Course Number and Title:	EE-312 Electromagnetic Field Theory			
Credit Hours:	3+0			
Pre Requisite	Multivariable Calculus			
Instructor (s):	Engr. Abu Bakar Waqas			
Lab Engineer:	N/A			
Compulsory/Elective:	Compulsory (Breadth)			
If Elective: Depth Core/ Breadth Core:				
Course Schedule:	Lecture:	3 hours/week		
	Lab:	N/A		
	Office hours:	4 hours/week		
Course Assessment:	Assignments/ Course project:	3		
	Quizzes:	3		
	Lab work:	N/A		
	Exams:	Mid-semester and Final		
Grading Policy:	Quizzes:	10%		
	Assignments/ Course project:	10%		
	Lab work:	00%		
	Mid-Semester:	20%		
	End-Semester:	60%		
Text Book:	Engineering Electromagnetics by William Hayt and John A. Buck, McGraw-Hill, Latest Edition.			
Reference Book(s):	Elements of Electromagnetics by Sadiku, Matthew N, Latest Edition, Oxford University Press.			
Course Objective:	Introduce the concepts and mathematical methods to understand and analyze electromagnetic fields and waves.			
Course Learning Outcome	CLO Statement		PLO	Bloom
CLO-1:	Knowledge about the vector calculus and the fundamental laws of physics to understand the electric and magnetic fields		PLO-1	C1 C2
CLO-2:	Problem formulation and analysis of electromagnetic fields in the region surrounded by different static and moving charge configurations		PLO-2	C3 C4
Topics covered in the course and level of coverage:	❖ Vector analysis			6 hours
	❖ Coulombs law and electric field intensity			6 hours
	❖ Gauss's law, flux density and divergence			6 hours
	❖ Energy and potential			3 hours
	❖ Electrostatic fields and materials, boundary value problems			6 hours
	❖ Capacitance, Poisson's and Laplace's equations			6 hours
	❖ Magneto-static fields			6 hours
	❖ Magneto-static fields and materials, inductance calculation			6 hours
	❖ Time-varying fields and Maxwell's equations			3 hours
Program learning outcomes and how they are covered by specific course outcomes:	Detailed Contents		CLO	PLO
	❖ Vector algebra, Cartesian, cylindrical and spherical co-ordinate systems		CLO-1	PLO-1
	❖ Relationship between different co-ordinate systems,		CLO-1	PLO-1

	Transformation of vectors		
	❖ Coulombs law and electric field intensity	CLO-1	PLO-1
	❖ Electric field due to different charge distributions	CLO-2	PLO-2
	❖ Electric field arising from an infinite line and sheet of charges with examples	CLO-2	PLO-2
	❖ Electric flux density, Gauss's law	CLO-1	PLO-1
	❖ Applications of Gauss's law	CLO-2	PLO-2
	❖ Divergence and divergence theorem, Maxwell's first equation	CLO-2	PLO-2
	❖ Work done, Potential difference and absolute potential	CLO-1	PLO-1
	❖ Potential field due to different charge distributions	CLO-2	PLO-2
	❖ Potential gradient, Electric dipole, Energy density	CLO-2	PLO-2
	❖ Continuity of current, OHM's law	CLO-2	PLO-2
	❖ Polarization of dielectric materials	CLO-2	PLO-2
	❖ Boundary conditions for conductor and dielectric materials	CLO-2	PLO-2
	❖ Capacitance calculation of parallel plate and two wire line using boundary conditions	CLO-2	PLO-2
	❖ Poisson's and Laplace's equations with examples	CLO-2	PLO-2
	❖ Biot-Savart and Ampere's circuital laws	CLO-1	PLO-1
	❖ Curl and stokes' theorem	CLO-2	PLO-2
	❖ Magnetic flux density, Scalar and vector magnetic potentials	CLO-1	PLO-1
	❖ Steady magnetic field laws	CLO-2	PLO-2
	❖ Forces and torques on current carrying conductors	CLO-1	PLO-1
	❖ Nature of Magnetic materials and boundary conditions	CLO-2	PLO-2
	❖ Magnetic circuit, Potential energy and forces on magnetic materials	CLO-2	PLO-2
	❖ Inductance and mutual inductance	CLO-2	PLO-2
	❖ Faraday's law and displacement current	CLO-2	PLO-2
	❖ Maxwell's Equations in point and integral form, The Retarded potentials	CLO-2	PLO-2

Mapping of CLOs with PLOs and Bloom's Taxonomy Cognitive Levels:

PLO	1	2	3	4	5	6	7	8	9	10	11	12
CLO-1	C1 C2											
CLO-2		C3 C4										

Mapping of CLOs with Assessment Methods:

CLOs/Assessment	CLO-1	CLO-2
Assignments:	√	√
Quizzes:	√	√
Lab work:		
Mid-Semester:	√	√
End-Semester:	√	√