



Maratha Vidya Prasarak Samajs Nashik

G.M.D. Arts, B.W. Commerce & Science College, Sinnar

DEPARTMENT OF PHYSICS

(Po, POS, CO)

Bachelor of Science (B.Sc.)

Goals:

The department has formulated three broad educational goals for the undergraduate degree programs:

1. Physics Knowledge: To provide students with the basic foundation in Physics and allied subject, the interplay of theory and experiment, and to motivate scientific enthusiasm and curiosity and joy of learning.
2. Problem solving skills: To provide the students with technical skills necessary for successful careers in physics
3. Employment and technical skills: To provide the students with technical skills necessary for successful careers in physics These include to a breadth of experimental techniques using modern instrumentations and communication skills.

Programme Out Comes (PO):

After successfully completing B.Sc. programme, Students will able to:

- PO-1. Demonstrate, solve and an understanding of major concepts in all disciplines of physics.
- PO-2. Solve the problem and also think methodically, independently and draw a logical conclusion.
- PO-3. Employ critical thinking and the scientific knowledge to design, carryout, record and analyze the results of Physics experiments.
- PO-4. Create an awareness of the impact of Physics on the society, and development outside the scientific community.
- PO-5. To inculcate the scientific temperament in the students and outside the scientific community.
- PO-6. Use modern techniques, decent equipment's and Phonics software's

PROGRAMME SPECIFIC OUTCOMES (PSO):

PSO1: Students are expected to acquire a core knowledge in physics, including the major premises of classical mechanics, quantum mechanics, electromagnetic theory, electronics, optics, special theory of relativity and modern physics.

PSO2: Students are also expected to develop written and oral communication skills in communicating physics-related topics.

PSO3: Students should learn how to design and conduct an experiment (or series of experiments) demonstrating their understanding of the scientific method and processes. Not only that they are expected to have an understanding of the analytical methods required to interpret and analyze results and draw conclusions as supported by their data.

PSO4: Students will develop the proficiency in the acquisition of data using a variety of laboratory instruments and in the analysis and interpretation of such data.

PSO5: Students will learn the applications of numerical techniques for modelling physical systems for which analytical methods are inappropriate or of limited utility.

PSO6: Students will realize and develop an understanding of the impact of physics and science on society.

PSO7: Apply conceptual understanding of the physics to general real-world situations.

PSO8: Describe the methodology of science and the relationship between observation and theory.

PSO9: Learn to minimize contributing variables and recognize the limitations of equipment.

PSO10: Discover of physics concepts in other disciplines such as mathematics, computer science, engineering, and chemistry.

PSO11: Develop the following experimental tools: Numerically model simple physical systems using Euler's method, curve fitting, and error analysis.

PSO12: Analyze physical problems and develop correct solutions using natural laws

F.Y.B.Sc. COURSE OUTCOMES (CO) (Sem - I and II):

COURSE CODE AND TITLE: PHY-111 Mechanics and Properties of Matter

CO1. The student will be able to understand motion,

CO 2. The student understands the importance of Work and Energy

CO 3. The student knows Concept of viscous force and viscosity

COURSE CODE AND TITLE: PHY-112 PHYSICS PRINCIPLES AND APPLICATIONS

CO1. To understand the general structure of atom, spectrum of hydrogen atom.

CO2. To understand the atomic excitation and LASER principles.

CO3. To understand the bonding mechanism and its different types. CO4. To demonstrate an understanding of electromagnetic waves and its spectrum.

CO 5. Understand the types and sources of electromagnetic waves and applications.

CO 6. To demonstrate quantitative problem solving skills in all the topics covered.

COURSE CODE AND TITLE: PHY-121 HEAT AND THERMODYNAMICS

CO1. Learning outcomes for Concept of thermodynamic

CO2. The learner will understand the importance Applied Thermodynamics

CO3. The learner understands Heat Transfer Mechanisms

CO4. To understand Concept of heat & temperature

COURSE CODE AND TITLE: PHY-122 ELECTRICITY AND MAGNETISM

CO1: To understand the concept of the electric force, electric field and electric potential for stationary charges

CO2: Able to calculate electrostatic field and potential of charge distributions using Coulomb's law and Gauss's law.

CO3: To understand the dielectric phenomenon and effect of electric field on dielectric. CO4. To Study magnetic field for steady currents using Biot-Savart and Ampere's Circuital laws.

CO5: To study magnetic materials and its properties

S.Y.B.Sc. COURSE OUTCOMES (CO) (Sem - I and II):**COURSE CODE AND TITLE: PH211: MATHEMATICAL METHODS IN PHYSICS**

CO1. After the completion of this course students will be able to

CO2. Understand the complex algebra useful in physics courses

CO3. Understand the role of partial differential equations in physics.

CO4. Understand vector algebra useful in mathematics and physics

CO5. Understand the singular points of differential equation.

PH212: ELECTRONICS

CO1. Apply laws of electrical circuits to different circuits.

CO2. Understand the relations in electricity • Understand the properties and working of transistors.

CO 3. Understand the functions of operational amplifiers

CO 4. Design circuits using transistors and operational amplifiers.

CO 5. Understand the Boolean algebra and logic circuits.

COURSE CODE AND TITLE: PH221: OSCILLATIONS, WAVES AND SOUND

CO1. Solve the equations of motion for simple harmonic, damped, and forced oscillators.

CO2. Formulate these equations and understand their physical content in a variety of applications,

CO3. Describe oscillatory motion with graphs and equations, and use these descriptions to solve problems of oscillatory motion.

CO4. Explain oscillation in terms of energy exchange, giving various examples.

CO5. Solve problems relating to undamped, damped and force oscillators and superposition of oscillations.

CO6. Understand the mathematical description of travelling and standing waves.

CO7. Recognise the one-dimensional classical wave equation and solutions to it.

CO8 : Calculate the phase velocity of a travelling wave.

CO9. Explain the Doppler effect, and predict in qualitative terms the frequency change that will occur for a stationary and a moving observer.

CO10. Define the decibel scale qualitatively, and give examples of sounds at various levels.

CO11 Explain in qualitative terms how frequency, amplitude, and wave shape affect the pitch, intensity, and quality of tones produced by musical instruments.

COURSE CODE AND TITLE: PH222: OPTICS

CO1. Describe how light can constructively and destructively interfere.

CO2. Explain why a light beam spreads out after passing through an aperture.

CO3. Summarize the polarization characteristics of electromagnetic waves.

CO4. Understand optical phenomena such as polarisation, birefringence, interference and diffraction in terms of the wave model.

CO5. Analyse simple examples of interference and diffraction phenomena.

CO6. Be familiar with a range of equipment used in modern optics.

T.Y.B.Sc. COURSE OUTCOMES (CO) (Sem - I and II):

SEMESTER I:

COURSE CODE AND TITLE: PH331 : MATHEMATICAL METHODS IN PHYSICS-II

CO1. Introduction to Cartesian, Spherical polar and Cylindrical co-ordinate systems, transformation equations

CO2. Able to appreciate the process The Special Theory of Relativity

CO3. To discuss Special functions

CO4. To understand Differential equations

COURSE CODE AND TITLE: PH332: SOLID STATE PHYSICS

CO1. To explain Special functions

CO2. Understanding . X ray Diffraction and Other Characterization Techniques

CO3. Understanding . Free Electron and Band Theory of Metals

COURSE CODE AND TITLE: PH 333 CLASSICAL MECHANICS

CO1. Understand the mechanics of system of particles

CO2. Get an idea on Motion in Central Force Field

CO3. Help to explore new developments Scattering of particles.

CO4. Enable the students to illustrate Langrangian and Hamiltonian formulation

CO5. Develop an interest in the Canonical Transformation and Poisson's Bracket

COURSE CODE AND TITLE: PH334 ATOMIC AND MOLECULAR PHYSICS

CO1. Understanding on the basic theories and principles of Atomic structure

CO2. Learn current environmental issues based on One and two valence electron systems

CO3. Gain critical understanding Two valence electron systems.

CO4. Expose to the basics and advances in Zeeman Effect, X ray spectroscopy and Molecular spectroscopy

COURSE CODE AND TITLE: PH335: COMPUTATIONAL PHYSICS

CO1. To provide students with knowledge Concepts of programming:

CO2. To enable students to understand the Structure of C program, Character set, key words,

CO3. To enable students to reach Arrays and Pointers and User Defined Function in C

CO4. To provide students with adequate knowledge about Computational Physics

COURSE CODE AND TITLE: PH-336 ELECTIVE I (B) ELEMENTS OF MATERIALS SCIENCE

CO1. Understanding on the details. Defects in Solids

CO2. Explain the fine structure in Phase Metals Molecular Phases and Ceramic Materials CO3. Understanding the structure and function of Phase Diagrams.

SEMESTER II:

COURSE CODE AND TITLE: PH-341: CLASSICAL ELECTRODYNAMICS

CO1. Understand the importance of Electrostatics:

CO2. Get an idea on tools and techniques available for studying Magneto statics:

CO3. To acquire the Concept of electromagnetic.

COURSE CODE AND TITLE: PH-342: QUANTUM MECHANICS

CO1. To study Origin of Quantum Mechanics:

CO2. Learn more about Physical interpretation of wave function

CO3. Outline the basic Schrodinger's equation in spherical polar co-ordinate system

CO4. Compare the different Operators in Quantum Mechanics

COURSE CODE AND TITLE: PH-343: THERMODYNAMICS AND STATISTICAL PHYSICS

CO1. Discuss Assumptions of Kinetic theory of gases

CO2. Explain the Maxwell Relations and Application

CO3. Describe how Elementary Concepts of Statistics

CO4. Distinguish Statistical Distribution of System of Particles: and Statistical Ensembles

COURSE CODE AND TITLE: PH 344 NUCLEAR PHYSICS

CO1. Explain Basic Properties of Nucleus

CO2. Describe the experiments of Radioactivity

CO3. Describe the Meson theory of nuclear forces, Properties of nuclear forces,

CO4. Explain the consequence Introduction to particle Accelerators

COURSE CODE AND TITLE: PH345: ELECTRONICS

CO1. Expose to concepts and process in developmental Special Purpose Diodes and Transistor amplifier

CO2. Understand Operational Amplifier and Timer (IC555)

CO3. Introduction to SOP and POS technique in Combinational circuits CO1. Demonstrate advanced.

COURSE CODE AND TITLE: PH346 ELECTIVE II (K): LASERS

CO1. Knowledge and understanding of Introduction to Lasers:

CO2. Describe the Laser Action and Laser Oscillators

CO3 To understand Characteristics of Laser as well as Types and Applications of Lasers

DEPARTMENT OF PHYSICS

POST-GRADUATE (MSc) SECTION

Preamble of the Syllabus: Master of Science (M.Sc.) in Physics is a post-graduation course of University of Pune.

The credit system to be implemented through this curriculum, would allow students to develop a strong footing in the fundamentals and specialize in the disciplines of his/her liking and abilities. The students pursuing this course would have to develop in depth understanding various aspects of the subject. The principles in Physics will be studied in depth. Students will have deeper understanding of laws of nature through the subjects like classical mechanics, quantum mechanics, electrodynamics, statistical physics etc. Students' ability of problem solving will be enhanced. Students can apply principles in physics to real life problems.

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COURSE OUTCOMES (COS)

SEMESTER-I

COURSE CODE AND TITLE: PHYUT501: CLASSICAL MECHANICS

CO1: Define basic terms Constrained Motion and Lagrangian formulation

CO2: Explain the applications of Variational Principle and Hamilton's formulation.

CO3: Explain the structure and functions of Canonical Transformations and Poisson Brackets

CO4: Explain the importance of tools and techniques Non inertial frames of References ,

Central Force COURSE CODE AND TITLE: PHYUT502: ELECTRONICS:

CO1: Label the Applications of special function ICs

CO2: Explain Regulated power supply

CO3: Explain the ultrastructure and functions of various cell organelles.

CO4: Explain the concepts Digital Logic circuits I: Combinational Logic

CO5: Illustrate the Digital Logic circuits II: Sequential Logic:

CO6: Illustrate the types, development and causes of Data Converters

COURSE CODE AND TITLE: PHYUT503: MATHEMATICAL METHODS IN PHYSICS:

CO1: Define the : Linear spaces and operators

CO2: Identify Matrix representation, Similarity transformations,

CO3: Discuss Special Function

CO4: Explain the principles Fourier series and Integral transforms

COURSE CODE AND TITLE: PHYUT504: ATOMS AND MOLECULES

CO1: Explain the Atomic structure and atomic spectra :.

CO2: Explain Molecular Spectra – Rotational and vibrational spectra for diatomic molecules, Electronics spectra of diatomic molecules.

CO3: Explain the concept ESR- Principles of ESR, ESR spectrometer

CO4: Explain Crystal Diffraction and Lattice Vibrations of Solids.

COURSE CODE AND TITLE: PHYUT505: EXPERIMENTAL TECHNIQUES IN PHYSICS I

CO1 : Signal and Signal Analysis

CO2 :important and fields applications of vacuum

CO3 :Principles of pumping concept,

CO4 :Vacuum Measurements and Low Temperature Technique

SEMESTER-II

COURSE CODE AND TITLE: PHYUT601: ELECTRODYNAMICS

CO1: Multipole expansions and time varying fields

CO2: Energy, force, momentum relations and electromagnetic wave equations 1

CO3: Inhomogeneous wave equations.

CO4: Relativistic Mechanics and Covariance

COURSE CODE AND TITLE: PHYUT602: SOLID STATE PHYSICS

CO1: Band Theory of Solids

CO2 Diamagnetism and Paramagnetism

CO3: Ferromagnetism, Antiferromagnetism and Ferrimagnetism 1 C

CO4: Superconductivity.

COURSE CODE AND TITLE: PHYUT 603: QUANTUM MECHANICS I

CO1: To do Revision and general formalism

CO2: to understand Representation of States – Dirac notation.

CO3: To study and verify Approximation Methods

CO4: To Introduction to WKB approximation,

COURSE CODE AND TITLE: PHYUT604: LASERS

CO1: To understand Interaction of radiation with matter

CO2: To study Different types of gas lasers

CO3: To discuss industrial applications:

COURSE CODE AND TITLE: PHYUT605: EXPERIMENTAL TECHNIQUES IN PHYSICS II

CO1: To understand Radiation Sources, Detectors and Sensors

CO2: To discuss Structural Characterization and Thermal Analysis.

CO3: To verify Morphological and Magnetic Characterization

CO4: To discuss Spectroscopic Analysis

PROPOSED STRUCTURE OF M. SC. (PHYSICS) SYLLABUS (C.B.C.S.)

From Academic Year 2019-2020 Preamble:

The curriculum for the M. Sc. (Physics) programme is designed to cater to the requirement of Choice Based Credit System following the University Grants Commission (UGC) guidelines. In the proposed structure, due consideration is given to Core and Elective Courses (Discipline specific - Physics), along with Ability Enhancement (Compulsory and Skill based) Courses. Furthermore, continuous assessment is an integral part of the CBCS, which will facilitate systematic and thorough learning towards better understanding of the subject. The systematic and planned curricula divided into two years (comprised of four semesters) shall motivate the student for pursuing higher studies in Physics and inculcate enough skills for becoming an entrepreneur.

Objectives: To foster scientific attitude, provide in-depth knowledge of scientific and technological

concepts of Physics.

To enrich knowledge through problem solving, minor/major projects, seminars, tutorials, review of research articles/papers, participation in scientific events, study visits, etc.

PO 1 : To familiarize with recent scientific and technological developments

PO 2 : To create foundation for research and development in Physics

PO3 : To help students to learn various experimental and computational tools thereby developing analytical abilities to address real world problems.

PO4 : To train students in skills related to research, education, industry and market

PO 5 : To help students to build-up a progressive and successful career in Physics.

COURSE CODE AND TITLE: PHCT-111: MATHEMATICAL METHODS IN PHYSICS

CO1: Explain Complex Analysis

CO2: Explain Vector Space and Matrix Algebra

CO3: Explain the concept Special Functions and Fourier Series and Integral Transforms

COURSE CODE AND TITLE: PHCT-112: CLASSICAL MECHANICS

CO1: To do Analytical Dynamics (Lagrangian and Hamiltonian Dynamics

CO2: To understand Lagrangian formulation of motion under central forces. Kepler problem.

CO3: To study and verify Moment of inertia tensor. Euler angles. Euler equation of motion for rigid body motion,

COURSE CODE AND TITLE: PHCT-113: QUANTUM MECHANICS

CO1: Inadequacy of classical Physics, wave packets and uncertainty relations

CO2: To understand Representation of States – Dirac notation.

CO3: To study Angular Momentum

CO4: To Introduction Approximation Methods,

COURSE CODE AND TITLE: PHCT-114 ELECTRONICS

CO1: To understand Semiconductor Devices and its Applications

CO2: To understand Special Function ICs and their Applications.

CO3: To study Digital Logic Circuits I: Combinational Logic

CO4: To Introduction Data Converters

COURSE CODE AND TITLE: PHCT-121, ELECTRODYNAMICS

CO1 Inadequacy of Multiple expansions and time varying fields

CO2: To understand Energy, Force, Momentum relations and Electromagnetic wave equations

CO3: To study Inhomogeneous Wave Equations

CO4: To Introduction Relativistic Mechanics and Covariance

COURSE CODE AND TITLE: PHCT-122 SOLID STATE PHYSICS

CO1 : Inadequacy of Crystal Structure of Solids

CO2: To understand Electronic Structure of Solids

CO3: To study Magnetism and Superconductivity

CO4: To Introduction Dielectric Properties of Solids

COURSE CODE AND TITLE: PHCT-123 STATISTICAL MECHANICS

CO1 : Brief discussion on probability distributions

CO2: To understand Classical Statistical Mechanics

CO3: To study Applications of Statistical Mechanics and Quantum Distribution Functions

CO4: To Introduction Ideal Bose and Fermi Systems

COURSE CODE AND TITLE: PHCT-124 :ATOMS AND MOLECULES

CO1: Brief discussion on Atomic models, Hydrogen atom, and quantum numbers.

CO2: To understand Molecules

CO3: To study Spectroscopic Techniques

CO4: To study Resonance spectroscopy

COURSE CODE AND TITLE: PHCT-231 PHYSICS OF SEMICONDUCTOR DEVICES

CO1 : Brief discussion Properties of semiconductor CO2: To understand Types of semiconductor, direct and indirect band gap semiconductors

CO3: To study : Junction Transistor and Field Effect Devices

CO4: To study Metal and Metal Insulator semiconductor devices

COURSE CODE AND TITLE: PHCT-232 LASER FUNDAMENTALS AND APPLICATIONS

CO1 : Brief discussion Interaction of radiation with matter

CO2: To understand Types Three and four level system and rate equations

CO3: To study Principle, Construction, Energy level diagram and working

CO4: To study Industrial applications

COURSE CODE AND TITLE: PHCT-233: EXPERIMENTAL TECHNIQUES IN PHYSICS-I

CO1 : Inadequacy of Signal, Signal Analysis and Sensors

CO2: To understand Vacuum Physics and Vacuum Techniques

CO3: To study Vacuum Measurement and Low Temperature Techniques

COURSE CODE AND TITLE: PHOP234-L: PHYSICS OF THIN FILMS

CO1 : To overview Introduction to Thin Films

CO2: To understand Deposition Techniques and Measurement of Thickness

CO3: To study Properties of Thin Films

CO4: To study Applications of Thin Films



HEAD
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