Semester	**VI**
Course	**Minor**
Paper Code	
Paper Title	**Waves and Optics & Minor Lab 1**
No. of Credits	**4 (3+1)**
Theory / Practical / Composite	**Composite**
Minimum No. of preparatory hours per week a student has to devote	**5**
Number of Modules	**2**
Syllabus	**Module A: Waves & Optics [36 L]** **Waves**: Superposition of parallel and perpendicular simple harmonic motions, Lissajous figures. Damped Vibration, Forced Vibration (Solution of the equation of motion, Energy resonance) One dimensional plane progressive wave, Energy and Intensity of plane wave. [12 Lectures] **Optics**: Fermat's principle and its application to reflection and refraction at plane surfaces. Matrix Methods- Reflection, refraction, translation matrices (derivation), Refraction at thin lens [6 Lectures] Interference: Young's double slit experiment, concept of spatial and temporal coherence, Stokes relations, Thin films, Newton's rings. [6 Lectures] Diffraction – Fraunhofer single slit diffraction, Double slit diffraction, Plane transmission grating (no derivation), Rayleigh's criterion, Resolving power of grating. [6 Lectures] Polarization – Transverse nature of light, States of polarization, Brewster's law, Concept of double refraction, Ordinary ray and extraordinary ray, Optical activity, Polarimeter (biquartz) (qualitative discussion only) [6 Lectures]

	Module B: Lab I (24L) 1. Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electron versus frequency of light 2. To determine the Planck's constant using LEDs of four different colours. 3. Determination of the moment of inertia of a cylinder about an axis passing through its centre of gravity and perpendicular to its length using a cylinder as an auxiliary body and comparison with the theoretical value. 4. Determination of the Young's modulus of the material of the given uniform bar supported at two ends and loaded at the centre. 5. Determination of the modulus of rigidity of the material of a given wire by dynamical method. 6. Determination of the surface tension of water by capillary rise method. 7.Determination of the coefficient of viscosity of water by Poiseuille's method. 8.Determination of the focal length of a given concave lens combination method. 9.Determination of the refractive index of a liquid and that of the material of the convex lens by using the lens and a plane mirror. 10.Determination of the wavelength of a monochromatic light by Newton's ring method. 11.Calibration of a given polarimeter and determination of the specific rotation of sugar solution.
Learning Outcomes	**Module A** 1. Students learn about the superposition of SHMs and how Lissajous figures are formed. 2. Exposure to the analysis of damped and forced vibration enables the students to understand these phenomena. 3. Students learn to set up the equation of motion for a plane progressive wave and how to calculate the energy and intensity associated with it. 4. The students learn how to apply Fermat's principle to obtain the laws of reflection and refraction

	5. The students are introduced to the matrix method for paraxial optics which they can apply to simple cases 6. Interference by division of wavefront, the concepts of temporal and spatial coherence are understood through the Young's double slit experiment 7. Interference by division of amplitude is introduced through the understanding of thin films 8. Students understand the phenomenon of diffraction and its application in plane transmission grating to resolve wavelengths 9. Students will be familiar with polarisation of light, optical activity and qualitatively understand the working of a polarimeter **Module B** 1. A student is able to understand the particle nature of radiant energy and verify Einstein's equation on photoelectric effect. and determine Planck's constant by studying I-V characteristics of LEDs. 2. Students can understand the idea of rotational motion through simple experiments and calculate moment of inertia for bodies of definite geometrical shapes. 3. Measuring different modulus of elasticity by simple techniques and understanding the concepts of stress and strain. 4. Experiments on measuring coefficient of viscosity and surface tension effects help the students to understand these properties of a liquid. 5. Experiment on optics helps a student in understanding the phenomena of refraction, interference and polarisation,
Reading/Reference Lists	**Module A References :** (1) Advanced Acoustics, D.P. RayChaudhuri, The New Book Stall (2) A Handbook of Degree Physics, C.R. Dasgupta, Book Syndicate Pvt. Ltd. (3) Optics, Ajoy Ghatak, McGraw Hill Education **Module B References:** 1. A textbook on Practical Physics, K.G. Mazumdar & B. Gho Sreedhar Publishers 2.Advanced Practical Physics Vol 1. B. Ghosh & K Mazumdar, Sreedhar Publishers 3.Advanced Practical Physics Vol 2. B. Ghosh , Sreedl Publishers

	4.An Advanced Course in Practical Physics, D. Chattopadhy P.C. Rakshit, New Central Book Agency Pvt. Ltd.	
Evaluation	Theory : 60 Th CIA : 15 SEM Exam : 45	Practical 40 CA 38 + 2 Attn.
Paper Structure for Theory Semester Exam	(5 / 7) * 3 Marks each + (3 / 4) * 10 Marks each Marks: 45	