

Course Outcome (as per NEP2020)

Four Year Undergraduate program (FYUGP)

Department of Physics

Nalbari College, Nalbari

Sl. No.	Sem.	Course Name/Code	Course out comes	Unit/Chapter
1	1	Paper Name: Mathematical Physics & Mechanics Paper Code: PHY010104	(Part A: Mathematical Physics; credit: 1) This course introduces vector calculus, curvilinear coordinates and Dirac delta function. On successful completion of the course, students will be able to understand how to compute in the calculus of vectors which plays a central role in laws of physics. They will be able to apply vector calculus in curved spaces which play major role in relativity. They will also be able to learn the powerful method of computation through Dirac delta function which often appears in complex problems of physics. In general, the students will be able to apply the mathematical methods on the problems of physics and engineering.	Unit - I: Vector calculus
				Unit - II: Curvilinear coordinates
				Unit - III: Dirac delta function
			(Part B: Mechanics; credit 01) On successful completion of this course students should be able understand inertial and non-inertial reference frames, Newtonian motion, projectile motion, work and energy, elastic and inelastic collisions, motion under central force, simple harmonic oscillations. They will be able to apply foundational principles of physics in higher studies of physics, technology and engineering.	Unit – I: Reference frames
				Unit – II: Gravitation and central force motion
				Unit – III: Conservation laws
				Unit – IV: Dynamics of rigid bodies
				Unit – V: Work and energy
				Unit – VI: Oscillations
				Unit – VII: Properties of matter
(Part C; Laboratory; Credit =1) After the successful completion of this course, students will be able to determine various physical quantities of mechanics that will help them understand important principles related to the subject.	Laboratory			
2	1	Paper Name: Electronic Circuit Design Paper Code: SEC0103403	By the end of the course, students will be able to: <ul style="list-style-type: none"> • Explain structure, operation, and characteristics of electronic components 	Unit I: Analog Electronics
				Unit II: Digital Electronics

			<ul style="list-style-type: none"> • Understand number systems and logic gates • Operate combinational and sequential logic circuits • Design basic electronic circuits using analog and digital components • Apply electronic components in real-life situations 	
1	2	Paper Name: Mathematical Physics & Electricity and Magnetism Paper Code: PHY020104	After the successful completion of the course, students will be able to understand methods of solving various differential equations appearing in physics. It will give an idea of how to study evolution of a physical system. Through matrix algebra students will be able to compute various matrix operations which are required for solving physical problems. They will be able to understand electric field and magnetic fields in matter, dielectric properties of matter, magnetic properties of matter, application of Kirchhoff's law in different circuits, and application of network theorem in different circuits. The students will also get accustomed to using multimeters and potentiometers, and they will be able to determine some of the important physical quantities related to electricity and magnetism for a better understanding of the topic.	Unit - I: Differential equations Unit - II: Matrices Unit - I: Electric field and electric potential Unit - II: Dielectric properties of matter Unit - III: Magnetic field Unit - IV: Magnetic properties of matter Unit - V: Electrical circuits Laboratory
	2	Paper Name: Basic Skills on Electronic Equipments Paper Code: SEC0200903	At the end of the course, the students shall be able to identify the fault, repair & do maintenance of daily use electronic equipment's.	Unit-1: Basic Electronic Components Unit-2: Basic Electronic Circuits Unit-3: Use of Laboratory Instrument Unit-4: Soldering Technique Unit-5: Electrical Switch Board, Power Supply and PCB Laboratory
3	3	Paper Name: Wave and Optics Paper Code: PHY030104	On successful completion of the course students will: 1. understand Simple Harmonic Oscillation and superposition principle. 2. understand the classical wave	Unit I: Superposition of harmonic oscillations Unit II: Wave motion

			equation in transvers and longitudinal waves and solutions of few physical systems on its basis. 3. understand the concept of normal modes in transvers and longitudinal waves 4. understand the interference as superposition of waves from coherent sources and also understand the basic principle of Young's double slit experiment, Fresnel's Biprism, Newton's Rings, Michelson interferometer etc. 5. understand the basic concept of diffraction, Fresnel and Fraunhofer diffraction from a slit. 6. understand the concept of polarization of light, the production and detection of polarized light. 7. understand working principle of prism, biprism, spectrometer, Newton's ring apparatus, grating, CRO, sodium and mercury light sources etc.	Unit III: Velocity of waves Unit IV: Superposition of two harmonic waves Unit V: Wave optics Unit VI: Interference Unit VII: Diffraction Unit VII: Polarization (Practical)
4	3	Paper Name: Electromagnetic Theory Paper Code: PHY0300204	After the 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 of waveguides and fibre optics.	Unit - I: Maxwell's equations Unit - II: EM Wave Propagation in Unbounded Media Unit - III: EM wave in Bounded Media Unit - IV: Polarization of Electromagnetic Waves Unit - V: Rotary Polarization Unit - VI: Optical Fibres Laboratory
4	3	Paper Name: Computer Programming and Circuit Designing Paper Code: SEC0306103	On successful compilation of the course, students will be able to: ▪ Distinguish between different parts of the computer. ▪ Compile computer programme to find the solution of Scientific problem. ▪ Identify and use the different components in electronics/electrical circuit designing. ▪ Problem specific circuit designing.	Unit I. Basics of Computer Unit II. Basics of Scientific Programming Unit III. Introduction to Language C/C++/Fortran etc. Unit IV. Circuits and Devices Unit V. Introduction to Circuit Designing Software (SPICE/Multisim etc.) Laboratory
5	4	Paper Name: Classical Mechanics Paper Code: PHY040104	On successful completion of the course students will be able to apply the laws of classical dynamics to physical problems of motion of particles, systems of particles and fluids in various fields of physics and natural science as a whole. They will also get the exposure of the	Unit -I: Mechanics of point particles-the Lagrangian approach Unit-II: Mechanics of point particles – the Hamiltonian approach

			idea of how space and time play role in dynamics of matter.	Unit – III: Small oscillation Unit-IV: Special theory of relativity Unit- V: Fluid dynamics
6	4	Paper Name: Quantum mechanics I Paper Code: PHY040204	On successful completion of the course students will be able to learn physical and mathematical fundamentals of Quantum physics, and various topics in it. These concepts are used in various branches of physics, like condensed matter physics, lasers, quantum statistics, atomic and molecular physics, particle physics, astrophysics and optics etc.	Unit I : Origin of Quantum Theory Unit II: Dynamical Variables as Operators and Uncertainty Principle Unit III : Matter Wave and Wave-Particle Duality Unit IV : Schrödinger Equation and it's applications Laboratory
7	4	Paper Name: Mathematical Physics Paper Code: PHY040404	On successful completion of the course, the students will be equipped with the techniques related to solving partial differential equations using separation of variables method, application of Fourier series analysis, solving complex integrations, dealing with tensors and probability distributions which are relevant while dealing with wave mechanics, electrodynamics, quantum mechanics, theory of relativity and experimental physics.	Unit I: Partial Differential Equations Unit II: Fourier Series Unit III: Complex Analysis Unit IV: Tensor Algebra Unit V: Introduction to Probability Laboratory
8	5	Paper Name: Atomic and Molecular Physics Paper Code: PHY050104	Students will be able to describe the atomic spectra of one and two valence electron atoms and will also understand the change in behavior of atoms and corresponding modification of their spectra in external applied electric and magnetic field. They will understand the basic principle of pure rotational, vibrational, Rotation-Vibration and Raman spectra of molecules and their few applications.	Unit I: Atom Model Unit II: X-rays Unit III: Multi electron atoms Unit IV: Molecular Spectra Unit V: Raman Effect
9	5	Paper Name: Condensed Matter Physics Paper Code: PHY050204	On successful completion of the course students will be able to acquire the basic knowledge of crystal structure, bonding in solids and elementary lattice dynamics of materials, dielectric, ferroelectric and magnetic properties of solids, the physics of electrons in solids, basic idea about nanomaterials, thin film and soft matter and understand the basic concept in superconductivity.	Unit I: Crystal Structure and Bonding in solids Unit II: Elementary Lattice Dynamics Unit III: Dielectric and Ferroelectric Properties of Materials Unit IV: Transport properties of materials Unit V: Nanophysics and soft matter

				Unit VI: Magnetic Properties of Matter
				Unit VII: Superconductivity
10	5	Paper Name: Electromagnetic Theory Paper Code: PHY050404	After the 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 of waveguides and fibre optics.	Unit - I: Maxwell's equations
				Unit - II: EM Wave Propagation in Unbounded Media
				Unit - III: EM wave in Bounded Media
				Unit - IV: Polarization of Electromagnetic Waves
				Unit - V: Rotary Polarization
				Unit - VI: Optical Fibres
				Laboratory
11	5	Paper Name: Heat & Thermodynamics Paper Code: PHY050304	Upon completion of this course, students will be able to learn thermal properties of gas molecules and their collisions. With this course, students will acquire knowledge of thermodynamics with practical insights into thermal physics, which will help them to understand real world situations.	Unit I: Distribution of Velocities and Molecular Collisions
				Unit II: Real Gases
				Unit III: Principles of Thermodynamics
				Unit IV: Entropy
				Unit V: Thermodynamic Potentials and Thermodynamic Relations
12	6	Paper name: nuclear & particle physics paper code: PHY060104	On successful completion of the course, the students shall be able to understand the structure and properties of a nucleus. They will also know about the properties of strong nuclear force that keeps the nuclei bound. They will learn about the radioactive decays and various laws of radioactive disintegration. Students will have adequate knowledge on the construction and working principles of particle accelerators and detectors. Moreover, students will be introduced to the world of particle physics – types and interactions. The acquired knowledge can be applied in the areas of nuclear medicine, medical physics, archaeology, geology and other interdisciplinary fields of Physics and Chemistry. It will enhance the special skills required for these fields	Unit – I: Basic Properties of Nuclei
				Unit – II: Radioactivity and Radioactive Laws
				Unit III: Nuclear Instrumentation
				Unit IV: Fission and Fusion
				Unit V: Elementary Particles
13	6		Upon completion of the course, students will get accustomed to the microscopic	Unit I: Classical Statistics

		Paper name: Statistical Mechanics paper code: PHY060404	origin of thermodynamic processes. After successful completion of the course, students will be able to perceive classical and quantum pictures of physical and chemical events.	Unit II: Classical and Quantum Theory of Radiation Unit III: Bose-Einstein Statistics Unit IV: Fermi-Dirac Statistics
14	6	Paper name: Digital Electronics paper code: PHY060204	After successful completion of the course student will be able to develop, implement and analyze digital logic circuits and apply them to solve real-life problems and classify different semiconductor memories.	Unit I: Integrated Circuits (qualitative treatment only) Unit II: Digital Circuits Unit III: Boolean Algebra Unit IV: Arithmetic Circuits Unit V: Timers: IC 555 Unit VI: Sequential Circuits Unit VII: Shift Registers Unit VIII: Computer Organization
15	6	Paper name: Astronomy & Astrophysics paper code: PHY060304	On successful completion of this course students will be able to understand the fundamental concepts in astronomy. They will be able to apply physics of celestial objects in understanding the universe. They will be equipped with the skills required for (i) observational astronomy (ii) virtual observatory tools and (iii) physical concepts of recent frontiers in astrophysics	Unit –I: Fundamentals of astronomy Unit- II : Astronomical techniques Unit – III: Stellar astrophysics Unit-IV: The solar system Unit- V : Galaxies and cosmology