



BEJOY NARAYAN MAHAVIDYALAYA

(GOVT. SPONSORED)
NAAC ACCREDITED

P.O. ITACHUNA, DIST. HOOGHLY, PIN - 712147

website : www.bnmv.ac.in ✱ e.mail ID : bnmv2012@yahoo.in

Ref. No.

Date. 01.08.2022

B. Sc. (CBCS) Six Semester Physics Honours Course

Programme Outcomes (PO)

This undergraduate course in Physics of Burdwan University (started from the session 2017-2018) would provide the opportunity to the students of our Mahavidyalaya:

- PO-1:** To understand the basic laws and explore the fundamental concepts of physics
- PO-2:** To understand the concepts and significance of the various physical phenomena.
- PO-3:** To carry out experiments to understand the laws and concepts of Physics.
- PO-4:** To apply the theories learnt and the skills acquired to solve real time problems.
- PO-5:** To acquire a wide range of problem-solving skills, both analytical and technical and to apply them.
- PO-6:** To enhance the student's academic abilities, personal qualities and transferable skills this will give them an opportunity to develop as responsible citizens.
- PO-7:** To motivate the students to pursue PG courses in reputed institutions.
- PO-8:** This course introduces students to the methods of experimental physics. Emphasis will be given on laboratory techniques specially the importance of accuracy of measurements.
- PO-9:** Providing a hands-on learning experience such as in measuring the basic concepts in properties of matter, heat, optics, electricity and electronics.
- PO-10:** The course as a whole opens up several career doors for the students interested in various areas of science and technology in private, public and government sectors.
- PO-11:** Students may get job opportunities in higher education, research organizations, physics consultancy, and many others. Some of the institutions where physics students can start their carrier are: BARC, DRDO, NPTC, IISc, ISRO, ONGC, BHEL, PRL, NPL, SINP, VECC, IITs, NITs, IIPR etc.

Principal
Bejoy Narayan Mahavidyalaya
P.O. - Itachuna, Dt. Hooghly.

Head
Department of Physics
Bejoy Narayan Mahavidyalaya
Itachuna, Hooghly



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Course Outcomes (CO)

The outcome of the following courses:

Core Courses:

CC-I: (Mathematical Physics-I):

CO-1: The course gives the opportunity to learn basic mathematical methods to solve the various problems in physics.

CO-2: The topics include the calculus of functions, Vector calculus, curvilinear coordinate systems, idea of probability function and Dirac delta function.

CO-3: This course is very useful to understand the essence of mathematical tools to demonstrate the various physical phenomena in every branch of science and engineering.

CC-II: (Mechanics):

CO-1: The students would learn about the behaviour of physical bodies as it provides the basic concepts related to the motion of all the objects around us in our daily life.

CO-2: The course builds a foundation of various applied field in science and technology; especially in the field of mechanical engineering.

CO-3: The course comprises of the study vectors, laws of motion, momentum, energy, rotational motion, gravitation, fluids, elasticity and special relativity.

CC-III: (Electricity and Magnetism):

CO-1: It gives an opportunity for the students to learn about one of the fundamental interactions of electricity and magnetism, both as separate phenomena and as a singular electromagnetic force.

CO-2: The course contains vector analysis, electrostatics, magnetism, electromagnetic induction and Maxwell's equations.

CO-3: The course is very useful for the students in almost every branch of science and engineering.

CC-IV: (Waves and Optics):

CO-1: The course comprises of the study of superposition of harmonic oscillations, waves motion (general), oscillators, sound, wave optics, interference, diffraction, polarization.

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21.08.2022



Phone : (03213) 272 275

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CO-2: The course is important for the students to make their career in various branches of science and engineering, especially in the field of photonic engineering and holography.

CO-3: The practical knowledge of wave motion doing experiments: Tuning fork, electric vibrations.

CO-4: They would also learn optical phenomena such as interference, diffraction and dispersion and do experiments related to optical devices: Prism, grating, spectrometers.

CC-V: (Mathematical Physics-II):

CO-1: Students would learn some advanced mathematical methods to solve the various problems in physics.

CO-2: The topics include Fourier series, Frobenius Method and Special Functions, some special integrals, Theory of errors and partial differential equations.

CO-3: The practical (Laboratory) class associated with this course gives the opportunity to learn introductory computational language Scilab and to solve various physics problems using Scilab simulation.

CC-VI: (Thermal Physics):

CO-1: The course makes the students able to understand the basic physics of heat and temperature and their relation with energy, work, radiation and matter.

CO-2: The students also learn how laws of thermodynamics are used in a heat engine to transform heat into work.

CO-3: The course contains the study of laws of thermodynamics, thermodynamic description of systems, thermodynamic potentials, kinetic theory of gases.

CO-4: In laboratory class, students would gain practical knowledge about heat and radiation such as Thermal conductivity experiments, thermodynamics, thermo-emf, etc. and temperature-dependent resistance etc.

CO-5: The course is very useful for the students specially in the branch of low-temperature physics and thermal physics.

CC-VII: (DIGITAL SYSTEMS AND APPLICATIONS):

CO-1: This course helps the students to gain basic ideas of the construction and working of electronic devices and circuits and to understand the fundamentals of communication systems.

CO-2: The course includes the study of number systems, Boolean algebra, logic gates, combinational circuits, sequential circuits, memory devices and IC technology. The course is of much practical purpose for the students to learn basics of digital electronics.



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CO-3: The digital electronics has wide applications in computing, process control, signal processing, communication systems, digital instruments etc. The associated practical or Laboratory class also gives in-hand experience for handling different digital elements such as logics gates, ICs and thereby making combinational circuits.

CC-VIII: (Mathematical physics-III):

CO-1: Students would learn mathematical methods to solve the various problems in physics.

CO-2: The topics include the calculus of functions, Fourier transform, Laplace transform, special functions and special integrals, partial differential equations, complex analysis and variables.

CO-3: Various practical problems related to applications of mathematical tools to solve the problems, using Scilab simulations in physics would be learned by students.

CC-IX: (Element of Modern Physics):

CO-1: Students would know about the basic principles in the development of modern physics.

CO-2: The topics covered in the course build a basic foundation of undergraduate physics students to study the advance branches: quantum physics, nuclear physics, particle physics and high-energy physics. The course contains the study of Planck's hypothesis, photoelectric effect, Compton effect, matter waves, atomic models, Schrodinger wave equations, and brief idea of nuclear physics. The course also contains the concept of radioactivity, the mechanism of fission and fusion.

CO-3: In this course students would be able to understand Basic experiments of modern physics such as: Determination of Planck's and Boltzmann's constants, Determination of ionization potential, Wavelength of H-spectrum, Single and double slit diffraction, Photo electric effect and determination of e/m .

CC-X: (Analog Systems and Applications):

CO-1: The students would gain the knowledge of Basic Electronics circuits, network theorems and measuring instruments:

CO-2: They would know about common solid-state devices: Semiconductor diodes, transistors and amplifier. The topics also include the application of OP-AMP, which are foundation blocks of digital electronics.

CO-3: In this course students would be able to understand Basic experiments of semiconductor physics such as: characteristic features of Diode, Zener diode, Transistor, OP-Amp. Students would be experienced about various use of OP-Amp by hands on experiments.



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CC-XI: (Quantum Mechanics & Applications):

CO-1: Quantum mechanics provides a platform for the physicists to describe the behaviour of matter and energy at atomic and subatomic level. The course plays a fundamental role in explaining how things happen beyond our normal observations.

CO-2: The course includes the study of Schrodinger equations, particle in one-dimension potential, quantum theory of H like atoms, atoms/molecules in electric and magnetic fields and many electrons atoms.

CO-3: The understanding of the course will be very much necessary several branch in physics such as Advanced physics, Condensed matter physics (Theory & Experimental), Nanoscience& Technology and Material physics etc.

CO-4: In the Laboratory class, students would learn the use of Scilab simulations in solving some Quantum Mechanical problems.

CC-XII: (Solid State Physics):

CO-1: Students will be able to develop an understanding of the crystal lattice, different types of crystal structures, symmetries. The student would gain insight about the interior of the substances using X-ray diffraction in crystals.

CO-2: This course also includes elastic waves, phonons, and lattice vibrational properties. Beside this, in depth understanding of condensed matter physics, including Dielectric and Ferroelectric, Piezoelectric properties, magnetic properties of solids and superconductivity is emphasized.

CO-3: The laboratory class also gives in hand experience of measurement of different properties such as dielectric, magnetic and electrical properties of solids.

CO-4: The students have the opportunity to use the basic principles of condensed matter physics in frontier areas of research and development in the field of material science, nanoscience and nanotechnology.

CO-5: This course also is of immense importance for the students seeking R & D opportunities in the field of theoretical condensed matter physics, material science, device fabrication, nanoscience and nanotechnology etc.

CC-XIII: (Electromagnetic Theory):

CO-1: It gives an opportunity for the students to learn about the fundamental of electromagnetic wave and its behavior during propagation in various mediums.

CO-2: The course contains vector analysis, electrostatics, magnetism, electromagnetic induction and Maxwell's equations.



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Ref. No. **CO-3** The course is very useful for the students in almost every branch of science and engineering.

CO-4: Students would gain practical knowledge about polarization of electromagnetic wave and measurements such as: specific rotation of sugar solution, analyze elliptic polarization, Stefan's constant by Stefan's law of radiation etc.

CC-XIV: (Statistical Mechanics):

CO-1: The course makes the students able to understand the basic physics of heat and temperature and their relation with energy, work, radiation and matter. The students also learn how laws of thermodynamics are used in a heat engine to transform heat into work.

CO-2: The course contains the study of laws of thermodynamics, thermodynamic description of systems, thermodynamic potentials, kinetic theory of gases, theory of radiation and statistical views. The course includes the study of Basic postulates, application of classical distribution to ideal gases, imperfect gases, quantum statistics and black body radiation.

CO-3: The course is helpful for the students to understand the dynamics of the bulk material in macroscopic as well as microscopic levels. It is also useful to understand the relation between microscopic and macroscopic systems.

CO-4: Students would gain practical knowledge about heat and radiation, thermodynamics, thermo emf, etc. and perform various computational experiments.

DSE (Discipline Specific Elective) Course:

DSE-1: (Advanced Mathematical Physics):

CO-1: Students would be able to understand the mathematical methods essential for solving the advanced problems in physics.

CO-2: It would be helpful in the development of the ability to apply the mathematical concepts and techniques to solve the problems in theoretical and experimental physics. The knowledge of mathematical physics would be beneficial in further research and development as it serves as a tool in almost every branch of science and engineering.

CO-3: The Course includes advanced mathematical topics such as Linear vector space (LVS), Matrices, Cartesian Tensor and General Tensors. Scilab/C++ based simulations experiments on some important mathematical physics problems are very useful for students.

DSE-2 (Classical Dynamics):

CO-1: In this course students would learn an alternative approach of the Newtonian mechanics using various mathematical formulations to describe the motions of macroscopic objects using generalized coordinates, momentum, forces and energy.



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CO-2: Student will realize the importance of scalar formulation such as Lagrangian, Hamiltonian, and Variational Principle etc. to find the equation of motion of different physical motion.

CO-3: The course also gives opportunities to learn the Special Theory of Relativity as advanced relativistic mechanics beyond Newtonian mechanics.

CO-4: The classical mechanics would be helpful in understanding of advanced branches of modern physics.

DSE-3:(Nuclear and Particle Physics):

CO-1: In this course students would know about the general properties of nuclei, nuclear forces and detectors, radioactive decay and nuclear reactions.

CO-2: The course expands the knowledge of students especially, the various applications of nuclear physics.

CO-3: The course builds a foundation for the students to carry out research in the field of nuclear physics, high-energy physics, nuclear astrophysics, nuclear reactions and applied nuclear physics.

DSE-4: (Applied Dynamics):

CO-1: In this course students would know about the dynamical systems and their distinguished characteristics. This course builds up the idea of phase space.

CO-2: This course helps students to understand the underneath reasons as well as the mechanism or the physics of Chaos and Fractals. The course builds the basic behavior of fluid and its dynamical approaches.

Skill Enhancement Course (SEC):

SEC-1(Renewable Energy & Energy Harvesting):

CO-1: This course is focused on the ways of different alternative source of energy rather than conventional energy.

CO-2: Hence, the students will learn about fossil fuels, Nuclear energy, tidal energy, solar energy, Wind energy harvesting, Ocean energy, Geothermal energy and Hydro-energy as alternative source of energy.

CO-3: As all such source of energy are natural, hence, students will also be environment friendly and environment-conscious at the same time. The students will also get some advantages in higher education and R & D sectors regarding Geophysics and environment Physics.



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SEC-2:(Electrical Circuits and Network Skills):

CO-1: It enables the students to learn the basic about electric components and the electric circuit.

CO-2: Students would gain practical knowledge about AC and DC electricity and measurements such as: Resistance, Voltage, current etc.

CO-3: The topic also gives an opportunity for the students to learn about the working principle of Electric motor, electric transformer and Generator.

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B. Sc. (CBCS) Six Semester Physics General Course

Course Outcomes (CO)

The outcome of the following courses:

Discipline Specific Core (DSC) courses, Physics:

DSC-1A: (Mechanics):

CO-1: The students would learn about the behaviour of physical bodies as it provides the basic concepts related to the motion of all the objects around us in our daily life.

CO-2: The course builds a foundation of various applied field in science and technology; especially in the field of mechanical engineering.

CO-3: The course comprises of the study vectors, laws of motion, momentum, energy, rotational motion, gravitation, fluids, elasticity and special relativity.

DSC-1B: (Electricity and Magnetism):

CO-1: It gives an opportunity for the students to learn about one of the fundamental interactions of electricity and magnetism, both as separate phenomena and as a singular electromagnetic force.

CO-2: The course contains vector analysis, electrostatics, magnetism, electromagnetic induction and Maxwell's equations.

CO-3: The course is very useful for the students in almost every branch of science and engineering.

DSC-1C: (Thermal Physics & Statistical Mechanics):

CO-1: The course makes the students able to understand the basic physics of heat and temperature and their relation with energy, work, radiation and matter.

CO-2: The students also learn how laws of thermodynamics are used in a heat engine to transform heat into work.

CO-3: The course contains the study of laws of thermodynamics, thermodynamic description of systems, thermodynamic potentials, kinetic theory of gases and Statistical Mechanics.

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CO-4: In laboratory class, students would gain practical knowledge about heat and radiation such as Thermal conductivity experiments, thermodynamics, thermo-emf, etc. and temperature-dependent resistance etc. The course is very useful for the students specially in the branch of low-temperature physics and thermal physics.

DSC-1D: (Waves and Optics):

CO-1: The course comprises of the study of superposition of harmonic oscillations, waves motion (general), oscillators, sound, wave optics, interference, diffraction, polarization.

CO-2: The course is important for the students to make their career in various branches of science and engineering, especially in the field of photonic engineering and holography.

CO-3: The practical knowledge of wave motion doing experiments: Tuning fork, electric vibrations. They would also learn optical phenomena such as interference, diffraction and dispersion and do experiments related to optical devices: Prism, grating, spectrometers.

Discipline Specific Elective (DSE) papers:

DSE-1A: (Element of Modern Physics):

CO-1: Students would know about the basic principles in the development of modern physics.

CO-2: The topics covered in the course build a basic foundation of undergraduate physics students to study the advance branches: quantum physics, nuclear physics, particle physics and high-energy physics.

CO-3: The course contains the study of Planck's hypothesis, photoelectric effect, Compton effect, matter waves, atomic models, Schrodinger wave equations, and brief idea of nuclear physics. The course also contains the concept of radioactivity, the mechanism of fission and fusion.

CO-4: In addition, in this course students would be able to understand Basic experiments of modern physics such as: Determination of Plank's and Boltzmann's constants, Determination of ionization potential, Wavelength of H-spectrum, Single and double slit diffraction, Photo electric effect and determination of e/m .

DSE-1B: (Nuclear and Particle Physics):

CO-1: In this course students would know about the general properties of nuclei, nuclear forces and detectors, radioactive decay and nuclear reactions.



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- Ref. No. CO-2: The course expands the knowledge of students especially, the ~~Data~~ applications.. of nuclear physics.
- CO-3: The course builds a foundation for the students to carry out research in the field of nuclear physics, high-energy physics, nuclear astrophysics, nuclear reactions and applied nuclear physics.

Skill Enhancement Course (SEC):

SEC-1(Renewable Energy & Energy Harvesting):

CO-1: This course is focused on the ways of different alternative source of energy rather than conventional energy.

CO-2: Hence, the students will learn about fossil fuels, Nuclear energy, Tidal energy, solar energy, Wind energy harvesting, Ocean energy, Geothermal energy and Hydro-energy as alternative source of energy. As all such source of energy are natural, hence, students will also be environment friendly and environment-conscious at the same time.

CO-3: The students will also get some advantages in higher education and R & D sectors regarding Geophysics and environment Physics.

SEC-3: (Computational Physics Skills):

CO-1: The course provides an opportunity to the students to learn about the fundamentals of computer applications in solving the problems in different branches of Physics and Mathematics.

CO-2: They would learn basics of C-programming and FORTRAN-90/95 programming languages and their applications which can be useful in their future career in the field of research and technology.

SEC-4:(Electrical Circuits and Network Skills):

CO-1: It enables the students to learn the basics about electric components and the electric circuits.

CO-2: Students would gain practical knowledge about AC and DC electricity and measurements such as: Resistance, Voltage, current etc. The topic also gives an opportunity for the students to learn about the working principle of Electric motor, electric transformer and Generator.

CO-3: Students can apply their knowledge/skills in the field of electrical projects and network designing in R & D sectors and many industrial causes.



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- PO-1: To understand the basic laws and explore the fundamental concepts of physics
- PO-2: To understand the concepts and significance of the various physical phenomena.
- PO-3: To carry out experiments to understand the laws and concepts of Physics.
- PO-4: To apply the theories learnt and the skills acquired to solve real time problems.
- PO-5: To acquire a wide range of problem-solving skills, both analytical and technical and to apply them.
- PO-6: To enhance the student's academic abilities, personal qualities and transferable skills this will give them an opportunity to develop as responsible citizens.
- PO-7: To motivate the students to pursue PG courses in reputed institutions.
- PO-8: This course introduces students to the methods of experimental physics. Emphasis will be given on laboratory techniques specially the importance of accuracy of measurements.
- PO-9: Providing a hands-on learning experience such as in measuring the basic concepts in properties of matter, heat, optics, electricity and electronics.
- PO-10: The course as a whole opens up several career doors for the students interested in various areas of science and technology in private, public and government sectors.
- PO-11: Students may get job opportunities in higher education, research organizations, physics consultancy, and many others. Some of the institutions where physics students can start their carrier are: BARC, DRDO, NPTC, IISc, ISRO, ONGC, BHEL, PRL, NPL, SINP, VEC, IITs, NITs, IIPR etc.

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