

Chapter 1: Electric Charge and Electric Field

- 1.1 Spatial scales and fundamental forces
- 1.2 The electromagnetic force and the photon
- 1.3 Introduction to electrostatics: charge and electrostatic induction
- 1.4 Charge and structure of matter
- 1.5 Coulomb's Law
- 1.6 Principle of superposition and distribution of charges
- 1.7 The electric field
- 1.8 Polarization and electric dipoles

Chapter 2: Gauss's law and consequences

- 2.1 Flow of the field lines and definition of the flux of the electric field.
- 2.2 Gauss's law
- 2.3 Consequences of Gauss's law (eg Faraday's cage)

Chapter 3: Electrical Potential

- 3.1 Electric potential energy
- 3.2. Definition of electric potential
- 3.3 Properties of conductors in electrostatic fields
- 3.4 The electric field as a derivative of the potential
- 3.5 Equipotential surfaces
- 3.6 From potential to the concept of electrical capacity

Chapter 4: Capacitance, Capacitors and Dielectrics

- 4.2 Electrical capacity and energy storage
- 4.3 Capacitors in electrical circuits
- 4.4 Dielectrics and polarization

Chapter 5: Electric Current, Resistance, Power and DC Circuits

- 5.1 Electric current and its carriers
- 5.2 Electric resistance

- 5.3 Electrical resistance and Ohm's law
- 5.4 Electrical power
- 5.5 Electromotive force (battery)
- 5.6 Electrical circuits and resistor combinations
- 5.7 Kirchhoff's rules
- 5.8 RC circuits

Chapter 6: Magnetism and Magnetic Field Sources

- 6.1 A new type of interaction: magnetic field and Lorentz force
- 6.2 Motion of charged particles in a magnetic field
- 6.3 Sources of magnetic fields
- 6.4 Sources of magnetic field: Ampère's law
- 6.5 Applications of Ampère's law, e.g. solenoids
- 6.6 Magnetic dipoles and magnetic moment
- 6.7 Examples of applications: galvanometer and electric motor
- 6.8 Magnetic fields in matter

Chapter 7: Electromagnetic induction and Faraday's law

- 8.1 Discovery of magnetic induction
- 8.2 Faraday's and Lenz's laws
- 8.3 Eddy currents
- 8.4 Transformers and generators

Chapter 9: Inductance and AC Circuits

- 9.1 Self and mutual inductance
- 9.3 Magnetic energy
- 9.5 Power in AC circuits
- 9.2 RL Circuits
- 9.2 LC Circuits

Chapter 10: Maxwell's equations and electromagnetic waves

10.1 Electromagnetic oscillations

10.2 Displacement current

10.3 Maxwell's equations in integral form

10.4 E.m. waves from Maxwell's equations

10.5 The wave equation and the general solution

10.7 Frequency, period, wave number and wavelength

10.8 Energy density in electromagnetic waves

10.9 Poynting vector, radiation intensity and pressure