

Vidyasagar Metropolitan College
Department of Physics

Programme Outcomes

1. Learning Physical Properties of Matters
2. Understanding Dynamics of Nature
3. Cognitive, Mathematical & Problem Solving Skill
4. Simulation Based Learning Skill
5. Foundation of Higher Studies and Research
6. Environmental Aspects & Awareness
7. Laboratory skill

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Course Outcomes

Sem.	Paper Name	Course Outcome
1	CC1 (MATHEMATICAL PHYSICS I)	<p>CO1: TO ACQUIRE KNOWLEDGE OF CALCULUS WHICH ARE INTEGRAL PART OF ANY BRANCH OF PHYSICS</p> <p>CO2: UNDERSTAND DIVERGENCE, GRADIENT AND CURL AND THEIR PHYSICAL INTERPRETATION WHICH ARE VERY IMPORTANT FOR THEORIES OF ELECTRICITY AND MAGNETISM TO BE TAUGHT LATER.</p> <p>CO3: UNDERSTAND BASICS OF MATRICES AND DETERMINANTS I.E. INVERSES, ADJOINT, LINEAR VECTOR SPACES, BASIS, BASIS TRANSFORMATIONS, HOW TO CALCULATE EIGENVALUES, EIGENVECTORS. SOLVE SIMPLE PROBLEMS WITH PHYSICS-ORIENTED APPLICATION.</p> <p>CO4: TO DEVELOP THE PROBLEM-SOLVING CAPABILITY</p>
1	CC2 (MECHANICS)	<p>CO1: STUDENTS LEARN ACCURATELY HOW TO DESCRIBE MOTION OF OBJECTS, PLANETARY MOTIONS, GRAVITATION ETC. UNDERSTAND THE MOTION OF OBJECTS IN DIFFERENT FRAME OF REFERENCES.</p> <p>CO2: KNOW HOW TO APPLY THE CONSERVATION PRINCIPLE AND SYMMETRY OF A SYSTEM.</p> <p>CO3: UNDERSTAND LAWS OF MOTION, REFERENCE FRAMES, AND ITS APPLICATIONS I.E. PROJECTILE MOTION, SIMPLE HARMONIC OSCILLATOR, ROCKET MOTION, ELASTIC AND INELASTIC COLLISIONS.</p> <p>CO4: UNDERSTAND THE IDEA OF CONSERVATION OF ANGULAR MOMENTUM, CENTRAL FORCES EFFECTIVE POTENTIAL.</p> <p>CO5: UNDERSTAND THE APPLICATION OF CENTRAL FORCE TO THE STABILITY OF CIRCULAR ORBITS, KEPLER'S LAWS OF PLANETARY MOTION.</p> <p>CO6: UNDERSTAND THE DYNAMICS OF ROTATING OBJECTS I.E. RIGID BODIES, ANGULAR VELOCITY, THE MOMENT OF INERTIA AND RELATED EXAMPLES INVOLVING THE CENTRIFUGAL FORCE AND CORIOLIS FORCE.</p> <p>CO7: LEARN ABOUT FLUID MOTIONS, ARCHIMEDES PRINCIPLE, EULER EQUATION, BERNOULLI'S LAW, PASCAL'S LAW ETC.</p>

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2	CC3 (ELECTRICITY AND MAGNETISM)	CO1: TO LEARN ABOUT BASIC CONCEPTS OF ELECTRICAL CHARGES AND CURRENTS AND THEIR PROPERTIES CO2: ENHANCE PROBLEM SOLVING CAPABILITY BASED ON VARIOUS REALISTIC SITUATION CO3: UNDERSTAND THE CONCEPT OF CONDUCTORS, DIELECTRICS, INDUCTANCE AND CAPACITANCE, AND ELECTRICAL IMAGE CHARGE. CO4: GATHER KNOWLEDGE ON THE NATURE OF MAGNETIC MATERIALS. CO5: UNDERSTAND THE CONCEPT OF STATIC FIELD AND POTENTIAL. CO6: GAIN KNOWLEDGE ON ELECTROMAGNETIC INDUCTION AND FARADAY'S LAW AND ITS APPLICATIONS
2	CC4 (WAVES AND OPTICS)	CO1: STUDENT LEARN ABOUT VARIOUS TYPES OF WAVES AND THEIR PROPAGATION, SUPERPOSITION OF WAVES. CO2: TO PROVIDE A BASIC UNDERSTANDING OF PHYSICAL OPTICS CO3: TO PROVIDE A KNOWLEDGE OF VARIOUS OPTICAL PHENOMENA, FOR EXAMPLE INTERFERENCE, DIFFRACTION, AND OPTICAL INSTRUMENTS.
3	CC5 (MATHEMATICAL PHYSICS II)	CO1: UNDERSTAND HOW TO EXPAND A FUNCTION IN A FOURIER SERIES. CO2: SOLVING DIFFERENTIAL EQUATION USING POWER LAW EXPANSION (SO CALLED FROBENIUS METHOD). LEARN ABOUT VARIOUS SPECIAL FUNCTIONS I.E. LEGENDRE, BESSEL FUNCTIONS, GENERATING FUNCTIONS AND THEIR PROPERTIES. CO3: FOURIER INTEGRAL AND ITS PROPERTIES AND APPLICATION TO SIGNAL ANALYSIS AND ALSO IN QUANTUM MECHANICS CO4: APPLICATION OF PROBABILITY AND VARIOUS DISTRIBUTION FUNCTIONS IN PHYSICS. CO5: LEARN TO SOLVE PARTIAL DIFFERENTIAL EQUATION WHICH IS VERY IMPORTANT IN ALL BRANCHES OF PHYSICS.
3	CC6 (THERMAL PHYSICS)	CO1: TO UNDERSTAND THE PRINCIPLE OF CALORIMETRY CO2: UNDERSTAND THE BASIC PRINCIPLE AND LAWS OF THERMODYNAMICS CO3: UNDERSTAND THE CONCEPTS OF ENTROPY, VARIOUS THERMODYNAMIC POTENTIALS AND THEIR APPLICATIONS IN VARIOUS SYSTEMS. CO4: UNDERSTANDING OF FIRST AND SECOND ORDER PHASE TRANSITION WITH EXAMPLES. CO5: GAIN KNOWLEDGE ABOUT MICROSCOPIC BEHAVIOR OF SYSTEMS IN EXPLAINING PRESSURE,

		TRANSPORT PROPERTIES, VISCOSITY, DIFFUSION ETC.
3	CC7 (MODERN PHYSICS)	CO1: BLACK BODY RADIATION AND ITS NATURE, OLD QUANTUM THEORY, CONCEPT OF WAVE-PARTICLE DUALITY AND DE BROGLIE HYPOTHESIS. CO2: INTRODUCTION TO SCHRODINGER EQUATION AND ITS APPLICATION, PROBABILISTIC INTERPRETATION OF QUANTUM MECHANICS, COMMUTATION RELATION AND THEIR MEANING. CO3: TO INCULCATE BASIC UNDERSTANDING IN QUANTUM MECHANICS. CO4: STUDENTS LEARN ABOUT NUCLEAR STRUCTURE AND VARIOUS MODELS. CO5: UNDERSTANDING OF INTERACTION WITHIN AND WITH NUCLEUS. GAMMA, BETA DECAY. NUCLEAR FISSION AND FUSION. CO6: TO KNOW ABOUT WORKING PRINCIPLE OF LASER AND ITS APPLICATIONS.
3	SEC A (RENEWABLE ENERGY AND ENERGY HARVESTING)	CO1: STUDENTS LEARN ABOUT FOSSIL FUELS AND ITS HAZARDS CO2: NEED FOR ALTERNATIVE ENERGY SOURCES, HOW TO HARVEST ENERGY FROM VARIOUS NON-CONVENTIONAL ENERGY SOURCES. CO3: KNOW ABOUT PIEZOELECTRIC ENERGY AND ELECTROMAGNETIC ENERGY HARVESTING, FUEL CELL.
4	CC8 (MATHEMATICAL PHYSICS III)	CO1: TO STUDY COMPLEX ANALYSIS, CAUCHY RIEMANN CONDITIONS, ANALYTICITY, CAUCHY INTEGRAL FORMULA, LAURENT AND TAYLOR SERIES EXPANSION AND DEFINITE INTEGRALS USING CONTOUR INTEGRATION. CO2: TO LEARN ABOUT VARIATIONAL CALCULUS, OPTIMIZATION THEORY. LAGRANGIAN AND HAMILTONIAN FORMULATION, EULER-LAGRANGE EQUATION, USE OF SYMMETRY AND CONSERVATION LAWS. CO3: TO UNDERSTAND SPECIAL THEORY OF RELATIVITY, LENGTH CONTRACTION, TIME DILATION, MASS-ENERGY RELATION ETC. CO4: RELATIVISTIC DYNAMICS, MINKOWSKI SPACE-TIME, PROPER TIME ETC. CO5: INTRODUCTION TO TENSOR CALCULUS, COVARIANT AND CONTRAVARIANT TENSORS, METRIC TENSOR, RELATIVITY IN 4-VECTOR NOTATION.

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4	CC9 (ANALOG ELECTRONICS)	<p>CO1: TO MOTIVATE THE STUDENTS TO APPLY THE PRINCIPLES OF ELECTRONICS IN THEIR DAY-TO-DAY LIFE.</p> <p>CO2: LEARN VARIOUS NETWORK THEOREMS, DIODES AND THEIR APPLICATION</p> <p>CO3: STUDY VARIOUS THEORY AND WORKING PRINCIPLES OF TRANSISTORS, FET, REGULATED POWER SUPPLY, AMPLIFIERS, CONCEPT OF FEEDBACK, OPAMP, MULTIVIBRATORS AND OSCILLATORS</p>
4	CC10 (QUANTUM MECHANICS)	<p>CO1: STUDENTS SOLVE VARIOUS QUANTUM MECHANICAL FEATURES BY SOLVING VARIOUS POTENTIALS: EXAMPLE, FINITE WELL, HARMONIC OSCILLATOR</p> <p>CO2: LEARN QUANTUM THEORY OF HYDROGEN ATOMS, SOLUTION OF SCHRODINGER EQUATION UNDER CENTRAL FORCE, ORBITAL ANGULAR MOMENTUM AND SPIN ANGULAR MOMENTUM</p> <p>CO3: TO KNOW GENERALIZED ANGULAR MOMENTA, ELECTRON'S MAGNETIC MOMENT, ENERGY OF A MAGNETIC DIPOLE, STERN-GARLACH EXPERIMENT</p> <p>CO4: TO STUDY FINE STRUCTURE OF HYDROGEN ATOMS, ATOMS IN PRESENCE OF ELECTRIC AND MAGNETIC FIELDS-- APPLICATION OF QUANTUM MECHANICS FOR ATOMIC SYSTEMS</p> <p>CO5: TO LEARN MANY ELECTRON ATOMS, IDENTICAL PARTICLES, PAULI EXCLUSION PRINCIPLE.</p>
4	SEC B (ELECTRICAL CIRCUITS AND NETWORK SKILLS)	<p>CO1: STUDENTS KNOW ABOUT VARIOUS ELECTRICAL INSTRUMENTS (GENERATORS, TRANSFORMERS, AC MOTOR ETC).</p> <p>CO2: SINGLE PHASE AND THREE PHASE AC DEVICES, CO3: MEASUREMENTS AND FAULTS DISTRIBUTION SYSTEM.</p>
5	CC11 (ELECTROMAGNETIC THEORY)	<p>CO1: LEARN MAXWELL'S EQUATIONS, GAUGE TRANSFORMATIONS, Poynting VECTOR, ELECTROMAGNETIC FIELD ENERGY DENSITY, MOMENTUM DENSITY ETC.</p> <p>CO2: PROPAGATION OF ELECTROMAGNETIC WAVE THROUGH MEDIUM</p> <p>CO3: POLARIZATION IN UNIAXIAL CRYSTALS AND ROTATORY POLARIZATION.</p>

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5	CC12 (STATISTICAL PHYSICS)	CO1: TO UNDERSTAND STATISTICAL PROPERTIES OF MATTER, CONNECTIONS WITH THERMODYNAMICS CO2: TO USE THESE THEORY IN PRACTICAL SYSTEMS (IDEAL GAS, BOSE AND FERMI SYSTEMS), IDENTICAL PARTICLES CO3: TO LEARN BOSE-EINSTEIN STATISTICS, AND ITS APPLICATION, FERMI-DIRAC STATISTICS AND ITS APPLICATION CO4: QUANTUM THEORY OF RADIATION.
5	DSE A1 (LASER AND FIBER OPTICS)	CO1: TO KNOW THEORY OF LASER, ITS BASIC PROPERTIES CO2: TO LEARN ABOUT RESONATORS, TRANSIENT EFFECT, MANY LASER SYSTEMS AND PRACTICAL USE OF LASER CO3: TO UNDERSTAND FIBER OPTICS, HOLOGRAPHY AND INTRODUCTORY NONLINEAR OPTICS.
5	DSE B1 (NUCLEAR AND PARTICLE PHYSICS)	CO1: TO LEARN GENERAL PROPERTIES OF NUCLEI, VARIOUS NUCLEAR MODELS, RADIOACTIVITY CO2: TO UNDERSTAND NUCLEAR REACTIONS AND INTERACTION OF NUCLEAR RADIATION WITH MATTER CO3: TO KNOW ABOUT THE DETECTORS FOR NUCLEAR RADIATIONS AND PARTICLE ACCELERATORS CO4: TO LEARN AND UNDERSTAND FUNDAMENTALS OF PARTICLE PHYSICS.
6	CC13 (DIGITAL SYSTEMS AND APPLICATIONS)	CO1: TO LEARN INTEGRATED CIRCUITS(IC), NUMBER SYSTEM AND BOOLEAN DESCRIPTION, INTRODUCTION TO LOGIC SYSTEMS, VARIOUS GATES CO2: TO UNDERSTAND PRODUCT AND SUM IN LOGICAL EXPRESSION, CONVERSION BETWEEN TRUTH TABLE AND LOGICAL EXPRESSION, KARNAUGH MAP CO3: TO LEARN HOW TO IMPLEMENT DIFFERENT CIRCUITS: ADDER, SUBTRACTOR, IDEA OF MULTIPLEXER, DEMULTIPLEXERS, ENCODER, DECODER CO4: TO KNOW REGISTERS AND COUNTERS, COMPUTER ORGANIZATION, DATA CONVERSION.
6	CC14 (SOLID STATE PHYSICS)	CO1: TO LEARN CRYSTAL STRUCTURE, LATTICE DYNAMICS CO2: TO UNDERSTAND QUANTUM PROPERTIES OF MATTER LIKE MAGNETIC AND DIELECTRIC PROPERTIES. CO3: TO UNDERSTAND ELEMENTARY BAND THEORY CO4: SUPERCONDUCTIVITY, MEISSNER EFFECT AND INTRODUCTION TO BCS THEORY.

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6	DSE-A2 (ADVANCED CLASSICAL DYNAMICS)	CO1: TO UNDERSTAND CALCULUS OF VARIATION CO2: TO LEARN ABOUT SMALL OSCILLATIONS CO3: TO UNDERSTAND ABOUT RIGID BODY MOTION CO4: TO KNOW ABOUT NON-LINEAR DYNAMICS
6	DSE-B2 (ADVANCED STATISTICAL MECHANICS)	CO1: TO REVIEW CLASSICAL STATISTICAL MECHANICS CO2: TO UNDERSTAND QUANTUM STATISTICAL MECHANICS CO3: TO LEARN IDEAL BOSE AND FERMI SYSTEMS CO4: TO LEARN ISING MODEL AND NON- EQUILIBRIUM STATISTICAL MECHANICS

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Mapping/Co-relation Program Outcome(PO) & Course Outcome(CO)

Department : Physics Academic Session : 2022-23

Department : Physics Academic Session : 2022-23								
CO Details		PO Details						
Sl No.	Course Name	PO1 (Learning Physical Properties of Matters)	PO2 (Cognitive, Mathematical & Problem Solving Skill)	PO3 (Simulation Based Learning Skill)	PO4 (Foundation of Higher Studies and Research)	PO5 (Understanding Dynamics of Nature)	PO6 (Laboratory skill)	PO7 (Environmental Aspects & Awareness)
1	CC1 (MATHEMATICAL PHYSICS I)		✓	✓	✓			
2	CC2 (MECHANICS)	✓	✓		✓	✓	✓	
3	CC3 (ELECTRICITY AND MAGNETISM)	✓	✓		✓	✓	✓	✓
4	CC4 (WAVES AND OPTICS)	✓	✓		✓	✓	✓	
5	CC5 (MATHEMATICAL PHYSICS II)		✓	✓	✓			
6	CC6 (THERMAL PHYSICS)	✓	✓		✓	✓	✓	✓
7	CC7 (MODERN PHYSICS)	✓	✓		✓	✓	✓	

8	SEC A (RENEWABLE ENERGY AND ENERGY HARVESTING)	✓			✓			✓
9	CC8 (MATHEMATICAL PHYSICS III)		✓	✓	✓			
10	CC9 (ANALOG ELECTRONICS)		✓		✓	✓	✓	✓
11	CC10 (QUANTUM MECHANICS)		✓	✓	✓	✓		
12	SEC B (ELECTRICAL CIRCUITS AND NETWORK SKILLS)		✓					✓
13	CC11 (ELECTROMAGNETIC THEORY)	✓	✓		✓	✓	✓	
14	CC12 (STATISTICAL PHYSICS)	✓	✓	✓	✓	✓		
15	DSE A1 (LASER AND FIBER OPTICS)	✓	✓		✓	✓		✓
16	DSE B1 (NUCLEAR AND PARTICLE PHYSICS)	✓	✓		✓	✓		
17	CC13 (DIGITAL SYSTEMS AND APPLICATIONS)		✓				✓	

18	CC14 (SOLID STATE PHYSICS)	✓	✓		✓	✓	✓	
19	DSE-A2 (ADVANCED CLASSICAL DYNAMICS)	✓	✓		✓	✓		
20	DSE-B2 (ADVANCED STATISTICAL MECHANICS)	✓	✓		✓	✓		