**Generic Elective Papers offered to I. M.Sc. Programmes of other Departments**

**PH 109 Physics- I** **50 Lectures**

**Course Objectives:** This course enables the students

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| --- | --- |
|  | To know the basic theories of Electrostatics and Magnetostatics. |
|  | To get the basic knowledge of Electromagnetic theory. |
|  | To gather a general information of Nuclear Physics. |
|  | To make acquainted with the theories of Physical Optics. |
|  | To have some basic knowledge of the Special Theory of Relativity. |

**Course Outcomes**

After the completion of this course, students will be:

|  |  |
| --- | --- |
| 1. | Able to implement the theories of Electrostatics and Magnetostatics for different physical problem. |
| 2. | Able to understand the practical and theoretical approaches of Electromagnetic theory. |
| 3. | Understanding about the Nuclear Reactor, Source of Sun Energy etc. |
| 4. | Acquainted with the theories of Physical Optics and its relevant results observed in practice. |
| 5. | Acquainted with the Special Theory of Relativity and its applications. |

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| **Code: PH 109** | **Title: Physics- I** | L-T-P-C **3-1-0-4** |
| Module I | **Electromagnetic Theory I:**  Gauss’s law and its applications, electric potential, relation between **E** and V, capacitance, energy density of an electric field, dielectrics, dielectric constant, dielectric polarization, three electric vectors **E, D, P,** boundary conditions for **E** and **D** at interface between two dielectrics | [10] |
| Module II | **Electromagnetic Theory II:**  Ampere’s law, Biot-Savart law, inductance, energy density of a magnetic field, Gauss’s law in magnetism, three magnetic vectors H**, B, M,** boundary conditions for **B** and H, Faraday’s Law, Displacement current, Maxwell’s equations in free space, plane electromagnetic waves in free space, Poynting vector, pressure and momentum of EM waves | **[10]** |
| Module III | **Nuclear physics**  Nuclear forces, binding energy, liquid drop model, fission, nuclear reactors, fusion, energy processes in stars, controlled thermonuclear reactions. | **[5]** |
| Module IV | **Physical Optics:**  Huygen’s construction for propagation of a wavefront, superposition principle, conditions for interference of light, coherence, Young’s double-slit experiment, Newton’s rings, Diffraction, Fraunhofer diffraction by a single slit, diffraction grating (qualitative), Polarization, polarizers, Malus’ Law, Brewster’s Law, Double Refraction | **[15]** |
| Module V | **Special Theory of Relativity:**  Postulates, Galilean transformations, Lorentz transformation, length contraction, time dilation, velocity addition, mass change and Einstein's mass energy relation, Application os Relativity in GPS system. | **[10]** |
| **Text Books:**  **Modules 1 and 2: E.M. theory**   1. Halliday, Resnick, Walker , Fundamentals of Physics, 6th Edition, John Wiley & Sons, 2004 2. D. J. Griffith, Introduction to Electrodynamics, 3rd Edition. 3. Mathew N.O. Sadiku, Elements of Electromagnetics, 4th Edition, Oxford University Press, ( 2012).   **Modules 4:**   1. Halliday, Resnick, Walker , Fundamentals of Physics, 6th Edition, John Wiley & Sons, 2004 2. Ajoy Ghatak , Optics, 5th Edition, Tata McGraw Hill, 2012 3. Jenkins and White: Fundamentals of Optics   **Module 3 and 5: Relativity**   1. Arthur Beiser, Concept of Modern Physics, 6th Edition, Tata McGraw Hill, 2009 | |  |

**POs met through Topics beyond syllabus/Advanced topics/Design**

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| --- |
| **Course Delivery methods** |
| Lecture by use of boards/LCD projectors/OHP projectors |
| Tutorials/Assignments |
| Seminars |
| Mini projects/Projects |
| Laboratory experiments/teaching aids |
| Industrial/guest lectures |
| Industrial visits/in-plant training |
| Self- learning such as use of NPTEL materials and internets |
| Simulation |

**Course Outcome (CO) Attainment Assessment tools & Evaluation procedure**

**Direct Assessment**

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| --- | --- |
| **Assessment Tool** | **% Contribution during CO Assessment** |
| Mid Sem Examination Marks | 25 |
| End SemExamination Marks | 50 |
| Two Quizzes | 10+10 |
| Teacher’s assessment | 5 |

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| **Assessment Compoents** | **CO1** | **CO2** | **CO3** | **CO4** | **CO5** |
| Mid Sem Examination Marks | **√** | **√** | **√** |  |  |
| End Sem Examination Marks | **√** | **√** | **√** | **√** | **√** |
| Quiz I | **√** |  |  |  |  |
| Quiz II |  |  |  |  | **√** |

**Indirect Assessment –**

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

**Mapping between Objectives and Outcomes**

**Mapping of Course Outcomes onto Program Outcomes**

|  |
| --- |
| **Course Outcome #** |
| a | b | c | d | e |
| 1 | H | H | H | M | H |
| 2 | H | H | H | L | H |
| 3 | H | H | H | M | H |
| 4 | H | H | H | M | H |
| 5 | H | H | H | M | H |

**Mapping of Course Outcomes onto Course Objective**

|  |
| --- |
| **Course Objective#** |
| a | b | c | d | e |
| 1 | H | H | H | M | M |
| 2 | H | H | H | M | H |
| 3 | H | H | H | M | M |
| 4 | H | H | H | M | H |
| 5 | H | H | H | M | M |
|  |  |  |  |  |  |

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| **Mapping Between COs and Course Delivery (CD) methods** | | | | |
| **CD** | **Course Delivery methods** |  | **Course Outcome** | **Course Delivery Method** |
| CD1 | Lecture by use of boards/LCD projectors/OHP projectors |  | CO1 | CD1 |
| CD2 | Tutorials/Assignments |  | CO2 | CD1 |
| CD3 | Seminars |  | CO3 | CD1 and CD2 |
| CD4 | Mini projects/Projects |  |  |  |
| CD5 | Laboratory experiments/teaching aids |  |  |  |
| CD6 | Industrial/guest lectures |  |  |  |
| CD7 | Industrial visits/in-plant training |  |  |  |
| CD8 | Self- learning such as use of NPTEL materials and internets |  |  |  |
| CD9 | Simulation |  |  |  |

**Lecture wise Lesson planning Details.**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Week**  **No.** | **Lect.**  **No.** | **Tentative**  **Date** | **Ch.**  **No** | **Topics to be covered** | **Text**  **Book /**  **Refere**  **nces** | **COs**  **mapped** | **Actual Content covered** | **Methodology**  **used** | **Remarks byfaculty if any** |
| 2.5 | L1-L10 |  | 1-3 | Module I | T1,T2, T3 | 1, 2 | 25% | CD1 and CD2 |  |
| 2.5 | L11-L20 |  | 4-6 | Module II | T1, T2, T3 | 1,2 | 25% | CD1 and CD2 |  |
| 2 | L21-29 |  | 9-10 | Module III | T1 | 3 | 15 | CD1 and CD2 |  |
| 4. | L30-42 |  | 1-5 | Module IV | T2 | 4 | 25 | CD1 and CD2 |  |
| 5. | L43-50 |  | 1 | Module V | T1 | 5 | 10 | CD1 and CD2 |  |
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**PH110 Physics- I Lab**

**List of Experiments**

1. Error analysis, Standard Deviation, Standard error
2. Determination of acceleration due to gravity using bar pendulum
3. Determination of Young’s modulus of a material of thin wire using Searl’s apparatus
4. Determination of modulus of the material of metallic bar by bending of beam method
5. Determination of modulus of rigidity by Barton’s apparatus
6. Determination of Surface Tension of liquid by capillary rise tube method.
7. Determination of Surface Tension using Jaeger’s method
8. Determination of Viscosity of Liquid by Poiseuill’s method
9. To study the motion of spring and calculate (a) Spring constant (b) g
10. Frequency determination of Tuning Fork using Melde’s method
11. Determination of frequencty of AC mains using Sonometer Setup.
12. Determination of Specific gravity for given solid materials
13. To determine the angle of contact of water and mercury.
14. To find the Poisson’s ratio of Rubber in the form of Tube

**PH 111 Physics II (50 lectures)**

**Course Objectives:** This course enables the students

|  |  |
| --- | --- |
|  | To get the basic knowledge of Thermodynamics and Statistical Physics |
|  | To know the basic theories of Quantum mechanics |
|  | To gather a general information of Laser Physics. |
|  | To have some basic knowledge of dielectric materials. |
|  | To have some basic knowledge of magnetic materials. |

**Course Outcomes**

After the completion of this course, students will be:

|  |  |
| --- | --- |
| 1. | Able to understand the practical and theoretical approaches of Thermodynamics and Statistical Physics. |
| 2. | Able to implement the theories of Quantum mechanics for microscopic particles and the concerned nanoscience. |
| 3. | Understanding about the Laser source, Optical fibres, holography etc. |
| 4. | Acquainted with the properties and applications of dielectric materials. |
| 5. | Acquainted with the properties and applications of magnetic materials. |

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| **Code:** **PH 111** | **Title: Physics II** | L-T-P-C **3-1-0-4** |
| **Module I** | **Thermodynamics** **and Statistical Physics**  Zeroth law, first law, second law, entropy, heat transfer, steady state one-dimensional heat conduction.  Elementary ideas, comparison of Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics. | [12] |
| **Module II** | **Quantum mechanics**  Planck's theory of black-body radiation, Compton effect, wave particle duality, De Broglie waves, Davisson and Germer's experiment, uncertainty principle, physical interpretation of wave function and its normalization, expectation value. Schrodinger equation in one dimension, solutions of time-independent Schrodinger equation for free particle, particle in an infinite square well, potential barrier and tunneling. | **[10]** |
| **Module III** | **Lasers and applications**  Emission of light by atoms, spontaneous and stimulated emission, Einstein's A and B coefficients, laser: population-inversion, properties of laser radiation, Ruby & He-Ne lasers, applications of lasers, elementary ideas of holography and fiber optics. | [10] |
| **Module IV** | **Dielectrics properties**  Dielectric constant and polarization of dielectric materials. Types of polarization. Equation for internal field in liquids and solids (one dimensional). Ferro and Piezo electricity. Frequency dependence of dielectric constant. Important applications of dielectric materials. | **[10]** |
| **Module V** | **Magnetic properties**  Classification of dia, para and ferro-magnetic materials. Hysterisis in ferromagnetic materials. Soft and hard magnetic materials, Applications. | **[8]** |
| **Text Books:**   1. Perspective of Modern Physics, A. Beiser (AB), Mc Graw Hill Int. Ed. 2002 2. Physics for Engineers, M. R. Srinivasan, New Age International, 1996. 3. Fundamentals of Thermodynamics, 6th Ed., Sonntag, Borgnakke & Van Wylen, John Wiley & Sons. | |  |

**PH 112 Physics II Lab**

**List of Experiments**

1. Error analysis in Physics Laboratory
2. To determine the frequency of AC mains with the help of sonometer
3. To determine the wavelength of sodium light by Newton’s rings method
4. To determine the resistance per unit length of a Carey Foster’s bridge wire and then to find the resistivity of the material of a given wire
5. Measurement of mechanical equivalent of heat by electrical method
6. Determination of refractive index of the material of a prism using spectrometer and sodium light
7. To determine the frequency of electrically maintained tuning fork by Melde’s experiment
8. Measurement of voltage and frequency of a given signal using cathode ray oscilloscope
9. To determine the wavelength of prominent spectral lines of mercury light by a plane transmission grating using normal incidence
10. To determine the electromotive force (emf) of an unknown cell using a stretched wire potentiometer
11. To study the frequency response and quality factor of series LCR circuit.
12. To verify the electromagnetic induction using Faraday’s Law.