# UNDERGRADUATE PROGRAMME

# B.Sc.

## Programme Outcomes (POs)

### At the end of the completion students are able to attain the following attributes

- **Critical thinking**: Undergraduate program syllabus for different courses is designed by Board of Studies of Hemchand Yadav University, Durg. The combination of different subjects in the courses in graduation level leads to knowledge gathering of students. They develop critical thinking about the subject and are able to check the assumptions and ideas from different perspectives.

- **Effective communication:** Foundation course includes two language papers as Hindi language and English language in the undergraduate programme, which aims for development of communication skills. The students will be able to communicate with people, express ideas through books, media and technology.

- **Social interaction**: In UG programme, the courses include practical's and most of the subjects includes field excursion, and field studies, industrial visits which assist students for participative discussions and interactions with experts, professionals, industrialists, entrepreneurs, social activists etc.

- **Ethics:** College administration induce the ethical conducts to students during the entire stay of students in campus and by conducting induction program in the beginning of session and imparting code of conduct to students from time to time thus helping them to develop ethical values amongst the students.

- **Environment and Sustainability:** As per the supreme court guideline the undergraduate courses incorporate Environmental studies as a subject which imparts studies related to environmental issues and sustainability in which the students are given projects pertaining to the environmental concerns. It leads students to understand the issues of environmental contexts and sustainable development.

- **Effective Citizenship**: During the three-year UG programme, students actively participate in NCC, NSS, Red cross society activities. This participation helps them in developing effective citizenship, awareness of national issues and concerns and to be good citizens.

- **Self-directed and lifelong learning**: Students acquire various traits on completion of the course and program and develop the ability to learn by their own, consequently lifelong learning process is part of the personality.

# DEPARTMENT OF PHYSICS

## Course Outcome for B.Sc. – I

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| **B.SC. Part-1** | **Paper first: - MECHANICS AND RELATIVITY**<br><br>• Understand the motion of objects in different frame of references.<br>• Understand laws of motion, reference frames, and its applications i.e., projectile motion, simple harmonic oscillator, Rocket motion, elastic and inelastic collisions.<br>• Understand the idea of conservation of angular momentum, central forces and the effective potential.<br>• Understand the application of central force to the stability of circular orbits, Kepler's laws of planetary motion, Orbital Precession and Rutherford scattering.<br>• Understand the dynamics of rotating objects i.e., rigid bodies, angular velocity, the moment of inertia, parallel axis theorem, the inertia tensor, the motion of rigid bodies. non-inertial frames: pseudo forces, examples involving the centrifugal force and Coriolis force.<br>• Understand the basics of material properties like, elasticity, elastic constants and their relation, torsion of a cylinder, bending of a beam, cantilever, beam supported at its ends and loaded in the middle.<br>• Understand the basics of motion of fluid which includes streamlined and turbulent flows, equation of continuity, critical velocity, flow of a liquid through a capillary tube, capillaries in series and parallel, Stokes' formula. |
| **B.Sc. part-1** | **Paper second: - MATHEMATICAL METHOD**<br><br>• Learn and understand calculus. Starting with review of differentiation, exponential and logarithm functions, trigonometric functions, plotting functions, differentials and basics of integration.<br>• Understand Gaussian integrals, integration by parts, differential and integral calculus for many variables, Lagrange multipliers and Jacobins, Taylor series and their applications in physics.<br>• Understand math of complex number and application of Cauchy-Riemann Equations, Residue Theorem and Taylor Series for analytic functions.<br>• Understand basics of vector calculus.<br>• Understand divergence, gradient and curl and their physical interpretation.<br>• Understand divergence theorem, green's theorem, Stokes' theorem and appreciate its applications.<br>• Understand basics of matrices and determinants i.e., inverses, linear vector spaces, basis, basis transformations and linear operators, determinants, eigenvalues, eigenvectors, simple applications, and basics of tensors. |

| B.Sc. part-1 | PHYSICS LAB: - <br><br> • A working knowledge of fundamental physics and basic mechanics principles. <br> • The ability to identify, formulates, and solve physics problems. <br> • The ability to formulate, conduct, analyzes and interprets experiments in physics. <br> • The ability to use modern physics techniques and tools, including mathematical techniques, graphs and laboratory instrumentation. |
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# Course Outcome for B.Sc. – II

| B.Sc. part-2 | **Paper first: - OSCILLATIONS, WAVES & ACOUSTICS** <br> • Understand the concepts of mechanics, acoustics and the properties of matter. <br> • Ability to recognize and use a mathematical oscillator equation and wave equation, and derive these equations for certain systems, point out the limitations and be able to refer to very different solutions of identical oscillator equations due to different initial and boundary conditions. <br> • Understand how several waves or parts of waves interact, and be able to calculate and analyze diffraction and interference phenomena, and explain the conditions required for such phenomena to appear. <br> • Able to calculate what happens when waves move from one medium to another, and be able to explain dispersion and group and phase velocity. <br> • Use Lissajous figures to understand simple harmonic vibrations of same frequency and different frequencies. <br> • Able to solve wave equation and understand significance of transverse waves. <br> • Able to solve wave equation of a longitudinal vibration in bars free at one end and also fixed at both the ends. <br> • Obtain boundary conditions of a longitudinal vibration in bars free at one end and also fixed at both the ends. <br> • Gain knowledge on applications of transverse and longitudinal waves. <br> • Understand application of acoustics in noise and music, musical scale, sonar and ultrasonic. |
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| B.Sc. part-2 | **Paper second: - ELECTRICITY & MAGNETISM** <br> • Understand the basic concepts of electric and magnetic fields. <br> • Understand the concept of conductors, dielectrics, inductance and capacitance. <br> • Gain knowledge on the nature of magnetic materials. <br> • Understand the concept of static and time varying fields. <br> • Gain knowledge on electromagnetic induction and its applications <br> • Gain knowledge on EM waves, propagation and their properties. <br> • Ability to use Maxwell's equations in calculations featuring: both free and stationary electromagnetic waves. |

| B.Sc. part-2 | **PHYSICS LAB** |
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| | • Understand physical characteristics of SHM and obtaining solution of the oscillator using experiment. |
| | • Use both analytical mathematics and numerical methods to explore the subjects mentioned above. In particular you should be able to analyse experimental oscillator or wave phenomena, such as sound, using suitable methods. |
| | • Use Lissajous figures to understand simple harmonic vibrations of same frequency and different frequencies. |
| | • Solve wave equation and understand significance of transverse waves. |
| | • Solve wave equation of a longitudinal vibration in bars free at one end and also fixed at both the ends. |
| | • Obtain boundary conditions of a longitudinal vibration in bars free at one end and also fixed at both the ends. |
| | • Gain knowledge on applications of transverse and longitudinal waves. |

# Course Outcome for B.Sc. – III

| B.Sc. part-3 | **Paper first: - OPTICS** |
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| | • Understand phenomenon based on light and related theories . |
| | • Get skills to identify and apply formulas of optics and wave physics |
| | • Understand the event like reflection, refraction, interference, diffraction etc |
| | • Understand the applications of diffraction and polarization. |
| | • Understand the applications of interference in design and working of interferometers. |
| | • Understand the resolving power of different optical instruments. |
| | • Understand working of optical fiber and their applications in communication. |
| B.Sc. part-3 | **Paper second: -  INTRODUCTION TO QUANTUM MECHANICS** |
| | • Understand the origins of quantum mechanics |
| | • Understand and explain the differences between classical and quantum mechanics |
| | • Understand the idea of wave function |
| | • Understand the Schrodinger wave mechanics and operator formalism |
| | • Solve the Schrodinger equation for simple 1D time-independent potentials |
| | • Appreciate the importance and develop an understanding of angular momentum |
| | • Develop the idea of spin and quantum statistical mechanics |
| B.Sc. part-3 | **PHYSICS LAB** |
| | • Understand optical components and systems. |
| | • Understand, and choose, different models for light. |
| | • Ability to calculate light level and ray paths in optical systems. |
| | • Understand the operating principle of some important types of optical instruments. |