

**COMMECS COLLEGE**  
**Macro Plan (2025-2026)**

Subject: PHYSICS

Teacher: For All Physics Teachers

Class: **XII**

<b>Start Date</b>	<b>End Date</b>	<b>Units</b>	<b>Topic/ Chapter</b>	<b>Contents</b>	<b>Objectives</b> By the end of the unit S.W.A.T.
<b>01-08-24</b>	<b>12-08-24</b>	<b>08 units</b>	<b>Ch.15 Molecular theory of gases</b>	<ol style="list-style-type: none"> <li>1. Recall concept of temperature</li> <li>2. Solve problems using scales of temperature and their conversion</li> <li>3. Explain triple point of water</li> </ol>	<ol style="list-style-type: none"> <li>1. Describe temperature</li> <li>2. Explain triple point of water</li> <li>3. Demonstrate scales of temperature</li> <li>4. Apply the knowledge of temperature scales in solving problems with their conversions.</li> </ol>
			<b>Ch. 15 Molecular theory of gases</b>	<ol style="list-style-type: none"> <li>1. State general gas law</li> <li>2. Derive gas laws (Boyle's law, Charles's law and Avogadro's law)</li> <li>3. Solve problems using gas laws</li> </ol>	<ol style="list-style-type: none"> <li>1. Explain general gas laws</li> <li>2. Derive gas laws ( Boyle's law, Charles's law, and Avogadro's law)</li> <li>3. Apply gas laws in problem solving</li> </ol>
			<b>Ch.15 Molecular theory of gases</b>	<ol style="list-style-type: none"> <li>1. Kinetic Theory of Gases (KTG).</li> <li>2. State the basic postulates of KTG.</li> <li>3. Describe the molecular movement causes the pressure exerted by gas and derive pressure equation.</li> <li>4. Describe the relation between kinetic energy of molecules and temperature.</li> <li>5. Solve problems using relation between kinetic energy and</li> </ol>	<ol style="list-style-type: none"> <li>1. Define the basic postulates of KTG.</li> <li>2. Understand molecular movement causes the pressure exerted by gas.</li> <li>3. Derive a pressure equation.</li> <li>4. Derive a relationship between kinetic energy of molecules and temperature.</li> <li>5. Apply the relation of kinetic</li> </ol>

				temperature.	energy of molecules and temperature in problem solving. 6. Solve problems using relation between kinetic energy and temperature.
<b>13-08-25</b>	<b>26-08-25</b>	<b>10 units</b>	<b>Ch. 16 First Law of thermodynamics</b>	<ol style="list-style-type: none"> <li>1 Describe that heat flow and work are two forms of energy transfer between systems and calculate heat being transferred.</li> <li>2 Relate rise in temperature of a system increases its internal energy.</li> <li>3 Explain that internal energy is determined by the state of the system and that it can be expressed as the sum of the random distribution of kinetic and potential energies associated with the molecules of the system.</li> </ol>	<ol style="list-style-type: none"> <li>1. Define heat flow and work and Describe how they are forms of energy transfer between systems.</li> <li>2. Explain internal energy and how a rise in temperature affects it.</li> <li>3. Understand the relationship between temperature changes and internal energy in a system.</li> <li>4. Apply the concepts to solve problems related to energy transfer, internal energy and specific heat capacity.</li> <li>5. Define internal energy and its dependence on the system's state.</li> <li>6. Explain internal energy as the sum of kinetic and potential energies.</li> <li>7. Relate internal energy to different states of matter and temperature changes.</li> </ol>

			<p><b>Ch.16</b> <b>First Law of thermodynamics</b></p>	<ol style="list-style-type: none"> <li>1. Define thermodynamics and various terms associated with it.</li> <li>2. Calculate work done by a thermodynamic system during a volume change.</li> <li>3. Describe the first law of thermodynamics expressed in terms of the change in internal energy, the heating of the system and work done on the system.</li> <li>4. Explain that first law of thermodynamics expresses the conservation of energy</li> <li>5. Describe the applications of first law of thermodynamics with the help of equations and graphs</li> <li>6. Solve the problems using the equations of first law of thermodynamics</li> </ol>	<ol style="list-style-type: none"> <li>1. Define thermodynamics and understand key terms associated with it.</li> <li>2. Calculate the work done by a thermodynamic system during a volume change.</li> <li>3. Define the First Law of Thermodynamics and its significance in energy conservation.</li> <li>4. Explain the relationship between internal energy, heat, and work.</li> <li>5. Apply the First Law to solve problems involving changes in internal energy due to heat transfer and work.</li> <li>6. Apply the First Law to analyze energy transformations in heat engines and refrigeration cycles.</li> <li>7. Use the First Law to solve problems involving chemical reactions and phase transitions.</li> <li>8. Interpret and draw relevant graphs to illustrate energy changes and transformations.</li> </ol>
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			<b>Ch.16 First Law of thermodynamics</b>	<ol style="list-style-type: none"> <li>1. Define the terms specific heat and molar specific heats of a gas.</li> <li>2. Apply first law of thermodynamics to derive <math>C_p - C_v = R</math>.</li> <li>3. Solve the problems using equations of specific heat.</li> </ol>	<ol style="list-style-type: none"> <li>1. Define specific heat and molar specific heat of gases.</li> <li>2. Derive the equation <math>C_p - C_v = R</math> using the First Law of Thermodynamics.</li> <li>3. Apply these concepts to analyze thermodynamic processes involving ideal gases.</li> </ol>
<b>27-08-25</b>	<b>12-09-25</b>	<b>12 units</b>	<b>Ch.17 Second Law of thermodynamics</b>	<ol style="list-style-type: none"> <li>1 State and explain second law of thermodynamics.</li> <li>2 State the working principle of heat engine.</li> <li>3 Describe the concept of reversible and irreversible processes.</li> <li>4 Describe the working of petrol engine and diesel engine.</li> </ol>	<ol style="list-style-type: none"> <li>1. State and explain the Second Law of Thermodynamics.</li> <li>2. Describe the working principle of heat engines.</li> <li>3. Understand and apply the concepts of entropy and efficiency in thermodynamic processes.</li> <li>4. Describe reversible and irreversible processes.</li> <li>5. Explain the workings of petrol and diesel engines.</li> <li>6. Compare petrol and diesel engines.</li> </ol>

			<p><b>Ch.17 Second Law of thermodynamics</b></p>	<ol style="list-style-type: none"> <li>1 Explain the working principle of Carnot's U engine.</li> <li>2 Explain that the efficiency of a Carnot engine is independent of the nature of the working substance and depends on the temperatures of hot and cold reservoirs.</li> <li>3 Solve problems to find out the efficiency of heat engine.</li> </ol>	<ol style="list-style-type: none"> <li>1. Describe the working principle of the Carnot engine.</li> <li>2. Explain the formula for Carnot engine efficiency and its dependence on temperatures.</li> <li>3. Understand why Carnot engine efficiency is independent of the working substance.</li> </ol>
			<p><b>Ch.17 Second Law of thermodynamics</b></p>	<ol style="list-style-type: none"> <li>1 Describe that refrigerator is a heat engine U operating in reverse as that of an ideal heat engine and find its efficiency.</li> <li>2 Solve problems to find out the efficiency of a refrigerator.</li> </ol>	<ol style="list-style-type: none"> <li>1. Describe how a refrigerator functions as a reversed heat engine.</li> <li>2. Calculate the coefficient of performance (COP) for a refrigerator.</li> <li>3. Solve problems involving the COP and efficiency of refrigerators.</li> </ol>

			<b>Ch.17 Second Law of thermodyna- mics</b>	<ol style="list-style-type: none"> <li>1. Describe that change in entropy is positive U when heat is added and negative when heat is removed from the system.</li> <li>2. Explain that increase in entropy means degradation of energy.</li> <li>3. Show that energy is degraded during all- natural processes.</li> <li>4. Identify that system tend to become less orderly over time.</li> <li>5. Solve problems using the equation of entropy.</li> </ol>	<ol style="list-style-type: none"> <li>1. Describe how entropy changes when heat is added to or removed from a system.</li> <li>2. Explain that an increase in entropy represents the degradation of energy.</li> <li>3. Illustrate the concept with examples and problems.</li> <li>4. Show how energy degradation occurs in natural processes.</li> <li>5. Explain the concept of increasing disorder in systems over time.</li> <li>6. Illustrate these concepts with examples and problem-solving.</li> </ol>
<b>15-09-25</b>	<b>26-09-25</b>	<b>10 units</b>	<b>Ch. 18 Magnetic fields</b>	<ol style="list-style-type: none"> <li>1. Describe that a magnetic field is an example U conductors or by of a field of force produced either by current-carrying permanent magnets.</li> <li>2. Describe and sketch field lines pattern due to a long straight wire.</li> </ol>	<ol style="list-style-type: none"> <li>1. Define magnetic field with unit and formula.</li> <li>2. Describe magnetic fields produced by current-carrying conductors and permanent magnets.</li> <li>3. Explain and sketch the field lines pattern due to a long straight wire.</li> </ol>

			<b>Ch. 18 Magnetic fields</b>	<ol style="list-style-type: none"> <li>1. Describe the factors affecting the force on a current carrying conductor in a magnetic field.</li> <li>2. Solve problems using the equation <math>F = BIL \sin \theta</math>, with directions as interpreted by Fleming's left-hand rule</li> </ol>	<ol style="list-style-type: none"> <li>1. Introduction of the force on a current carrying conductor in a magnetic field.</li> <li>2. Describe the factors affecting the force on a current-carrying conductor in a magnetic field.</li> <li>3. Solve problems using the equation <math>F = BIL \sin \theta</math></li> <li>4. Explain Fleming's Left Hand Rule and its application.</li> </ol>
			<b>Ch. 18 Magnetic fields.</b>	<ol style="list-style-type: none"> <li>1. Define magnetic flux density and the Tesla.</li> <li>2. Understand how the force on a current-carrying conductor can be used to measure the flux density of a magnetic field using a current balance.</li> <li>3. Describe the concept of magnetic flux (<math>\Phi</math>) as scalar product of magnetic field (<math>B</math>) and area (<math>A</math>) using the relation <math>\Phi = B \cdot A</math>.</li> <li>4. Solve the problems using <math>\Phi_B = B \cdot A</math></li> </ol>	<ol style="list-style-type: none"> <li>1. Define magnetic flux density and the Tesla.</li> <li>2. Calculate magnetic flux density using a current balance.</li> <li>3. Describe the concept of magnetic flux and its calculation.</li> <li>4. Apply the relation (<math>\Phi = B \cdot A</math>) to solve problems involving magnetic flux.</li> </ol>
			<b>Ch. 18 Magnetic fields.</b>	<ol style="list-style-type: none"> <li>1. State and explain Ampere's law</li> <li>2. Explain solenoid and toroid Solve problems to obtain Magnetic flux density of solenoid and toroid by ampere's law <math>B = \frac{\mu_0 I}{2\pi r}</math> and <math>B = \mu_0 NI</math></li> </ol>	<ol style="list-style-type: none"> <li>1. State and explain Ampere's Law.</li> <li>2. Describe the concepts of solenoids and toroid.</li> <li>3. Apply Ampere's Law to solve problems involving solenoids</li> </ol>

					and toroid.
			<b>Ch. 18 Magnetic fields.</b>	<ol style="list-style-type: none"> <li>1. Explain that a force acts on a charged particle in a uniform magnetic field.</li> <li>2. Solve problems using <math>F = qvB\sin\theta</math></li> <li>3. Describe a method to measure the <math>e/m</math> of an electron by applying magnetic field and electric field on a beam of electrons.</li> <li>4. Describe the motion of electrons in an electric field and magnetic field using a Cathode Ray tube.</li> <li>5. Solve problems using related equations.</li> </ol>	<ol style="list-style-type: none"> <li>1. Explain the force experienced by a charged particle in a uniform magnetic field.</li> <li>2. Solve problems using the formula <math>F=qvB\sin\theta</math></li> <li>3. Describe a method to measure the charge-to-mass ratio (<math>e/m</math>) of an electron using magnetic and electric fields.</li> <li>4. Discuss the motion of electrons in electric and magnetic fields as demonstrated by a Cathode Ray Tube (CRT).</li> <li>5. Solve related problems involving the motion of electrons in CRT.</li> </ol>
			<b>Ch. 18 Magnetic fields.</b>	<ol style="list-style-type: none"> <li>1. Understand the turning effect on a current carrying coil in a magnetic field.</li> <li>2. Derivation and use of <math>\tau = BANl</math></li> </ol>	<ol style="list-style-type: none"> <li>1. Explain the turning effect (torque) on a current-carrying coil in a magnetic field.</li> <li>2. Derive (<math>\tau = BANl</math>).</li> </ol>
			<b>Ch. 18 Magnetic fields.</b>	Describe the construction and working of Galvanometer and Its conversion into Voltmeter, Ammeter and Avometer.	<ol style="list-style-type: none"> <li>1. Describe the construction and working principle of a galvanometer.</li> </ol>

				<p>Solve problems using</p> $R_x = \frac{V}{I_g} - R_g$ $R_y = \left( \frac{I_g}{I - I_g} \right) R_g$	<ol style="list-style-type: none"> <li>2. Explain how to convert a galvanometer into a voltmeter, ammeter, and Avometer.</li> <li>3. Solve problems related to the conversion using the given equations.</li> </ol>
27-09-25	14-10-25	12 units	<b>Ch.19 Magnetic Induction</b>	<ol style="list-style-type: none"> <li>1. Describe the production of electricity by magnetism.</li> <li>2. Explain that induced emf's can be generated in two ways. <ol style="list-style-type: none"> <li>(i) by relative movement (the generator effect).</li> <li>(ii) by changing a magnetic field (the transformer effect).</li> </ol> </li> <li>3. Infer the factors affecting the magnitude of U the induced emf.</li> <li>4. State Faraday's law of electromagnetic induction.</li> <li>5. Account for Lenz's law to predict the direction of an induced current and relate to the principle of conservation of energy.</li> <li>6. Apply Faraday's law of electromagnetic induction and Lenz's law to solve problems.</li> </ol>	<ol style="list-style-type: none"> <li>1. Explain how electricity is generated through magnetic fields.</li> <li>2. Describe and differentiate between the two methods of generating induced EMF: relative motion and changing magnetic fields.</li> <li>3. Identify and explain factors affecting the magnitude of the induced EMF.</li> <li>4. State Faraday's Law of Electromagnetic Induction and applies it to practical situations.</li> <li>5. Use Lenz's Law to predict the direction of induced currents and understand its connection to energy conservation.</li> <li>6. Apply Faraday's Law and Lenz's Law to solve problems involving electromagnetic induction.</li> </ol>
			<b>Ch.19 Magnetic Induction</b>	<ol style="list-style-type: none"> <li>1. Explain the production of eddy currents and identify their magnetic and heating effects.</li> </ol>	<ol style="list-style-type: none"> <li>1. Explain how eddy currents are produced and describe their magnetic and heating effects.</li> </ol>

				2. Explain the need for laminated iron cores in electric motors, generators and transformers.	2. Understand the reasons for using laminated iron cores in electrical devices and their benefits.
			<b>Ch.19 Magnetic Induction</b>	<ol style="list-style-type: none"> <li>1. Define Self Induction and its unit.</li> <li>2. How an inductor is used to store electric K potential energy?</li> <li>3. Derive energy produced in Self Induction is <math>E = \frac{1}{2}Li^2</math></li> </ol>	<ol style="list-style-type: none"> <li>1. Define self-induction and its unit.</li> <li>2. Explain how an inductor stores electric potential energy.</li> <li>3. Derive the formula for the energy stored in an inductor.</li> <li>4. Understand the relationship between the inductance, current, and stored energy.</li> </ol>
			<b>Ch.19 Magnetic Induction</b>	<ol style="list-style-type: none"> <li>1. Explain Mutual Inductance (M) and its unit henry.</li> <li>2. Describe the construction of a transformer and explain how it works.</li> <li>3. Identify the relationship between the ratio of the number of turns in the primary and secondary coils and the ratio of primary to secondary voltages.</li> <li>4. Recall that how step up and step-down transformers can be used to ensure efficient K transfer of electricity along cables.</li> <li>5. Describe the use of step-down and step-up transformers for the electric supply from power station to houses and electric appliances at home.</li> <li>6. Solve problems using <math>\frac{N_s}{N_p} = \frac{V_s}{V_p}</math></li> </ol>	<ol style="list-style-type: none"> <li>1. Define mutual inductance and its unit, Henry.</li> <li>2. Describe the construction and working principle of a transformer.</li> <li>3. Explain the relationship between the turn's ratio of the coils in a transformer and the ratio of primary to secondary voltages.</li> <li>4. Explain how step-up and step-down transformers improve the efficiency of power transmission.</li> <li>5. Describe the role of transformers in electric power distribution from power stations to homes.</li> <li>6. Solve problems related to transformers, including calculating voltages, currents, and turns ratios.</li> </ol>

			<b>Ch.19 Magnetic Induction</b>	<ol style="list-style-type: none"> <li>1. Define motional emf</li> <li>2. Compute the potential difference across ends of a given rod or wire moving through a magnetic field</li> <li>3. Explain construction and working of an AC generator</li> <li>4. Identify the factors affecting induced EMF of an AC generator</li> <li>5. Solve problems using <math>\varepsilon = \varepsilon_0 \sin 2\pi ft</math></li> </ol>	<ol style="list-style-type: none"> <li>1. Define motional EMF and compute it.</li> <li>2. Calculate the potential difference across a moving rod in a magnetic field.</li> <li>3. Describe the construction and working principle of an AC generator.</li> <li>4. Identify the factors that influence the induced EMF in an AC generator.</li> <li>5. Solve problems involving induced EMF using sinusoidal functions</li> </ol>
			<b>Ch.19 Magnetic Induction</b>	<ol style="list-style-type: none"> <li>1. Describe the main features of an A.C motor and the role of each feature.</li> <li>2. Explain the production of back emf in electric motors.</li> </ol>	<ol style="list-style-type: none"> <li>1. Describe the main features of an AC motor and their functions.</li> <li>2. Explain the production of back EMF in electric motors.</li> </ol>
<b>15-10-25</b>	<b>29-10-24</b>	<b>11 units</b>	<b>Ch.20 AC circuits</b>	<ol style="list-style-type: none"> <li>1. Define the terms time period, frequency, instantaneous peak value and root mean square value of an alternating current and voltage.</li> <li>2. Represent a sinusoidal alternating current or voltage by an equation of the form <math>x = x_0 \sin \omega t</math>.</li> <li>3. Describe the phase of A.C and how phase lags and leads in A.C Circuits</li> </ol>	<ol style="list-style-type: none"> <li>1. Define and understand the terms time period, frequency, instantaneous peak value, and root mean square (RMS) value of an alternating current and voltage.</li> <li>2. Represent a sinusoidal alternating current or voltage using the equation <math>x = x_0 \sin \omega t</math></li> <li>3. Explain the concept of phase in AC circuits and how phase lags and leads occur.</li> </ol>

			<b>Ch.20 AC circuits</b>	<ol style="list-style-type: none"> <li>1. AC through Resistor</li> <li>2. Calculate the resistance of resistors</li> <li>3. Construct phasor diagrams and carry out calculations on circuits including resistive components</li> </ol>	<ol style="list-style-type: none"> <li>1. Describe the flow of AC through resistors and calculate resistance.</li> <li>2. Construct phase diagrams and perform calculations on AC circuits involving resistive components.</li> </ol>
			<b>Ch.20 AC circuits</b>	<ol style="list-style-type: none"> <li>1. Explain the flow of A.C through capacitors</li> <li>2. Calculate the reactance of capacitors</li> <li>3. Construct phasor diagrams and carry out calculations on circuits including reactive components</li> </ol>	<ol style="list-style-type: none"> <li>1. Explain how AC flows through capacitors and the concept of capacitive reactance.</li> <li>2. Calculate the capacitive reactance of a capacitor.</li> <li>3. Construct phase diagrams for circuits with capacitors and perform calculations involving reactive components.</li> </ol>
			<b>Ch.20 AC circuits</b>	<ol style="list-style-type: none"> <li>1. Explain Ac through inductors.</li> <li>2. Identify inductors as important components of A.C circuits termed as chokes</li> <li>3. Construct phasor diagrams and carry out calculations on circuits including inductive components</li> </ol>	<ol style="list-style-type: none"> <li>1. Explain how AC flows through inductors and the concept of inductive reactance.</li> <li>2. Identify inductors as chokes and understand their importance in AC circuits.</li> <li>3. Construct phase diagrams for AC circuits with inductive components.</li> <li>4. Perform calculations on circuits</li> </ol>

					involving inductive components
			<b>Ch.20 AC circuits</b>	<ol style="list-style-type: none"> <li>1. Describe impedance as vector summation of resistances and reactance.</li> <li>2. Construct phasor diagrams and carry out calculations on circuits including resistive reactive and inductive components in series and parallel.</li> <li>3. Solve the problems using the formulae of A.C Power.</li> <li>4. Explain resonance in an A.C circuit and carry out calculations using the resonant frequency formulae.</li> <li>5. Describe that maximum power is transferred when the impedances of source and load match to each other.</li> <li>6. Illustrate the principle of metal detectors used for security checks.</li> <li>7. State the principle of electro-cardiograph in U medical diagnostic.</li> <li>8. Describe the importance of oscillator circuit as broadcaster of radio waves.</li> <li>9. Describe the principle of resonance in tuning circuits of a</li> </ol>	<ol style="list-style-type: none"> <li>1. Describe impedance as the vector sum of resistance and reactance.</li> <li>2. Construct phase diagrams for AC circuits involving resistive, reactive, and inductive components.</li> <li>3. Perform calculations on circuits with these components both in series and parallel.</li> <li>4. Solve problems involving AC power calculations for circuits with resistive and reactive components.</li> <li>5. Construct and interpret phase diagrams for the circuits.</li> <li>6. Explain and calculate resonance in AC circuits.</li> <li>7. Understand and apply impedance matching principles for maximum power transfer.</li> <li>8. Describe the principle and application of metal detectors.</li> <li>9. Explain the principle and operation of an electrocardiograph (ECG).</li> <li>10. Describe the role and importance of oscillator circuits in the</li> </ol>

				<p>radio.</p> <p>10. Solve problems using Equations of RC, RL, LC, RLC circuits in series and parallel</p>	<p>transmission of radio waves.</p> <p>11. Explain the principle of resonance in tuning circuits of a radio.</p> <p>12. Solve problems involving RC, RL, LC, and RLC circuits in both series and parallel configurations using appropriate equations.</p> <p>(a) <math>Z_{RC} = \sqrt{R^2 + \frac{1}{(\omega C)^2}}</math></p> <p>(b) <math>Z_{RL} = \sqrt{R^2 + (\omega L)^2}</math></p> <p>(c) <math>f_R = \frac{1}{2\pi\sqrt{LC}}</math></p>
30-10-25	07-11-25	7 units	<b>Ch.21 Physics of Solids</b>	<ol style="list-style-type: none"> <li>1. Distinguish between the structure of crystalline, glassy, amorphous and polymeric solids.</li> <li>2. Describe that deformation in solids is caused by a force and that in one dimension; the deformation can be tensile or compressive.</li> </ol>	<ol style="list-style-type: none"> <li>1. Distinguish between crystalline, glassy, amorphous, and polymeric solids based on their structures.</li> <li>2. Describe the causes of deformation in solids and the types of deformation in one dimension.</li> </ol>
			<b>Ch.21 Physics of Solids</b>	<ol style="list-style-type: none"> <li>1. Define and use the terms Young's modulus, bulk modulus and shear modulus.</li> <li>2. Demonstrate the force-extension graphs for typical ductile, brittle and polymeric materials.</li> <li>3. Become familiar ultimate tensile stress, elastic deformation and plastic deformation of a material</li> </ol>	<ol style="list-style-type: none"> <li>1. Define and apply Young's modulus, bulk modulus, and shear modulus.</li> <li>2. Interpret force-extension graphs for ductile, brittle, and polymeric materials.</li> <li>3. Define and calculate ultimate tensile stress.</li> <li>4. Explain elastic deformation and its characteristics.</li> <li>5. Describe plastic deformation and its characteristics.</li> </ol>

			<b>Ch.21 Physics of Solids</b>	<ol style="list-style-type: none"> <li>1. Describe the idea about energy bands in solids.</li> <li>2. Classify insulators, conductors, and semiconductors on the basis of energy bands.</li> <li>3. Become familiar with the behavior of superconductors and their potential uses.</li> <li>4. Describe the applications of superconductors in magnetic resonance imaging (MRI), magnetic levitation trains, powerful but small electric motors and faster computer chips.</li> </ol>	<ol style="list-style-type: none"> <li>1. Describe the concept of energy bands and band gaps in solids.</li> <li>2. Classify materials as insulators, conductors, or semiconductors based on their energy band structures.</li> <li>3. Illustrate how the position of the Fermi level affects a material's conductivity.</li> <li>4. Define the behavior of superconductors.</li> <li>5. Describe the conditions under which superconductivity occurs.</li> <li>6. Identify and explain at least three practical applications of superconductors.</li> <li>7. Discuss how superconductors are used in MRI machines, magnetic levitation trains, small electric motors, and computer chips.</li> </ol>
			<b>Ch.21 Physics of Solids</b>	<ol style="list-style-type: none"> <li>1. Distinguish between dia, para and Ferro magnetic materials.</li> <li>2. Describe the concepts of magnetic domains in a material.</li> <li>3. Explain the Curie point.</li> <li>4. Classify hard and soft ferromagnetic substances.</li> <li>5. Describe hysteresis loss.</li> </ol>	<ol style="list-style-type: none"> <li>1. Define and differentiate between diamagnetic, paramagnetic, and ferromagnetic materials.</li> <li>2. Explain the behavior of each type of magnetic material in an external magnetic field.</li> <li>3. Describe the concept of magnetic domains and their role in ferromagnetic materials.</li> <li>4. Define the Curie point and explain its significance in ferromagnetic materials.</li> <li>5. Classify ferromagnetic</li> </ol>

				<ol style="list-style-type: none"> <li>6. Synthesis from hysteresis loop how magnetic field strength varies with magnetizing current.</li> <li>7. Identify the importance of hysteresis loop to select materials for their use to make them temporary magnets or permanent magnets.</li> </ol>	<p>substances as hard or soft and describe their applications.</p> <ol style="list-style-type: none"> <li>6. Explain the concept of hysteresis loss and its implications in magnetic materials.</li> <li>7. Interpret the hysteresis loop to understand the relationship between magnetic field strength and magnetizing current.</li> <li>8. Describe how hysteresis loop characteristics inform the selection of materials for use as temporary or permanent magnets.</li> <li>9. Explain the practical implications of hysteresis loss in different magnetic applications.</li> </ol>
<b>10-11-25</b>	<b>21-11-25</b>	<b>8 units</b>	<b>Ch.22. Solid State Electronics</b>	<ol style="list-style-type: none"> <li>1. Intrinsic (pure) and doped semiconductors</li> <li>2. How the n-type and p-type semiconductors are produced</li> <li>3. Explain the concept of holes and electrons in semiconductors.</li> </ol>	<ol style="list-style-type: none"> <li>1. Explain the difference between intrinsic and doped semiconductors.</li> <li>2. Describe the processes of producing n-type and p-type semiconductors.</li> <li>3. Understand and explain the concepts of holes and electrons in semiconductors</li> </ol>
			<b>Ch.22. Solid State Electronics</b>	<ol style="list-style-type: none"> <li>1. Explain how electrons and holes flow across a junction.</li> <li>2. Describe a PN junction(diode)</li> <li>3. Discuss its forward and reverse biasing.</li> <li>4. Describe the I-V characteristic curves of PN junction</li> <li>5. Define rectification and describe</li> </ol>	<ol style="list-style-type: none"> <li>1. Explain the flow of electrons and holes across a PN junction.</li> <li>2. Describe the structure and operation of a PN junction diode.</li> <li>3. Discuss the effects of forward and reverse biasing on a PN junction diode.</li> </ol>

				<p>the use of diodes for half and full wave rectifications.</p> <p>6. Describe the function and use of LED, Photodiode and Photo voltaic cell.</p>	<p>4. Describe the I-V characteristic curves of a PN junction diode.</p> <p>5. Define rectification and explain half and full wave rectification.</p> <p>6. Describe the function and use of LEDs, photodiodes, and photovoltaic cells.</p>
			<b>Ch.22. Solid State Electronics</b>	<p>1. Distinguish between PNP &amp; NPN transistors.</p> <p>2. Describe the operations of transistors</p> <p>3. Deduce current equation and apply it to solve problems on transistors.</p> <p>4. Apply operation principles of the transistor including I-V characteristics and biasing methods</p> <p>5. Explain the use of transistors as a switch and an amplifier (common-emitter)</p> <p>6. Explain common-base and common collector configurations)</p>	<p>1. Differentiate between PNP and NPN transistors.</p> <p>2. Describe the operations of transistors.</p> <p>3. Derive the current equation for transistors and apply it to solve problems.</p> <p>4. Apply the principles of transistor operation, including I-V characteristics and biasing.</p> <p>5. Explain the use of transistors as switches and amplifiers.</p> <p>6. Describe and differentiate between common-emitter, common-base, and common-collector transistor configurations.</p>
			<b>Ch.22. Solid State Electronics</b>	<p>1. Describe the properties of an ideal operational amplifier.</p> <p>2. Express operational amplifier as a comparator.</p> <p>3. Understand the effects of negative feedback on the gain of an operational amplifier</p>	<p>1. Describe the properties of an ideal operational amplifier.</p> <p>2. Explain how an operational amplifier functions as a comparator.</p> <p>3. Understand and analyze the effects of negative feedback on the gain of an operational amplifier.</p> <p>4. Draw and explain the circuit</p>

				<ol style="list-style-type: none"> <li>4. Draw the circuit diagrams for both the inverting and the non inverting amplifier for single signal input.</li> <li>5. Understand the virtual earth approximation and derive an</li> <li>6. Express for the gain of inverting amplifiers.</li> <li>7. Recall and use expressions for the voltage gain of inverting and of non-inverting amplifiers</li> </ol>	<ol style="list-style-type: none"> <li>diagrams for inverting and non-inverting amplifiers.</li> <li>5. Understand and apply the virtual earth approximation in operational amplifier circuits.</li> <li>6. Derive and apply the gain formulas for inverting and non-inverting amplifiers.</li> <li>7. Express the voltage gain of an inverting amplifier.</li> <li>8. Derive the voltage gain of a non-inverting amplifier.</li> <li>9. Apply these expressions to solve practical problems involving amplifier circuits.</li> </ol>
20-11-25	26-11-25	5 units	<b>Ch.23 Digital Electronics</b>	<ol style="list-style-type: none"> <li>1. Explain signal levels employed in digital electronics or circuits are 'high' (for example, +5 volts) and 'low' (for example, 0 volts)</li> <li>2. Describe the 'high' and 'low' states are referred to as '1' and '0' for open and close circuit respectively</li> </ol>	<ol style="list-style-type: none"> <li>1. Describe the concept of digital signal levels.</li> <li>2. Define high and low signal levels.</li> <li>3. Explain how signal levels are measured and interpreted in digital circuits.</li> <li>4. Evaluate scenarios where signal level may cause issues.</li> <li>5. Explain the characteristics of high level and low level.</li> <li>6. Understand the differences between high level and low level.</li> <li>7. Identify and categorize examples.</li> </ol>

			<b>Ch.23 Digital Electronics</b>	<ol style="list-style-type: none"> <li>1. Recall electronic symbols of the logic gates AND, OR, NOT, NOR, NAND, XOR</li> <li>2. Use logic gates (AND, OR, NOT, NOR, NAND, XOR, combinations) and their truth tables for 2, 3 and 4 inputs</li> <li>3. Identify the behavior of a 2 inputs AND gate and a 2 inputs OR gate with simple circuit using 2 switches, a lamp and a battery</li> </ol>	<ol style="list-style-type: none"> <li>1. Evaluate different strategies for managing high and low states.</li> <li>2. Understand the electronic symbols of logic gates.</li> <li>3. Differentiate between the electronic symbols.</li> <li>4. Explain AND &amp; OR gate.</li> <li>5. Explain NOT, NOR, NAND and XOR logic gates.</li> <li>6. Differentiate between the gates.</li> <li>7. Explain how 2-input AND &amp; OR gates function within a circuit.</li> <li>8. Construct a simple circuit using 2 switches, a lamp, and a battery to demonstrate the behavior of gates.</li> <li>9. Analyzing the circuit diagram.</li> <li>10. Create truth tables</li> </ol>
<b>27-11-25</b>	<b>28-11-25</b>		<b>Revision</b> Problems from book and BIE papers. Revision/Synchronization		
<b>01-12-25</b>	<b>16-01-25</b>		<b>Mid Term Exams</b> <b>Units , 83/133</b> <b>Classes Conducted =62.4%</b>		
<b>17-12-25</b>	<b>19-12-25</b>	<b>Sports Gala</b>			
<b>21-12-25</b>	<b>28-12-25</b>	<b>Winter Vacations</b>			
<b>01-01-26</b>	<b>12-01-26</b>	<b>7 units</b>	<b>Ch.24 Relativity</b>	<ol style="list-style-type: none"> <li>1. Describe Relative Motion with suitable examples (same and opposite direction)</li> <li>2. Distinguish between inertial and non-inertial frames of reference</li> </ol>	<ol style="list-style-type: none"> <li>1. Define relative motion and explain how relative motion is observed.</li> <li>2. Describe the characteristics of inertial and non-inertial frames of reference.</li> </ol>

				<ol style="list-style-type: none"> <li>3. Predict the motion of an object relative to a different frame of reference e.g. dropping a balling a moving vehicle observed from the vehicle and by a person standing on the side walk.</li> </ol>	<ol style="list-style-type: none"> <li>3. Identify examples of inertial and non-inertial frames of reference.</li> <li>4. Demonstrate relative motion using simple examples.</li> <li>5. Construct scenarios involving both inertial and non-inertial frames of reference.</li> <li>6. Apply the concept of frame of references in problem solving.</li> <li>7. Describe the two postulates of Einstein's theory of special relativity.</li> <li>8. Explain the significance of each postulate in the context of relativity.</li> <li>9. Illustrate how each postulate applies to real-world scenarios.</li> </ol>
			<b>Ch.24 Relativity</b>	<ol style="list-style-type: none"> <li>1. Analyze and evaluate the evidence confirming or denying Einstein's two postulates</li> <li>2. Identify that if <math>c</math> is constant then space and time become relative.</li> <li>3. Explain qualitatively and quantitatively the consequence of special relativity in relation to the relativity of simultaneity length contraction time dilation mass increase the equivalence between mass and energy</li> <li>4. Discuss the limitation on the maximum velocity of a particle imposed by special relativity</li> <li>5. Explain the implications of mass</li> </ol>	<ol style="list-style-type: none"> <li>1. By the end of this unit, students will be able to:</li> <li>2. Identify key experiments and evidence supporting or challenging Einstein's postulates.</li> <li>3. Describe how these experiments provide evidence for or against Einstein's postulates.</li> <li>4. Use experimental results to illustrate the confirmation or denial of Einstein's postulates in practical scenarios.</li> <li>5. Evaluate the overall impact of the evidence on the acceptance of Einstein's postulates</li> </ol>

				<p>increase, time dilation and length contraction for space travel.</p> <p>6. Identify the role of special theory of relativity in global positioning, NAVSTAR system.</p> <p>7. Solve problems using <math>t = \frac{t_0}{\sqrt{1-\frac{v^2}{c^2}}}</math>,</p> $I = I_0 \sqrt{1 - \frac{v^2}{c^2}}, m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} \text{ and}$ $E = mc^2$	<p>6. Explain how the constancy of light speed leads to the relativity of space and time.</p> <p>7. Analyze how different scenarios illustrate the relativity of space and time based on the constancy of light speed.</p> <p>8. Define key concepts of special relativity.</p> <p>9. Describe the qualitative effects of special relativity on simultaneity, length, time, and mass.</p> <p>10. By the end of this unit, students will be able to:</p> <p>11. Define the relativistic speed limit and the role of the speed of light in special relativity.</p> <p>12. Illustrate how increasing velocity affects the relativistic mass of a spacecraft using mathematical formulas.</p> <p>13. Analyze the implications of mass increase on the energy required for space travel.</p> <p>14. Describe how time dilation affects the passage of time for astronauts traveling at high speeds.</p> <p>15. Combine the effects of mass increase, time dilation, and length contraction to propose a theoretical plan for interstellar travel.</p>
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					<p>16. Explain the basic principles of the NAVSTAR GPS system and its dependence on accurate timekeeping.</p> <p>17. Solve problems using <math>t = \frac{t_0}{\sqrt{1-\frac{v^2}{c^2}}}</math></p> <p>, <math>I = I_0\sqrt{1-\frac{v^2}{c^2}}</math>, <math>m = \frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}}</math> and <math>E = mc^2</math></p>
			<b>Ch.24 Relativity</b>	<ol style="list-style-type: none"> <li>1. Describe the general relativity</li> <li>2. Understand gravity as space time continuum</li> </ol>	<ol style="list-style-type: none"> <li>1. Define general relativity and its significance in the context of modern physics.</li> <li>2. Explain the idea of gravity as the curvature of space-time.</li> <li>3. Analyze how the curvature of space-time affects the motion of objects and the concept of gravity.</li> <li>4. Describe how general relativity generalizes Newtonian gravity and the implications for understanding gravitational forces.</li> <li>5. Discuss how general relativity impacts our understanding of the universe and technological advancements.</li> </ol>
<b>13-01-26</b>	<b>28-01-26</b>	<b>12 units</b>	<b>Ch.25 Quantum physics</b>	<ol style="list-style-type: none"> <li>1. Describe the concept of black body radiation.</li> <li>2. Describe how energy is distributed over the wavelength range for several values of source temperature.</li> </ol>	<ol style="list-style-type: none"> <li>1. Define black body radiation and its significance in physics.</li> <li>2. Illustrate the black body radiation spectrum using Planck's law.</li> <li>3. Analyze how the intensity of</li> </ol>

				<ol style="list-style-type: none"> <li>3. Describe the Planck's hypothesis that radiation emitted and absorbed by the walls of a black body cavity is quantized.</li> <li>4. Elaborate the particle nature of electromagnetic radiation</li> <li>5. Solve problems using <math display="block">E = \frac{hc}{\lambda}</math> </li> </ol>	<ol style="list-style-type: none"> <li>radiation emitted by a black body varies with wavelength for different temperatures.</li> <li>4. Explain how the total energy emitted by a black body is related to its temperature.</li> <li>5. Demonstrate how the shape of the spectrum changes with increasing or decreasing temperature.</li> <li>6. Define Planck's hypothesis and its significance in quantum mechanics.</li> <li>7. Explain the concept of quantized energy and the introduction of Planck's constant.</li> <li>8. Illustrate how Planck's hypothesis applies to the emission and absorption of radiation by black body cavities.</li> <li>9. Describe the dual nature of electromagnetic radiation as both waves and particles.</li> <li>10. Explain real-world applications of Planck's hypothesis and the particle nature of radiation.</li> <li>11. Solve problems using <math>E = \frac{hc}{\lambda}</math></li> </ol>
			<b>Ch.25 Quantum physics</b>	<ol style="list-style-type: none"> <li>1. Describe the phenomenon of photoelectric effect</li> <li>2. Explain Photoelectric Effect on the basis of quantum theory</li> <li>3. Solve problems using <math>hf - \phi = \frac{1}{2}mv^2</math></li> </ol>	<ol style="list-style-type: none"> <li>1. Define the photoelectric effect and describe the basic experimental observations associated with it.</li> <li>2. Compare classical wave theory predictions with experimental results of the photoelectric</li> </ol>

				<p>4. Identify data sources, gather, process and present information to summarize the use of the photoelectric effect in solar cells &amp; photocells</p>	<p>effect.</p> <p>3. Describe the quantum theory explanation proposed by Albert Einstein, including the concept of photons.</p> <p>4. Explain important concepts such as photon energy, work function, and threshold frequency.</p> <p>5. Evaluate the significance of the photoelectric effect in confirming quantum theory.</p> <p>6. Derive the equation <math>hf - \phi = \frac{1}{2}mv^2</math> to relate photon energy, work function, and kinetic energy.</p> <p>7. Solve problems involving the calculation of kinetic energy, photon energy, and the velocity of ejected electrons.</p> <p>8. Explain the principle of solar cells and how they use the photoelectric effect to convert light into electrical energy.</p> <p>9. Describe how photocells operate based on the photoelectric effect to measure light intensity.</p>
			<b>Ch.25 Quantum physics</b>	<p>1. Explain the particle model of light in terms of photons with particular energy and frequency.</p> <p>2. Describe Compton effect qualitatively.</p> <p>3. Solve problems using</p>	<p>1. Define the particle model of light and introduce the concept of photons.</p> <p>2. Evaluate the significance of the particle model in contrast to the wave model.</p> <p>3. Illustrate real-world applications</p>

				$\Delta\lambda = \frac{h}{m_0c} (1 - \cos \theta)$	<p>where the particle model of light is important.</p> <ol style="list-style-type: none"> <li>4. Describe the Compton Effect and its historical significance in the study of light and matter.</li> <li>5. Explain the experimental setup and qualitative observations of the Compton Effect.</li> <li>6. Discuss the significance of the Compton Effect in confirming the particle nature of photons.</li> <li>7. Explain the derivation of the Compton wavelength shift formula and its physical implications.</li> <li>8. Solve problems using the derived Compton wavelength shift formula.</li> </ol>
			<b>Ch.25 Quantum physics</b>	<ol style="list-style-type: none"> <li>1. Explain the process of pair production on the basis of conservation Laws</li> </ol>	<ol style="list-style-type: none"> <li>1. Define pair production and identify the particles produced in this process.</li> <li>2. Explain the role of a high-energy photon and the interaction with a nucleus in pair production.</li> <li>3. Describe why a nucleus is necessary for pair production to occur.</li> <li>4. Illustrate the conservation of energy, momentum &amp; charge in the context of pair production using simple diagrams.</li> <li>5. Assess the significance of each conservation law (energy,</li> </ol>

					momentum, charge) in determining whether pair production can take place.
			<b>Ch.25 Quantum physics</b>	<ol style="list-style-type: none"> <li>1. Describe conservation laws in the annihilation of matter.</li> </ol>	<ol style="list-style-type: none"> <li>1. Define annihilation of matter and list the conservation laws applicable to this process.</li> <li>2. Explain how conservation laws (energy, momentum, and charge) apply to the annihilation of matter.</li> </ol>
			<b>Ch.25 Quantum physics</b>	<ol style="list-style-type: none"> <li>1. Describe the impact of de Broglie's proposal that any kind of particle has both wave and particle properties.</li> <li>2. Describe the confirmation of de Broglie's proposal by Davisson and Germer experiment in which the diffraction of electrons by the surface layers of a crystal lattice was observed.</li> <li>3. Explain how the very short wavelength of electrons, and the ability to use electrons and magnetic fields to focus them, allows electron microscope to achieve very high resolution.</li> <li>4. Search and describe the role of electron microscope to study the micro structures and properties of matter.</li> </ol>	<ol style="list-style-type: none"> <li>1. State de Broglie's hypothesis regarding the wave-particle duality of matter.</li> <li>2. Describe the implications of de Broglie's proposal on our understanding of particles and waves.</li> <li>3. Illustrate examples where both wave and particle properties are observed, using de Broglie's hypothesis.</li> <li>4. Describe the Davisson-Germer experiment and its significance in confirming de Broglie's proposal.</li> <li>5. Analyze the experimental setup and results of the Davisson-Germer experiment to understand how they provide evidence for electron diffraction.</li> <li>6. Illustrate how diffraction patterns can be used to confirm the wave nature of particles.</li> </ol>

					<ol style="list-style-type: none"> <li>7. State how the very short wavelength of electrons contributes to the resolution of electron microscopes.</li> <li>8. Describe why electrons can be focused with magnetic fields and how this contributes to high-resolution imaging in electron microscopes.</li> <li>9. Describe the basic function and applications of an electron microscope.</li> <li>10. Explain how electron microscopes enhance the study of microstructures and properties of matter compared to light microscopes.</li> <li>11. Apply the principles of electron microscopy to identify and describe the microstructures of various materials.</li> </ol>
			<b>Ch.25 Quantum physics</b>	<ol style="list-style-type: none"> <li>1. Describe uncertainty principle</li> </ol>	<ol style="list-style-type: none"> <li>1. Define the Heisenberg Uncertainty Principle and its components.</li> <li>2. Analyze how the Heisenberg Uncertainty Principle affects measurements at the quantum level.</li> <li>3. Evaluate the significance of the Uncertainty Principle in understanding the limits of measurement and observation in quantum mechanics.</li> </ol>

29-01-26	11-02-26	8 units	<b>Ch.26 Atomic Physics</b>	<ol style="list-style-type: none"> <li>1. Describe and explain the origin of different types of optical spectra.</li> <li>2. Show an understanding of the existence of discrete electron energy levels in isolated atoms (e.g. atomic hydrogen) and deduce how this leads to spectral lines.</li> <li>3. Explain how the uniqueness of the spectra of elements can be used to identify an element</li> </ol>	<ol style="list-style-type: none"> <li>1. Define the three primary types of optical spectra: continuous, emission, and absorption spectra.</li> <li>2. Identify key examples and applications of each type of optical spectrum.</li> <li>3. Explain the physical processes responsible for the formation of continuous, emission, and absorption spectra.</li> <li>4. Describe how different types of optical spectra are used to gain information about substances and materials.</li> <li>5. Define discrete electron energy levels and their role in atomic spectra.</li> <li>6. Explain how discrete energy levels in isolated atoms lead to the formation of spectral lines.</li> <li>7. Analyze the relationship between electron transitions and the resulting spectral lines.</li> <li>8. Describe the concept of unique spectral lines for different elements and how these can be used for element identification.</li> <li>9. Describe the concept of unique spectral lines for different elements and how these can be used for element identification.</li> <li>10. Compare the spectra of different elements to understand why each</li> </ol>
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					element has a unique set of spectral lines.
			<b>Ch.26 Atomic Physics</b>	<ol style="list-style-type: none"> <li>1. Describe Bohr's postulates of Hydrogen atom.</li> <li>2. Derive an expression for quantized radii;</li> <li>3. Explain hydrogen atom in terms of energy levels on the basis of Bohr Model</li> <li>4. Determine the ionization energy and various excitation energies of an atom using energy level diagram</li> <li>5. Illustrate the significance of the hydrogen spectrum in the development of Bohr's model of the atom.</li> <li>6. Derive <math>\frac{1}{\lambda} = R_H \left[ \frac{1}{n_1^2} - \frac{1}{n_2^2} \right]</math></li> <li>7. Solve problems using <math>\frac{1}{\lambda} = R_H \left[ \frac{1}{n_1^2} - \frac{1}{n_2^2} \right]</math></li> </ol>	<ol style="list-style-type: none"> <li>1. State the key postulates of Bohr's model for the hydrogen atom.</li> <li>2. Describe how the concept of quantized angular momentum leads to discrete energy levels and radii.</li> <li>3. Apply Bohr's postulates to derive the quantized radii of electron orbits in a hydrogen atom.</li> <li>4. Use the derived expression to determine the radius for a specific principal quantum number.</li> <li>5. Explain the concept of energy levels and quantization of energy in the Bohr model.</li> <li>6. Identify and explain the excitation and emission energies associated with transitions between these energy levels.</li> <li>7. Determine the ionization energy of a hydrogen atom using the Bohr model.</li> <li>8. Construct an energy level diagram for the hydrogen atom</li> </ol>

					<p>showing the first few energy levels.</p> <p>9. Calculate the excitation energy required for an electron to transition between two specified energy levels.</p> <p>10. Explain how the hydrogen spectrum provided evidence for the quantization of energy levels in atoms.</p> <p>11. Derive the formula <math>\frac{1}{\lambda} = R_H \left[ \frac{1}{n_1^2} - \frac{1}{n_2^2} \right]</math> from Bohr's model.</p> <p>12. Apply the Rydberg formula to solve problems involving the wavelength of emitted or absorbed light.</p>
			<b>Ch.26 Atomic Physics</b>	<ol style="list-style-type: none"> <li>1. Describe inner shell transitions</li> <li>2. Explain production and characteristics of X-rays based on inner shell transition.</li> <li>3. Describe properties and uses of X-rays</li> </ol>	<ol style="list-style-type: none"> <li>1. Describe what inner shell transitions are and how they occur.</li> <li>2. Explain the process of X-ray production due to inner shell transitions.</li> <li>3. Outline the steps involved in the production of X-rays.</li> <li>4. Identify and explain the key characteristics of X-rays, including their energy, wavelength, and penetrating ability.</li> </ol>

					5. Evaluate the uses of X-rays in various fields, including medicine, industry, and research.
			<b>Ch.26 Atomic Physics</b>	<ol style="list-style-type: none"> <li>1. Explain the terms spontaneous emission, stimulated emission, meta stable states, population inversion and laser action.</li> <li>2. Describe the structure and purpose of the main components of a He-Ne gaslaser.</li> <li>3. Identify the useful properties of laser light and give some examples of their uses.</li> <li>4. Identify the measures requirement for safe handling of lasers.</li> </ol>	<ol style="list-style-type: none"> <li>1. Define and explain the terms spontaneous emission, stimulated emission, metastable states, and population inversion.</li> <li>2. Describe the basic principles underlying laser action.</li> <li>3. Illustrate how spontaneous and stimulated emissions contribute to laser functionality.</li> <li>4. Explain the significance of metastable states and population inversion in the laser process.</li> <li>5. Analyze the conditions required for achieving and maintaining population inversion.</li> <li>6. Describe the main components of a He-Ne gas laser and their functions.</li> <li>7. Explain how each component contributes to the laser's operation.</li> <li>8. List and explain the key properties of laser light, including coherence, monochromaticity, and directionality.</li> <li>9. Identify practical applications of laser light in various fields.</li> </ol>

					10. Analyze the safety requirements for handling lasers.
<b>13-02-26</b>	<b>27-02-26</b>	<b>10 units</b>	<b>Ch.27 Nuclear Physics</b>	<ol style="list-style-type: none"> <li>1. Recall the composition of atomic nuclei</li> <li>2. Describe isotopes in detail</li> <li>3. Explain that an element can exist in various isotopic forms each with a different number of neutrons.</li> <li>4. Explain the use of mass spectrograph to demonstrate the existence of isotopes and to measure their relative abundance.</li> </ol>	<ol style="list-style-type: none"> <li>1. Identify and describe the fundamental components of atomic nuclei, including protons and neutrons.</li> <li>2. Explain the role of protons and neutrons in determining the properties of an atom.</li> <li>3. Define isotopes and explain their characteristics.</li> <li>4. Describe how different isotopic forms of an element have different number of neutrons.</li> <li>5. Define key terms: mass spectrograph, isotopes and mass-to-charge ratio.</li> <li>6. Explain the main steps in the mass spectrometry process.</li> <li>7. Describe the process by which a mass spectrograph separates ions based on their mass-to-charge ratio.</li> <li>8. Illustrate how different isotopes of an element appear as distinct peaks in a mass spectrum.</li> </ol>

			<p><b>Ch.27 Nuclear Physics</b></p>	<ol style="list-style-type: none"> <li>1. Explain the process of radioactive decay</li> <li>2. State law of radioactive decay</li> <li>3. Identify the spontaneous and random nature of nuclear decay.</li> <li>4. Define the terms activity and decay constant and recall and</li> <li>5. Solve problems using <math>A(t) = \lambda N(t)</math></li> <li>6. Infer and sketch the exponential nature of radioactive decay.</li> <li>7. Describe the term half life and solve problems using the equation.</li> </ol>	<ol style="list-style-type: none"> <li>1. Identify the different types of radioactive decay (alpha decay, beta decay, gamma decay).</li> <li>2. Summarize how radioactive decay leads to the transformation of an unstable nucleus into a more stable one.</li> <li>3. State law of radioactive decay.</li> <li>4. Recall the mathematical expression for the law of radioactive decay.</li> <li>5. Define key terms related to radioactive decay: activity and decay constant.</li> <li>6. Explain the relationship between the decay constant and the half-life of a radioactive substance.</li> <li>7. Discuss the spontaneous and random nature of nuclear decay.</li> <li>8. Describe how activity <math>A(t)</math> depends on both the decay constant <math>\lambda</math> and the number of remaining nuclei <math>N(t)</math>.</li> <li>9. Solve problems involving radioactive decay using the formula <math>A(t) = \lambda N(t)</math></li> <li>10. Explain the main features of exponential decay.</li> <li>11. State the definition of half-life (<math>T_{\frac{1}{2}}</math>) and describe what it represents in radioactive decay.</li> <li>12. Explain the concept of half-life and its significance.</li> <li>13. Solve problems involving the</li> </ol>
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					half-life equation.
			<b>Ch.27 Nuclear Physics</b>	<ol style="list-style-type: none"> <li>1. Define the terms unified mass scale, mass defect and calculate binding energy using Einstein's equation</li> <li>2. Illustrate graphically the variation of binding A energy per nucleon with the mass number</li> </ol>	<ol style="list-style-type: none"> <li>1. Define key terms: unified mass scale, mass defect and binding energy.</li> <li>2. Analyze how the mass defect relates to the binding energy of a nucleus and its stability.</li> <li>3. Recall Einstein's mass-energy equivalence equation <math>E = \Delta m \times c^2</math></li> <li>4. Calculate the binding energy of a nucleus using Einstein's equation.</li> <li>5. Examine how binding energy per nucleon changes as the mass number increases and identify the trends on a graph.</li> </ol>

			<p><b>Ch.27 Nuclear Physics</b></p>	<ol style="list-style-type: none"> <li>1. Determine the release of energy from different nuclear reactions.</li> <li>2. Explain that atomic number and mass number conserve in nuclear reactions.</li> <li>3. Describe energy and mass conservation in simple reactions and in radioactive decay.</li> <li>4. Describe the phenomena of nuclear fission and fusion.</li> <li>5. Describe the fission chain reaction</li> <li>6. Describe the function of various components of a nuclear reactor.</li> <li>7. Explain the basic principle of nuclear reactor.</li> <li>8. Describe how the conditions in the interiors of the Sun and other stars allow nuclear fusion to take place and hence, how nuclear fusion is their main energy conversion process.</li> </ol>	<ol style="list-style-type: none"> <li>1. Analyze the energy released from different nuclear reactions based on mass defect and binding energy data.</li> <li>2. Explain that atomic number and mass number conserve in nuclear reactions.</li> <li>3. Recall conservation of energy and conservation of mass.</li> <li>4. Explain how the total mass and energy of the system remain constant during radioactive decay.</li> <li>5. Describe what nuclear fission and fusion are and the fundamental processes involved.</li> <li>6. Explain how nuclear fission involves the splitting of heavy nuclei and how nuclear fusion involves the combining of light nuclei.</li> <li>7. Define key components of a nuclear reactor.</li> <li>8. State the basic principle of a nuclear reactor.</li> <li>9. Describe how the reactor core, fuel rods, control rods, moderator, coolant, and containment vessel contribute to the reactor's operation.</li> <li>10. Analyze reactor diagrams to identify components and understand their interactions.</li> <li>11. Discuss why nuclear fusion is</li> </ol>
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					<p>the primary energy source for stars.</p> <p>12. Evaluate how well fusion processes convert mass into energy and compare it to other energy sources.</p>
			<p><b>Ch.27 Nuclear Physics</b></p>	<ol style="list-style-type: none"> <li>1. Show awareness about nuclear radiation exposure and biological effects of radiation.</li> <li>2. Describe the term dosimetry.</li> <li>3. Describe the use of radiations for medical diagnosis and therapy.</li> <li>4. Explain the importance of limiting exposure to ionizing radiation.</li> <li>5. Describe the examples of the use of radioactive tracers in medical diagnosis, agriculture and industry.</li> </ol>	<ol style="list-style-type: none"> <li>1. Explain the concept of nuclear radiation exposure.</li> <li>2. Describe how radiation exposure occurs and the different sources of radiation.</li> <li>3. Discuss the biological effects of radiation on human tissue.</li> <li>4. Describe dosimetry and its purpose.</li> <li>5. Use dosimetry principles to assess radiation exposure scenarios.</li> <li>6. Explain the use of radiation in medical diagnosis and therapy.</li> </ol>

					<ol style="list-style-type: none"> <li>7. Discuss the importance of limiting exposure to ionizing radiation.</li> <li>8. Describe how radioactive tracers work and provide examples of their use in medical, agricultural, and industrial contexts.</li> <li>9. Apply knowledge of radiation types to specific medical diagnostic techniques.</li> </ol>
<b>02-03-26</b>	<b>10-03-26</b>	<b>7 units</b>	<b>Ch.28 Particle physics</b>	<ol style="list-style-type: none"> <li>1. Describe the fundamental forces of nature and their field particles</li> <li>2. Describe the key features and components of the standard model of matter including hadrons, leptons and quarks.</li> </ol>	<ol style="list-style-type: none"> <li>1. Define the four fundamental forces of nature.</li> <li>2. Identify the field particles associated with each fundamental force.</li> <li>3. List the key components of the Standard Model of matter.</li> <li>4. Explain the role of each fundamental force in nature.</li> <li>5. Discuss the significance of the field particles in mediating fundamental forces.</li> <li>6. Describe how hadrons, leptons, and quarks fit into the Standard Model and their roles in particle physics.</li> </ol>
			<b>Ch.28 Particle physics</b>	<ol style="list-style-type: none"> <li>1. Describe the working principal, construction and use of Wilson Cloud Chambers</li> <li>2. Describe the working principal, construction and use of GM counter</li> </ol>	<ol style="list-style-type: none"> <li>1. Define the four fundamental forces of nature.</li> <li>2. Identify the field particles associated with each fundamental force.</li> <li>3. List the key components of the Standard Model of matter.</li> </ol>

					<ol style="list-style-type: none"> <li>4. Explain the role of each fundamental force in nature.</li> <li>5. Discuss the significance of the field particles in mediating fundamental forces.</li> <li>6. Describe how hadrons, leptons, and quarks fit into the Standard Model and their roles in particle physics.</li> <li>7. Define a Geiger-Müller (GM) Counter.</li> <li>8. List the key components of a GM counter.</li> <li>9. Explain the working principle of a GM counter.</li> <li>10. Discuss the construction of GM counter.</li> <li>11. Describe the use of a GM counter in radiation detection.</li> <li>12. Evaluate the effectiveness of a GM counter compared to other radiation detection methods.</li> </ol>
<b>12-03-26</b>	<b>19-03-26</b>	<b>06 units</b>	<b>Revision</b> Problems from book and BIEk papers. Revision/Synchronization		
<b>25-03-26</b>	<b>10-04-26</b>		<b>(Total Units: 133 )</b> <b>100% Course</b> <b>Preliminary Examination 2025-2026</b>		