric Field	Electric field intensity and electric field denity	International Journal of Engineering Trends and Technology
Conductors, Dielectrics and Capacitance	Poisson's equation, Laplace's equation, Solution of Laplace and Poisson's equation	IEEE
Static Magnetic Fields	Biot-Savart Law, Ampere Law and application of both these law	Springer
Magnetic Forces, Materials and Inductance	Sensorless Control of Permanent Magnet Synchronous Motor	IEEE
Time Varying Fields and Maxwell's Equations	Faraday's law for Electromagnetic induction, Integral form of Maxwell's equations	IET
Electromagnetic Waves	Uniform Plane Waves, Plane waves in lossy dielectrics, Propagation in good conductors, Skin effect. Poynting theorem.	IEEE

iii) Vocabulary Improvement

- Learning 10 New Words each day with their meanings. Sentence formation using these words.

iv) Current Affairs

- Discussion over 5 daily Current Affairs

v) Role Plays By Students on important topics.
vi) Group Discussion on a topic having different techniques.
vii) Feedback of every lecture by student
viii) Think-Pair-Share

6). Books/ Website/Journals & Handbooks/ Association & Institution:

a). Recommended Text & Reference Books and Websites:

S. No.	Title of Book	Authors	Publisher	Cost (Rs.)	No. of books in Library
Text Books					
T1	Electromagnetics with application	Jd Kraus	TMH	350/-	20
T2	Element of Electromagnetics	M.N.O. Sadiku	Oxford	300/-	30
T3	Electromagnetic Field Theory	U.A.Bakshi A.V.Bakshi	Technical Publication Pune	250/-	12
Reference Books					
R1	Field & Wave Electromagnetic	Cheng	Pearson		06
Websites related to subject					
1	www.ieee.org.in				
2	www.ie.org.in				

b). Journals & Handbooks: -

1. Journal of Scientific and Industrial Research
2. Indian Journal of Engineering and Material Science
3. Green Energy
4. Dawn of Earth
5. Science Competition Vision
6. Electrical India

c). Associations and Institutions:

1. Department Of Science and Technology(DST)
2. IEEE
3. MNIT & IIT

d). ***Websites related to subject:-***

1. www. nptel.iitm.ac.in
2. www.4shared.com
3. www.mit.com
4. www.electrical4u.com/electrical-drives/

7). Syllabus Deployment: -

a). Total weeks available for academics (excluding exams/ holidays) as per PGC calendar-

SEMESTER	**IV**
No. of Working Days Available (Approx.)	70
No. of Weeks(Approx.)	14

- Total weeks available for covering RTU syllabus- 11-12weeks (Approx.)
- Total weeks available for special activities (as mentioned below)- 02 weeks (Approx.)

b). Course Assesment Methods (Special Activities):

- Open Book Test

- Quiz (50% Technical & 50% Aptitude)- Once in a semester
- Revision classes:- 1 to 3 turn at the end of semester (Before II Mid Term Exam)
- Solving Important Question Bank- 1 Turn before I & II Mid Term Exam (each) - Total Two turn.
- I and II Midterms
- RTU University Examinations

c). Lecture schedule per week/ Contact Hours:

i). University scheme (L+T+P) = 3+1+0
ii). PGC scheme (L+T+P) = 3+1+0

Sr. No.	Name of Unit	Broad Area	Degree of difficulty (High/Medium/Low)	Text/ Reference books
1	**Review of Vector Calculus**	Vector analysis, Curl,Divergence	Low	M.Sadiku
2	**Static Electric Field**	Coulomb's law, Electric field intensity	Medium	M.Sadiku
3	**Conductors, Dielectrics and Capacitance**	Current and current density	High	M.Sadiku
4	**Static Magnetic Fields**	Biot-Savart Law, Ampere Law, Magnetic flux and magnetic flux density	Medium	M.Sadiku
5	**Magnetic Forces, Materials and Inductance**	Force on a moving charge, Force on a differential current element	Low	M.Sadiku
6	**Time Varying Fields and Maxwell's Equations**	Faraday's law for Electromagnetic induction, Maxwell's equation	Medium	M.Sadiku
7	**Electromagnetic Waves**	Maxwell's equation in Phasor form, Wave equation in Phasor form	Medium	M.Sadiku

d). Introduction & Conclusion: Each subject, unit and topic shall start with introduction & close with conclusion. In case of the subject, it is Zero lecture.

e). Time Distribution in lecture class: - Time allotted: 60 min.

i. First 5 min. should be utilized for paying attention towards students who were absent for last lecture or continuously absent for many days + taking attendance by calling the names of the students and also sharing any new/relevant information.
ii. Actual lecture delivery should be of 50 min.
iii. Last 5 min. should be utilized by recapping/ conclusion of the topic. Providing brief introduction of the coming up lecture and suggesting portion to read.
iv. After completion of any Unit/Chapter a short quiz should be organized.
v. During lecture student should be encouraged to ask the question**.**

8). Home assignment: - An essential component of Teaching- Learning process in Professional Education.

Home assignment shall comprise of two parts:

Part (i) Minimum essential questions, which are to be solved and submitted by all with in specified due date.

Part (ii) Other important questions, which may also be solved and submitted for examining and guidance by teacher.

11). Examination System:

Sr. No.	**Name of the Exam**	**Max. Marks**	**% of passing marks**	**Nature of paper Theory + Numerical**	**Syllabus coverage (in %)**	**Conducted by**
1.	Ist Mid Term Exam	40	40%	T+N	60%	PCE
2.	IInd Mid Term Exam	40	40%	T+N	40%	PCE
3.	University (End) Term Exam	80	30%	T+N	100%	RTU

Place: **Jaipur**
Date: **10/08/2023**

GAURAV JAIN
(Professor)

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

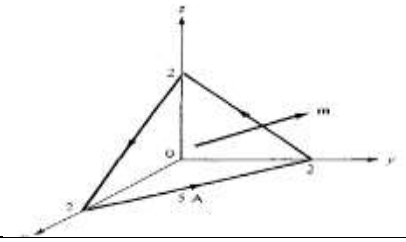
DEPARTMENT OF ELECTRICAL ENGINEERING

Campus: Poornima College of Engg. **Class/Section: 2nd Year/ Section - A** **Date: 16 Sep 2023**
Course: B.Tech.
Name of Faculty: Gaurav Jain **Name of Subject: EMFT** **Code: 3EE4-08**

DEPARTMENT OF ELECTRICAL ENGINEERING
CLASS TEST
Session 2023-24
B.Tech. II year III sem Section: A
Code: 3EE4-08 Subject Name– Electromagnetic Field

Max. Time: 1 hr. **Max. Marks: 20**

Note: Attempt all questions.

Q.1	**CO 1**	**PO 1**	Derive Poisson's and enlist Laplace properties	**(4)**
Q.2	**CO 2**	**PO 1**	Determine the divergence of these vector fields: (i) $P = x^2 yz\hat{a}_x + xz\hat{a}_z$ (ii) $Q = \rho \sin\phi \hat{a}_\rho + \rho^2 z\hat{a}_\phi + z\cos\phi\hat{a}_z$ $T = \frac{1}{r^2}\cos\theta\hat{a}_r + r\sin\theta\cos\phi\hat{a}_\theta + \cos\theta\hat{a}_\phi$	**(4)**
Q.3	**CO 3**	**PO 3**	Determine the magnetic moment of an electric circuit formed by the triangular loop as shown in figure below: 	**(4)**
Q.4	**CO 3**	**PO 2**	A parallel plate capacitor with plate area of 6 cm^2 and plate separation of 4 mm has a voltage 50 sin 10^3 t V applied to its plates. Calculate the displacement current assuming $\varepsilon = 2\varepsilon_0$.	**(4)**
Q.5	**CO 4**	**PO 1**	Show that in a good conductor, $\alpha = \beta = \text{sqrt}((\omega\mu\sigma)/2)$. Where α is the attenuation factor and β is the phase shift constant.	**(4)**

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

DEPARTMENT OF ELECTRICAL ENGINEERING

Campus: Poornima College of Engg. **Class/Section: 2nd Year/ Section - A** **Date: 10 Oct 2023**
Course: B.Tech.
Name of Faculty: Gaurav Jain **Name of Subject: EMFT** **Code: 3EE4-08**

DEPARTMENT OF ELECTRICAL ENGINEERING
QUIZ TEST
Session 2023-24
B.Tech. II year III sem Section: A
Code: 3EE4-08 Subject Name– Electromagnetic Field

1. The Cartesian system is also called as
a) Circular coordinate system
b) Space coordinate system
c) Spherical coordinate system
d) Rectangular coordinate system ( )

2. The angular separation between the vectors A = 4i + 3j + 5k and B = i – 2j + 2k is (in degrees)
a) 65.8
b) 66.8
c) 67.8
d) 68.8 ( )

3. Transform the vector A = 3i – 2j – 4k at P(2,3,3) to cylindrical coordinates
a) -3.6j – 4k
b) -3.6j + 4k
c) 3.6j – 4k
d) 3.6j + 4k ( )

4. Divergence of gradient of a vector function is equivalent to
a) Laplacian operation
b) Curl operation
c) Double gradient operation
d) Null vector ( )

5. Curl of gradient of a vector is
a) Unity
b) Zero
c) Null vector
d) Depends on the constants of the vector ( )

6 The gradient can be replaced by which of the following?
a) Maxwell equation
b) Differential equation
c) Volume Integral
d) Surface integral ( )

7 Find the gradient of the function sin x + cos y.

a) cos x i – sin y j
b) cos x i + sin y j
c) sin x i – cos y j
d) sin x i + cos y j ( )

8. The Stoke's theorem uses which of the following operation?

a) Divergence
b) Gradient
c) Curl
d) Laplacian

( )

9 . The Stoke's theorem can be used to find which of the following?

a) Area enclosed by a function in the given region
b) Volume enclosed by a function in the given region
c) Linear distance
d) Curl of the function

( )

10 . Which of the following is not an application of Green's theorem?

a) Solving two dimensional flow integrals
b) Area surveying
c) Volume of plane figures
d) Centroid of plane figures ( )

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

DEPARTMENT OF ELECTRICAL ENGINEERING

Campus: Poornima College of Engg. **Class/Section: 2nd Year/ Section - A** **Date: 20 Sep 2023**
Course: B.Tech.
Name of Faculty: Gaurav Jain **Name of Subject: EMFT** **Code: 3EE4-08**

FIRST MID TERM EXAMINATION 2023-24
Code: 3EE4-08 Category: PCC Subject Name–Electromagnetic Fields (EMF)
(BRANCH – ELECTRICAL ENGINEERING)

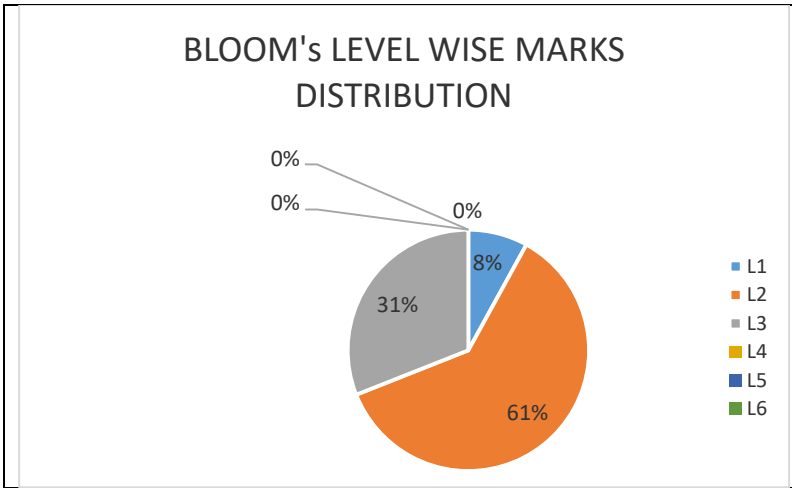
Course Outcomes (CO):

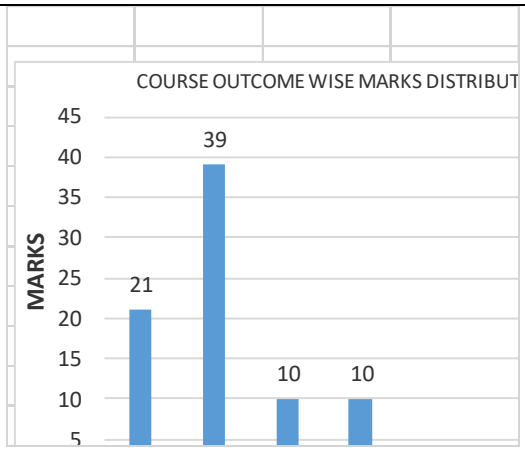
At the end of the course the student should be able to:

CO1: Demonstrate the laws and theorems of electric field, magnetic field and time varying fields.
CO2: Debate the Charge distribution, boundary conditions, Laplace, Poisson and Maxwell's equations in search of a solution.
CO3: Investigate the behavior of dielectric and conductive material in electromagnetic fields by using electric or magnetic motive force conditions.
CO4: Estimate the capacitance, inductance, mutual inductance, electronic wave, electric field intensity, electric flux density, magnetic flux density and Plane wave conditions for real time problem.

	PART - A: (All questions are compulsory) Max. Marks (10)				
		Marks	**CO**	**BL**	**PO**
Q.1	Evaluate the mathematical expression of the divergence of a Vector.	**2**	**1**	**2**	**1**
Q.2	What is permittivity of a dielectric material for design perspective?	**2**	**2**	**1**	**3**
Q.3	Define Energy Intensity and Energy Density	**2**	**1**	**1**	**1**
Q.4	Write Statement of Vector multiplication and Vector addition.	**2**	**1**	**1**	**1**
Q.5	Evaluate the mathematical expression of Electric Dipole.	**2**	**2**	**2**	**2**
	PART - B: (Attempt 4 questions out of 6) Max. Marks (20)				
Q.6	Drive the Mathematical expression of Cylindrical Coordinates in detail.	**5**	**2**	**2**	**2**
Q.7	Express the following points in cylindrical and spherical coordinates using transformation technique. a) P (7,3,-6) b) (4, -5, 4)	**5**	**2**	**2**	**2**
Q.8	Evaluate the mathematical expression of the Electric Field due to Line charge distribution in detail.	**5**	**2**	**2**	**2**
Q.9	Define Coulomb's law. Also explain the mathematical expression of the boundary condition between dielectric materials in detail.	**5**	**4**	**2**	**3**
Q.10	Design Electric Flux Density in free Space is Given by	**5**	**4**	**3**	**3**

	$D=Y^2Z^3\,a_x+2XYZ^3\,a_y+3XY^2Z^2\,a_z$ a) Find the total electric flux passing through the Surface X=4, 0≤Y≤2, 0≤Z≤1 in a direction away from the origin b) Find the Magnitude of E at (0,1,2)				
Q.11	Drive the Mathematical transformation between Cartesian to spherical Coordinates in detail.	**5**	**1**	**2**	**1**
	PART - C: (Attempt 3 questions out of 4) Max. Marks (30)				
Q.12	Given vector $A=2rCos\phi a_r - ra_\phi$ in cylindrical coordinates for counter shown, solve this expression using curl theory. 	**10**	**2**	**3**	**2**
Q.13	Define Gauss law. Also explain the mathematical expression of symmetric charge distribution application.	**10**	**1**	**2**	**1**
Q.14	State and Prove divergence theorem with mathematical treatment. (l) Draw the pattern of magnetic field in which the divergence zero and (2) Draw the pattern of electric field in which divergence non-zero.	**10**	**3**	**3**	**2**
Q. 15	What is Electrical Potential? Calculate the Electrical Potential in Co-axial Cable.	**10**	**2**	**2**	**2**





BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

CO – Course Outcomes; PO – Program Outcomes

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

DEPARTMENT OF ELECTRICAL ENGINEERING

Campus: Poornima College of Engg. **Class/Section: 2nd Year/ Section - A** **Date: 06 Dec 2023**
Course: B.Tech.
Name of Faculty: Gaurav Jain **Name of Subject: EMFT** **Code: 3EE4-08**

SECOND MID TERM EXAMINATION 2023-24
Code: 3EE4-08 Category: PCC Subject Name–Electromagnetic Fields (EMF)
(BRANCH – ELECTRICAL ENGINEERING)

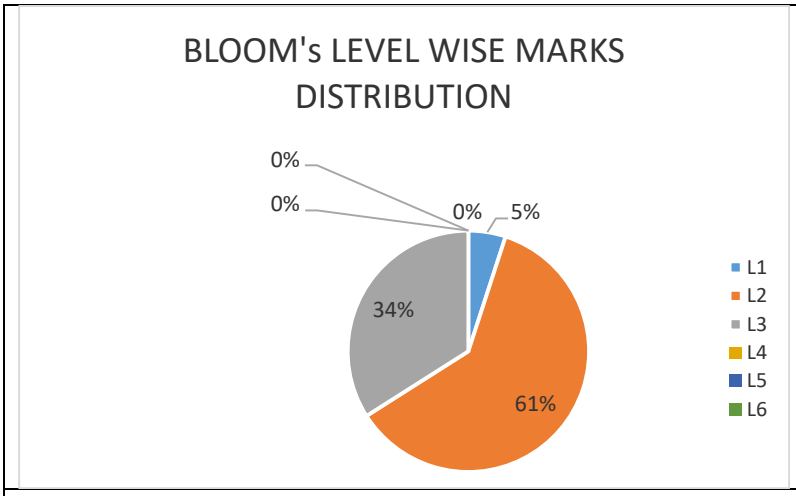
Course Outcomes (CO):

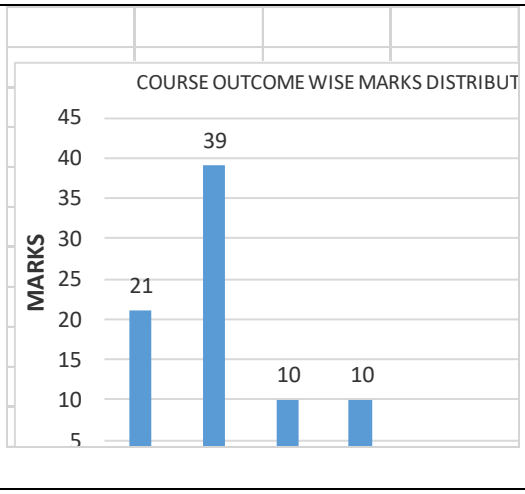
At the end of the course the student should be able to:

CO1: Demonstrate the laws and theorems of electric field, magnetic field and time varying fields.
CO2: Debate the Charge distribution, boundary conditions, Laplace, Poisson and Maxwell's equations in search of a solution.
CO3: Investigate the behavior of dielectric and conductive material in electromagnetic fields by using electric or magnetic motive force conditions.
CO4: Estimate the capacitance, inductance, mutual inductance, electronic wave, electric field intensity, electric flux density, magnetic flux density and Plane wave conditions for real time problem.

	PART - A: (All questions are compulsory) Max. Marks (10)				
		Marks	**CO**	**BL**	**PO**
Q.1	Define Magneto-Motive force (MMF) in electro-magnetic Fields.	**2**	**1**	**2**	**1**
Q.2	Find the inductance of a solenoid with 300 turn. I=0.65mA and a circular cross section of radius 0.03m.	**2**	**2**	**2**	**2**
Q.3	Explain inductance and mutual inductance using their mathematical expression.	**2**	**1**	**1**	**1**
Q.4	Define Skin effect and Poynting theorem.	**2**	**1**	**1**	**1**
Q.5	Derive the mathematical equation of plane wave in free space.	**2**	**4**	**3**	**2**
	PART - B: (Attempt 4 questions out of 6) Max. Marks (20)				
Q.6	Give mathematical Analysis of the magnetic field in Current Loop using Bio-Savart's Law.	**5**	**2**	**2**	**2**
Q.7	Express the mathematical expression of parallel plate capacitor using Laplace formulation.	**5**	**2**	**2**	**1**
Q.8	Give the classification of Magnetic material and explain their applications.	**5**	**2**	**2**	**1**
Q.9	Derive mathematical equation of Uniform plane waves equation according to your Symbolization.	**5**	**4**	**2**	**3**
Q.10	Evaluate Maxwell's equations for a Static field medium in terms of E_s and	**5**	**4**	**3**	**3**

	H_s only assuming the time factor e^{jwt}.				
Q.11	Explain Maxwell's equation. Also explain the mathematical expression of the static field and time varying field in detail.	**5**	**1**	**2**	**1**
	PART - C: (Attempt 3 questions out of 4) Max. Marks (30)				
Q.12	Evaluate the mathematical expression of the magnetic boundary condition in detail.	**10**	**2**	**3**	**2**
Q.13	Drive Different mathematical expression of Faraday law according to their form. Also give the statement of Faraday law.	**10**	**1**	**2**	**1**
Q.14	Write Short note on a) Force on a moving charge b) Force on a differential current element	**10**	**1**	**2**	**1**
Q. 15	Check whether the following fields are genuine EM fields, i.e., they satisfy Maxwell's equations. Assume that the fields exist in charge-free regions. (a) A = 40 sin(ωt + 10x)az (b) B = 10/ϕ cos(cor - *2ρ)aϕ*	**10**	**2**	**3**	**2**





BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating)

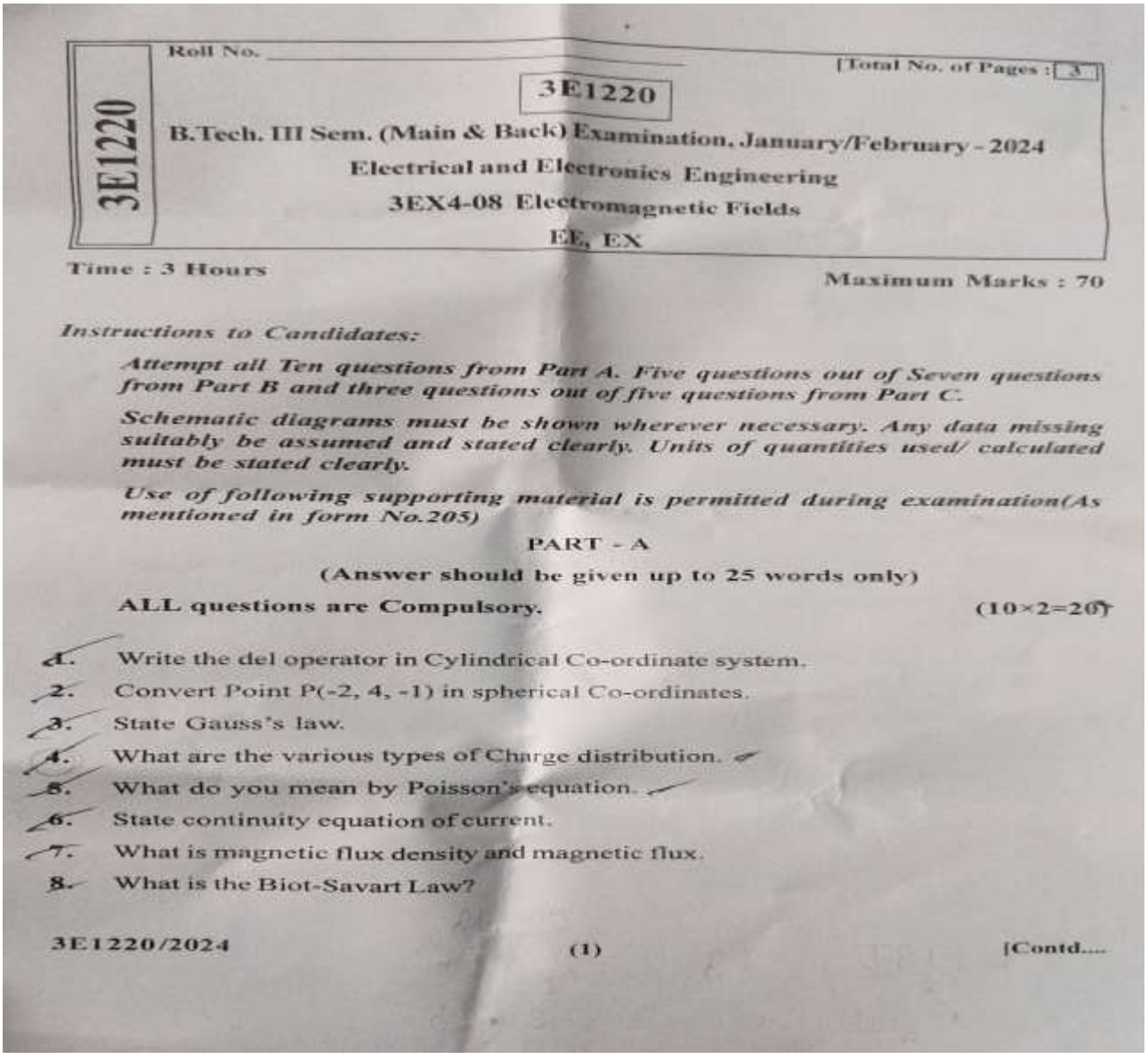
CO – Course Outcomes; PO – Program Outcomes

POORNIMA COLLEGE OF ENGINEERING, JAIPUR

DEPARTMENT OF ELECTRICAL ENGINEERING

Campus: Poornima College of Engg. **Class/Section: 2nd Year/ Section - A** **Date: 20 Feb 2024**
Course: B.Tech.
Name of Faculty: Gaurav Jain **Name of Subject: EMFT** **Code: 3EE4-08**

RTU EXAMINATION 2023-24
Code: 3EE4-08 Category: PCC Subject Name–Electromagnetic Fields (EMF)
(BRANCH – ELECTRICAL ENGINEERING)



3E1220

Roll No. _____ [Total No. of Pages : 3

3E1220

B.Tech. III Sem. (Main & Back) Examination, January/February - 2024

Electrical and Electronics Engineering

3EX4-08 Electromagnetic Fields

EE, EX

Time : 3 Hours Maximum Marks : 70

Instructions to Candidates:

Attempt all Ten questions from Part A. Five questions out of Seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination(As mentioned in form No.205)

PART - A

(Answer should be given up to 25 words only)

ALL questions are Compulsory. (10×2=20)

1. Write the del operator in Cylindrical Co-ordinate system.
2. Convert Point P(-2, 4, -1) in spherical Co-ordinates.
3. State Gauss's law.
4. What are the various types of Charge distribution.
5. What do you mean by Poisson's equation.
6. State continuity equation of current.
7. What is magnetic flux density and magnetic flux.
8. What is the Biot-Savart Law?

3E1220/2024 (1) [Contd....

9. Write the Maxwell's first equation in integral form.

10. What are uniform Plane waves?

PART - B

(Analytical/Problem solving questions)

Attempt any FIVE questions. **(5×4=20)**

1. Determine divergence of following functions.

   a) $P = xy^2z\,\widehat{ax} + 2yz\,\widehat{ay} + y\,\widehat{az}$

   b) $Q = \text{Cos}^2 x\,\widehat{ax} + \text{Sin}^2 y\,\widehat{ay} + e^z\,\widehat{az}$

   c) $P = (x^2 + 3y)\,\widehat{ax} + (y^2 + 2z)\,\widehat{ay} + 2xz^2\,\widehat{oz}$

2. If potential $V = 3x^2yz + 2Ay^3z$

   a) Determine 'A' so that Laplace equation satisfies

   b) Find electric field at *(3, 2, -1)*

3. Derive boundary condition of electric field for dielectric-dielectric interface.

4. Derive the expression of Magnetic field due to infinitely long current carrying conductor.

5. State and explain the Maxwell's equation in differential and integral form, also define the displacement current and depth of penetration.

6. Explain Power flow and Poynting vector.

7. Write short notes on :

   a) Cylindrical Co-ordinate system.

   b) Spherical co-ordinate system.

PART - C

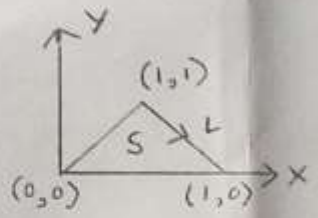
(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any THREE questions. **(3×10=30)**

1. A Vector is given as $F = x^2 y\widehat{a_x} - y\widehat{a_y}$ Calculate

   a) $\oint_L F.de$ b) $\oint_S (\nabla \times F).ds$

   Where'L' is shown in below figure and 'S' is area bounded by 'L', also verify Stoke's theorem



2. Derive the expression of electric field and electric potential due to dipole.

3. Describe the magnetic boundary conditions and compare with that of electric boundary conditions.

4. Describe the solution of Wave equation for free space.

5. For the potential, $V = \frac{10}{r^2}\text{Sin}\theta\text{Cos}\phi$

   Find:

   a) Flux density 'D' at point $(3, \pi/4, 0)$

   b) Work done to move *10 uc* charge from point A(1, 30°, 120°) to point B(4, 90°, 60°).