

FIELD THEORY
(Common to EC/TC/ML/EE)

Sub Code	:	10ES36	IA Marks	:	25
Hrs/ Week	:	04	Exam Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

UNIT 1:

a. Coulomb's Law and electric field intensity: Experimental law of Coulomb, Electric field intensity, Field due to continuous volume charge distribution, Field of a line charge.

b. Electric flux density, Gauss' law and divergence: Electric flux density, Gauss' law, Divergence, Maxwell's First equation(Electrostatics), vector operator ∇ and divergence theorem.

UNIT 2:

a. Energy and potential : Energy expended in moving a point charge in an electric field, The line integral, Definition of potential difference and Potential, The potential field of a point charge and system of charges, Potential gradient , Energy density in an electrostatic field.

b. Conductors, dielectrics and capacitance: Current and current density, Continuity of current, metallic conductors, Conductor properties and boundary conditions, boundary conditions for perfect Dielectrics, capacitance and examples.

UNIT 3:

Poisson's and Laplace's equations: Derivations of Poisson's and Laplace's Equations, Uniqueness theorem, Examples of the solutions of Laplace's and Poisson's equations.

UNIT 4:

The steady magnetic field: Biot-Savart law, Ampere's circuital law, Curl, Stokes' theorem, magnetic flux and flux density, scalar and Vector magnetic potentials.



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UNIT 5:

a. Magnetic forces: Force on a moving charge and differential current element, Force between differential current elements, Force and torque on a closed circuit.

b. Magnetic materials and Inductance: Magnetization and permeability, Magnetic boundary conditions, Magnetic circuit, Potential energy and forces on magnetic materials, Inductance and Mutual Inductance.

UNIT 6:

Time varying fields and Maxwell's equations: Faraday's law, displacement current, Maxwell's equation in point and Integral form, retarded potentials.

UNIT 7:

Uniform plane wave: Wave propagation in free space and dielectrics, Poynting's theorem and wave power, propagation in good conductors – (skin effect).

UNIT 8:

Plane waves at boundaries and in dispersive media: Reflection of uniform plane waves at normal incidence, SWR, Plane wave propagation in general directions.

TEXT BOOK:

1. "Engineering Electromagnetics", William H Hayt Jr. and John A Buck, Tata McGraw-Hill, 7th edition, 2006

REFERENCE BOOKS:

1. "Electromagnetics with Applications", John Krauss and Daniel A Fleisch, McGraw-Hill, 5th edition, 1999
2. "Electromagnetic Waves And Radiating Systems," Edward C. Jordan and Keith G Balmain, Prentice – Hall of India / Pearson Education, 2nd edition, 1968.Reprint 2002
3. "Field and Wave Electromagnetics", David K Cheng, Pearson Education Asia, 2nd edition, - 1989, Indian Reprint – 2001.



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