BSc Physics

Programme Specific Outcomes

After the completion of the programme, a student will be able to:

1. Gain knowledge and understanding of various mathematical techniques used in physics such as the Frobenius method, Fourier series, solutions of different types of differential equations, the use of complex functions, integral transforms, curve fitting, and least square fit as well as C/C++ computational techniques and Python programming for solving various theoretical problems.

2. Acquire the ability to understand the properties of matter, viz., elasticity, surface tension and viscosity as well as the theory of relativity.

3. Understand waves and oscillation and gain knowledge of various wave phenomena related to optics like interference, diffraction, and holography and use them to determine wavelengths of light from multiple sources.

4. Understand electricity and magnetism, electromagnetic theory starting with Maxwell's equations, propagation of EM waves, polarization, waveguides, and network theorems and analyse the results experimentally.

5. Gain knowledge of thermal physics covering the basic laws of thermodynamics, entropy, kinetic theory of gases, and real gases and evaluateexperimental outcomes to measure thermal conductivity of good and bad conductors.

6. Understand various digital circuits starting with CRO, integrated circuits, Boolean algebra and their applications in timers, flip-flops, counters,shift registers, and microprocessors.

7. Gain familiarity with concepts of modern physics, viz., Planck's quantum theory, Heisenberg uncertainty principle, and Eigen value problems in confined particles; then move forward to Schrodinger equations, bound states and ideas of atomic physics.

8. Understand analog systems with diodes, transistors, amplifiers, and OPAMP and their various day-to-day applications.

9. Acquire knowledge and understanding of crystal structures, magnetic properties, dielectric properties, superconductivity, and

hysteresis loop of ferro-magnets and experimentally find dielectric constants and magnetic susceptibility.

10. Understand the concepts of both classical and quantum statistical physics and analyze large samples of data both theoretically and using computational techniques.

11. Gain knowledge of classical dynamics, fluid dynamics, nuclear physics, radioactive decay, particle physics, and astrophysics along with detailed information regarding our universe and planetary systems as well as numerous experimental techniques.

12. Understand the basic instrumental skills and their usages through practice.

13. Build a strong basis for pursuing various career options.

Course Outcomes

SL. NO.	SEMESTER	PAPER CODE & TITLE	COURSE OUTCOMES	UNIT /CHAPTER	BLOOM'S TAXONOMIC LEVELS
1.	I	PHY-HC-1016 Mathematical Physics I	Students should be able to understand the different types of mathematical tools: Vector calculus, Differential equations, orthogonal curvilinear coordinate, Dirac Delta function, Probability Theory of errors and their use in solving problems in various physical fields.	UnitI: Vector Calculus	Remember, Understand, Apply, Analyse , Evaluate
				Unit II: First and Secondorder Differential Equations	Remember, Understand, Apply, Analyse, Evaluate
				Unit III: Orthogonal Curvilinear Coordinates	Remember, Understand, Apply, Analyse, Evaluate, Create
				Unit IV: Dirac Deltafunction and its Properties	Remember, Understand, Apply, Analyse, Evaluate
				Unit V: Introduction to Probability	Remember, Understand, Apply, Analyse, Evaluate

					UnitVI:Theory of Errors	Remember, Understand, Apply,Analyse, Evaluate
2	I	PHY-HC-1026 Mechanics	Students completing the coursewillgain knowledge on Fundamentals of Dynamics, principles of work and energy, collisions, rotational dynamics, elasticity, fluid motion,gravitational and central force motion, oscillations as well as understand Non Inertial Systems and Special theory of relativity.		UnitI: Fundamentals ofDynamics	Remember, Understand, Apply, Evaluate
					UnitII: WorkandEnergy	Remember, Understand, Apply, Analyse, Evaluate
					UnitIII:Collisions	Remember,Understand,Apply, Evaluate
					UnitIV:RotationalDynamics	Remember, Understand, Apply, Analyse, Evaluate
					UnitV:Elasticity	Remember, Understand, Apply
					UnitVI:FluidMotion	Remember , Understand,Apply
					UnitVII:Gravitation and CentralForceMotion	Remember, Understand, apply, Analyse, evaluate
					UnitVIII:Oscillations	Remember, understand, apply
					UnitIX:Non-InertialSystems	Remember, Understand, Apply, Analyse
					UnitX:Special TheoryofRelativity	Remember, Understand, Apply
3	II	PHY-HC-2016 Electricity & Magnetism	Oncompletionofthiscourse,students willbeab letounderstandelectricandmagn eticfields in matter, propertiesofmatter,magneticprop ertiesofm		UnitI:ElectricField and ElectricPotential	Remember, Understand, Apply,Analyse, Evaluate

					atter,electromagneticinduction, applicationsofKirchhoff'slawind ifferentcircui ts,applicationsofnetworktheore mincircuits		
					UnitII:DielectricPro pertiesof Matter	Remember, Understand, Apply, Analyse, Evaluate, Create
					UnitIII:MagneticFiel d	Remember, Understand, Apply,Analyse, Evaluate
					Unit IV: Magnetic PropertiesofMatt er	Remember, Understand, Apply, Analyse, Evaluate
					Unit V: Electromagn eticInduction	Remember, Understand, Apply, Analyse, Evaluate
					UnitVI:ElectricalCirc uits	Remember,Understand, Apply, Analyse,Evaluate, Create
					UnitVII:NetworkTh eorems	Remember,Understand, Apply, Analyse,Evaluate, Create
					UnitVIII:BallisticG alvanometer	Remember,Understand, Apply, Evaluate
4	II	PHY-HC-2026 Waves and Optics	Thecourse enablestudentstounderstandsup erpositionof harmonicoscillations,differentty pesofwave motions,superpositionofharmoni cwaves,int erferenceandinterferometer,diffr action,holo -graphy	Unit I:SuperpositionofC ollinear HarmonicOscillati ons	Remember,Understand, Apply,Analyse
					UnitII:Superposition ofTwo Perpendicular HarmonicOscillatio ns	Remember,Understand, Apply,Analyse,Evaluate

				UnitIII:WaveMotion	Remember,Understand, Apply,Analyse,Evaluate
				UnitIV: VelocityofWaves	Remember,Understand, Apply, Analyse
				Unit V: Superposition of TwoHarmonicWaves	Remember,Understand, Apply,Analyse,Evaluate
				UnitVI:WaveOptics	Understand, Apply, Analyse,Evaluate
				UnitVII:Interference	Understand, Apply,Analyse,Evaluate
				UnitVIII:Interferometer	Remember,Understand, Apply,Analyse,Evaluate
				Unit IX: Diffraction	Understand, Apply,Analyse,Evaluate
5	III	PHY-HC-3016	Aftersuccessfulcompletionofthe course,stud entswillbeabletosolve differential equation	UnitI:Frobenius Method andSpeci al	Remember, Understand, Apply, Analyse, Evaluate Apply,Analyse,Evaluate
		Mathematical PhysicsII	usingpowerseriessolutionmetho d.Thecoursewill enablestudentstounderstanddiff erentprope rtiesofmatrix.	Functions	
				UnitII:PartialDiffere ntial Equations	Remember,Understand, Apply,Analyse,Evaluate
				UnitIII:SomeSpecial Integrals	Remember,Understand, Apply, Analyse,Evaluate
				UnitIV:Matrix	Remember,Understand, Apply, Analyse,Evaluate, Create
				UnitV:FourierSeries	Remember,Understand, Apply, Analyse,Evaluate

6	III	PHY-HC-3026 Thermal Physics	Students will have the knowledgeand skills toidentify and describethe statistical nature ofconceptsand laws in thermodynamics, inparticular:entropy,temperature,thermody namicpotentials,Freeenergies, Maxwell'srela tionsinthermo-dynamics,behaviourofreal gases.	UnitI:ZerothandFirs tL awof Thermodynamics	Remember,Understand, Apply
				UnitII:SecondLa wof Thermodynamic s	Remember,Understand, Apply,Evaluate
				UnitIII:Entropy	Remember,Understand, Apply, Analyse,Evaluate
				UnitIV:Thermodyn amic Potentials	Remember,understand,apply,evaluate
				UnitV:Maxwell's Thermodyna mic relations	Remember,Understand, Apply,Evaluate
				UnitVI:Distribution of Velocities	Understand, Apply,Evaluate
				UnitVII:MolecularC ollisions	Remember,Understand, Apply,Evaluate
				UnitVIII:RealGases	Remember,Understand, Apply,Evaluate
7	III	PHY-HC-3036	Aftersuccessfulcompletionofth e	UnitI:IntroductiontoC R	Remember, Understand, Apply,
		Digital Systems & Applications	coursestudentwillbeableto understandtheworkingprincipl e and application of CRO,Integrated circuits, develop a digitallogicandapplyittosolve	O	Analyse..
				UnitII:IntegratedCir cuits	Remember&Understand.
				UnitIII:DigitalCircuit s	Understand,Apply,Analyse.

					UnitIV: BooleanAlgebra	Remember, Understand, Apply, Analyse, Evaluate
				reallife problems, Analyse, Design andimplement combinational Logic circuits, Classifydifferentsemiconductor memories,Analyse,designand implementsequentiallogiccircuits.Alsostud entswillbeableto analyze digital system designusing PLD, Simulate and implementcombinational and sequentialcircuits.	UnitV:DataProcessingCircuits	Understand&Apply.
					UnitVI:ArithmeticCircuits	Understand,Apply,Analyse.
					UnitVII:SequentialCircuits	Understand,Apply,Analyse.
					Unit VIII: Timers-IC555	Understand&Apply.
					UnitIX:ShiftRegisters	Understand,Apply,Analyse.
					Unit X:Counters(4 bits)	Understand&Apply.
					UnitXI:ComputerOrganization	Remember,Apply,Analyse.
					Unit XII:Intel 8085Microproces sorArchitecture	Understand,Apply,Analyse.
					Unit XIII: Introduction toAssembly Language	Remember, Understand,Apply.
8	III		PHY-SE-3014 Physics Workshop Skills	The aim of this course is to enable the students to familiarize and experiment with various	Unit I: Introduction	Remember, Understand
					Unit II: Mechanical Skill	Remember, Understand, Apply &Analyse.

				Unit III : Electrical and Electronic Skill	Remember, Understand, Apply &Analyse.
			mechanical and electrical tools through hands-on mode.	Unit IV: Introduction to prime movers	Remember, Understand, Apply, Analyse, Evaluate
9	IV	PHY-HC-4016 Mathematical PhysicsIII	Onsuccessfulcompletionofthe coursestudentswill understand and gain knowledge on complex analysis and integration using residue theorem, applications of Fourier and Laplace transforms in solving differential equations, various properties of Tensor	UnitI:ComplexAnalysis	Remember, Understand, Apply, Analyse, Evaluate
				UnitII:ComplexIntegration	Remember, Understand, Apply, Analyse, Evaluate
				UnitIII:FourierTransforms	Remember, Understand, Apply ,Analyse, Evaluate
				UnitIV:LaplaceTransforms	Remember, Understand, Apply, Analyse, Evaluate
				UnitV:TensorAlgebra	Remember, Understand, Apply, Analyse, Evaluate
10	IV	PHY-HC-4026 Elements of Modern Physics	After completionof thecourse studentswill be Schrodingerequation.Student swillalsogetideaof Structure of	UnitI:QuantumTheoryandBlackbody Radiation	Remember, Understand, Apply, Analyse, Evaluate
				UnitII:Uncertaintyan dWave-ParticleDuality	Remember, Understand, Apply, Analyse, Evaluate
				UnitIII:Schrödinger Equation	Remember, Understand, Apply, Analyse, Evaluate
				UnitIV:One-dimensionalBox andStepBarrier	Remember, Understand, Apply, Analyse, Evaluate
				UnitV:Structu reoftheAtomi cNucleus	Remember, Understand, Apply, Analyse, Evaluate Apply,Evaluate

					Unit VI:Radioactivity	Remember, Understand, Apply, Analyse, Evaluate
					UnitVII:Detection ofnuclearradiation	Remember, Understand, Apply, Analyse, Evaluate
					UnitVIII:Fissio nandFusion	Remember, Understand, Apply, Analyse, Evaluate
					UnitIX:Lasers	Remember, Understand, Apply, Analyse, Evaluate
11	IV	PHY-HC-4036 Analog Systems & Applications	On completion circuits,theconceptoffeedbac kinamplifiers andtheoscillatorcircuits		UnitI:Semiconducto rDiodes	Remember, Understand, Apply, Analyse, Evaluate
					UnitII:Two-terminalDevicesandt heirApplications	Remember,Understand,Analyse,Evaluate.
					Unit III: Bipolar JunctionTra nsistors	Understand,Apply,Analyse.
					UnitIV:Amplifiers	Remember,Understand,Apply, Analyse,Evaluate.
					UnitV:CoupledAmp lifier	Understand,Apply,Analyse.
					UnitVI:FeedbackinA mplifiers	Remember,Apply,Analyse.
					UnitVII:Sinusoidal Oscillators	Understand,Apply,Analyse.
					UnitVIII:Operational Amplifiers	Understand&Apply.
					Unit IX: Applications ofOp-Amps	Understand,Apply,Analyze, Create

				Unit X:Conversion	Remember,understand,Apply.
12	IV	PHY-SE-4014 Basic InstrumentationSkills	The aim of the course is to get exposurewith various aspects of instruments and theirusage through hands-on mode.	UnitI: Basic of Measurement	Remember, Understand, Apply,Analyse.
				UnitII: Electronic Voltmeter	Remember,Understand,Analyse, Evakuate
				Unit III: Cathode Ray oscilloscope	Understand,Apply,Analyse.
				UnitIV:Use of CRO forthe measurement of voltage	Remember,Understand,Apply, Analyse,Evaluate.
				UnitV: Signal Generators and Analysis Instruments	Understand,Apply,Analyse.
				UnitVI:Impedance Bridges & Q-Meters	Remember,Apply,Analyse.
				UnitVII: Digital Instruments	Understand,Apply,Analyse.
				UnitVIII: Digital Multimeter	Understand&Apply.
13	V	PHY-HC-5016 Quantum Mechanicsand	After completion etheSchrödingerequationforhydrogenatom	Unit I: Time DependentSchrödingerEquation	Remember,Understand,Apply,Analyse,Evaluate

228

		Applications	.Studentswillunderstandtheconceptsofang ular momentum and spin, aswell as therules quantizationandadditionofthese,spin-orbit couplingandZeeman Effect.	Unit II: Time IndependentSchrödingerEquation	Remember,Understand,Apply,Analyse,Evaluate
				UnitIII: BoundStates	Remember,Understand,Apply,Analyse,Evaluate
				UnitIV:Hydrogen-likeAtoms	Remember,Understand,Apply,Analyse,Evaluate
				UnitV:AtomsinEl ectric&MagneticFields	Remember, Understand,Apply,Analyse,Evaluate
				UnitVI:ManyElectronAtoms	Remember, Understand,Apply,Analyse,Evaluate
14	V	PHY-HC-5026 Solid State Physics	On successful completion of thecoursestudents should be ferroelectric magneticproperties ofsolidsand understandthebasi cconceptsin superconductivity.	UnitI:CrystalStructure	Remember, Understand,Apply,Analyse,Evaluate
				Unit II: Elementary LatticeDynamics	Remember, Understand,Apply,Analyse,Evaluate
				Unit III: Magnetic Properties ofMatter	Remember, Understand,Apply,Analyse,Evaluate
				Unit IV : Dielectric Properties ofMaterials	Remember, Understand,Apply,Analyse,Evaluate
				Unit V : Ferroelectric Properties of Materials	Remember, Understand,Apply,Analyse,Evaluate
				Unit VI : Free ElectronTheory of Metals	Remember, Understand,Apply,Analyse,Evaluate

					UnitVII:Superconductivity	Remember, Understand,Apply,Analyse,Evaluate
15	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	Remember,understand,apply
					Unit II: Power supplyand Filters	Remember,understand,apply,
					Unit III: Active andPassive Filters	Remember,understand, apply,analyse,evaluate, Create
					Unit IV: Multivibrators	Remember, understand, apply,analyse,evaluate
					Unit V: Phase Locked Loop(PLL)	Remember, understand, apply,analyse
					Unit VI: Processing ofDevices	Remember, understand, apply,analyse
					Unit VII: Digital Data Communication Standards	Remember, understand, apply,analyse
					Unit VIII: Introductionto communication systems	Remember,understand,apply
16	V	PHY-HE-5056 Nuclear and Particle Physics	Oncompletionofthiscourse, students will have understandingofthesubatomic particles and their properties. Theywillgainknowledgeaboutt hedifferentn ucleartechniquesandtheir		UnitI:General Pro pertiesofNucle i	Remember,understand,apply
					UnitII:NuclearModels	Remember,understand
					UnitIII:Radioactivitydecay	Remember, understand, apply,analyse,evaluate

					Unit IV: NuclearReactions	Remember, understand, apply,analyse,evaluate
				applications in different branchesofPhysicsandsocietal application.Thecoursewilldevelop problem based skills andacquiredknowledgecanbe appliedintheareasofnuclear, medical,and otherinterdisciplinary fi elds ofPhysicsandChemistry.	Unit V: Interactionof NuclearRadiation withmatter	Remember, understand, apply,analyse
					UnitVI:Detectorfo rNuclearRadiatio ns	Remember, understand, apply,analyse
					UnitVII:ParticleAccelerators	Remember, understand, apply,analyse
					UnitVIII:Particlephysics	Remember,understand
17	VI	PHY-HC-6016 Electromagnetic Theory		Onsuccessfulcompletionofth ecoursestude ntswillunderstandtheconcept sofMaxwell' sequations,propagationofelec tromagnetic (EM)wavesindifferentmedia productionan ddetectionofdifferenttypesof polarizedEM	UnitI:Maxwel lEquations	Remember, understand, Evaluate,apply
					Unit II: EM Wave PropagationinUnb oundedMedia	Remember, understand, Evaluate,apply
					Unit III: EM Wave in BoundedMedia	Remember, understand, Evaluate,apply
					Unit IV: Polarization ofElectroma gn eticWaves	Remember, understand, Evaluate,apply
					Unit V: Rotatory Polarizati on	Remember, understand, Evaluate,apply
					Unit VI: Optical Fibres	Remember, understand, apply,Create

18	VI	PHY-HC-6026 Statistical Mechanics	Onsuccessfulcompletionofthe coursestuden tswilllearnthetechniques of	UnitI:ClassicalStatistics	Remember,understand,apply
				Unit II: Classical Theory ofRadiation	Remember,understand,apply
				UnitIII:Quant umTheoryof Radiation	Remember,understand,apply
				Unit IV: Bose- EinsteinStat istics	Remember,understand,apply
19	VI	PHY-HE-6046 Astronomy and Astrophysics	Upon completion of this course, students will be able to understand 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 as well as an overview on key developments in observational 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 propertiesof Sun and the components of the solar system; and stellar	Unit I: Stellar properties	Remember, understand, apply,analyse,evaluate
				Unit II: The Sun and the solar system	Remember,understand,apply
				Unit III: Positiona l Astrono my	Remember,understand,apply, analyse
				Unit IV: Astronomi cal Techniques	Remember,understand,apply, analyse

			and interstellar components of our Milky Way galaxy. Students will also have the understanding of the origin and evolution of galaxies, presence of dark matter and large scale structures of the Universe.		