Lovely Professional University, Punjab

Course Code	Course Title	Lectures	Tutorials	Practicals	Credits	
ECE207	ELECTROMAGNETIC FIELD THEORY	3	1	0	4	
Course Weightage	ATT: 5 CA: 25 MTT: 20 ETT: 50					

Course Focus	EMPLOYABILITY

Course Outcomes :Through this course students should be able to

CO1 :: recall the basic the basic Electro and Magneto static theorems and laws

CO2 :: describe the concepts of electrodynamics & to derive and discuss the Maxwell's equations.

CO3 :: interpret Maxwell's equations to electromagnetic waves propagation and transmission line

CO4 :: explore solutions of problems relating to transmission lines and uniform plane wave propagation.

CO5 :: apply the characteristics of electromagnetic wave and its propagation in free space and different medium

CO6 :: deduce the knowledge of electromagnetic fields in practice

	TextBooks (T)		
Sr No	**Title**	**Author**	**Publisher Name**
T-1	PRINCIPLES OF ELECTROMAGNETICS	MATTHEW N.O. SADIKU,KULKARNI	OXFORD UNIVERSITY PRESS

	Reference Books (R)		
Sr No	**Title**	**Author**	**Publisher Name**
R-1	ENGINEERING ELECTROMAGNETICS	WILLIAM H.HAYT,JR AND JOHN A.BUCK	Tata McGraw Hill, India

Other Reading (OR)	
Sr No	**Journals articles as Compulsary reading (specific articles, complete reference)**
OR-1	http://en.wikipedia.org/wiki/Electromagnetism ,
OR-2	http://ieeexplore.ieee.org/book/047173277X.01.pdf ,
OR-3	http://llovesumi.tripod.com/menu.htm ,

Relevant Websites (RW)		
Sr No	**(Web address) (only if relevant to the course)**	**Salient Features**
RW-1	http://www.pha.jhu.edu/~javalab/spherical/spherical.html	Coordinate System

RW-2	http://www.falstad.com/mathphysics.html	Demonstarion of TE and TM waves
RW-3	http://www.fourier-series.com/rf-concepts/smithchart.html	Smith Chart
RW-4	nptel.ac.in/courses/108104130	NPTEL registration site

Audio Visual Aids (AV)		
Sr No	**(AV aids) (only if relevant to the course)**	**Salient Features**
AV-1	nptel.ac.in/courses/108104130	Video lectures on Field theory

LTP week distribution: (LTP Weeks)	
Weeks before MTE	7
Weeks After MTE	7
Spill Over (Lecture)	7

Detailed Plan For Lectures

Week Number	Lecture Number	Broad Topic(Sub Topic)	Chapters/Sections of Text/reference books	Other Readings, Relevant Websites, Audio Visual Aids, software and Virtual Labs	Lecture Description	Learning Outcomes	Pedagogical Tool Demonstration/ Case Study / Images / animation / ppt etc. Planned	Live Examples
Week 1	Lecture 1	Introduction to Vector Analysis(Introduction to Coordinate systems and Transformation)	T-1 R-1	RW-1 RW-4	L:1 Reserved for lecture zero L:2 Introduction to vectors L:3 Introduction to coordinate systems	Applications of Electromagnetic field theory and coordinate systems	Live example,Questioning and lecturing	Example of microwave oven and radar systems
	Lecture 2	Introduction to Vector Analysis(Introduction to Coordinate systems and Transformation)	T-1 R-1	RW-1 RW-4	L:1 Reserved for lecture zero L:2 Introduction to vectors L:3 Introduction to coordinate systems	Applications of Electromagnetic field theory and coordinate systems	Live example,Questioning and lecturing	Example of microwave oven and radar systems

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Week 1	Lecture 3	Introduction to Vector Analysis(Introduction to Coordinate systems and Transformation)	T-1 R-1	RW-1 RW-4	L:1 Reserved for lecture zero L:2 Introduction to vectors L:3 Introduction to coordinate systems	Applications of Electromagnetic field theory and coordinate systems	Live example,Questioning and lecturing	Example of microwave oven and radar systems
Week 2	Lecture 4	Introduction to Vector Analysis(Differential Length,Area and Volume)	T-1 R-1	AV-1	Differential Length area and volume	To Explore the various methods of Vector calculations	Discussion,problem solving and lecturing	
	Lecture 5	Introduction to Vector Analysis(Line,Surface and Volume Integrals)	T-1 R-1	OR-3	Integrals line surface and volume	To Explore the various methods of Vector calculations	Discussion,problem solving and lecturing	
	Lecture 6	Introduction to Vector Analysis(Del Operator,Gradient,Divergence and Curl)	T-1 R-1	OR-3	gradient, divergence and curl	To Explore the various methods of Vector calculations	Discussion,problem solving and lecturing	
Week 3	Lecture 7	Introduction to Vector Analysis(Divergence Theorem)	T-1 R-1	AV-1	Divergence theorem	To analyze the use of divergence theorem	Lecturing,Discussion and problem solving	
		Introduction to Vector Analysis(Laplacian of a Scalar)	T-1	AV-1	Divergence theorem	To analyze the use of divergence theorem	Lecturing,Discussion and problem solving	
	Lecture 8	Introduction to Vector Analysis(Stoke's Theorem)	T-1	AV-1	Stokes theorem	To Explore various Applications of Stokes theorem	Discussion and lecturing	
	Lecture 9	Electrostatics(Coulomb Law)		OR-1	Permitivity , Electric flux density and potential	To understand the use of flux density and electric potential.	Discussion,problem solving and lecturing	
Week 4	Lecture 10	Electrostatics(Electric potential)	T-1 R-1	OR-1	Permitivity , Electric flux density and potential	To understand the use of electric potential.	Discussion,problem solving and lecturing	
	Lecture 11	Electrostatics(Continuity Equation)	T-1	OR-2	Gauss law and Continuity equation	To explore the Gauss law continuity equation	Discussion and problem solving	
	Lecture 12				Test 1			
Week 5	Lecture 13	Magnetostatics(Biot Savart Law)	T-1		Biot Savart Law and derivation	To explore the applications of Biot Savart law	Discussion,brain storming and lecturing	
	Lecture 14	Magnetostatics(Biot Savart Law)	T-1		Biot Savart Law and derivation	To explore the applications of Biot Savart law	Discussion,brain storming and lecturing	

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Week 5	Lecture 15	Magnetostatics(Ampere's circuit law and its application)	T-1		Ampere's law ,derivation,applications and its inconsistency	To analyze the various applications of Ampere's Law	Discussion and lecturing and videos	
Week 6	Lecture 16	Magnetostatics(Ampere's circuit law and its application)	T-1		Ampere's law ,derivation,applications and its inconsistency	To analyze the various applications of Ampere's Law	Discussion and lecturing and videos	
	Lecture 17	Magnetostatics(Permeability and Magnetic flux Density)	T-1		Magnetic flux density and equations	To understand various applications of Magnetic Flux	Discussion and live example	Example of MRI and its working
		Magnetostatics(Magnetic flux and magnetic flux density)	T-1		Magnetic flux density and equations	To understand various applications of Magnetic Flux	Discussion and live example	Example of MRI and its working
	Lecture 18	Magnetostatics(Magnetic flux and magnetic flux density)	T-1		Magnetic flux density and equations	To understand various applications of Magnetic Flux	Discussion and live example	Example of MRI and its working
Week 7	Lecture 19	Magnetostatics(Derivation of the steady magnetic field laws)	T-1		Derivation of the steady magnetic field laws	student will learn about Derivation of the steady magnetic field laws	Discussion, problem solving and lecturing	In Motors and transformer
		SPILL OVER						
Week 7	Lecture 20				Spill Over			
	Lecture 21				Spill Over			
		MID-TERM						
Week 8	Lecture 22	Waves and Applications (Faraday's law)	T-1 R-1		Faraday's Law	To explore the use of Faraday's Law	Discussion,lecturing and problem solving	
	Lecture 23	Waves and Applications (Displacement current)	T-1		Displacement Current	To analyze the displacement current	brain storming and lecturing	
	Lecture 24	Waves and Applications (Maxwell's equations in point form and integral form for steady fields)	T-1		Maxwell's Equation in final form	To explore the use of Maxwell equation	Discussion ,lecturing and problem solving	
Week 9	Lecture 25	Waves and Applications (Phasor form of Maxwell's equation)	T-1		Phasor diagram for Maxwell equation	To analyze the phasor diagram for Maxwell equations	Discussion,power point slides and problem solving	
	Lecture 26	Waves and Applications (Phasor form of Maxwell's equation)	T-1		Phasor diagram for Maxwell equation	To analyze the phasor diagram for Maxwell equations	Discussion,power point slides and problem solving	
	Lecture 27	Electromagnetic Wave Propagation(Wave Propagation in Lossy Dielectrics)	T-1	RW-2	Wave propagation in lossy dielectrics	To investigate the wave propagation in lossy medium	Discussion,questioning and problem solving	

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Week 10	Lecture 28	Electromagnetic Wave Propagation(Wave Propagation in Lossy Dielectrics)	T-1	RW-2	Wave propagation in lossy dielectrics	To investigate the wave propagation in lossy medium	Discussion,questioning and problem solving	
	Lecture 29	Electromagnetic Wave Propagation(Plane Waves)	T-1		Plane waves in free space	To analyze wave propagation in free space	Lecturing and discussion	
		Electromagnetic Wave Propagation(Power and Poynting Vector)	T-1		Plane waves in free space	To analyze wave propagation in free space	Lecturing and discussion	
	Lecture 30				Test 2			
Week 11	Lecture 31	Electromagnetic Wave Propagation(Reflection at boundries)	T-1		Reflection of plane waves at normal incidence	To analyze wave reflection	problem solving and discussion	
	Lecture 32	Transmission Line (Transmission line parameters)	T-1		Parameters of transmission lines	To explore the parameters of transmission line	Discussion,questioning and power point slides	
	Lecture 33	Transmission Line (Transmission line equation and reflection coefficients of voltage and current)	T-1		Line equation and reflection coefficient	To analyze the line equations	Problem solving and discussion	
Week 12	Lecture 34				Certification - MOOCs			
	Lecture 35	Transmission Line(Input Impedance)	T-1 R-1		Input impedance	Line parameters and its applications	discussion,power point slides and questioning	
	Lecture 36	Transmission Line(Input Impedance)	T-1 R-1		Input impedance	Line parameters and its applications	discussion,power point slides and questioning	
Week 13	Lecture 37	Transmission Line(SWR and Power)	T-1 R-1		Standing wave ratio and Power	knowledge about Line parameters	discussion,power point slides and questioning	
	Lecture 38	Transmission Line(SWR and Power)	T-1 R-1		Standing wave ratio and Power	knowledge about Line parameters	discussion,power point slides and questioning	
	Lecture 39	Transmission Line(Smith Chart)	T-1 R-1	RW-3	Basic parameter of smith chart	Line parameters and basic applications of smith chart	discussion,power point slides and questioning	
Week 14	Lecture 40	Transmission Line(Smith Chart)	T-1 R-1	RW-3	Basic parameter of smith chart	Line parameters and basic applications of smith chart	discussion,power point slides and questioning	
		SPILL OVER						
Week 14	Lecture 41				Spill Over			
	Lecture 42				Spill Over			

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Week 15	Lecture 43				Spill Over			
	Lecture 44				Spill Over			
	Lecture 45				Spill Over			

Scheme for CA:

CA Category of this Course Code is:C010102 (Total 3 tasks, 1 compulsory and out of remaining 1 best out of 2 to be considered)

Component	Iscompulsory	Weightage (%)	Mapped CO(s)
Test 1	NO	50	CO1, CO2
Certification - MOOCs	Yes	50	CO1, CO2, CO3, CO4, CO5
Test 2	NO	50	CO2, CO3, CO4, CO5

Details of Academic Task(s)

Academic Task	Objective	Detail of Academic Task	Nature of Academic Task (group/individuals)	Academic Task Mode	Marks	Allottment / submission Week
Certification - MOOCs	Apply the concept of electromagnetism in modern communications	Either complete the Certification or write and publish Paper/Patent	Individual	Online	30	1 / 13
Test 2	Apply the concept of electromagnetism in modern communications such as antenna and microwave engineering.	Activity based Test	Individual	Online	30	10 / 11
Test 1	Analyse Maxwell's equation and apply them to diverse engineering problems.	Design based Test	Individual	Online	30	3 / 4

MOOCs/ Certification etc. mapped with the Academic Task(s)

Academic Task	Name Of Certification/Online Course/Test/Competition mapped	Type	Offered By Organisation
Certification - MOOCs	ELECTROMAGNETIC FIELDS IN 3-D	MOOCs	SWAYAM

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Test 1	ELECTROMAGNETIC FIELDS IN 3-D	MOOCs	SWAYAM

Where MOOCs/ Certification etc. are mapped with Academic Tasks:
1. Students have choice to appear for Academic Task or MOOCs etc.
2. The student may appear for both, In this case best obtained marks will be considered.

Plan for Tutorial: (Please do not use these time slots for syllabus coverage)

Tutorial No.	Lecture Topic	Type of pedagogical tool(s) planned (case analysis,problem solving test,role play,business game etc)
Tutorial1	Numerical problems on basics of vectors and coordinate systems.	Problem Solving
Tutorial2	Problems on differential length,area and volume	Problem Solving
Tutorial3	Problems on Divergence and Stokes theorem	Problem Solving
Tutorial4	Problems based on Gauss law	Problem Solving
Tutorial5	Numerical problems on Biot Savart.	Problem Solving
Tutorial6	Problems based on Ampere circuit law	Problem Solving
Tutorial7	Problems on magnetic flux density	Problem Solving
After Mid-Term		
Tutorial8	Problems on Faraday law	Problem Solving
Tutorial9	Problems on Phasor form of Maxwell equation	Problem Solving
Tutorial10	Problems on wave equations	Problem Solving
Tutorial11	Problem based on Power and poynting vector	Problem Solving
Tutorial12	Numerical problems on transmission line parameters	Problem Solving
Tutorial13	Numerical problems based on Smith Chart	Problem Solving
Tutorial14	Numerical problems on Smith chart.	Problem Solving

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