

ELECTROMAGNETICS / 4TH STAGE

2020-2021

PHYSICS DEPARTMENT/COLLEGE OF SCIENCE WASIT UNIVERSITY

- Chapter One : **VECTOR ALGEBRA**
 1. Scalars and Vectors
 2. Unit Vector
 3. Vector Addition and Subtraction
 4. Position and Distance Vectors
 5. Vector Multiplication
 6. Components of a Vector

- Chapter Two : **COORDINATE SYSTEMS**
 1. Cartesian Coordinates
 2. Cylindrical Coordinates
 3. Spherical Coordinates

- Chapter Three : **VECTOR CALCULUS**
 1. Differential Length, Area, and Volume
 2. Line, Surface, and Volume Integrals
 3. Del Operator
 4. Gradient of a Scalar
 5. Divergence of a Vector and Divergence Theorem
 6. Curl of a Vector and Stokes's Theorem
 7. Laplacian of a Scalar

- Chapter Four : **ELECTROSTATICS**
 1. Coulomb's Law
 2. Electric Fields Due to Continuous Charge Distributions
 3. Electric Flux Density
 4. Gauss's Law
 5. Applications of Gauss's Law
 6. Electric Potential
 7. Relationship between E and V
 8. An Electric Dipole and Flux Lines
 9. Energy Density in Electrostatic Fields

- Chapter Five : **ELECTRIC FIELDS IN MATERIAL SPACE**
 1. Properties of Materials
 2. Convection and Conduction Currents
 3. Conductors
 4. Polarization in Dielectrics
 5. Dielectric Constant and Strength
 6. Linear, Isotropic, and Homogeneous Dielectrics
 7. Continuity Equation and Relaxation Time

- Chapter six : **ELECTROSTATIC BOUNDARY-VALUE PROBLEMS**
 1. Poisson's and Laplace's Equations
 2. Uniqueness Theorem
 3. General Procedures for Solving Poisson's or Laplace's Equation
 4. Resistance and Capacitance
 5. Method of Images

- Chapter Seven : **MAGNETOSTATIC FIELDS**
 1. Biot-Savart's Law
 2. Ampère's Circuit Law
 3. Applications of Ampère's Law
 4. Magnetic Flux Density
 5. Maxwell's Equations for Static Fields
 6. Magnetic Scalar and Vector Potentials
 7. Derivation of Biot-Savart's Law and Ampère's Law

- Chapter Eight : **MAGNETIC FORCES and MAGNETIC MATERIALS**
 1. Forces Due to Magnetic Fields
 2. Magnetic Torque and Moment
 3. A Magnetic Dipole
 4. Magnetization in Materials
 5. Classification of Materials
 6. Magnetic Boundary Conditions
 7. Inductors and Inductances
 8. Magnetic Energy
 9. Magnetic Circuits
 10. Force on Magnetic Materials

- Chapter Nine : **MAXWELL'S EQUATIONS**
 1. Faraday's Law
 2. Transformer and Motional Electromotive Forces
 3. Displacement Current
 4. Maxwell's Equations in Final Forms
 5. Time-Varying Potentials
 6. Time-Harmonic Fields

REFERENCES

- 1. M. N. O. Sadiku, Elements of Electromagnetics, 5th Ed., Oxford University Press, 2010.**
- 2. D. K. Cheng, Field and wave electromagnetic, 2nd Ed., Addison-Wesley, 1989.**
- 3. J. Edminister, Schaum's Outline of Electromagnetics, 3rd Ed., McGraw-Hill Professional, 2010.**
- 4. W. H. Hayt, "Engineering Electromagnetics", McGraw-Hill Book Company, 2012.**
- 5. Ulaby, Fawwaz T., and Umberto Ravaioli. "Fundamentals of Applied Electromagnetics " seventh edition, Pearson (2015).**