COURSE OUTCOME (CO)

BSC (HONOURS) PHYSICS

Sl. No.	Sem.	Course Name/ Code	Course out comes	Unit/Chapter	Bloom Taxonomy level
1	I	Mathematical Physics 1 PHY-HC-1016	Successful students should be able to understand vector and its applications in various fields, differential equations and its applications, different oordinate systems, concept of probability and error.	*Unit I: Vector Calculus*	Remember, Understand, Apply, Analyse, Evaluate
				Unit II: First and Second order Differential Equations	
				Unit III: Orthogonal Curvilinear Coordinates	
				Unit IV: Dirac Delta function and its Properties	
				Unit V: Introduction to Probability	
				Unit VI: Theory of Errors	
				Lab	
2	I	PHY-HC-1026 Mechanics	*On successful completion of the course students should be able understand Inertial and non inertial reference frames, Newtonian motion, Galilean transformations, projectile motion, work and energy, Elastic and inelastic collisions, motion under central force, simple harmonic oscillations, special theory of relativity.*	*Unit I: Fundamentals of Dynamics*	Remember, Understand, Apply, Analyse, Evaluate
				Unit II: Work and Energy	
				Unit III: Collisions	
				Unit IV: Rotational Dynamics	
				Unit V: Elasticity	
				Unit VI: Fluid Motion	
				Unit VII: Gravitation and Central Force Motion	
				Unit VIII: Oscillations	
				Unit IX: Non-Inertial Systems	
				Unit X: Special Theory of Relativity	
				Lab	

3	I	PHY-HG-1016 (PHY-RC-1016) Mechanics	*Upon completion of this course, students are expected to understand the role of vectors and coordinate systems in Physics, solve Ordinary Differential Equations, laws of motion and their application to various dynamical situations, Inertial reference frames their transformations, concept of conservation of energy, momentum, angular momentum and apply them to basic problems, phenomenon of simple harmonic motion, motion under central force, concept of time dilation, Length contraction using special teory of relativity. In the laboratory course, after acquiring knowledge of how to handle measuring instruments (like screw gauge, Vernier calipers, travelling microscope) student shall embark on verifying various principles and associated measurable parameters.*	*Unit I : Vectors* *Unit II : Laws of Motion* *Unit III : Momentum and Energy* *Unit IV : Rotational Motion* *Unit V : Gravitatio* *Unit VI : Oscillations* *Unit VII : Elasticity* *Unit VII : Special Theory of Relativity* Lab	Remember, Understand, Apply, Analyse, Evaluate
4	II	PHY-HC-2016 Electricity & Magnetism	*After successful completion of this course, students will be able to Understand electric and magnetic fields in matter, Dilectric properties of matter magnetic properties of matter, electromagnetic induction, applications of Kirchhofff's law in different circuits, applications of network theorem in circuits.*	*Unit I: Electric Field and Electric* *Unit II: Dielectric Properties of Matter* *Unit III: Magnetic Field* *Unit IV: Magnetic Properties of Matter* *Unit V: Electromagnetic Induction* *Unit VI: Electrical Circuits* *Unit VII: Network Theorems* *Unit VIII: Ballistic Galvanometer* *Lab*	Remember, Understand, Apply, Analyse, Evaluate

5	II	PHY-HC-2026 Waves & optics	*After successful completion of this course, students will be able to Understand superposition of harmonic oscillations, different types of wave motions, superposition of harmonic waves, interference and interferometer, diffraction, holography.*	*Unit I: Superposition of Collinear Harmonic Oscillations* *Unit II: Superposition of Two Perpendicular Harmonic Oscillations* *Unit III: Wave Motion* *Unit IV: Velocity of Waves* *Unit V: Superposition of Two Harmonic Waves* *Unit VI: Wave Optics* *Unit VII: Interference* *Unit VIII: Interferometer* *Unit IX: Diffraction* *Unit X: Fraunhofer Diffraction* *Unit XI: Holography* Lab	Remember, Understand, Apply, Analyse, Evaluate
6	II	PHY-HG-2016 (PHY-RC-2016) Electricity & Magnetism	*Upon completion of this course, students are expected to apply Gauss's law of electrostatics to solve a variety of problems, calculate the magnetic forces that act on moving charges and the magnetic fields due to currents, have brief idea of magnetic materials, understand the concepts of induction, and apply them to solve variety of problems. In the Lab course, students will be able to measure resistance (high and low), Voltage, Current, self and mutual inductance, capacitor, strength of magnetic field and its variation, study different circuits RC, LCR etc.*	*Unit I : Vector Analysis* *Unit II : Electrostatics* *Unit III : Magnetism* *Unit IV : Electromagnetic Induction* *Unit V : Maxwell's Equations and EM Wave* Lab	Remember, Understand, Apply, Analyse, Evaluate

7	III	PHY-HC-3016 Mathematical Physics II	*After successful completion of the course, students will be able to solve differential equation using power series solution method, solve differential equation using separation of variables method, special integrals, different properties of matrix, Fourier series.*	*Unit I: Frobenius Method and Special Functions* *Unit II: Partial Differential Equations* *Unit III: Some Special Integrals* *Unit IV: Matrix* *Unit V: Fourier Series* Lab	Remember, Understand, Apply, Analyse, Evaluate, Create
8	III	PHY-HC-3026 Thermal Physics	*Upon successful completion, students will have the knowledge and skills to identify and describe the statistical nature of concepts and laws in thermodynamics, in particular: entropy, temperature, Thermodynamics potentials, Free energies, Maxwell's relations in thermodynamics, behaviour of real gases.*	Unit I: *Zeroth and First Law of Thermodynamics* Unit II: *Second Law of Thermodynamics* Unit III: *Entropy* Unit IV: *Thermodynamic Potentials* Unit V: *Maxwell's Thermodynamic Relations* Unit VI: *Distribution of Velocities* Unit VII: *Molecular Collisions* Unit VIII: *Real Gases* Lab	Remember, Understand, Apply, Analyse, Evaluate

9	III	PHY-HC-3036 Digital Systems & Applications	*After successful completion of the course student will be able to understand the working principle of CRO, develop a digital logic and apply it to solve real life problems, Analyze, design and implement combinational logic circuits, Classify different semiconductor memories, Analyze, design and implement sequential logic circuits, Analyze digital system design using PLD, Simulate and implement combinational and sequential circuits.*	*Unit I: Introduction to CRO* *Unit II: Integrated Circuits (qualitative treatment only)* *Unit III: Digital Circuits* *Unit IV: Boolean Algebra* *Unit V: Data Processing Circuits* *Unit VI: Arithmetic Circuits* *Unit VII: Sequential Circuits* *Unit VIII: Timers: IC 555* *Unit IX: Shift Registers* *Unit X: Counters (4 bits)* *Unit XI: Computer Organization* *Unit XII: Intel 8085 Microprocessor Architecture* *Unit XIII: Introduction to Assembly Language* *Lab*	Remember, Understand, Apply, Analyse, Evaluate, Create
10	III	PHY-HG-3016 Thermal Physics & Statistical Mechanics	*Upon completion of this course, students are expected learn the basic concepts of thermodynamics including advance topics in thermodynamics concept of entropy and the associated theorems, the thermodynamic potentials and their physical interpretations, Maxwell's thermodynamic relations, Bose-Einstein statistics and the Fermi-Dirac statistics. In the laboratory course, the students will be able to various theorems related to thermodyanamics*	*Unit I : Laws of Thermodynamics* *Unit II : Thermodynamic Potentials* *Unit III : Kinetic Theory of Gases* *Unit IV : Theory of* *Unit V : Statistical Mechanics* Lab	Remember, Understand, Apply, Analyse, Evaluate Create

11	IV	PHY-SE-3024 COMPUTATIONAL PHYSICS SKILLS	*The aim of this course is not just to teach computer programming and numerical analysis but to emphasize its role in solving problems in Physics. • Highlights the use of computational methods to solve physical problems • Use of computer language as a tool in solving physics problems (applications) • Course will consist of hands on training on the Problem solving on Computers*	*Unit I: Introduction* *Unit II: Basics of Scientific Programming* *Unit III: Scientific Programming* Unit IV: Control Statements, Functions, and Subroutines *Unit V: Visualization* Hands on exercises:	Remember, Understand, Apply, Analyse, Evaluate, Create
12	IV	PHY-HC-4016 Mathematical Physics III	*On successful completion of the course students will able to solve complex integrals using residue theorem, apply Fourier and Laplace transforms in solving differential equations, understand properties of Tensor like Transformation of coordinates, contravariant and co-variant tensors, indices rules for combining tensors.*	*Unit I: Complex Analysis* *Unit II: Complex Integration* *Unit III: Fourier Transforms* *Unit IV: Laplace Transforms* *Unit V: Tensor Algebra* Lab	Remember, Understand, Apply, Analyse, Evaluate, Create
13	IV	PHY-HC-4026 Elements of Modern Physics	*On completion of the course students will be able to understand modern development in Physics, Starting from Planck's law, it development of the idea of probability interpretation and the formulation of Schrodinger equation. Students will also get preliminary idea of structure of nucleus, radioactivity Fission and Fusion and Laser*	*Unit I: Quantum Theory and Blackbody Radiation* *Unit II: Uncertainty and Wave-Particle Duality* *Unit III: Schrödinger Equation* *Unit IV: One-dimensional Box and Step Barrier* *Unit V: Atomic Nucleus* *Unit VI: Radioactivity* *Unit VII : Detection of nuclear radiation* *Unit VIII: Fission and Fusion* *Unit IX: Lasers* Lab	Remember, Understand, Apply, Analyse, Evaluate

14	IV	PHY-HC-4036 Analog Systems & Applications	*On successful completion of the course students will be able to understand about the physics of semiconductor p-n junction and devices such as rectifier diodes, zener diode, photodiode etc. and bipolar junction transistors, transistor biasing and stabilization circuits, the concept of feedback in amplifiers and the oscillator circuits, students will also have an understanding of operational amplifiers and their applications.*	*Unit I: Semiconductor Diodes* *Unit II: Two-terminal Devices and their Applications* *Unit III: Bipolar Junction Transistors* *Unit IV: Amplifiers* *Unit V: Coupled Amplifier* *Unit VI: Feedback in Amplifiers* *Unit VII: Sinusoidal Oscillators* *Unit VIII: Operational Amplifiers (Black Box approach)* *Unit IX: Applications of Op-Amps* *Unit X: Convversion* *Lab*	Remember, Understand, Apply, Analyse, Evaluate
15	IV	PHY-HG-4016 (PHY-RC-4016) Waves & Optics	*Upon completion of this course, students are expected to understand Simple harmonic oscillation and superposition principle, importance of classical wave equation in transverse and longitudinal waves and solving a range of physical systems on its basis, concept of normal modes in transverse and longitudinal waves: their frequencies and configurations, interference as superposition of waves from coherent sources derived from same parent source, In the laboratory course, student will gain hands-on experience of using various optical instruments.*	*Unit I: Superposition of Two Collinear Harmonic Oscillations* *Unit II: Superposition of Two Perpendicular Harmonic Oscillations* *Unit III: Waves Motion* *Unit IV: Fluids* *Unit V : Sound* *Unit VI : Wave Optics* *Unit VII : Interference* *Unit VIII : Michelson Interferometer* *Unit IX : Diffraction* *Unit X : Polarization* Lab	Remember, Understand, Apply, Analyse, Evaluate, Create

16	IV	PHY-SE-4024 Research & Technical Writing	*On successful completion of the course students will be able to identify and write different parts of technical reports, write article, thesis, and presentation in latex, create chart in Microsoft excel, use different format of chart based on need, plot data from different sources using Origin plot.*	*Introduction* *Unit II: Technical Writing in LaTex* *Unit III: Scientific graphing and data analysis* Lab	Remember, Understand, Apply, Analyse, Evaluate, Create
17	V	PHY-HC-5016 Quantum Mechanics & Applications	*On successful completion of the course students will be able to understand the principles in quantum mechanics, such as the Schrödinger equation, the wave function, the uncertainty principle, stationary and non-stationary states, time evolution of solutions, as well as the relation between quantum mechanics and linear algebra. Students will be able to solve the Schrödinger equation for hydrogen atom. Students will have the concepts of angular momentum and spin, as well as the rules for quantization and addition of these, spin-orbit coupling and Zeeman Effect.*	*Unit I: Time Dependent Schrödinger Equation* *Unit II: Time Independent Schrödinger Equation* *Unit III: Bound States* *Unit IV: Hydrogen-like Atoms* *Unit V: Atoms in Electric & Magnetic Fields* *Unit VI: Many Electron Atom* Lab	Remember, Understand, Apply, Analyse, Evaluate
18	V	PHY-HC-5026 Solid State Physics	*On successful completion of the course students should be able to explain the main features of crystal lattices and phonons, understand the elementary lattice dynamics and its influence on the properties of materials, describe the main features of the physics of electrons in solids; explain the dielectric ferroelectric and magnetic properties of solids and understand the basic concept in superconductivity*	*Unit I: Crystal Structure* *Unit II: Elementary Lattice Dynamics* *Unit III: Magnetic Properties of Matter* *Unit IV: Dielectric Properties* *Unit V: Ferroelectric Properties* *Unit VI: Free Electron Theory of Metals* *Unit VII: Superconductivity* Lab	Remember, Understand, Apply, Analyse, Evaluate

19	V	PHY-HE-5046 Physics of Devices and Instruments	*Upon completion of this course, students will be able to gain knowledge on advanced electronics devices such as UJT, JFET, MOSFET, CMOS etc., detailed process of IC fabrication, Digital Data serial and parallel Communication Standards along with the understanding of communication systems.*	*Unit I: Devices* *Unit II: Power supply and Filters* *Unit III: Active and Passive Filters* *Unit IV: Multivibrators* *Unit V: Phase Locked Loop(PLL)* *Unit VI: Processing of Devices* *Unit VII: Digital Data Communication Standards* *Unit VIII: Introduction to communication systems* Lab	Remember, Understand, Apply, Analyse, Evaluate Create
20	V	PHY-HE-5056 Nuclear and Particle Physics	*Upon completion of this course, students will have the understanding of the sub atomic particles and their properties. They will gain knowledge about the different nuclear techniques and their applications in different branches of Physics and societal application. The course will develop problem based skills and the acquire knowledge can be applied in the areas of nuclear, medical, archeology, geology and other interdisciplinary fields of Physics and Chemistry.*	*Unit I: General Properties of Nuclei* *Unit II: Nuclear Models* *Unit III: Radioactivity decay* *Unit IV: Nuclear Reactions* *Unit V: Interaction of Nuclear Radiation with matter* *Unit VI: Detector for Nuclear Radiations* *Unit VII: Particle Accelerators* *Unit VIII: Particle physics*	Remember, Understand, Apply, Analyse, Evaluate

21	VI	PHY-HC-6016 Electromagnetic Theory	*On successful completion of the course students will acquire the concepts of Maxwell's equations, propagation of electromagnetic (EM) waves in different homogeneous-isotropic as well as anisotropic unbounded and bounded media, production and detection of different types of polarized EM waves, general information as waveguides and fibre optics.*	*Unit I: Maxwell Equations* *Unit II: EM Wave Propagation in Unbounded Media* *Unit III: EM Wave in Bounded Media* *Unit IV: Polarization of Electromagnetic Waves* *Unit V: Rotatory Polarization* *Unit VI: Optical Fibres* Lab	Remember, Understand, Apply, Analyse, Evaluate
22	VI	PHY-HC-6026 Statistical Mechanics	*On successful completion of the course students will be learn the techniques of Statistical Mechanics to apply in various fields including Astrophysics, Semiconductors, Plasma Physics, Bio-Physics, Chemistry and in many other directions.*	*Unit I: Classical Statistics* *Unit II: Classical Theory of Radiation.* *Unit III: Quantum Theory of Radiation* *Unit IV: Bose-Einstein Statistics* *Unit V: Fermi-Dirac Statistics* Lab	Remember, Understand, Apply, Analyse, Evaluate

23	VI	PHY-HE-6046 Astronomy and Astrophysics	*Upon completion of this course, students will be able to understanding the origin and evolution of the Universe. The course will give a comprehensive introduction on the measurement of basic astronomical parameters such as astronomical scales, luminosity and astronomical quantities. It will give an overview on key developments in o servational astrophysics. Students will have the idea of the instruments implemented for astronomical observation, the formation of planetary system and its evolution with time, the physical properties of Sun and the components of the solar system; and stellar and interstellar components of our Milky Way galaxy. Students will have the understanding of the origin and evolution of galaxies, presence of dark matter and large scale structures of the Universe.*	*Unit I: Stellar properties* *Unit II: The Sun and the solar system* *Unit III: Positional Astronomy* *Unit IV: Astronomical Techniques* *Unit V: Galaxies* *Unit VI: Large Scale Structure and Cosmology*	Remember, Understand, Apply, Analyse, Evaluate
24	VI	PHY-HE-6056 PHYSICS-DSE: CLASSICAL DYNAMICS	*Upon completion of this course, students will have the overview of Newton's Laws of Motion, Special Theory of Relativity by 4-vectoer approach and fluids. Students will also have the understanding of the Lagrangian and Hamiltonian of a system.. By the end of this course, students will be able to solve the seen or unseen problems/numericals in classical mechanics*	*Unit I: Classical Mechanics of Point Particles* *Unit II: Small Amplitude Oscillations* *Unit III: Special Theory of Relativity* *Unit IV: Fluid Dynamics*	Remember, Understand, Apply, Analyse, Evaluate