

## Engineering Physics

Course objectives:

To provide the concept and knowledge of physics with the emphasis of present day application. The background of physics corresponding to Proficiency Certificate Level is assumed.

1. Oscillation(7 hours)
  - a. Mechanical Oscillation: Introduction
  - b. Free oscillation
  - c. Damped oscillation
  - d. Forced mechanical oscillation
  - e. EM Oscillation: Free, Damped and Forced Electromagnetic oscillation
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2. Wave motion(2 hours)
  - a. Waves and particles
  - b. Progressive wave
  - c. Energy, power and intensity of progressive wave
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3. Acoustics(3 hours)
  - a. Reverberation
  - b. Sabine's Law
  - c. Ultrasound and its applications
4. Physical Optics(12 hours)
  - a. Interference
    - i. Intensity in double slit interference
    - ii. Interference in thin films
    - iii. Newton's rings
    - iv. Hadinger fringes
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  - b. Diffraction
    - i. Fresnel and Fraunhofer's diffraction
    - ii. Intensity due to a single slit
    - iii. Diffraction grating
    - iv. X-ray diffraction, X-ray for material test
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  - c. Polarization
    - i. Double refraction
    - ii. Nichol prism, Wave plates
    - iii. Optical activity, Specific rotation
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5. Geometrical Optics(3 hours)
  - a. Lenses, combination of lenses
  - b. Cardinal points
  - c. Chromatic aberration

## 6. Laser and Fiber Optics(4 hours)

- Laser production
  - He-Ne laser
  - Uses of laser
- Fiber Optics
  - Self focusing
  - Applications of Optical fiber

## 7. Electrostatics(8 hours)

- Electric charge and Force
- Electric field and Potential
- Electrostatic potential energy
- Capacitors, Capacitor with dielectric
- Charging and Discharging of a capacitor

## 8. Electromagnetism(11 hours)

- Direct Current: Electric current
  - Ohm's law, Resistance and Resistivity
  - Semiconductor and Superconductor
- Magnetic Fields:
  - Magnetic force and Torque
  - Hall effect
  - Cyclotron, Synchrotron
  - Biot-Savart law
  - Ampere's circuit law, Magnetic fields straight conductors
  - Faraday's laws, Induction and Energy transformation, Induced field
  - LR circuit, Induced Magnetic field
  - Displacement current

## 9. Electromagnetic Waves(5 hours)

- Maxwell's equations
- Wave equations, Speed
- E and B fields
- Continuity equation
- Energy transfer

## 10. Photon and Matter Waves(5 hours)

- Quantization of energy
- Electrons and Matter waves
- Schrodinger wave equation
- Probability distribution
- One dimensional potential well
- Uncertainty principle
- Barrier tunneling

## References:

- Fundamentals of Physics: Halliday, Resnick, Walker (Latest Edition)
- A text book of Optics: Brij Lal and Subrahmanyam (Latest edition)
- Modern Engineering Physics: A. S.Basudeva
- Engineering Physics: R. K.Gaur and S. L.Gupta
- Waves and Oscillation: Brij Lal and Subrahmanyam