

Branch Name:	Electrical Engineering
Program Code:	ET109
Course Name:	Field Theory
Course Code:	1ET1090505
Pre-requisite Course:	Fundamental Knowledge of Physics, Scalar and Vector Algebra

Course Objectives:

1. Field theory is a subject in which a student will be able to analyses the behavior of electric fields related to electrostatics and magnetic fields related to electromagnetics circuits.
2. Furthermore, a student will also be able to grasp the physical significance of various mathematical theories.
3. Also able to Derivation of Poisson's and Laplace's equations.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)								
Lecture	Tutorial	Practical	Credit	Theory				Practical				Total
				University Assessment		Continuous Assessment		University Assessment		Continuous Assessment		
				Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	-	-	3	28	70	12	30	-	-	-	-	100

Course Contents:

Sr. No.	Topic	Total Hours	Weightage (%)
1	Vector Analysis: Basic Concepts of Scalars and Vectors, The Cartesian (rectangular) co-ordinate system, Vector components and unit vectors, The dot product, The cross product, The cylindrical co-ordinate system, The spherical co-ordinate system.	7	15
2	Coulomb's law and Electric Field Intensity: The experimental law of Coulomb, Concept of Electric flux and Electric field intensity, Concept of Charge Distribution, Electric field intensity due to a line charge, Electric field intensity, Electric field intensity due to a surface (sheet) charge.	7	15
3	Electric Flux Density, Gauss' law and Divergence: Concept of Electric flux density, Gauss' law, Application of Gauss' law to differential volume element, Divergence, Maxwell's first equation, The divergence theorem.	5	13
4	Energy and Potential: Concept of a point charge moving in electric field, The line integral, Definition of potential and potential difference, The potential field of a	7	15

	point charge, The potential field of a system of charges, Potential gradient, The dipole, Energy density in the electrostatic field.		
5	Current, Conductors and Dielectrics: Current and current density, Continuity of current, Metallic conductors, Conductor properties and boundary conditions, The nature of dielectric materials, Boundary conditions for perfect dielectric materials.	7	15
6	Poisson's and Laplace's Equation: Derivation of Poisson's and Laplace's equations, Uniqueness theorem, Example of the solution of Laplace's equation.	5	14
7	Time Varying Fields and Maxwell's equation: Faraday's Law, Displacement current, Maxwell's equation in point form, Maxwell's equation in integral form, Time varying potentials.	5	13

Reference Books:

1. Engineering Electro magnetics by W.H. Hayt and J. A. Buck, Tata McGraw Hill Publications, 2005.
2. Elements of Electro magnetics by Matthew N. O. Sadiku, Oxford University Press, 2012.
3. Electromagnetic Field Theory and Transmission Lines by G.S.N. Raju, Pearson Education, 2003.
4. Fundamentals of Electro magnetics by A.V. Mahatme, University Science Press, 2016.
5. Fundamentals of Engineering Electro magnetics by Sunil Bhooshan, Oxford University Press, 2002

List of Open Source Software/learning website:

- Some tutorials might be included based on MATLAB Programming.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understanding Basic Concepts of Scalars and Vectors.	2 Understanding
CLO2	Analyze the experimental law of Coulomb.	4 Analyze
CLO3	State the of electrostatic and magneto static fields.	1 Remembering
CLO4	Identify Current, Conductors and Dielectrics.	1 Remembering
CLO5	Analyze the Steady Magnetic Field.	4 Analyze
CLO6	Give Physical description of transmission line propagation.	2 Understanding

Mapping of CLOs with POs & PSOs:

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1		L	L		M						L			L		M
CLO2		L		L				L		L		L			L	
CLO3	M		L			L			L				L			L
CLO4	L						M			M				M		
CLO5				M			L				M				L	
CLO6		L	H		L			M				L	L	L		

H: High, M: Medium, L: Low