Government PG College Ambala Cantt

Session: 2023-2024 (Even semester)

Name of Assistant Professor: Dr. Samiksha Kumari

Class: B.A. Ist year (Sem-II) Section E

Subject: Physics (Paper: Physics Fundamentals –II, PHY-204)

SYLLABUS

Max. Marks:75

Internal Assessment Marks:20

End Term Exam Marks: 55

Time: 3 hours

Note: Nine questions will be set in total. Question no. 1 will be compulsory and based on the conceptual aspects of the entire syllabus. This question may have 4 parts and the answer should be in brief but not in Yes/No. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks. 20% numerical problems are to be set. Use of scientific (non-programmable) calculator is allowed.

Unit – I

Light and optics-Nature and properties of light, its speed, frequency and wavelength; Reflection of light-types of reflection and their importance in daily life, laws of reflection, multiple reflection by mirrors and their applications.

Refraction of light- laws of refraction, refractive index, refraction of light through prism (dispersion of light), formation Rainbow, twinkling of stars, advance Sunrise and delayed Sunset; Scattering of light and blue colour of the sky; apparent depth, total internal reflection and its important applications.

Unit – II

Image formation through reflection-images formed by plane mirrors, multiple images formed by two flat mirrors and optical illusions; images formed by parabolic mirrors and spherical mirrors- Concave and convex mirrors, ray diagrams, mirror equation and magnification; applications of plane and curved mirrors in daily life. Image formation through refraction- images by convex and concave lenses, ray diagrams and lens equation.

Optical instruments- Camera, eye, telescope and microscope

Unit – III

Electricity- electric charge, types of charges, unit of charge, frictional electricity, electricity by conduction and electric current, units of electric current, measurement of current, conductors and insulators; resistance, resistivity and Ohm’s law, electric potential and potential difference, emf; Electric circuit- resistor, capacitor, battery, ammeter and voltmeter; Series and parallel combinations of resistors, electrical wiring in houses and electrical safety (fuse, hot wire, neutral, ground and short circuit), electric power and electric power transmission; Heating effect of current and its practical applications.

Magnetic effect of electric current- Magnetic field and field lines, bar magnet, magnetic field and direction of field due to a current- through straight conductor and through a circular loop; solenoid, electromagnet.

Unit – IV

Structure of an atom- Rutherford’s model of an atom, Bohr’s model of an atom and composition of the atom-electron, proton and neutron, orbits or shells (energy levels in an atom), distribution of electrons in different shells of the atom, atomic number and atomic mass of an atom, core shell and outer shell, valency of an atom, excitation and ionization of the atom, meaning of atomic transitions; Discovery of X-rays, Generation of X-rays, their characteristics, applications and harmful effects; Composition of nucleus, meaning of nuclear transitions and properties of α-, β- and γ-rays.

Recommended Books/e-resources/LMS:

1. Essential University Physics, Vol.-1 &2 by Richard Wolfson, Pearson Education, Patparganj, Delhi, India.

2. Concept of Physics by H.C. Verma, Bharti Bhawan, Ansari Road, Daryaganj, New Delhi, India.

3. Modern Physics (2nd edition), by S.L. Kakani and Shubhra Kakani, Viva Books, New Delhi.

4. Physics for Scientists and Engineers with Modern Physics, 7 th edition, by Raymond A. Serway and John W. Jewett, Jr., Thomson Higher Education 10 Davis Drive Belmont, CA 94002-3098 USA.

5. Physics For You (Fifth Edition) by Keith Johnson.

**Course objectives:**

1. To recognize the concepts of Physics related to various natural phenomena such as reflection, refraction, interference, diffraction of light, formation of rainbow.

2. Differentiates between certain physical quantities; such as electric field and electric potential; electrical resistance and resistivity; potential difference and emf of a cell; interference and diffraction; wave and particle nature of light.

3. Able to differentiates between Insulator, conductors and dielectrics.

4. Able to uses International system of units (SI Units), symbols, nomenclature of physical quantities and formulations, conventions; such as coulomb (C), farad (F), ampere (A), ohm (Ω) etc.

5. Able to explains processes, phenomena and laws with the understanding of the relationship between nature and matter on scientific basis; such as, force between charges, electric field and potential due to charges; force on charges in an electric field; forces on moving charges in a magnetic field.

6. To handle tools and laboratory apparatus properly; measures physical quantities using appropriate apparatus, instruments, and devices; such as, power supplies; voltmeter; ammeter; multimeter; galvanometer, sonometer, concave and convex lens, prism, glass slab.

7. To develops positive scientific attitude, and appreciates the role and impact of Physics and technology towards the improvement of quality of life and human welfare.

8. Exhibits values of honesty, objectivity, respect for life, rational thinking, and freedom from myth and superstitious beliefs while taking decisions, etc.

Course Learning Outcomes:

After completing this course, the learner will be able to:

1. Have basic knowledge about nature of light, the associated phenomena and their importance in daily life.

2. Understand and describe the working of important optical instruments through the learning of image formation by mirrors and lenses.

3. Have basic knowledge about electric current, electric circuit, electric components, and practical utility of heating and magnetic effects of electric current.

4. Grasp an introductory idea about the generation of X-rays, α-, β- and γ-rays through an understanding of composition of atom & nucleus.

5. Understand the observations, results, analysis and different concepts related to experiments of light & optics.

Lesson Plan

Session Started: 15 Feb 2024 Session Ended: 31 May 2024

MDC (Two classes in a week i.e. on Friday & Saturday) Holi Break: 23-31 March 2024

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| **Week** | **Topic** |
| **1** | **Unit 1:** **Light and optics-**Nature and properties of light, its speed, frequency and wavelength; Reflection of light-types of reflection and their importance in daily life |
| **2** | laws of reflection, multiple reflection by mirrors and their applications. Refraction of light- laws of refraction, refractive index |
| **3** | refraction of light through prism (dispersion of light), formation Rainbow, twinkling of stars, advance Sunrise and delayed Sunset; Scattering of light and blue colour of the sky; apparent depth |
| **4** | total internal reflection and its important applications, **Revision** |
| **5** | **Unit 2: Image formation through reflection**-images formed by plane mirrors, multiple images formed by two flat mirrors and optical illusions; images formed by parabolic mirrors |
| **6** | and spherical mirrors-Concave and convex mirrors, ray diagrams, mirror equation and magnification; applications of plane and curved mirrors in daily life. |
| **7** | Image formation through refraction- images by convex and concave lenses, ray diagrams and lens equation, Optical instruments- Camera, eye, telescope and microscope, **Revision and Test** |
| **8** | **Unit 3:** **Electricity:** electric charge, types of charges, unit of charge, frictional electricity, electricity by conduction and electric current, units of electric current, measurement of current, conductors and insulators; resistance, resistivity and Ohm’s law, |
| **9** | electric potential and potential difference, emf; Electric circuit- resistor, capacitor, battery, ammeter and voltmeter; Series and parallel combinations of resistors, electrical wiring in houses and electrical safety (fuse, hot wire, neutral, ground and short circuit) |
| **10** | electric power and electric power transmission; Heating effect of current and its practical applications. Magnetic effect of electric current- Magnetic field and field lines, bar magnet |
| **11** | magnetic field and direction of field due to a current- through straight conductor and through a circular loop; solenoid, electromagnet |
| **12** | **Unit 4: Structure of an atom**- Rutherford’s model of an atom, Bohr’s model of an atom and composition of the atom-electron, proton and neutron, orbits or shells (energy levels in an atom) |
| **13** | distribution of electrons in different shells of the atom, atomic number and atomic mass of an atom, core shell and outer shell, valency of an atom, excitation and ionization of the atom |
| **14** | meaning of atomic transitions; Discovery of X-rays, Generation of X-rays, their characteristics, applications and harmful effects; Composition of nucleus |
| **15** | meaning of nuclear transitions and properties of α-, β- and γ-rays |
| **16** | **Revision & Tests** |