BS 102PH *with effect from the academic year 2015-2016*

Engineering Physics-I

(Common to All Branches)

Instructions	3 Periods/week
Duration of University Examination	3 Hours
University Examination	70 Marks
Sessional	30 Marks
Credits	3

OBJECTIVES: The objective of the course is to acquire the knowledge on basic concepts in Physical Optics, Lasers, Fibre Optics, Wave mechanics, Statistical mechanics and Electromagnetic theory. It is also aimed at understanding various phenomena that are present in the course content and their applications in Engineering and Technology.

OUTCOME: On the completion of the course the student will acquire the basic knowledge and skills apart from understanding the concepts that are involved in the contents incorporated in the syllabus. The students will be able use them in solving the problems in their respective engineering fields.

UNIT- I (8 periods)

Interference: Coherent and non-coherent sources - Division of amplitude and division of wave front - Interference in thin films (reflected light) - Newton's rings - Fresnel's biprism

Diffraction: Distinction between Fresnel and Fraunhoffer diffraction - Diffraction at a single slit - Double slit diffraction - Diffraction grating (N-slits)

UNIT - II (9 Periods)

Polarization: Introduction - Malus's law - Double refraction - Nicol's prism - Quarter wave and half wave plates - Optical activity - Laurent's half shade polarimeter.

Lasers: Characteristics of lasers - Spontaneous and stimulated emission of radiation - Einstein's coefficients - Population inversion - Ruby laser - Helium-Neon laser – Semiconductor laser – Applications of lasers.

Basic principles of holography – Construction and reconstruction of image on hologram – Applications of holography

UNIT- III (9 periods)

***Fibre Optics*:** Introduction – Propagation of light through an optical fiber - Critical angle - Acceptance angle - Numerical aperture (NA)– Types of optical fibers and refractive index profiles – Fibre drawing process (double crucible method)- Application of optical fibers

***Ultrasonics*:** Introduction to Ultrasonic waves – Production of ultrasonic waves by Piezoelectric method – Detection of ultrasonic waves : Piezoelectric detector – Properties of Ultrasonics – Wavelength of Ultrasonics by Debye-Sears method – Applications.

UNIT- IV (7 Periods)

Elements of Statistical Mechanics: Introduction – Ensembles – Phase space - Probability – Thermodynamical probability – Boltzmann's theorem on entropy and probability – Maxwell- Boltzmann statistics - Bose-Einstein statistics - Fermi-Dirac

statistics – Photon gas - Planck's law of black body radiation distribution – Wien's law and Rayleigh Jeans law.

UNIT-V (9 Periods)

Wave mechanics: de-Broglie concept of matter waves – de-Broglie wavelength – Physical significance and properties of wave function - Schrödinger time dependent and time independent wave equations - Particle in an Infinite Square well potential (Particle in a box).

Electromagnetic theory: Review of steady and varying fields - Conduction and displacement current - Maxwell's equations in integral and differential forms. Electromagnetic waves: Plane wave equation – Poynting theorem.

Suggested reading :

1) R.K. Gaur and S.L. Gupta – Engg. Physics, Dhanpat Rai Publications, 8th Ed. (2001).
2) M.S. Avadhanulu and P.G. Kshirasagar – Engg. Physics, S. Chand & Co., 9th Ed. (2010).
3) R. Murugeshan and K. Sivaprasath – Modern Physics, S. Chand & Co.,13th Ed. (2007).
4) D.K.Bhattacharya and Poonam Tandon – Engg. Physics, Oxford Higher Education.
5) Resnick, Halliday and Krane – Physics Volume 2, 5th Edition, Wiley-India (P) Ltd. (2007).
6) B.K. Pandey and S. Chaturvedi, *Engineering Physics,* Cenage Learning India (P) Ltd., 2012.

BS 151PH

Engineering Physics Lab - I

(Common to All Branches)

Instructions	3 Periods/week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks
Credits	2

1. **Biprism**: To determine the wavelength (λ) of the given monochromatic source of light using Fresnel's Biprism.

2. **Diffraction Grating**: To determine the wavelength of a spectral line by a plane transmission diffraction grating.

3. **Laser:** To determine the wavelength of laser using diffraction grating.

4. **Polarimeter:** To determine the specific rotation of sugar solution using Polarimeter.

5. **Ultrasonics** : To find the ultrasonic velocity in the given liquid using Debye Sears method.

6. **Fiber Optics-I:** (a) To determine the numerical aperture (NA) of the Optical Fiber.
   (b) To determine the losses in optical fiber due to i) bending and ii) coupling.

7. **Newton's Rings:** To determine the radius of curvature of a plano convex lens using Newton's rings experiment.

8. **e/m of an electron:** To determine the specific charge (e/m) of an electron by J.J. Thomson's method.

9. To study the double refraction characteristics of a crystal.

Demonstration Experiment:

CRO – Measurement of amplitude, frequency and phase.

Note: The candidate has to perform a minimum of **six** experiments in each semester

BS 202PH

Engineering Physics-II

(Common to All Branches)

Instructions	3 Periods/week
Duration of University Examination	3 Hours
University Examination	70 Marks
Sessional	30 Marks
Credits	3

OBJECTIVES: The aim of this course is to acquire the basic knowledge on elements of solid state physics. To understand the properties of semiconducting , superconducting ,dielectric and magnetic materials in their bulk form. To acquire the knowledge on latest material characterization techniques such as X-ray Diffractometry (XRD), Scanning Electron Microscopy (SEM), Atomic Force microscopy (AFM) and Raman Spectroscopy. Also get introduction to basics of thin films and nano materials.

OUTCOME : At the end of the course the student will acquire the knowledge on the properties of the materials in their bulk, thin film and nano forms. Student will apply his knowledge of the materials in selecting the suitable materials for various engineering applications.

UNIT- I (9 periods)

Crystallography: Crystal systems - Bravais lattices – Lattice planes and Miller Indices – Inter planar spacing - Bragg's law - Experimental determination of lattice constant by powder diffraction method.

Crystal defects: Classification of defects - Concentration of Schottky defects in metals and ionic crystals - Concentration of Frankel defects.

Band Theory of Solids: Classical free electron theory (qualitative) – Energy band formation in solids - Kronig-Penney model (qualitative treatment) – Electron gas - Fermi energy and Fermi level in metals - Classification of solids into conductors, semiconductors and insulators.

UNIT- II (8 Periods)

Magnetic Materials: Classification of magnetic materials: dia, para, ferro, antiferro and ferrimagnetic materials – Weiss molecular field theory of ferromagnetism - Magnetic domains - Hysteresis curve - Soft and hard magnetic materials – Properties and Applications of ferrites.

Superconductivity: Introduction - General properties of super conductors - Meissner effect - Type I and Type II superconductors - BCS theory (qualitative) – High T_c superconductors (in brief) - Applications of superconductors, Josephson's Junction and SQUIDS.

UNIT- III (8 Periods)

***Semiconductors*:** Intrinsic and Extrinsic semiconductors - Concept of a hole - Concept of Fermi level in semiconductor - Carrier concentration in intrinsic semiconductors – P-N junction diode and its I-V characteristics – Thermistor - Hall effect.

***Dielectric Materials*:** Dielectrics - Types of dielectric polarizations – Electronic polarization, Ionic, Orientational and Space-charge polarizations – Expression for Electronic polarization - Frequency and temperature dependence of dielectric polarizations - Determination of dielectric constant by capacitance Bridge method - Ferro electricity - Barium titanate - Applications of Ferroelectrics.

UNIT-IV (8 Periods)

Techniques for characterization of materials: Principles of X-ray fluorescence – Raman effect (Quantum approach) - Atomic force microscopy - Electron microscopy (SEM).

Thin films: Distinction between bulk, thin films and nano materials - Thin film preparation techniques: Thermal evaporation methods, Electron beam evaporation - Applications of thin films - Solar cell.

UNIT-V (7 Periods)

Nanomaterials: Properties of materials at reduced size: Electrical, Optical, Mechanical and Magnetic properties - Surface to volume ratio at nano scale - Quantum confinement - Preparation of nanomaterials: bottom–up methods (sol gel and CVD), Top-down methods (ball milling) - Elementary ideas of carbon nanotubes – Applications.

Suggested Reading:

1) Dr. M. Arumugam – Materials Science, Anuradha Agencies, Third revised Edition, 2002
2) M.S. Avadhanulu and P.G. Kshirasagar- Engg. Physics, S.Chand & Co., Edition, 2014
3) Hitendra K Malik and A. K. Singh - Engg. Physics, McGraw Hill publishers, Edition, 2010
3) A. Goswami - Thin Film Fundamentals, New Age International, 2007.
4) A.K Bhandhopadhya - Nano Materials, New Age International, 1st Edition, 2007.
5) C.M. Srivastava and C. Srinivasan - Science of Engg. Materials, New Age International, 2002.
6) D.K.Bhattacharya and Poonam Tandon – Engg. Physics, Oxford Higher Education.

BS 251PH

Engineering Physics Lab -II

(Common to All Branches)

Instructions	3 Periods/week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks
Credits	2

1. **Dielectric Constant:** To determine the dielectric constant and phase transition temperature of given material (PZT).

2. **B-H Curve:** *(a)* To draw graph between the magnetising field and the intensity of magnetisation of a ferromagnetic specimen and *(b)* To determine i) Coercivity ii) Retentivity and iii) Hysteresis loss of given specimen (soft iron) from the graph.

3. **P-N Junction Diode:** To draw the volt-ampere characteristics of the given P-N junction diode.

4. **Photo Cell:** To determine the planck's constant and the work function of the photometal.

5. **Thermister:** To draw the temperature characteristics of a thermistor and to evaluate the constants

6. **Solar Cell:** To draw I-V characteristics of a solar cell and to calculate the (a) Fill factor (b) Efficiency and (c) Series resistance

7. **Hall Effect:** To determine the (a) Hall coefficient (b) Carrier concentration and (c) Mobility of charge carriers of given semi conducting material.

8. **Thermo Electric Power:** To calculate (a) Thermoelectric power (b) Fermi Energy and (c) Carrier concentration of given ferrite sample.

9. **Four Probe Method:** To determine the conductivity of semiconductors.

Demonstration Experiments:

1. X – Ray Diffractometer
2. D.C. Conductivity
3. Preperation of Nano materils- Sol-gel method

Note: The candidate has to perform a minimum of **six** experiments in each semester

Question paper proforma

PART-A

Note: Answer all questions from the following

Q.No.1, Q.No.2 — Unit - I

Q.No.3, Q.No.4 — Unit - II

Q.No.5, Q.No.6 — Unit - III

Q.No.7, Q.No.8 — Unit - IV

Q.No.9, Q.No.10 — Unit - V

PART-B

Note: Answer any five questions from the following

Q.No. 11 from Unit - I

Q.No. 12 from Unit - II

Q.No. 13 from Unit - III

Q.No. 14 from Unit - IV

Q.No. 15 from Unit - V

Q.No. 16 from Unit – I, II & III

Q.No. 17 from Unit – IV & V

Note: 30% of question paper may contain problems.