B.Sc HONOURS PHYSICS

Paper	Paper Name	Outcomes After completion of the course the student should be able to
SEMESTER I		
COURSE 1	ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES	**CO 1 :**Apply critical thinking skills to solve complex problems involving complex numbers, trigonometric ratios, vectors, and statistical measures. **CO 2 :** To Explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to Connect their knowledge of physics to everyday situations **CO 3 :** To Explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to Connect their knowledge of physics to daily life. **CO 4 :**Understand the interplay and connections between mathematics, physics, and chemistry in various applications. Recognize how mathematical models and physical and chemical principles can be used to explain and predict phenomena in different contexts. **CO 5 :** To explore the history and evolution of the Internet and to gain an understanding of network security concepts, including threats, vulnerabilities, and countermeasures.

COURSE 2	ADVANCES IN MATHEMATICAL, PHYSICALAND CHEMICAL SCIENCES	**CO 1 :**Explore the applications of mathematics in various fields of physics and chemistry, to understand how mathematical concepts are used to model and solve real-world problems. **CO 2 :**To Explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to Connect their knowledge of physics to everyday situations. 3. Understand the different sources of renewable energy and their generation processes and advances in nanomaterials and their properties, with a focus on quantum dots. To study the emerging field of quantum communication and its potential applications. To gain an understanding of the principles of biophysics in studying biological systems. Explore the properties and applications of shape memory materials. **CO 3 :** Understand the interplay and connections between mathematics, physics, and chemistry in various advanced applications. Recognize how mathematical models and physical and chemical principles can be used to explain and predict phenomena in different contexts.
		CO 4 : Understand and convert between different number systems, such as binary, octal, decimal, and hexadecimal. Differentiate between analog and digital signals and understand their characteristics. Gain knowledge of different types of transmission media, such as wired (e.g., copper cables, fiber optics) and wireless (e.g., radio waves, microwave, satellite).
SEMESTER II		

COURSE 3	Mechanics &properties of matter	CO 1 : understand and apply the concepts of scalar and vector fields, calculate the gradient of a scalar field, determine the divergence and curl of a vector field CO 2 : apply the laws of motion, solve equations of motion for variable mass systems CO 3 : define a rigid body and comprehend rotational kinematic relations, derive equations of motion for rotating bodies, analyze the precession of a top and gyroscope, understand the precession of the equinoxes CO 4 : define central forces and provide examples, understand the characteristics and conservative nature of central forces, derive equations of motion under central forces. CO 5 : differentiate between Galilean relativity and the concept of absolute frames, comprehend the postulates of the special theory of relativity, apply Lorentz transformations, understand and solve problems
	PRACTICAL Mechanics &properties of matter	**CO 1 :**. Students should become proficient in using laboratory equipment and experimental techniques to measu systems. **CO 2 :**Students should be able to apply theoretical concepts learned in lectures to real-world situations, and understand the limitations of theoretical models. lectures to real-world situations, and understand the limitations of theoretical models. **CO 3 :**Students should be able to accurately record and analyze experimental data, including understanding the significance of error analysis and statistical methods.
COURSE 4	Waves& oscillations	CO 1 : To describe the basic characteristics of waves such as frequency, wavelength, amplitude, period, and speed. CO 2 :utilize mathematical relationships related to wave characteristics. CO 3 : To compare particle motion and wave motion in different types of waves

	PRACTICAL Waves& oscillations	CO 1 : determine the unknown frequency of tuning fork by volume resonator experiment **CO 2** : determine 'g' by compound/bar pendulum **CO 3 :** Students are made to determine the force constant of a spring by static and dynamic method.
SEMESTER-lll		
COURSE 5	Optics	CO 1: Explain about the different aberrations in lenses and discuss the methods of minimizing them CO 2 : Understand the phenomenon of interference of light and its formation in (i) Lloyd's single mirror due to division of wave front and (ii) Thin films, Newton's rings and Michelson interferometer due to division of amplitude. CO 3: Distinguish between Fresnel's diffraction and Fraunhoffer diffraction and observe the diffraction patterns in the case of single slit and the diffraction grating and to describe the construction and working of zone plate and make the comparison of zone plate with convex lens CO 4: Explain the various methods of production of plane, circularly and polarized light and their detectio and the concept of optical activity
	PRACTICAL Optics	CO 1 : Students should become proficient in using laboratory equipment and experimental techniques for studying light and its interactions with matter. CO 2 :Students should be able to apply theoretical concepts learned in lectures to real-world situations, and understand the limitations of theoretical models. CO 3 : Students should be able to accurately record and analyze experimental data, including understanding the significance of error analysis and statistical methods.
COURSE 6	Heat & Thermodynamics	CO 1 :understandthebasicaspectsofkinetictheoryofgases,Max well-Boltzmann distribution law, equipartition of energies, mean free path of molecular collisions andthetransportphenomenon in ideal gases CO 2 : Gain knowledge on the basic concepts of thermodynamics, the first and the second lawof thermodynamics, the basic principles of refrigeration, the concept of entropy,

		thethermodynamicpotentials and their physical interpretations. UnderstandtheworkingofCarnot'sidealheatengine,Carnot cycleanditsefficiency CO 3 : Develop critical understanding of concept of Thermodynamic potentials,the formulation of Maxwell's equations and its applications. CO 4:Differentiatebetweenprinciplesandmethodstoproducelowtemperature, liquefy air,andunderstand thepracticalapplicationsofsubstances at lowtemperatures
	PRACTICAL Heat & Thermodynamics	CO 1 : Students should become proficient in using laboratory equipment and experimental techniques for studying heat and thermodynamics. CO 2 : Students should be able to apply theoretical concepts learned in lectures to real-world situations, and understand the limitations of theoretical models. CO 3 : Students should be able to accurately record and analyze experimental data, including understanding the significance of error analysis and statistical methods. Co 4: Students should be able to identify sources of error, troubleshoot experimental problems, and develop critical thinking skills in experimental design and analysis.
COURSE 7	Electronic devices& circuits	CO 1 :Understand the behavior of P-N junction diodes in forward and reverse bias conditions and analyze the impact of junction capacitance on diode characteristics. Co 2: Analyze and compare the characteristics and operation of different BJT configurations (CB, CE, and CC) and demonstrate proficiency in biasing techniques.

		Co 3: Comprehend the operation and characteristics of FETs, including JFETs and MOSFETs, and explain the working principles and characteristics of UJTs. Co 4: Describe the operation and applications of various photoelectric devices such as LEDs, photo diodes, phototransistors, and LDRs. Co 5: Understand the operation of rectifiers (half-wave, full-wave, and bridge), analyze the ripple factor and efficiency, and demonstrate knowledge of different filter types and three-terminal voltage regulators
	PRACTICAL Electronic devices& circuits	CO 1 : Understand the principles of electronic devices and circuits and their applications in real-world scenarios. Co 2: Analyze and design electronic circuits using diodes, transistors, and operational amplifiers. Co 3: Understand the importance of biasing and stability in electronic circuits and how to achieve them.
COURSE 8	Analog& Digital electronics	CO 1 : Understand Principles and Working of Operational Amplifier Co 2: Apply their knowledge on OP-Amp in different Applications Co 3: understand the number systems, Binary codes and Complements. Co 4: understand the Boolean algebra and simplification of Boolean expressions. Co 5: analyze logic processes and implement logical operations using combinational logic circuits.
	PRACTICAL Analog& Digital electronics	CO 1 : Understand the principles of analog and digital electronic circuits and their applications in real-world scenarios. Co 2: Analyze and design analog electronic circuits using diodes, transistors, and operational amplifiers. Co 3:Analyze and design digital electronic circuits using logic gates, flip-flops, and counters.
SEMESTER IV		

COURSE 9	Electricity & magnetism	CO 1 : Understand the Gauss law and its application to obtain electric field in different cases and formulate the relationship between electric displacement vector, electric polarization, Susceptibility, Permittivity and Dielectric constant. Co 2: learn the methods used to solve problems using loop analysis, Nodal analysis, Thvenin's theorem, Norton's theorem, and the Superposition theorem Co 3:Distinguish between the magnetic effect of electric current and electromagnetic induction and apply the related laws in appropriate circumstances.
	PRACTICAL Electricity & magnetism	CO 1 : Demonstrate a thorough understanding of the fundamental concepts and principles of electricity and magnetism. CO 2 : Apply the laws and principles of electricity and magnetism to analyze and solve electrical and magnetic problems. CO 3 : Design, construct, and test electrical circuits using various components and measuring instruments
COURSE 10	Modern physics	CO 1 : Understand the principles of atomic structure and spectroscopy. Co 2: Understand the principles of molecular structure and spectroscopy Co 3: Develop critical understanding of concept of Matter waves and Uncertainty principle. Co 4: Get familiarized with the principles of quantum mechanics and the formulation of Schrodinger wave equation and its applications. co5: Increase the awareness and appreciation of superconductors and their practical applications

	PRACTICAL Modern physics	CO 1 : Apply experimental techniques and equipment to investigate and analyze phenomena related to modern physics, such as quantum mechanics, relativity, atomic physics, and nuclear physics. Co 2:Demonstrate a deep understanding of the principles and theories of modern physics through hands-on experimentation and data analysis. Co 3: Develop proficiency in using advanced laboratory instruments and techniques specific to modern physics experiments, such as spectroscopy, interferometry, particle detectors, and radiation measurement. Co 4:Analyze and interpret experimental data using statistical methods and error analysis, drawing meaningful conclusions and relating them to theoretical concepts
COURSE 11	Introduction to Nuclear& particle physic	CO 1 : know about high energy particles and their applications which prepares them for further study and research in elcitrapphysics Co 2:Students can explain important concepts on nucleon-nucleon interaction, such as its short-range, spin dependence, isospin, and tensors. Co 3: Students can show the potential shapes from nucleon nucleon interactions. Co 4: Students can explain the single particle model, its strengths, and weaknesses Co 5: Students can explain magic numbers based on this model
	PRACTICAL Introduction to Nuclear& Particle physics	CO 1 : Gain a solid understanding of fundamental concepts in nuclear and particle physics. Co 2:Acquire knowledge of experimental techniques and methodologies used in the field. Co 3: Understand the principles and operation of laboratory equipment and instruments specific to nuclear and particle physics experiments. Co 4: Develop proficiency in conducting experiments related to nuclear and particle physics. Co 5: Acquire skills in data acquisition, analysis, and interpretation using appropriate software and techniques. Co 6: Learn to design and perform experiments, including calibration, measurement, and control of v a r i a b l e s