Program Offered

B.Sc. (CBCS) Course outcomes Department of Physics

2019-2020

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| **Sr.**  **No.** | **Program** | **Program Objectives** | **Program Specific Outcomes** |
| 1 | B. Sc. Physics CBCS | 1. To foster scientific attitude, provide in-depth knowledge of scientific and technological concepts of Physics. 2. To enrich knowledge through problem solving, minor/major projects, seminars, tutorials, review of research articles/papers, participation in scientific events, study visits, etc. 3. To familiarize with recent scientific and technological developments. 4. To create foundation for research and development in Physics. 5. To help students to learn various experimental and computational tools thereby developing analytical abilities to address real world problems. 6. To train studentsin skills related to research, education, industry, and market. 7. To help students to build-up a   progressive and successful career in Physics. | 1. After completion of program, students will be able to have in-depth knowledge of basic concepts in Physics. 2. Students will be able to apply the laws of Physics in real life situations to solve the problems. 3. Students develop aptitude of doing research through undertaking small projects. 4. Student will have set his foundation to pursue higher education in Physics. 5. After completing the program student will have developed interdisciplinary approach and can pursue higher studies in subjects other than Physics 6. Ability Enhancement |

Courses Offered: (Executed last year: F.Y.B. Sc. CBCS Physics)

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| **Sr. No.** | **Course** | **Course Outcome** |
| **F. Y. B. Sc.** | | |
| **Semester 1** | 1. Mechanics PHY-111 Credit 2 | 1. Demonstrate an understanding of Newton's laws and applying them in calculations of the motion of simple systems. 2. Use the free body diagrams to analyse the forces on the object. 3. Understand the concepts of energy, work, power, the concepts of conservation of energy and be able to perform calculations using them. 4. Understand the concepts of elasticity and be able to perform calculations using them. 5. Understand the concepts of surface tension and viscosity and be able to perform calculations using them. 6. Use of Bernoulli’s theorem in real life problems. 7. Demonstrate quantitative problem solving skills in all the topics covered. |
| 2. Physics Principles and Applications PHY-112  Credit 2 | On successful completion of this course students will be able to do the following:   1. To understand the general structure of atom, spectrum of hydrogen atom. 2. To understand the atomic excitation and LASER principles. 3. To understand the bonding mechanism and its different types. 4. To demonstrate an understanding of electromagnetic waves and its spectrum. 5. Understand the types and sources of electromagnetic waves and applications. 6. To demonstrate quantitative problem solving skills in all the topics covered. |
| 3.  Physics Laboratory-IA  PHY-113  Credit 1.5 | 1. Acquire technical and manipulative skills in using laboratory equipment, tools, and materials. 2. Demonstrate an ability to collect data through observation and/or experimentation and interpreting data. 3. Demonstrate an understanding of laboratory procedures including safety, and scientific methods. 4. Demonstrate a deeper understanding of abstract concepts and theories gained by experiencing and visualizing them as authentic phenomena. 5. Acquire the complementary skills of collaborative learning and teamwork in laboratory settings. |

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| **Semester 2** | 1. Heat and Thermodynamics  PHY-121  Credit 2 | 1. Describe the properties of and relationships between the thermodynamic properties of a pure substance. 2. Describe the ideal gas equation and its limitations. 3. Describe the real gas equation. 4. Apply the laws of thermodynamics to formulate the relations necessary to analyze a thermodynamic process. 5. Analyze the heat engines and calculate thermal efficiency. 6. Analyze the refrigerators, heat pumps and calculate coefficient of performance. 7. Understand property ‘entropy’ and derive some thermo dynamical relations using entropy concept. 8. Understand the types of thermometers and their usage. |
| 2. Electromagnetic PHY-122 Credit 2 | On successful completion of this course students will be able to do the following:   1. To understand the concept of the electric force, electric field and electric potential for stationary charges. 2. Able to calculate electrostatic field and potential of charge distributions using Coulomb's law and Gauss's law. 3. To understand the dielectric phenomenon and effect of electric field on dielectric. 4. To Study magnetic field for steady currents using Biot-Savart and Ampere's Circuital laws. 5. To study magnetic materials and its properties. 6. Demonstrate quantitative problem solving skills in all the topics covered. |
| 3.  Physics Laboratory-IB  PHY-123  Credit 1.5 | 1. Acquire technical and manipulative skills in using laboratory equipment, tools, and materials. 2. Demonstrate an ability to collect data through observation and/or experimentation and interpreting data. 3. Demonstrate an understanding of laboratory procedures including safety, and scientific methods. 4. Demonstrate a deeper understanding of abstract concepts and theories gained by experiencing and visualizing them as authentic phenomena. 5. Acquire the complementary skills of collaborative learning and teamwork in laboratory settings. |

Courses Offered: (S.Y.B. Sc. CBCS Physics)

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| **Sr. No.** | **Course** | **Course Outcome** |
| **S. Y. B. Sc.** | | |
| **Semester 3** | PHY-231: Mathematical Methods in Physics-I | * Understand the complex algebra useful in physics courses. * Understand the concept of partial differentiation. * Understand the role of partial differential equations in physics. * Understand vector algebra useful in mathematics and physics. * Understand the concept of singular points of differential equations. |
| PHY-232: Electronics | * Apply different theorems and laws to electrical circuits. * Understand the relations in electricity. * Understand the parameters, characteristics and working of transistors. * Understand the functions of operational amplifiers. * Design circuits using transistors and applications of operational amplifiers. * Understand the Boolean algebra and logic circuits. |
| PHY-233: Practical Course (Laboratory 2A) | * Use various instruments and equipment. * Design experiments to test a hypothesis and/or determine the value of an unknown quantity. * Investigate the theoretical background of an experiment. * Setup experimental equipment to implement an experimental approach. * Analyze the data, plot appropriate graphs and reach conclusions from data analysis. * Work in a group to plan, implement and report on a project/experiment. * Keep a well-maintained and instructive laboratory logbook. |

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| **Semester 4** | PHY-241: Oscillations, Waves, and Sound | * To study underlying principles of oscillations and it’s scope in development. * To understand and solve the equations **/** graphical representations of motion for simple harmonic, damped, forced oscillators and waves. * To explain oscillations in terms of energy exchange with various practical applications. * To solve numerical problems related to undamped, damped, forced oscillations and superposition of oscillations. * To study characteristics of sound, decibel scales and applications |
| PHY-242: Optics | * + Acquire the basic concept of wave optics.   + Describe how light can constructively and destructively interfere.   + Explain why a light beam spread out after passing through an aperture   + Summarize the polarization characteristics of electromagnetic wave   + Understand the operation of many modern optical devices that utilize wave optics   + Understand optical phenomenon such polarization, diffraction and interference in terms of the wave model   + Analyze simple example of interference and diffraction. |
| : PHY-243: Practical Course (Laboratory 2B) | * Use various instruments and equipment. * Design experiments to test a hypothesis and/or determine the value of an unknown quantity. * Investigate the theoretical background of an experiment. * Setup experimental equipment to implement an experimental approach. * Analyze the data, plot appropriate graphs and reach conclusions from data analysis. * Work in a group to plan, implement and report on a project/experiment. * Keep a well-maintained and instructive laboratory logbook. |

Courses Offered: (T.Y.B. Sc. CBCS Physics)

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| **Sr. No.** | **Course** | **Course Outcome** |
| **T. Y. B. Sc.** | | |
| **Semester 5** | PHY-351 Mathematical Methods in Physics-II | 1. To understand general curvilinear co-ordinate system 2. To derive the relations for Gradient, Divergence, Curl, Laplacian operator for Cartesian, Spherical Polar and Cylindrical co-ordinate systems 3. To understand the basic concepts in Special Theory of Relativity 4. To solve the Partial differential equations using variables separable method 5. To solve linear second order differential equations using Frobenius series solution method 6. To determine Legendre, Hermite polynomials and Bessel’s functions of first kind 7. To prove various relations for Legendre, Hermite polynomials and Bessel’s functions of first kind |
| PHY-352 Electrodynamics | After completion of course students should   * Be able to use method of images in electrostatics to solve the * Boundary value problems. * Should have understood the basic laws in magneto statics like Biot-Savart’s law, Ampere’s law etc. * have understood the concept of magnetic vector potential. * Have understood Maxwell’s laws of electrodynamics.   Be able to solve Maxwell’s equations in free space and write equation of plane e-m waves. |
| PHY-353 Classical Mechanics | The course aims to develop an understanding of Lagrangian and  Hamiltonian formulation which allow for simplified treatments  of many complex problems in classical mechanics and provides  the foundation for the modern understanding of dynamics.  At the end of the course, students will have thorough knowledge  and problem solving skills related to the Classical mechanics  T.Y. B.Sc. Syllabus topics.  Internal class test I  Home Assignment (Book Problem solving )  Internal class test II |
|  | PHY-354 Atomic and Molecular Physics | * Understand different atomic models rite from classical to quantum mechanical models. * Spectra associated with one and two valence electron systems with examples. * Effect of magnetic and electric field on spectral lines can be study. * Understand the concepts of atomic and molecular spectra’s * Study the concepts of Raman Spectroscopy and its applications |
|  | PHY-355 Computational Physics | * In this course students will learn about basic concepts of C language and various numerical methods used for solving problems. * In C language students will learn about characters used in C, C-tokens, operators, variables, constants, keywords, special symbols, blank spaces, input output statements, iterative loops, if- statements, arrays, pointers, functions and graphics programming. * In numerical analysis students will learn methods to find roots of equation, integration of a function. |
|  | PHY-356(B) Elements of Materials Science | Student understands the various properties of solids.  Student finds types of properties exist in materials.  From Phase diagram, student can easily identify the states of matter. |
|  | PHY-357 Physics Laboratory-3A | Student understands the details of properties material by performing experimentation. |
|  | PHY-358 Physics Laboratory-3B | * In this course students will learn some basic physics experiments to find specific heat, susceptibility. * Also, students will learn about interfacing of computer with experiments.   Also students will learn to write programs in C language |
|  | PHY-359 Project-I | In this course students will get hands on experience to carry out project work. Also they will understand how to analyse and interpret data, write scientific report. |
|  | PHY-3510(H) Python Programming | * After completion of this course student will be able * To write code for complex scientific computational requirement. * Use Libraries like NumPy for numeric computation * Use Library SciPy for scientific and technological calculations * Use Library Matplotlib for plotting of graph and its visualization. * Develop own functions for Physics or mathematics. |
|  | PHY-3511(L) Physics Workshop Skill | After completion of this course student will able to handle and test various instruments |

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| **Semester 6** | PHY-361 Solid State Physics | After completion of course students should   * Have deep understanding of various types of crystal structures and * should have understood the concept of reciprocal lattice. * Have clear idea of various characterization techniques like x-ray diffraction, UV-visible spectroscopy, SEM, TGA etc. * Have understood the free electron model, band formation and origin of band gap. * Be able to understand the theory of magnetism and phenomena like superconductivity. |
| PHY-362 Quantum Mechanics | In this course will learn basic as well as advanced concepts of quantum mechanics. In basics concepts, students will learn about origin and history of quantum mechanics, De-Brogile hypothesis, wave particle duality, concept of wave packet, Heisenberg’s uncertainty principle, derivation of Schrodinger’s time dependent and time independent equations.  Also students will understand how to solve any problem quantum mechanically. For this there are topics on infinite square well, step potential, potential.  Also students will learn about different operators used quantum mechanics, hermitian operators and Poisson bracket of operators.  Also students will learn about the concept of parity and representation of Schrodinger’s equation in spherical polar coordinates and its application to spherically symmetric potential problems. |
| PHY-363 Thermodynamics and Statistical Physics | After the end of this course students will come to know about..   * The concepts of transport phenomenon. * Understand the concept of throttling process. * Elementary concepts of Statistics such as Probability calculation mean value calculation. * Concepts about the types of ensembles. * Detail understanding about the classical and quantum mechanical distribution. |
|  | PHY-364 Nuclear Physics | * The students will have an understanding of the structure of the * nucleus, * radioactive decay, nuclear reactions and the interaction of * nuclear radiation with matter. The students will have an * understanding of quantum behavior of atoms in external electric * and magnetic fields. * At the end of the course, students will have thorough * knowledge basic nuclear forces ; composition of nucleus * etc and problem solving skills related to the Nuclear * Physics T.Y. B.Sc. Syllabus topics * Internal class test I |
|  | PHY-365 (A) Electronics-II | * After completing the syllabus student know more about LED, * Photodiode, optocoupler, Use Applications of semiconductor * devices, digital circuits |
|  | PHY-366(Q) Physics of Nanomaterials | 1. |To introduce the concept of nanosized materials and structures 2. To explain the physical significance of nanosized materials 3. To classify nanosized materials 4. To understand various method of synthesis for Nanomaterials 5. To understand different characterization techniques such as; XRD, SEM, EDS, TEM, UV-Vis spectroscopy 6. To study different special Nanomaterials such as; carbon nanotubes, quantum dots etc. 7. To study different applications of nanomateirals |
|  | PHY-367 Physics Laboratory-4A | * Student understands the details of properties material by performing experimentation. |
|  | PHY-368 Physics Laboratory-4B | * Have acquired necessary skills to design astable * multivibrator circuit using IC-555. * Be able to plan an experiment to study the characteristics of FET. * Be able to plan and perform experiment to determine the thickness of cylindrical obstacle by using diffraction of laser light * Should be able to analyse uv-visible spectroscopic data of semiconductor thin films. * Be able to determine particle size by using Scherer formula from XRD. |
|  | PHY-369 Project-II | * In this course students will get hands on experience to carry out project work. Also they will understand how to analyse and interpret data, write scientific report. |
|  | PHY-3610(W) Scientific Data Analysis using Python | * Know basic notions and definitions in data analysis. * Know standard methods of data analysis and information retrieval. * Be able to formulate the problem of knowledge extraction as combinations of data filtration, * analysis and exploration methods. * Be able to translate a real-world problem into mathematical terms. |
|  | PHY- 3611(AA) Microcontrollers | At the end of this course students will be able to:  Understand the fundamentals of Microprocessors.  Understand the internal design of 8051 microcontroller along with the  features and their programming.  Competent with the on chip peripherals of microcontrollers.  Design different interfacing applications using microcontrollers and  peripherals.  Demonstrate the limitations and strengths of different types of  microcontrollers and their comparison. |