F.E. FIRST SEMESTER

Course Code – 210104

Course Name: Applied Science – I (Physics)

Credit Points	Teaching Hrs/Week	Practical Hrs/Week
	02	02

Objective	To enable the student to grasp basic principles of Optics, Ultrasonics and Nuclear Physics and their Applications to Engineering and Industry.
Prerequisites	Knowledge of Mathematics and Physics at plus two CBSE/ISC level.

Unit	Topic Name	Details	Hrs
I	**Interference**	Interference of waves, Interference due to thin films of uniform thickness (with derivation) and non-uniform thickness (without derivation), colours in thin films, Fringe width, Newton's rings and its applications, Michelson's Interferometer and its applications, Engineering applications of interference (viz. Testing of optical flatness, Antireflection coatings, Interference filters).	**10**
	Diffraction	Classes of diffraction, Fresnel and Fraunhofer diffraction, Fraunhofer diffraction at single slit (geometrical method), conditions for maxima and minima, intensity pattern for a single slit, Diffraction at a circular aperture(results only, Diffraction due to two and hence N slits (qualitative discussion and results only), Plane diffraction grating, resultant amplitude and intensity, conditions for maxima and minima, Rayleigh's criterion of resolution, Resolving power of grating and telescope.	
II	**Polarization**	Polarization of light waves, Brewster's Law, Double refraction (Huygen's theory), Geometry of Calcite crystal, Positive and Negative crystals, Nicol's Prism, Dichroism, Law of Malus, Quarter and half wave plate, Applications of polarization.	**08**
	Electron Optics	Motion of an electron under the action of electric and magnetic fields, Specific charge of an electron, e/m of an electron by Thomson’s method, Electrostatic focusing, Magnetostatic focusing, Electron microscope, Scanning electron microscope, Scanning tunneling microscope, Bainbridge mass spectrograph.	

III	**Ultrasonics**	Ultrasonic waves, Production of ultrasonic waves, Piezoelectric effect and piezoelectric oscillator, Magnetostriction and magnetostrictive oscillator, Detection of ultrasonic waves, Properties of ultrasonic waves, Applications of ultrasonic waves (Scientific, Engineering, Medical, Chemical).	**08**
	Nuclear Physics	Atomic mass unit and mass energy equivalence, Mass defect and Packing fraction, Binding energy, Binding energy curve, Nuclear fission, Q - value of nuclear reaction, Uranium Chain reaction, Four factor formula, Nuclear fusion, Distinction between Nuclear fission and fusion, Fusion as a future energy source, Fusion reactions, Basic requirements for fusion reactors, Magnetic confinement scheme, Inertial confinement scheme, Particle accelerators-cyclotron, betatron.	

Lab/ Term Work

Term Work

(Any Five Experiments)

1. Use of diffraction grating for the determination of wavelength of spectral line.
2. Newton's rings experiment (Wavelength, radius, refractive index)
3. Experiment based on ultrasonic waves.
4. Resolving power of a telescope / grating.
5. Determination of refractive indices for ordinary, extraordinary rays for a quartz crystal / prism.
6. Demonstration of Lissajous' figures using a CRO (Principle of interference) concepts of polarization
7. Michelson's Interferometer.
8. Determination of Brewster's angle for glass surface and to determine refractive index of glass.
9. Determination of Young's Modulus by Cornu's method.
10. To verify cosine square law of Malus for plane polarized light using photocell.
11. Birefringence and polarization with calcite.
12. e/m by J.J.Thomson's method

Text Books	1. Resnick R & Halliday D: Physics – I, Wiley Eastern Ltd., New Delhi, 1991 2. Gaur R K & Gupta S L: Engineering Physics. Delhi. Dhanpat Rai And Sons, 1990
Reference Books	1. Serway Raymond A & Jewett John W Jr.: Principles of Physics. (3rd) Fort Worth. Thomson Brooks/Cole, 2003 2. Cohen B L: Concepts of Nuclear Physics. Tata Mcgraw Hill Co New Delhi, 1989 3. Gupta A B & Ghosh Dipak: Atomic & Nuclear Physics. Books & Allied (p) Ltd. Calcut, 1999 4. Wong S S M: Introduction to Nuclear Physics. Prentice Hall Of India N Delhi, 1996 5. Francis J A: Fundamentals of Optics. Mcgraw Hill Int. Book Co. Toky, 1983 6. Jenkins & White: Fundamentals of Optics. M Hill Book Co, 1983 7. Ghatak Ajoy: Optics. (3rd) New Delhi. Tata McGraw Hill Pub Co, 2005 8. Hecht E: Optics. (4) Pearson Education New Delhi, 2002 9. Beiser Arthur: Concepts of Modern Physics. (6th) New Delhi. Tata Mc Graw Hill Pub. Co, 2005. 10. Young & Freedman: University Physics (Pearson Education) 11. Brijlal & Subramaniam: Textbook of Optics (S Chand & Company) <u>Reference books for Term Work:</u> 12. Worshnop & Flint: Practical Physics 13. Harnam Singh: Practical Physics 14. C. L. Arora: Practical Physics 15. Induprakash: Practical Physics
Related Websites	1. Indian Journal of Physics: www.iacs.res.in/ijp.html 2. Scientific American: www.sciam.co.in

Examination Scheme	Internal Assessment – 20 marks	
	Term Work-12.5 marks	
	Final Theory Paper – 30 marks	Written