EE3301 ELECTROMAGNETIC FIELDS

UNIT I ELECTROSTATICS – I

PART - A

1. Sources and effects of electromagnetic fields

2. Coordinate Systems + Transform

3. Scalar and Vector Fields

4. Gradient, Divergence, Curl

5. Stokes's and Divergence theorems with applications

6. Coulomb's Law

7. Electric field intensity ,Electric Flux density

8. Gauss's law and applications

9. Surface, Volume, Linear Charges

10. Principal of Superpositions of fields

PART-B and C

1. Gradient, Divergence, Curl + Problem

2. Coordinate Systems + Problem

3. Stokes's and Divergence theorems

4. Field due to line charge distribution and charged circular disc.

5. Gauss's law and applications

UNIT II ELECTROSTATICS – II

PART - A

1. **Electric potential and potential difference.**

2. **Equipotential plots**

3. **Uniform and Non-Uniform field**

4. **Utilization factor**

5. **Dielectric strength, Dielectric breakdown**

6. **Dielectric polarization**

7. **Boundary conditions**

8. **Poisson's and Laplace's equations**

9. **Energy stored and Energy density**

10. **Dipole and Dipole moment**

11. **Capacitance –All formula, Series + Parallel**

PART-B and C

1. **Electrical potential due to uniformly charged infinite line. Circular Disc, Electric dipole.**

2. **Poisson's and Laplace's equations**

3. **Capacitance (i) Two dielectric. (ii) Three dielectric. (iii) Concentric spheres.**

    (iv) Co-axial cable. (v) Transmission line.

4. **Boundary conditions**

5. **Energy stored and Energy density**

UNIT III MAGNETOSTATICS

PART - A

1. Lorentz force + Applications
2. Magnetic field intensity (H) and Magnetic flux density (B)
3. Biot–Savart's Law, Ampere's Circuit Law +Applications
4. Type of magnetic materials
5. Magnetization
6. Poisson's Equation
7. Magnetic force
8. Torque (Closed circuit, Solenoid)
9. Inductance –All formula, Series + Parallel
10. Energy stored and Energy density
11. Scalar and vector potential
12. Magnetic moment
13. Self, Mutual inductance and co-efficient coupling
14. Boundary conditions

PART-B and C

1. Biot–Savart's Law
2. Magnetic field indensity due to
   i. Finite and Infinite conductor
   ii. Circular coil
   iii. Rectangular coil
   iv. Solenoid
   v. Toroid
3. Ampere's Circuit Law +Applications
4. Force between current carrying conductors.
5. Magnetic materials.
6. Magnetization(B-H Curve)
7. Energy stored and Energy density
8. Boundary conditions
9. Inductance –All types
10. Self, Mutual inductance and co-efficient coupling (Series + Parallel)

UNIT IV ELECTRODYNAMIC FIELDS

PART - A

1. **Magnetic Circuits**

2. **Faraday's law**

3. **Transformer and motional EMF**

4. **Displacement current and Conduction current**

5. **Relation between field theory and circuit theory**

6. **Current density**

7. **Lenz's Law**

PART-B and C

1. **Maxwell's equations (differential and integral form, Free space, Time varying fields)**

2. **Relation between field theory and circuit theory**

UNIT V ELECTROMAGNETIC WAVES

PART - A

1. Wave equations

2. intrinsic impedance or Characteristic impedance

3. Propagation constant

4. Skin depth/Depth of penetration.

5. Poynting vector and Poynting Theorem.

6. Standing wave ratio

7. Wave + properties of uniform plane wave.

8. Polarization (Linear, Circular, Elliptical)

9. Velocity of wave equation

10. Helmholtz's equation

11. Brewster angle

12. Skin effect

13. Slepian vector

PART-B and C

1. Electromagnetic wave equations

2. Wave propagation

    i.   Free space

    ii.   Conducting medium

    iii. Good dielectrics

    iv.   Good conductor

    v.   Lossy and Lossless dielectrics

3. Reflection and Refraction of Plane waves

4. Brewster angle

5. Poynting Theorem