B.Sc. Forensic Science: Semester -III

BSF404: Physics-III

Teaching Scheme	Examination Scheme
Lectures- 3 hrs/Week	Class Test - 12 Marks
Tutorials- 1 hr/Week	Teachers Assessment – 6 Marks
Credits- 4	Attendance – 12 Marks
	End Semester Exam – 70 marks

Course outcomes:

- Better understanding of electrical and magnetic phenomenon in daily life.
- To troubleshoot simple problems related to electrical devices.
- Comprehend the powerful applications of ballistic galvanometer.
- Study the fundamental physics behind reflection and refraction of light (electromagnetic waves).
- Study the working and applications of Michelson and Fabry-Perot interferometers.
- Recognize the difference between Fresnel's and Fraunhofer's class of diffraction.
- Comprehend the use of polarimeters.
- Study the characteristics and uses of lasers.

Unit I – Electrostatics
• Electric charge & charge densities, electric force between two charges. General expression for Electric field in terms of volume charge density (divergence & curl of Electric field), general expression for Electric potential in terms of volume charge density and Gauss law (applications included). Study of electric dipole. Electric fields in matter, polarization, auxiliary field D (Electric displacement), electric susceptibility and permittivity.
Unit II – Magnetostatics
• Electric current & current densities, magnetic force between two current elements. General expression for Magnetic field in terms of volume current density (divergence and curl of Magnetic field), General expression for Magnetic potential in terms of volume current density and Ampere's circuital law (applications included). Study of magnetic dipole (Gilbert & Ampere model). Magnetic fields in matter, magnetization, auxiliary field H, magnetic susceptibility and permeability.
Unit III – Time Varying Electromagnetic Fields
• Faraday's laws of electromagnetic induction and Lenz's law. Displacement current, equation of continuity and Maxwell-Ampere's circuital law. Self and mutual induction (applications included). Derivation and physical significance of Maxwell's equations. Theory and working of moving coil ballistic galvanometer (applications included).
Unit IV – Electromagnetic Waves
• Electromagnetic energy density and Poynting vector. Plane electromagnetic waves in linear infinite dielectrics, homogeneous & inhomogeneous plane waves and dispersive & non-dispersive media. Reflection and refraction of homogeneous plane electromagnetic waves, law of reflection, Snell's law, Fresnel's formulae (only for normal incidence & optical frequencies) and Stoke's law.

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Unit V – Interference

- Conditions for interference and spatial & temporal coherence. Division of Wavefront - Fresnel's Biprism and Lloyd's Mirror. Division of Amplitude - Parallel thin film, wedge shaped film and Newton's Ring experiment. Interferometer - Michelson and Fabry-Perot.

Suggested Readings:
1. D.J. Griffiths, –Introduction to Electrodynamicsl, Prentice-Hall of India Private Limited, 2002, 3e
2. E.M. Purcell, –Electricity and Magnetism (In SI Units): Berkeley Physics Course Vol 2l, McGraw Hill, 2017, 2e
3. Richard P. Feynman, Robert B. Leighton, Matthew Sands, –The Feynman Lectures on Physics - Vol. 2l, Pearson Education Limited, 2012
4. D.C. Tayal, —Electricity and Magnetisml, Himalaya Publishing House Pvt. Ltd., 2019, 4e
5. Francis A. Jenkins, Harvey E. White, –Fundamentals of Opticsl, McGraw Hill, 2017, 4e
6. Samuel Tolansky, —An Introduction to Interferometryl, John Wiley & Sons Inc., 1973, 2e
7. A. Ghatak, –Opticsl, McGraw Hill, 2017, 6e

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