EE2101PC:ElectromagneticFields

B.Tech.IIYearISem.

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Prerequisite: Mathematics-II (Ordinary Differential Equations and Multivariable Calculus) &Applied Physics

CourseObjectives:

- Tointroducetheconceptsofelectricfieldandmagneticfield.
- Applications of electric and magnetic fields in the development of the theory forpower transmission lines and electrical machines.

CourseOutcomes: Attheendofthecourse,studentswilldemonstratetheability

- Tounderstandthebasiclawsofelectromagnetism.
- To obtain the electric and magnetic fields for simple configurations under staticconditions.
- Toanalyzetimevaryingelectricandmagneticfields.
- TounderstandMaxwell'sequationindifferentformsanddifferentmedia.
- TounderstandthepropagationofEMwaves.

UNIT–I

Static Electric Field: Review of conversion of a vector from one coordinate system to another coordinate system, Coulomb's law, Electric field intensity, Electrical field due to point charges. Line, Surface and Volume charge distributions. Gauss law and its applications. Absolute Electric potential, potential difference, Calculation of potential differences for different configurations. Electric dipole, Electrostatic Energy and Energy density.

UNIT–II

Conductors, Dielectrics and Capacitance: Current and current density, Ohms Law in Pointform,Continuityequation,Boundaryconditionsofconductorsanddielectricmaterials. Capacitance, Capacitance of a two-wire line, Poisson's equation, Laplace's equation, Solution of Laplace and Poisson's equation.

UNIT–III

Static Magnetic Fields and Magnetic Forces: Biot-Savart Law, Ampere Law, Magnetic flux and magnetic flux density, Scalar and Vector Magnetic potentials. Steady magnetic fields produced by current carrying conductors. Force on a moving charge, Force on a differential current element, Force between differential current elements,Magnetic boundary conditions, Magnetic circuits, Self inductances and mutual inductances.

UNIT-IV

Time VaryingFieldsandMaxwell'sEquations: Faraday'slawforElectromagnetic induction,Displacementcurrent,PointformofMaxwell'sequation,Integralformof Maxwell'sequations,MotionalElectromotiveforces.

UNIT- V

ElectromagneticWaves: DerivationofWaveEquation,UniformPlaneWaves,Maxwell's equationinPhasorform, WaveequationinPhasorform, Planewaveinfreespaceandin

a homogenous material. Wave equation for a conducting medium, Plane waves in lossy dielectrics, Propagation in good conductors. Pointing theorem.

TEXTBOOKS:

1. M.N.O.Sadiku,“ElementsofElectromagnetics”,OxfordUniversityPublicatio n, 2014.
2. W.Hayt,“EngineeringElectromagnetics”,McGrawHillEducation,2012.

REFERENCEBOOKS:

1. Pramanik,“Electromagnetism-Problems withsolution”,PrenticeHallIndia,2012.
2. G. W. Carter, “The electromagnetic field in its engineering aspects”, Longmans, 1954.
3. W.J.Duffin,“ElectricityandMagnetism”,McGrawHillPublication,1980.
4. W.J.Duffin,“AdvancedElectricityandMagnetism”,McGrawHill,1968.
5. E.G.Cullwick,“TheFundamentalsof Electromagnetism”, Cambridge University Press, 1966.
6. D.Popovic,“IntroductoryEngineeringElectromagnetics”,Addison-Wesley Educational Publishers, International Edition, 1971.
7. Pramanik,“Electromagnetism -Theory andapplications”, PHI LearningPvt. Ltd, New Delhi, 2009.