2019-20

COURSE/PROGRAMME
DEPARTMENT OF PHYSICS, KENDRAPARA AUTONOMOUS COLLEGE

The college offers Undergraduate Honours Course in Physics. The outcomes of this course are as follows.

Students who complete the Physics honours might come up the following knowledge and skills.

- **Core-1 Mathematical Physics** : To solve ordinary second order differential equations important in the physical sciences; solve physically relevant partial differential equations using standard methods like separation of variables, series expansion and integral transforms.

- **Core-2 Mechanics:** This course would empower the student to acquire engineering skills and practical knowledge, theoretical basis for doing experiments in related areas, which help the student in their everyday life. Students will gain basic knowledge for their higher studies.

- **Generic Elective-1 Electricity, Magnetism and EMT:** Explain various phenomenon like Ferromagnetism, ant ferromagnetism etc. Understand the relation in between Electromagnetic theory. Explain various phenomenon in light of Maxwell equations.

- **Core-3 Electricity and Magnetism:** Gain knowledge of Gauss laws and solve the electric field for various geometric objects. Enable to understand the concept of electrical conductivity and Gibbs Helmholtz equation. Enable to understand the concept of magnetic field. Thorough knowledge in the basic concept of electromagnetic induction. Able to derive the Maxwell's equation in free space and material media.

- **Core-4 Waves and Optics :** This course objective will give clear idea in geometrical optics, optical properties, optical instruments and spectroscopic applications to the students. Understand the physics behind various phenomenon in wave and optics. Understand various phenomenon and the cause or origin of them

- **Generic Elective-2 Thermal Physics and Statistical Mechanics :** Become familiar with various thermodynamic processes and work done in each of these process. Have a clear understanding about Reversible and irreversible process and also working of a Carnot engine, and knowledge of calculating change in entropy for various process. Realize the importance of Thermo dynamical functions and applications of Maxwell's relations. Familiarize in depth about statistical distribution and have basic Ideas about Maxwell-Boltzmann, Bose-Einstein and Fermi Dirac Statistics and their applications.

- **Core-5 Mathematical Physics-II :** Understand vector calculus in three dimensions and derive Gauss theorem, Stoke's theorem and Green's theorem. Derive Curvilinear coordinates and differential operators in cylindrical and spherical coordinates. Apply special function to solve integral. To understand Newtonian, Lagrangian and Hamiltonian mechanics. Compare Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac Statistics and derive it's outcomes.

- Core-6 Thermal Physics : This course is to develop a working knowledge of Thermal Physics to use this knowledge to explore various applications related to topics in material science and the physics of condensed matter.

- **Core-7 Digital System and Application :** To understand the concepts of Binary codes, concepts of Boolean algebra.. Gain knowledge about designing of arithmetic and logic circuits. To understand the operation of basic digital electronic devices. To provide strong ideas in Flip flops. Have foundation in the techniques and designing of counters, registers and converters.

- **Generic Elective-3 Electricity, Magnetism and EMT** : Explain various phenomenon like Ferromagnetism, ant ferromagnetism etc. Understand the relation in between Electromagnetic theory. Explain various phenomenon in light of maxwell equations

- **Core-8 Mathematical Physics-III** : Learn the Fourier analysis of periodic functions and their applications in physical problems such as vibrating strings etc. Learn about the special functions, such as the Hermite polynomial, the Legendre polynomial, the Bessel functions and their differential equations and their applications in various physical problems such as in quantum mechanics which they will learn in future courses in detail. Learn the beta, gamma and the error functions and their applications in doing integrations.

- **Core-9 Element of Modern Physics :** Use the principles of wave motion and superposition to explain the physics of polarisation, interference and diffraction. To understand the basics of modern optics like Fiber optics and holography. To solve problems in optics by selecting the appropriate equations and performing numerical or analytical calculations.

- **Core-10 Analog System and Application :** Understand different blocks in communication system and how noise affects communication using different parameters. Distinguish between different amplitude modulation schemes with their advantages, disadvantages and applications. Analyse generation and detection of FM signal and

comparison between amplitude and angle modulation schemes. Identify different radio receiver circuits and role of AGC. Sample analog signal and recover original.

- **Generic Elective-4 Thermal Physics and Statistical Mechanics** : Become familiar with various thermodynamic process and work done in each of these process. Have a clear understanding about Reversible and irreversible process and also working of a Carnot engine, and knowledge of calculating change in entropy for various process. Realize the importance of Thermo dynamical functions and applications of Maxwell's relations. Familiarize in depth about statistical distribution and have basic Ideas about Maxwell-Boltzmann, Bose-Einstein and Fermi Dirac Statistics and their applications.

- **Core-11 Quantum Mechanics and Application :** To become familiar with Blackbody radiation, Ultraviolet catastrophe, Photo Electric effect and Compton Effect and hence be aware how quantum theory emerged. Have gained a clear knowledge about wave properties of particles, De Broglie waves and its implications on the uncertainty principle.

- **Core-12 Solid State Physics :** The course gives an introduction to solid state physics, and will enable the student to employ classical and quantum mechanical theories needed to understand the physical properties of solids. Emphasis is put on building models able to explain several different phenomena in the solid state.

- **Discipline Specific (DSE-1) Classical Dynamics :** Define and understand basic mechanical concepts related to advanced problems involving the dynamic motion of classical mechanical systems. Describe and understand the differential equations and other advanced mathematics in the solution of the problems of mechanical systems. Describe and understand the motion of a mechanical system using Lagrange Hamilton formalism. Describe and understand the motion of the forces in non inertial systems.

- **Discipline Specific (DSE-2) Nuclear and Particle Physics :** After taking this course, students are able to determine the charge, mass of any nucleus by using various spectrograph. They are able to understand the size of nucleus and all its properties. This course has led the students to understand interaction of various types of radiation with matter which they observe in their daily life. It's easy for them now to relate the theory to practical.

- **Core-13 Electro-magnetic Theory**: To provide students with an opportunity to develop knowledge and understanding of the key principles and applications of Electromagnetic Theory, and their relevance to current developments in physics, at a level appropriate for a professional physicist.

- **Core-14 Statistical Mechanics :** After taking this course students are able to determine the probability of any type of events. They are able to interpret different types of events. Students have understood the concept of phase space and its volume. They can easily distinguish between different types of particles and statistics and can easily distribute bosons, fermions and classical particles among energy levels. After studying Fermi Dirac statistics, students have learnt to deal with many electron system in real life.

- **Discipline Specific (DSE-3) Bio Physics :** Students will demonstrate a core knowledge base in the theory and practice of modern Biophysics. Students will critically evaluate data and design experiments to test hypotheses relevant to the practice of Biophysics. Students will read and evaluate primary literature in the discipline. Students will effectively communicate scientific data and ideas, using various formats appropriate for different target audiences. Students will demonstrate awareness of ethical issues in the practice of science.