Department of Physics

Nabajyoti College, Kalgachia

A report on

Program Outcome (PO)

Program Specific Outcome (PSO)

Course Outcome (CO)

Programmes Offered:

B. Sc in Physics: The Department of **Physics** offers a three-year Bachelor in Physics Program (both Honours and Regular) comprising six semesters under Gauhati University affiliation. For evaluation and grading, the Choice Based Credit System (CBCS) is used as prescribed by the Gauhai University is adopted.

Programme Outcome (PO): Bachelor in Physics

Program Outcome:

Program	Outcome
B.Sc (Major/Honours) in Physics	After completion of the three-year Bachelor program in Physics (B.Sc in Physics) the students will able to: 1. Acquire knowledge and understand the major concepts in all of the prescribed courses in Physics. 2. Solve problems in different branches of physics by acquiring theoretical and practical knowledge of the respective branches. 3. Know the importance of physics in our lives and apply their scientific knowledge to design, study, analyze, and record the results of Physics experiments. 4. Enter the different fields of physics for higher study by considering their choices and interests. 5. Create awareness about the importance and impact of Physics in society and develop scientific attitudes among the non-scientific community. 6. To inculcate the scientific temperament in the students to combat harmful and destructive social evils. 7. Built the spirit of innovation for future research works.
B.Sc (Regular) in Physics	After completion of the three-year Bachelor program in Physics (B.Sc in Physics) the students will able to: 1. Acquire knowledge and understand the fundamental concepts of Physics. 2. Solve physics problems of different branches in physics. 3. Create awareness about the importance and impact of Physics in society and develop scientific attitudes among the non-scientific community. 4. To inculcate the scientific temperament in the students to combat harmful and destructive social evils. 5. Built the spirit of innovation for future research works.

Program Specific Outcome (PSO)

Major/Honours in Physics	
Semester	Outcome
Semester-I	After successful completion of the program students will be able to: 8. Develop the ability of a student to critically analyze a topic 9. Prepare a student for more advanced topics in Physics by providing a solid grip over the fundamental concepts in Physics. 10. Demonstrate the use and importance of computational methods in Physics and enable a student to construct a Physics problem computationally. 11. Introduce the basic concepts of mechanics. 12. Understanding simple harmonic oscillators as it is a unique mechanical problem will help them to understand the advanced treatment in quantum mechanics and modern Physics. 13. Develop knowledge of mechanics which will help students in their everyday life.
Semester-II	After successful completion of the program students will be able to: 1. Develop the basic theoretical knowledge as well as experimental skills of the students on electrical networking. 2. Enable the students to analyze different phenomena due to the interaction of light with light and matter. 3. Train the students to use different optical instruments. 4. Help the students to understand various natural phenomena using different apparatus in the laboratory.
Semester-III	After successful completion of the program students will be able to: 1. Develop the requisite mathematical skills to understand some of the fundamental topics (slightly more advanced than those in Mathematical Physics I) in Physics. 2. Develop the ability of a student to critically analyze a topic. 3. Enable a student to understand the use and importance of computational/numerical methods in Physics and enable a student to construct a Physics problem computationally. 4. Apply the laws of thermodynamics to real-world problems. 5. Conduct scientific problems and experiments on thermodynamics and allied disciplines. 6. Demonstrate a working knowledge of the physical principles in Thermal Physics. 7. Identify and understand digital electronic principles and systems. 8. Apply the knowledge to analyze and apply digital circuits in solving circuit-level problems.
Semester-IV	After successful completion of the program students will be able to: 1. Develop the mathematical skills of a student to understand some of the fundamental topics (slightly more advanced than those in Mathematical Physics I and II). 2. Develop the ability of a student to critically analyze a topic. 3. Enable a student to understand the use and importance of computational/ numerical methods in Physics and to construct a problem computationally. 4. Understand and appreciate the theory of modern physics.

	5. Develop the ability to apply it in solving simple problems in Quantum Mechanics (QM), structure of atoms, Laser, and Nuclear Physics. 6. Learn the foundation knowledge of analog electronic systems. 7. Learn the workings and applications of PN junction and bipolar junction transistors (BJT). 8. Learn to analyze circuits containing PN junction and BJT along with the application of BJT as amplifiers and oscillators. 9. Develop basic knowledge of operational amplifiers and their applications
Semester-V	After successful completion of the program students will be able to: 1. Learn how to apply quantum mechanics to solve physical systems 2. Know about the physical behaviour of materials. 3. Learn how the scientific behaviour of materials can be used for human applications. 4. Equip a student with basic concepts of Solid State Physics so that the knowledge can be applied for further development of the subject. 5. Help the students in thorough learning of the concepts associated with the course through laboratory experiments.
Semester-VI	After successful completion of the program students will be able to: 1. Solve problems relevant to interfaces between media with defined boundary conditions. 2. Use Maxwell's equations to describe the behaviour of electromagnetic waves in a vacuum as well as a medium. 3. Describe states and methods of polarization and analyze the polarization state of a light source. 4. Use Maxwell's equations to describe the behaviour of electromagnetic waves in n vacuum as well as a medium. 5. Students will learn the application of statistical mechanics in the physical field. 6. Students will learn about the evolution of quantum statistics from classical statistics.

Discipline Specific Outcome (DSO)

Major/Honours in Physics	
Semester	Outcome
Semester-V	After successful completion of the program students will be able to: 1. Develop knowledge about various devices like UJT, FET etc. and use these devices for different applications. 2. Design and analyse filter circuits, power supply FET amplifiers etc. 3. Develop the basic knowledge of IC fabrications, data communication standards and communication systems. 4. Develop knowledge regarding nuclear and elementary particles as well as properties and phenomena related to them. 5. Successfully apply the same knowledge in solving problems in the field of nuclear and particle Physics.
Semester-VI	After successful completion of the program students will be able to: 1. Equip the students with basic knowledge of Astrophysics. 2. Create interest in the subjects of Astrophysics and to pursue further higher studies in the subject concerned in future. 3. Develop the critically analyzing ability, which may motivate the students to solve any challenging physical problem in future. 4. Develop knowledge of special relativity which is essential to understand the relativistic formulation of modern theories. 5. To make the students understand about fluid dynamics. 6. To make the students understand about Lagrangian and Hamiltonian dynamics.

Course Outcome (CO)

Major/Honours in Physics	
Semester/Paper	Outcome
Semester-I Paper Code: PHY-HC-1016 Mathematical Physics-I	After successful completion of this paper, students will learn- 1. Identify a range of diverse mathematical techniques to formulate and solve a problem in basic Physics. 2. Analyze some of the basic mathematical concepts and methods. 3. Apply the knowledge and understanding of these mathematical methods to solve problems in many elementary branches of Physics like mechanics, electromagnetic theory, statistical Physics, thermal Physics etc. 4. Learn computer programming and numerical analysis and know its role in solving problems in Physics.
Semester-I Paper Code: PHY-HC-1026 Mechanics	After successful completion of this paper, students will learn- 1. Understand the basic concepts and ideas in mechanics- e.g. motion, force and torque, mass and moment of inertia, linear and angular momentum, kinetic energy and potential energy etc. by parallel studies of linear dynamics and rotational dynamics. 2. Understand the basic conservation laws by studying them in various mechanical systems including collisions, oscillations, gravitational systems etc. 3. Understand the concept of frame of reference, importance of relative transformations and invariance of laws of Physics. 4. Know about the peculiar phenomena of special relativity which are not seen in Newtonian relativity and to understand the concept of space-time.
Semester-II Paper Code: PHY-HC-2016 Electricity and Magnetism	After successful completion of this paper, students will learn- 1. Gain basic knowledge of electricity and magnetism. 2. Understand the electrical and magnetic properties of matter in brief. 3. Understand the effect of electric field on magnetic field and the effect of magnetic field on current. 4. Acquire the basic theoretical as well as experimental skill on electrical networking.
Semester-II Paper Code: PHY-HC-2026 Waves and Optics	After successful completion of this paper, students will learn- 1. Learn the basics of wave motion. 2. Know about the behavior of light due to its wave nature. 3. Identify and understand different phenomena due to the interaction of light with light and matter. 4. Analyze some of the fundamental laws and principles of light which is used in many important optical instruments.
Semester-III Paper Code: PHY-HC-3016 Mathematical Physics-II	After successful completion of this paper, students will learn- 1. Write a problem in Physics (slightly more advanced than those in Mathematical Physics I) in the language of Mathematics. 2. Analyze some of the useful mathematical methods. 3. Construct a problem in Physics computationally. 4. Apply the knowledge and understanding of these mathematical methods to solve problems in many fundamental topics in Physics.

Semester-III Paper Code: PHY-HC-3026 Thermal Physics	After successful completion of this paper, students will learn- 1. Develop knowledge on the classical laws of thermodynamics and their application. 2. Probe questions in varied fields of Physics, chemistry and biology based on principles of Thermal Physics. 3. Use the concept of thermodynamics in real world experiences. 4. Develop critical and analytical thinking of the student on thermodynamics and allied disciplines.
Semester-III Paper Code: PHY-HC-3036 Digital systems and applications	After successful completion of this paper, students will learn- 1. Know about the basic electronics laboratory equipment. 2. Understand basic digital electronics concepts and devices. 3. Analyze digital circuits.
Semester-IV Paper Code: PHY-HC-4016 Mathematical Physics-III	After successful completion of this paper, students will learn- 1. Write a problem in Physics (slightly more advanced than those in Mathematical Physics I and II) in the language of mathematics. 2. Identify a range of diverse mathematical techniques/ideas to formulate, simplify and solve some problems in Physics. 3. Construct a problem in Physics computationally and use simulations to design an experiment.
Semester-IV Paper Code: PHY-HC-4026 Elements of modern physics	After successful completion of this paper, students will learn- 1. Understand the theoretical basis for the understanding of quantum Physics as the basis for dealing with microscopic phenomena. 2. Apply concepts of 20th Century Modern Physics to deduce the structure of atoms. 3. Explain the wave-particle duality of the photon. 4. Develop insight into the key principles and applications of Nuclear.
Semester-IV Paper Code: PHY-HC-4036 Analog systems and applications	After successful completion of this paper, students will learn- 1. Know about the basics of semiconductor PN junction, its various types and its application to different electronic circuits. 2. Understand bipolar junction transistor and its applications as amplifier and oscillators. 3. Familiarize with operational amplifiers, its applications and analysis. 4. Develop knowledge about analog to digital and digital to analog conversion techniques.
Semester-V Paper Code: PHY-HC-5016 Quantum mechanics and applications	After successful completion of this paper, students will learn- 1. Know about the development of modern Physics and the theoretical formulation of quantum mechanics. 2. To understand spectral patterns of the atomic and molecular levels. 3. To understand the use of mathematical tools in understanding quantum mechanics.

	4. Use of computational techniques for the realization of the quantum mechanical phenomena.
Semester-V Paper Code: PHY-HC-5026 Solid state physics	After successful completion of this paper, students will learn- 1. Familiarize with fundamentals of Solid-State Physics. 2. Know about the structural, electronic and lattice vibration dependent behavior of solids. 3. Learn the basic concepts in hands on mode through laboratory experiments associated with the course.
Semester-V Paper Code: PHY-HE-5046 Physics of devices and instruments	After successful completion of this paper, students will learn- 1. Know about various devices like UJT, FET, MOSFET, CMOS etc. and its application to different electronic circuits. 2. Design rectifiers, passive and active filter, multivibrators etc. 3. Familiarize with the IC fabrication techniques. 4. Learn about digital data communication standards and also about communication systems.
Semester-V Paper Code: PHY-HE-5056 Particle and nuclear physics	After successful completion of this paper, students will learn- 1. Understand various concepts in Nuclear Physics. 2. Nuclear radiation detection equipment. 3. Theoretical evolution of nuclear models. 4. Stability of the nucleus. 5. Basics of particle physics
Semester-VI Paper Code: PHY-HC-6016 Electromagnetic theory	After successful completion of this paper, students will learn- 1. Understand the physical and mathematical principles to provide in-depth analysis of the behavior of electricity and magnetism in matter. 2. Apply Maxwell's equations to explain the properties of the electromagnetic wave and its interaction with matter. 3. Analyze the principles and processes related to polarization, interference, and diffraction along with their applications to the development of wave-guide and optical fibers.
Semester-VI Paper Code: PHY-HC-6026 Statistical mechanics	After successful completion of this paper, students will learn- 1. Introduce the basic concepts of Statistical Mechanics so that students will be able to cope-up with higher level of such course in future. 2. Develop the critically thinking ability of students to understand the diverse physical phenomena. 3. Student will learn about the evolution of quantum statistics from classical statistics.
Semester-VI Paper Code: PHY-HE-6046 Astronomy and astrophysics	After successful completion of this paper, students will learn- 1. Introduce the fundamental concepts of Astrophysics to the interested students. 2. Motivate students to pursue the further study in future in these challenging, fascinating and important fields of Physics. 3. Students will learn about optical instruments used in astronomy.

	4. Students will learn about large scale structures and basic concepts of cosmology.
<u>Semester-VI</u> Paper Code: PHY-HE-6056 Classical dynamics	After successful completion of this paper, students will learn- 1. Understand the underlying facts in the development of classical mechanics and the advantages of its formulation over Newtonian mechanics. 2. Understand Lagrangian formulation and Hamiltonian formulation of mechanics and their applications in mechanical problems. 3. Describe mechanics of a system in terms of equation of motion. 4. Observe the peculiar phenomena when transformed from Newtonian relativity to special relativity and to understand the concept of space-time. 5. Study the theoretical analysis of systems oscillating with small amplitudes.

Program Specific Outcome (PSO)/Course Outcome (CO)

Regular in Physics	
Semester	Outcome
Semester-I Paper code: PHY-RC-1016 Mechanics	After successful completion of the program students will be able to: 1. Understand the basic concepts and ideas in mechanics- e.g. motion, force and torque, mass and moment of inertia, linear and angular momentum, kinetic energy and potential energy etc. by parallel studies of linear dynamics and rotational dynamics. 2. Understand the basic conservation laws by studying them in various mechanical systems including collisions, oscillations, gravitational systems etc. 3. Understand the concept of frame of reference, importance of relative transformations and invariance of laws of Physics. 4. Know about the peculiar phenomena of special relativity which are not seen in Newtonian relativity and to understand the concept of space-time.
Semester-II Paper code: PHY-RC-2016 Electricity and magnetism	After successful completion of this paper, students will learn- 1. Gain basic knowledge of electricity and magnetism. 2. Understand the electrical and magnetic properties of matter in brief. 3. Understand the effect of electric field on magnetic field and the effect of magnetic field on current.
Semester-III Paper code: PHY-RC-3016 Thermal physics and statistical mechanics	After successful completion of this paper, students will learn- 1. Develop knowledge on the classical laws of thermodynamics and their application. 2. Develop analytical thinking of the student on thermodynamics and allied disciplines. 3. Introduce the basic concepts of Statistical Mechanics so that students will be able to cope-up with higher level of such course in future. 4. Student will learn about the evolution of quantum statistics from classical statistics.
Semester-IV Paper code: PHY-RC-4016 Waves and optics	After successful completion of this paper, students will learn- 1. Learn the basics of wave motion. 2. Know about the behavior of light due to its wave nature. 3. Identify and understand different phenomena due to the interaction of light with light and matter. 4. Analyze some of the fundamental laws and principles of light which is used in many important optical instruments.
Semester-V Paper Code: PHY-RE-5056 Particle and nuclear physics	After successful completion of this paper, students will learn- 1. Understand various concepts in Nuclear Physics. 2. Nuclear radiation detection equipment. 3. Theoretical evolution of nuclear models. 4. Stability of the nucleus. 5. Basics of particle physics

Semester-VI Paper Code: PHY-RE-6056 Classical dynamics	After successful completion of this paper, students will learn- 1. Understand the underlying facts in the development of classical mechanics and the advantages of its formulation over Newtonian mechanics. 2. Understand Lagrangian formulation and Hamiltonian formulation of mechanics and their applications in mechanical problems. 3. Describe mechanics of a system in terms of equation of motion. 4. Observe the peculiar phenomena when transformed from Newtonian relativity to special relativity and to understand the concept of space-time. 5. Study the theoretical analysis of systems oscillating with small amplitudes.

Course Outcome-SEC (CO-SEC)

Major/Honours in Physics	
Semester	Outcome
Semester-III Paper code: PHY-SE-3014 Physics workshop skills	After successful completion of the skill course students will be able to: 1. Use basic mechanical measuring instruments e.g vernier calipers and screw gauge. 2. Use basic electrical measuring instruments e.g galvanometer, ammeter, voltmeter, multimeter. 3. Use of soldering techniques in electrical circuit assembling.
Semester-IV Paper code: PHY-SE-4044 Photoshop	After successful completion of the skill course students will be able to: 1. Adobe photoshop CC. 2. Crop images techniques in Adobe photoshop CC. 3. Use of filters, brushes used in digital printing. 4. Use of masking and file formats in Adobe photoshop CC.

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