

| Course code | Course Title | C | H | I | E | T |
|-----------------------|------------------------|---|---|----|----|-----|
| 17U2PAC2/ 17U6PAC4 | Optics and electricity | 2 | 4 | 25 | 75 | 100 |

Unit 1 Optics

Dispersion – Dispersive power – Deviation without dispersion – Achromatic combination of prisms – Dispersion without deviation – Direct vision spectroscopy – Lenses – Power of a lens – Two lenses in contact and separated by a distance – Chromatic aberration in a lens – Expression for longitudinal chromatic aberration for an object at infinity – Achromatic lenses – Condition for achromatism of two lenses placed in contact and separated by a distance – Spherical aberration – Explanation – Eyepieces Huygen & Ramsden – Differences.

Unit 2 LASER

Stimulated emission – Absorption – Spontaneous emission – Population inversion – Optical pumping – Working principles of Ruby LASER – He–Ne LASER – LASER applications.

Unit 3 Fibre optics & holography

Introduction – Optical fibres – Necessity of cladding – Optical fibre system – Optical fibre cable – Total internal reflection – Propagation of light through optical fibre – Numerical Aperture (NA) – Fibre optic communication system and applications – Principles of hologram.

Unit 4 Electrostatics

Inverse square law – Electric field – Electric potential – Equi potential surface – Electric potential energy Gauss theorem – Proof – Applications – Mechanical force by charged surface – Electrified soap bubble – Capacity of a conductor – Energy of a charged conductor – Sharing of charge between two charged conductor – Principle of capacitor – Cylindrical capacitor – Parallel plate capacitor with & without dielectrics – Combination of capacitors in series & in parallel.

Unit 5 Current electricity

Ohm's law – Standard Unit of current – Definition of ampere – Units of voltage & resistance – Kirchoff's I & II law – Wheatstone's network – Condition for balance – Condition for sensitiveness – Carey Foster's bridge – Theory – Determination of the temperature coefficient of resistance – Principle of potentiometer – Measurement of current & resistance – Calibration of low & high range voltmeter.

Text Book(s):

1. N. Subramanyan, Brijlal and M. N. Avadhanulu, Text Book of optics, 25th edition, 2014, S. Chand & Co.
 Unit 1: Chapters 4.2, 4.16, 4.17, 4.17.1, 8.1, 8.4, 8.6–8.8, 9.1, 9.2, 9.5, 9.10, 9.11 (A), 9.13, 10.10, 10.11, 10.12.
 Unit 2: Chapters 22.1, 22.4, 22.7.1, 22.14.1, 22.14.3, 22.19
 Unit 3: Chapters 23.1, 23.2, 24.1, 24.2, 24.3, 24.4, 24.6, 24.21

2. Brijlal & N. Subrahmanyam, Electricity & magnetism, 2000, Ratan Prakashan Mandir publishers.

Unit 4: Chapters 5.1, 5.2, 5.4, 5.7(iii), 5.8, 6.1, 6.2, 6.4, 6.6, 7.1–7.2, 7.4–7.6

Unit 5: Chapters 13.1, 13.2, 13.13, 13.15, 13.21–13.22, 13.24, 13.32, 13.35, 13.40, 13.41.

References:

1. Segal, Chopra & Segal, Electricity and magnetism, 2000, Sultan Chand & Co.
2. R. Murugesan, Electricity and magnetism, Reprint - 2005, S.Chand & Co.
3. Dugel, Chopra, Electricity and magnetism, 2000, Sultan Chand & Co.
4. D.C. Tayal, Electricity and magnetism, 2000, Himalaya Publishing House.