# PANCHAKOT MAHAVIDYALAYA

**Sarbari Neturia Purulia**

# PROGRAMME & COURSE OUTCOMES

# NEP

**(Session 2023-24 onwards)**

## INTRODUCTION

Undergraduate degree programmes of either 3 or 4-year duration, with multiple entry and exit points and re-entry options, with appropriate certifications such as:

UG certificate after completing 1 year (2 semesters with 40 Credits + 1 Summer course of 4 credits) of study,

- UG diploma after 2 years (4 semesters with 80 Credits + 1 Summer course of 4 credits) of study,
- Bachelor's degree after a 3-year (6 semesters with 120 credits) programme of study,
- 4-year bachelor's degree (Honours) after eight semesters (with 170 Credits) programme of study.
- 4-year bachelor's degree (Honours with Research) if the student completes a rigorous research project (of 12 Credits) in their major area(s) of study in the 8th semester.

Note: The eligibility condition of doing the UG degree (Honours with Research) is- minimum75% marks to be obtained in the first six semesters.

- The students can make an exit after securing UG Certificate/ UG Diploma and are allowed to re-enter the degree programme within three years and complete the degree programme within the stipulated maximum period of seven years.

## PROGRAMME SPECIFIC OUTCOMES

**By the end of the program B. Sc. General in Physics, the student will be able to:**

- Students should formulate, analyze and solve complex and diverse problems through analytical and computational technique
- es and apply them to other disciplines when appropriate.
- Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological challenges.
- Analyses, test, and interpret technical arguments, and form independent judgments.
- Gather and organize relevant qualitative and quantitative information such as related problems, examples, and counterexamples.
- The graduates will be able to communicate physical ideas viaextended, clear, and well-organized written presentations.
- The degree with physics will prepare students for careers in the corporate sector, techindustry, and government agencies

# COURSE OUTCOME

## Course Type: MJ-1

Semester: 1
Course Code: BPHSMJ01C
Course Title: Mechanics and Properties of Matter
(L-P-Tu): 4-2-0
Credit: 6
Practical/Theory: Combined

**Course Objective:** The objective of this course is to provide students with a comprehensive understanding of mechanics and properties of matter. Through theoretical concepts, problem-solving exercises, and practical applications, students will develop a strong foundation in Mechanics and Properties of Matter, enabling them to analyze and interpret complex physical phenomena related to motion, forces, and material behavior of real world.

**Learning Outcome:** By achieving the course objectives, students will be well-prepared to solve complex problems in classical mechanics, understand the fundamental properties of materials, and interpret various physical phenomena, providing a solid foundation for further studies in physics, engineering, and related fields.

## Course Type: MJ-2

Semester: 2
Course Code: BPHSMJ02C
Course Title: Electricity and Magnetism
(L-P-Tu): 4-2-0
Credit: 6
Practical/Theory: Combined

**Course Objective:** The objective of this course is to provide students with a comprehensive understanding of electricity and magnetism, covering vector integration, electric fields, electric potential, dielectric properties of matter, magnetic fields, magnetic properties of matter, electromagnetic induction, and electrical circuits. Through theoretical concepts, practical experiments, and problem-solving exercises, students will develop a strong foundation in the fundamental principles of electricity and magnetism. The course aims to equip students with the knowledge and skills necessary to analyze, predict, and apply electromagnetic phenomena in various engineering, scientific, and technological contexts of their surroundings.

**Learning Outcome:** On completion of the course, the student should have the following learning outcomes defined in terms of knowledge, skills and general competence: Knowledge: The student has acquired detailed knowledge of electromagnetism (electric and magnetic force and field, induction) and preliminary knowledge of electromagnetic waves. Skills: The student can solve problems with moderate mathematical complexity related to electric and magnetic force and field, electric charge, electric potential, current, voltage and resistance, capacitors. They will be expert in application of Gauss law, Faradays law, Lenz law. General competence: Enhanced ability to handle force at a distance phenomenon.

## Course Type: MJ-3

Semester: 3
Course Code: BPHSMJ03C
Course Title: Waves and Optics
(L-P-Tu): 4-2-0
Credit: 6
Practical/Theory: Combined

**Course Objective:** This course aims to provide students with a comprehensive understanding of wave motion, oscillatory phenomena, as well as the principles of optics. Students will learn about the properties of waves, wave equations, and superposition. They will study harmonic oscillations, resonance, and wave interference. The course

will cover topics such as light propagation, reflection, refraction, and diffraction. By the end of the course, students will be able to analyze wave and oscillatory behavior, comprehend optical principles, and apply their knowledge to real-world applications.

**Learning Outcome:** By the end of this course, students will: a. Analyze wave properties and wave interference accurately. b. Understand harmonic oscillations, resonance, and wave superposition effectively. c. Apply optics principles to analyze light propagation, reflection, refraction, and diffraction. d. Design and optimize optical systems for specific applications. e. Proficiently use mathematical tools to solve complex wave and oscillation problems. f. Demonstrate practical expertise in conducting precise wave and optics experiments. g. Critically evaluate scientific literature in wave and optics. h. Appreciate the significance of wave and optics in modern science and technology. Overall, this course will provide students with a high level of competency in wave and optics, equipping them with the skills to analyze, predict, and apply wave and optical principles to solve complex problems and contribute effectively in scientific and technological endeavors.

**Course Type: MJ-4**

Semester: 4
Course Code: BPHSMJ04C
Course Title: Thermal Physics
(L-P-Tu): 4-2-0
Credit: 6
Practical/Theory: Combined

**Course Objective:** This course aims to provide students with a comprehensive understanding of the principles and concepts of thermal physics. Students will learn about thermodynamic laws, temperature, heat, and work. They will analyze the behavior of gases, phase transitions, and thermal properties of materials. The course will cover topics such as heat conduction in material, heat engines, entropy, and the kinetic theory of gases. Students will apply these principles to solve practical problems in engineering and everyday life. By the end of the course, students will be equipped to analyze and interpret thermal phenomena and appreciate their relevance in various scientific and technological applications.

**Learning Outcome:** By the end of this course, students will: a. Demonstrate a comprehensive understanding of the fundamental principles of thermal physics, including thermodynamic laws and heat transfer mechanisms. b. Analyze and predict the behavior of gases, liquids, and solids under varying temperature and pressure conditions. c. Comprehend the concepts of heat engines, refrigerators, and their practical applications in engineering and technology. d. Apply statistical mechanics and the kinetic theory of gases to interpret the macroscopic properties of matter at the molecular level. e. Evaluate and solve complex problems related to heat conduction, convection, and radiation in various physical scenarios. f. Develop practical skills in conducting thermal experiments and data analysis, reinforcing theoretical concepts and enhancing problem-solving abilities. g. Recognize the significance of thermal physics in various disciplines and its relevance to real-world applications in energy, environment, and technology.

**Course Type: MJ-5**

Semester: 4
Course Code: BPHSMJ05C
Course Title: Electronics-I
(L-P-Tu): 4-2-0
Credit: 6
Practical/Theory: Combined

**Course Objective:** This course will enable students to • Learn basic semiconductor physics and two terminal devices and its application. • Understand construction and characteristics of JFETs and MOSFETs and differentiate with BJT. • Demonstrate and Analyze Operational Amplifier circuits and their applications • Describe, Illustrate and Analyze Combinational Logic circuits, Simplification of Algebraic Equations using Karnaugh Maps and Quine McClusky Techniques. • Describe and Design Decoders, Encoders, Digital multiplexers, Adders and Subtractors, Binary comparators, Latches and Master-Slave Flip-Flops.

**Learning Outcome:** Upon completion of the Course, the students will be able to: a. Know the characteristics and utilization of various electronics components. b. Design and analyze electronic circuits for real world applications. In addition, students will also be able to design, analyze, and implement digital circuits. They will understand logic gates, Boolean algebra, and combinational and sequential circuits, gaining practical skills in building digital systems for various applications.

**Course Type: MJ-6**

Semester: 5
Course Code: BPHSMJ06C
Course Title: Electronics-I
(L-P-Tu): 4-2-0
Credit: 6
Practical/Theory: Combined

**Course Objective:** This course will enable students to • Learn basic semiconductor physics and two terminal devices and its application. • Understand construction and characteristics of JFETs and MOSFETs and differentiate with BJT. • Demonstrate and Analyze Operational Amplifier circuits and their applications • Describe, Illustrate and Analyze Combinational Logic circuits, Simplification of Algebraic Equations using Karnaugh Maps and Quine McClusky Techniques. • Describe and Design Decoders, Encoders, Digital multiplexers, Adders and Subtractors, Binary comparators, Latches and Master-Slave Flip-Flops.

**Learning Outcome:** Upon completion of the Course, the students will be able to: a. Know the characteristics and utilization of various electronics components. b. Design and analyze electronic circuits for real world applications. In addition, students will also be able to design, analyze, and implement digital circuits. They will understand logic gates, Boolean algebra, and combinational and sequential circuits, gaining practical skills in building digital systems for various applications.

**Course Type: ME-1**

Semester: 1
Course Code: BPHSMEA11C
Course Title: Mechanics
(L-P-Tu): 3-1-0
Credit: 4
Practical/Theory: Combined

**Course Objective:** This course aims to provide undergraduate students with a comprehensive understanding of classical (Newtonian) mechanics. Students will learn about the principles of motion, forces, and energy, applying Newton's laws to analyze particle and rigid body dynamics. They will comprehend the concepts of work, energy, momentum, and rotational motion, gaining practical problem-solving skills. The course will also cover topics like gravitation, oscillatory motion, and Elastic properties of material. By the end of the course, students will be equipped to analyze real-world physical phenomena, lay a strong foundation for further studies, and appreciate the role of mechanics in diverse fields like engineering, physics, and astronomy.

**Learning Outcome:** By the end of this course, undergrad students will: a. Demonstrate a solid understanding of classical mechanics principles, including motion, forces, and energy, and apply Newton's laws to analyze dynamic systems. b. Develop problem-solving skills in various mechanical scenarios, enhancing their critical thinking and analytical abilities. c. Gain practical knowledge of work, energy, momentum, and rotational motion, and apply them to real-world applications. d. Analyze complex physical phenomena, such as elastic properties of material and harmonic motion, using learned principles and mathematical tools. e. Lay a strong foundation for further studies in engineering, physics, and related disciplines, and appreciate the role of mechanics in understanding the natural world.

**Course Type: ME-2**

Semester: 2
Course Code: BPHSMEA24C
Course Title: Electricity and Magnetism
(L-P-Tu): 3-1-0

Credit: 4
Practical/Theory: Combined

**Course Objective:** The objective of this course is to familiarize undergraduate students with the principles of electricity and magnetism, providing a comprehensive understanding of their correlation. Students will learn about electric and magnetic fields, Gauss's Law, Ampere's Circuital Law, and Faraday's Law. Through theoretical concepts and practical applications, students will develop problem-solving skills and gain proficiency in analyzing electrical and magnetic phenomena. They will apply mathematical tools to solve complex electromagnetic problems, enhancing their quantitative abilities. By the end of the course, students will be equipped to comprehend and apply electromagnetism in various engineering, physics, and technological contexts, preparing them for advanced studies and careers in related fields.

**Learning Outcome:** By the end of this course, undergrad students will: a. Demonstrate a comprehensive understanding of electricity and magnetism principles, including electric and magnetic fields, Gauss's Law, Ampere's Circuital Law, and Faraday's Law. b. Develop problem-solving skills and apply mathematical tools to analyze and predict electrical and magnetic phenomena in various scenarios. c. Gain practical experience through laboratory experiments, enhancing their ability to conduct and interpret electrical and magnetic measurements. d. Apply electromagnetism knowledge to engineering, physics, and technological applications, fostering critical thinking and analytical abilities. e. Be prepared for advanced studies and careers in industry, physics, and related fields, equipped with a strong foundation in electromagnetism.

**Course Type: MDC-3**
Semester: 3
Course Code: BMDCPHY03T
Course Title: Physical Sciences
(L-P-Tu): 3-0-0
Credit: 3
Practical/Theory: Theory

**Course Objective:** The objective of this course is to provide beginners with a fundamental understanding of essential physics concepts. Students will explore topics in mechanics, electromagnetism, thermodynamics, and optics. Through engaging lectures, interactive demonstrations, and practical examples, students will develop a strong foundation in physics principles, enabling them to comprehend the natural world and apply their knowledge in various everyday scenarios.

**Learning Outcome:** By the end of this course, students will have a strong foundation in essential physics concepts. They will be able to analyze and solve simple physics problems, comprehend the natural phenomena around them, and understand the applications of physics in everyday life. This course will serve as a stepping stone for students interested in pursuing further studies in physics, engineering, or related scientific fields.

**Course Type: SEC-1**
Semester: 3
Course Code: BPHSSEC01C
Course Title: Electrical Circuits and Network Skills
(L-P-Tu): 2-1-0
Credit: 3
Practical/Theory: Combined

**Course Objective:** The objective of this course is to help the student to diagnose the electrical and electronic circuit problem.

**Learning Outcome:** Upon completion of the course, students will 1. develop an understanding of the fundamental laws and elements of electrical circuits. 2. learn the energy properties of electric elements and the techniques to measure voltage and current. 3. develop the ability to apply circuit analysis to DC and AC circuits.