Maratha Vidya Prasarak Samaj's

Karmaveer Shantarambapu Kondaji Wavare
Arts, Science and Commerce College, CIDCO, Nashik
Uttamnagar, Nashik- 422 008 (Maharashtra)

Affiliated to Savitribai Phule Pune University   **Id. No. PU/NS/ASC/047/1993**

AISHE C-42086   NAAC Re-accredited 'A' Grade (III Cycle 2017-22, CGPA 3.20)

Best College Award of Savitribai Phule Pune University Pune in 2009-10 and 2021-22

Internal Quality Assurance Cell

Programme Outcomes (PO's)

Programme Specific Outcomes (PSO's)

Course Outcomes (CO's)

Syllabus: 2013 Pattern

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Principal
Prof. (Dr) S. K. Kushare
M.Sc., Ph. D.

Programme Outcome (PO's), Programme Specific Outcome (PSO's), Course Outcome (CO's)

Department: Physics
Syllabus: 2013 Pattern

Sr. No.	Name of the Programme	Year of introduction of programme	Duration of introduction of Programme
1	B.Sc. Physics	1993-94	3 Years

Sr. No.	Programme Specific Outcome (B.Sc. Physics)
PSO 1	To foster scientific attitude, provide in-depth knowledge of scientific and technological concepts of Physics.
PSO 2	To enrich knowledge through problem solving, minor/major projects, seminars, tutorials, review of research articles/papers, participation in scientific events, study visits, etc.
PSO 3	To familiarize with recent scientific and technological developments.
PSO 4	To create foundation for research and development in Physics.
PSO 5	To help students to learn various experimental and computational tools thereby developing analytical abilities to address real world problems.
PSO 6	To train students in skills related to research, education, industry, and market.
PSO 7	To help students to build-up a progressive and successful career in Physics.

Course Outcome (B.Sc. Physics)

Class	Subject code	Title	Cos: After successful completion of this course, student will be able to
F.Y.B.Sc. Section I		Mechanics	CO 1: Demonstrate an understanding of Newton's laws and applying them in calculations of the motion of simple systems.
			CO 2 Use the free body diagrams to analyse the forces on the object.
			CO 3:Understand the concepts of energy, work, power, the concepts of conservation of energy and be able to perform calculations using them.
			CO 4:. Understand the concepts of elasticity and be able to perform calculations using them.
			CO 5:Understand the concepts of surface tension and viscosity and be able to perform calculations using them.
			CO 6:Use of Bernoulli's theorem in real life problems.
		Physics Principles and Applications	CO 1: . To demonstrate an understanding of electromagnetic waves and its spectrum
			CO 2: Understand the types and sources of electromagnetic waves and applications.
			CO 3: To understand the general structure of atom,

Class	Subject code	Title	Cos: After successful completion of this course, student will be able to
			spectrum of hydrogen atom.
			CO 4: To understand the atomic excitation and LASER principles.
			CO 5: To understand the bonding mechanism in molecules and rotational and vibrational energy levels of diatomic molecules
			CO 6: To demonstrate quantitative problem solving skills in all the topics covered.
		Practical	CO 1: Acquire technical and manipulative skills in using laboratory equipment, tools, and materials.
			CO 2: Demonstrate an ability to collect data through observation and/or experimentation and interpreting data.
			CO 3: Demonstrate an understanding of laboratory procedures including safety, and scientific methods.
			CO 4: Demonstrate a deeper understanding of abstract concepts and theories gained by experiencing and visualizing them as authentic phenomena.
			CO 5: Acquire the complementary skills of collaborative learning and teamwork in laboratory settings.
			CO 6:Demonstrate of thermocouple and determination of inversion temperature
F.Y.B. Sc. Section II		Heat and Thermodynamics	CO 1: Describe the properties of and relationships between the thermodynamic properties of a pure substance.
			CO 2: Describe the ideal gas equation and its limitations.
			CO 3: Describe the real gas equation.
			CO 4: Apply the laws of thermodynamics to formulate the relations necessary to analyze a thermodynamic process.
			CO 5: Analyze the refrigerators, heat pumps and calculate coefficient of performance.
			CO 6: Understand property 'entropy' and derive some thermo dynamical relations using entropy concept.
		Electromagnetics	CO 1: Demonstrate an understanding of the electric force, field and potential, and related concepts, for stationary charges.
			CO 2: Calculate electrostatic field and potential of simple charge distributions using Coulomb's law and Gauss's law.
			CO 3: Demonstrate an understanding of the dielectric and effect on dielectric due to electric field.
			CO 4: electric field. 4. Demonstrate an understanding of the magnetic field for steady currents using Biot-Savart and Ampere's laws.
			CO 5: Demonstrate an understanding of magnetization of materials.

Class	Subject code	Title	Cos: After successful completion of this course, student will be able to
			CO 6: Demonstrate quantitative problem solving skills in all the topics covered.
S.Y.B. Sc Sem I.	PHY211	Mathematical Methods in Physics I	CO 1: Understand the complex algebra useful in physics courses
			CO 2: Understand the concept of partial differentiation.
			CO 3: • Understand the role of partial differential equations in physics
			CO 4: Understand vector algebra useful in mathematics and physics
			CO 5: Understand the singular points of differential equation.
			CO 6:Understandthe Scalar triple product and its geometrical interpretation.
	PH212	ELECTRONICS	CO 1: Apply laws of electrical circuits to different circuits.
			CO 2: Understand the relations in electricity
			CO 3: Understand the properties and working of transistors.
			CO 4: Understand the functions of operational amplifiers.
			CO 5: Design circuits using transistors and operational amplifiers.
			CO 6: Understand the Boolean algebra and logic circuits.
	PH212	INSTRUMENTATION	CO 1: Understand the functions of different instruments.
			CO 2: Use different instruments for measurement of parameters.
			CO 3: Design experiments using sensors.
			CO 4: Understand the Signal conditioning and processing
			CO 5: To understand the Measurement of pressure, flow and magnetic field
			CO 6: To understand the concept of Transducers
S.Y.B. Sc Sem II.	PH221	OSCILLATIONS, WAVES AND SOUND	CO 1: Understand the physics and mathematics of oscillations.
			CO 2: Solve the equations of motion for simple harmonic, damped, and forced oscillators
			CO 3: Formulate these equations and understand their physical content in a variety of applications.
			CO 4: Explain oscillation in terms of energy exchange, giving various examples.
			CO 5: Explain in qualitative terms how frequency, amplitude, and wave shape affect the pitch, intensity, and quality of tones produced by musical instruments
			CO 6: Calculate the phase velocity of a travelling wave.
	PH222	OPTICS	CO 1: acquire the basic concepts of wave optics

Class	Subject code	Title	Cos: After successful completion of this course, student will be able to
			CO 2: describe how light can constructively and destructively interfere
			CO 3: explain why a light beam spreads out after passing through an aperture
			CO 4: summarize the polarization characteristics of electromagnetic waves
			CO 5: appreciate the operation of many modern optical devices that utilize wave optics
			CO 6: Understand optical phenomena such as polarisation, birefringence, interference and diffraction in terms of the wave model.
	PH223	PRACTICAL COURSE	CO 1: After completing this practical course students will be able to
			CO 2: Use various instruments and equipment.
			CO 3: Design experiments to test a hypothesis and/or determine the value of an unknown quantity.
			CO 4: Investigate the theoretical background to an experiment.
			CO 5: Set up experimental equipment to implement an experimental approach.
			CO 6:Analyse data, plot appropriate graphs and reach conclusions from your data analysis.
T.Y.B. Sc Sem I	PH-331	Mathematical Methods in Physics II	CO 1: Understand Cartesian, Spherical polar and Cylindrical co-ordinate systems.
			CO 2: : Understand the use of gradient, divergence, Laplacian and Curl.
			CO 3: Understand the Special Theory of Relativity: Mass-energy relation.
			CO 4: : Understand the degree, order, linearity and homogeneity of differential equations.
			CO 5: Understand the use of Legendre,Hermite Polynomials and Bessels functions.
			CO 6: To understand the Kinematic effects of Lorentz transformation
	PH332	Solid State Physics	CO 1: Understand Lattice, Basis, Translational vectors, Primitive unit cell, Symmetry operations, Different types oflattices and crystal structures.
			CO 2: Understand X ray Diffraction and Other Characterization Techniques.
			CO 3: Understand Free Electron and importance of Band Theory of Metals.
			CO 4: Understand the magnetic properties of materials.
			CO 5:To understand the Langevin theory of Diamagnetism, Application of diamagnetic material: (Superconductor)Occurrence of Superconductivity
			CO 6: Understand theConcept of reciprocal lattice and its properties with proof.
	PH 333	Classical	CO 1: Apply Newton's laws of motion to understand Projectile motion in various medium, Rocket

Class	Subject code	Title	Cos: After successful completion of this course, student will be able to
		Mechanics	CO 2: : motion, Motion of a charged particle in constant electric, magnetic and electromagnetic field.
			CO 3: Understand the Kepler's laws of planetary motion and Orbits of artificial satellites.
			CO 4: Understand the Elastic and inelastic scattering and relation between scattering angles in laboratory and centre of mass system.
			CO 5: Understand the use of Langrangian and Hamiltonian formulation in particle motion.
			CO 6: Understand the application of Canonical Transformation and Poisson's Bracket.
	PH334	Atomic and Molecular Physics	CO 1: : Understand the Rutherford atomic model and Vector atom model.
			CO 2: Understand the Pauli Exclusionprinciple and electron configuration.
			CO 3: : Understand the LS and JJ coupling schemes.
			CO 4: : Understand the normal and anomalous zeemaneffect and Stark effect.
			CO 5: Understand the application of X ray spectroscopy.
			CO6: : Understand the molecular spectroscopy and raman spectroscopy.
	PH335	Computational Physics	CO 1: Properties of algorithms,a for kinematic equations, free fall, equation of state, factorial of anumber.
			CO 2: : Develop the program using C Programming.
			CO 3: Understand the use of Graphics in C programing.
			CO 4: Understand the errors in computation
			CO 5: : Write C program for trapezoidalrule andSimpson's 1/3rd rule.
			CO 6: Understand the Operators and Expressions
	PH-336 Elective I (B)	Elements of Materials Science	CO 1: : Understand the defects in solids.
			CO 2: Understand the elastic deformation and plastic deformation.
			CO 3: Understand the cross linked polymer vulcanization
			CO 4: Understand the errors in computation.
			CO 5: Understand the Phase Diagram importance and objective.
			CO 6: Understand the Properties and applications of smart materials.
T.Y.B. Sc Sem II	PH-341	Classical Electrodynamics	CO 1: : Understand the concepts of magnetic induction, magnetic flux and magnetic field.
			CO 2: Understand the day to day applications of Electrodynamics
			CO 3: motion, Motion of a charged particle in constant electric, magnetic and electromagnetic field.

Class	Subject code	Title	Cos: After successful completion of this course, student will be able to
			CO 4: : Understand the Elastic and inelastic scattering and relation between scattering angles in laboratory and centre of mass system
			CO 5: : Understand the application of Canonical Transformation and Poisson's Bracket.
			CO 6: Apply Newton's laws of motion to understand Projectile motion in various medium, Rocket
	PH-342	Quantum Mechanics	CO 1: Understand the concept of wave packet, phase velocity, group velocity
			CO 2: Understand the Heisenberg's uncertainty principle with thought experiment.
			CO 3: Understand the physical interpretation of wave function, Schrodinger time dependent and independent equations
			CO 4: Apply the Schrodinger Steady state equation to study the motion of particles.
			CO 5: : Understand the importance of Operators in Quantum Mechanics.
			CO 6: : Understand the Concept of reciprocal lattice and its properties with proof.
	PH-343	Thermodynamics and Statistical Physics	CO 1: Understand the Maxwell Relations and Application.
			CO 2: Understand the Statistical Distribution of System of Particles.
			CO 3: Understand the Kinetic theory of gases.
			CO 4: Understand the Canonical ensembles and micro canonical Ensembles.
			CO 5: Understand the importance of Maxwell-Boltzmann's statistics, Bose-Einstein Statistics, Fermi-Dirac Statistics.
			CO 6: Understand the Maxwell-Boltzmann's statistics and Bose-Einstein Statistics
	PH 344	Nuclear Physics	CO 1:Understand the Basic Properties of Nucleus.
			CO 2:Understand the Properties of α, β,γ-rays.
			CO 3:Understand the use of Gas filled Detectors and Solid state detectors.
			CO 4:Understand the concept regarding nuclear fission, chain reaction and critical mass and nuclear reactor.
			CO 5:Understand the concept regarding nuclear fission, chain reaction and critical mass and nuclear reactor.
	PH345	Electronics	CO 1:Understand the application of light emitting diode.
			CO 2:Understand the working principle of different Transistor amplifiers.
			CO 3:Draw the IV characteristics of JFET,MOSFET (DEMOSFET and E only MOSFET)
			CO 4:Understand the application of Op-Amp in integrator, Differentiator, Comparator, Schmitt Trigger.
			CO 5:Understand the working of Astable, monostable and bistablemultivibrator using IC555.

Class	Subject code	Title	Cos: After successful completion of this course, student will be able to
			CO 6: understand theCombinational Circuits and sequential circuit.
	PH346 Elective II (H)	Physics of Nanomaterials	CO 1:Understand the history of nanomaterialsand challenges in nanotechnology.
			CO 2:: Understand the different methods of synthesis of nanomaterials and their importance.
			CO 3:: Understand the different characterization techniques use to study nanomaterials.
			CO 4:: Understand the Mechanical, Electrical, Thermal, Optical, solubility, melting point and Magnetic
			CO 5:Properties of nanomaterials.
			CO 6:Understand the application of nanomaterials in Medical, Biological, Automobiles, Space, Defense, Sports, Cosmetics and Cloth industry.
T.Y.B. Sc Sem III	PH347	Laboratory Course I	CO 1:Measure Coefficient of sound absorption.
			CO 2:: Measure the Hall coefficient by Hall effect.
			CO 3:Study of XRD spectrum of any material.
			CO 4:Measure thermal conductivity of rubber tube
			CO 5:: Determine Planck's constant
			CO 6:Verify Stefan's fourth power law by bulb filament.
	PH348	Laboratory Course II	CO 1:1 Design and built astablemultivibrator using IC 555/IC 741.
			CO 2:Understand the use of Ultrasonic interferometer to measure velocity of sound in liquids
			CO 3:Use of Temperature controller using PT 100 / thermocouple /thermistor temperature sensors.
			CO 4::Measure transmission loss using expansion chamber muffler.
			CO 5:Determine the diameter of a thin wire using a laser beam.
			CO 6:Study Factorial of a number by simple and recursive method.
	PH348	Laboratory Course III Project	CO 1:Prepare nanoparticles for various applications.
			CO 2:Handle scientific instruments such as furnace, weighing balance, etc.
			CO 3:Read and understand scientific research articles related to the project topic.
			CO 4:Write and present the project work in the national/international conferences.
			CO 5:apply the Fourier Series and Integral Transforms for scientific calculations.
			CO 6:Write and publish project work in reputed ugc listed journals.
MSc Sem I	PHYUT 501	Classical Mechanics	CO 1: apply the Lagrangian and Hamiltonian Dynamics to study motion of particles
			CO2: understand the use of Canonical Transformations and Poisson Brackets.

Class	Subject code	Title	Cos: After successful completion of this course, student will be able to
			CO 3: understand the Central Forces and Non-inertial Frames of Reference to study motion of different objects.
			CO 4: understand the Rigid Body Dynamics and Small Oscillations.
			CO 5:understand the two body central force problem, stability of orbits, condition for closure, integrable power laws, Kepler's problems
			CO 6:understand the orbits of artificial satellites, Virial theorem.
	PHYUT502	Electronics	CO 1: application of semiconductor devices in SCR, DIAC, TRIAC and DC-AC converters.
			CO 2: understand the importance of special function ICs and their applications.
			CO 3: use Karanaugh map to design 4-variable logic circuits like BCD to 7-segment decoder.
			CO 4: use IC 7495 as SISO, SIPO, PIPO and PISO.UP-DOWN counters.
			CO 5: understand the analog to digital converters: binary weighted type, R-2R ladder type, study of IC 0808
			CO 6:digital logic circuits I: combinational logic, digital logic circuits II: sequential logic
	PHYUT503	Mathematical Methods in Physics	CO 1: understand use of complex number, complex function (polynomial, exponential, trigonometric complex function
			CO 2: understand the use of logarithm.
			CO 3: understand the application of Vector Space and Matrix Algebra.
			CO 4: understand the application of special functions such as Bessel function, Legendre, Hermite, and Laguerre functions.
			CO 5: apply the Fourier Series and Integral Transforms for scientific calculations.
			CO 6:understand the application Power Series, Taylor's theorem,Laurent's theorem
	PHYUT504	Atoms, Molecules and Lasers	CO 1: understand the coupling schemes, two electron spectra, fine structure and hyperfine structure of spectra.
			CO 2: understand the spectra of diatomic
			CO 3: molecules, vibration course structure, vibrational analysis of band system, Frank Condon principle.

Class	Subject code	Title	Cos: After successful completion of this course, student will be able to
			CO 4: understand the principle of Microwave Spectroscopy, Infrared spectroscopy and Raman spectroscopy.
			CO 5: understand the principles of ESR, ESR spectrometer, NMR.

HoD, Physics   IQAC Coordinator

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Programme Outcomes (PO's)

Programme Specific Outcomes (PSO's)

Course Outcomes (CO's)

Syllabus: 2019 Pattern

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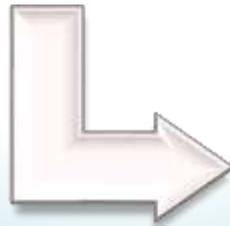**AISHE C-42086   NAAC Re-accredited 'A' Grade (III Cycle 2017-22, CGPA 3.20)**
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Principal
Prof. (Dr) S. K. Kushare
M.Sc., Ph. D.

Programme Outcome (PO's), Programme Specific Outcome (PSO's), Course Outcome (CO's)

Department: Physics
Syllabus: 2019 Pattern

Sr. No.	Name of the Programme	Year of introduction of programme	Duration of introduction of Programme
1	B.Sc. Physics	1993-94	3 Years

Programme Specific Outcome (B.Sc. Physics)

Sr. No.	Programme Specific Outcome (B.Sc. Physics)
PSO 1	To understand the concepts and significance of the various physical phenomena.
PSO 2	To understand the basic concepts of methodology of science and the fundamentals of mechanics, properties of matter and electrodynamics.
PSO 3	To understand the theoretical basis of quantum mechanics, relativistic physics, nuclear physics, optics, spectroscopy, solid state physics, astrophysics, statistical physics, photonics and thermodynamics.
PSO 4	To understand and apply the concepts of electronics in the designing of different analog and digital circuits.
PSO 5	To apply the theories learnt and the skills acquired to solve real time problems.

Class	Subject code	Title	Cos: After successful completion of this course, student will be able to
F.Y.B.Sc. SemI	PHY-111	Mechanics and Properties of Matter	CO 1: understand the newton's laws and its applications
			CO 2: understand the surface tension applications in daily life.
			CO 3: understand the basic concepts of mechanics, fluid dynamics and various types of forces.
			CO 4:Use of Bernoulli's theorem in real life problems.
			CO 5:Understand the concepts of elasticity and be able to perform calculations using them.
			CO 6:Use the free body diagrams to analyse the

Class	Subject code	Title	Cos: After successful completion of this course, student will be able to
			forces on the object.
	PHY-112	Physics Principles and Applications	CO 1: understand and imagine the internal structure of atom
			CO 2: understand the particle functions like electron, proton & neutron
			CO 3: understand the importance of electromagnetic radiation from sun to earth.
			CO 4: understand the basic function of laser and its use in various fields.
			CO 5:To understand the bonding mechanism in molecules and rotational and vibrational energy levels of diatomic molecules
			CO 6:To demonstrate quantitative problem solving skills in all the topics covered.
	PHY-123	Physics Laboratory-IB	CO 1: understand the use of various measuring Instruments like Verniercaliper, Micrometer Screw Gauge, Travelling Microscope .
			CO 2:determine the young's modulus, modulus of rigidity of materials by different methods.
			CO 3: use spectrometer and determination of angle of prism.
			CO 4:understand the total internal reflection using LASER.
			CO 5:understand how to determine wavelength of LASER light by plane diffraction grating.
			CO 6: draw I-V characteristics of solar cell
F.Y .B. Sc. Se mII	PHY-121	Heat and Thermodynamics	CO 1: understand the various thermodynamic processes like isothermal, isobaric, isochoric processes and laws of thermodynamics.
			CO 2: understand Carnot's cycle, Heat engines and Refrigerators.
			CO 3: understand the various types of thermometers like Liquid filledthermometers, Gas filled thermometers, Bimetallic thermometers, Platinum resistance thermometer
			CO 4:Analyze the refrigerators, heat pumps and calculate coefficient of performance.
			CO 5:: Understand property 'entropy' and derive some thermo dynamical relations using entropy concept.
			CO 6:Describe the properties of and relationships between the thermodynamic properties of a pure

Class	Subject code	Title	Cos: After successful completion of this course, student will be able to
			substance.
	PHY-122	Electricity and Magnetism	CO 1: understand the concept of the electric force, electric field and electric potential for stationary charges.
			CO 2:calculate electric potential and electric field by using Gauss's law.
			CO 3: concept of magnetic field, magnetic field for steady currents using Biot-Savart's law and Ampere's law.
			CO 4: study the magnetic materials and its properties.
			CO 5:Demonstrate quantitative problem solving skills in all the topics covered.
			CO 6:: Demonstrate an understanding of magnetization of materials.
	PHY-123	Physics Laboratory 1B	CO 1:Interpret Isothermal and Adiabatic curve on P-V diagram.
			CO 2:measure thermal conductivity by Lee's method
			CO 3:Determine calorific values of different fuels.
			CO 4:use of Voltmeter, Ammeter and Multimeter.
			CO 5: determine frequency of AC mains
			CO 6: understand LCR circuit and its use.
S.Y.B. Sc Se mI.	PHY-231	Mathematical Methods in Physics	CO 1: understand complex numbers, their forms and applications.
			CO 2: understand partial differentiation,
			CO 3: successive differentiation and total differentiation
			CO 4:understand cartesian and polar co-ordinates.
			CO 5:understand thd vector algebra and their analysis.
			CO 6: study the degree, order, linearity and homogeneity of differential equation.
	PHY-232	Electronics	CO 1: understand number Systems: decimal, binary, hexadecimal, BCD, gray code and their inter-conversions.
			CO 2: study Logic gates: AND, OR, NOT, EX-OR, NAND, NOR, EX-NOR, NAND and NOR gates.
			CO 3: verify Kirchhoff's Voltage and current laws
			CO 4: verify Thevenin's Theorem , Norton's Theorem , Maximum Power Transfer Theorem
			CO 5: understand working of BJT and UJT Basics and applications.
			CO 6: understand the working of OPAMP and their applications.

Class	Subject code	Title	Cos: After successful completion of this course, student will be able to
	PHY-233	Practical Course (Lab 2A)	CO 1: verify circuit theorems (Thevenin's, Norton's and Maximum Power Transfer Theorems).
			CO 2: study I-V Characteristics of UJT/ UJT as Relaxation Oscillator
			CO 3: verify Op-Amp as inverting and non-inverting, adder &subtractor.
			CO 4: study of logic gates and verification of de Morgan's theorems.
			CO 5: plot various trigonometric functions using spread sheet microsoft excel, sinx, cosx, tanx,ex, e-x, logx, lnx, xn.
			CO 6: plot various trigonometric functions using spread sheet microsoft excelcircle, ellipse, parabola, hyperbola.
S.Y.B. Sc Sem II.	PHY-241	Oscillations, Waves, and Sound	CO 1:Undamped Free Oscillations, Damped Oscillations, Forced Oscillations.
			CO 2: understand the wave motion and its interpretation.
			CO 3: understand the sound and Doppler effect.
			CO 4:Explain oscillation in terms of energy exchange, giving various examples.
			CO 5:Explain in qualitative terms how frequency, amplitude, and wave shape affect the pitch, intensity, and quality of tones produced by musical instruments
			CO 6:Solve the equations of motion for simple harmonic, damped, and forced oscillators
	PHY-242	Optics	CO 1: understand the geometrical optics.
			CO 2: understand the lens aberrations
			CO 3: use optical Instruments such as simple microscope, compound microscope, etc.
			CO 4: understand the polarisation of light.
	PHY-243	Practical Course (Lab 2B)	CO 1: determine the value of acceleration due to gravity
			CO 2: by bar pendulum
			CO 3: measure coefficient of absorption of sound for different materials.
			CO 4: understand the Lissajous figures and determination of unknown frequency.
			CO 5: determine the wavelength of monochromatic light source by Newton's ring method.
			CO 6: study the dispersive power of glass prism.
T.Y.B.	PHY-	Mathematical	CO 1: Understand Cartesian, Spherical polar and

Class	Subject code	Title	Cos: After successful completion of this course, student will be able to
Sc Sem I	351	Methods in Physics -II	Cylindrical co-ordinate systems.
			CO 2: Understand the use of gradient, divergence, LaplacianandCurl.
			CO 3: Understand the Special Theory of Relativity: Mass-energy relation.
			CO 4: Understand the degree, order, linearity and homogeneity of differential equations.
			CO 5: Understand the use of Legendre,Hermite Polynomials and Bessels functions.
			CO 6: To understand the Kinematic effects of Lorentz transformation
	PHY-352	Electrodynamics	CO 1: Understand the applications of Coulomb's law, Gauss law, Electric field, Electrostatic Potential.
			CO 2: Understand the concepts of magnetic induction, magnetic flux and magnetic field.
			CO 3: Understand the applications of Biot-Savart's law, Ampere's force law
			CO 4: Understand the day to day applications of Electrodynamics.
	PHY-353	Classical Mechanics	CO 1: Apply Newton's laws of motion to understand Projectile motion in various medium, Rocket
			CO 2: motion, Motion of a charged particle in constant electric, magnetic and electromagnetic field.
			CO 3: Understand the Kepler's laws of planetary motion and Orbits of artificial satellites.
			CO 4: Understand the Elastic and inelastic scattering and relation between scattering angles in laboratory and centre of mass system.
			CO 5: Understand the use of Langrangian and Hamiltonian formulation in particle motion.
			CO 6: Understand the application of Canonical Transformation and Poisson's Bracket.
	PHY-354	Atomic and Molecular Physics	CO 1: Understand the Rutherford atomic model and Vector atom model.
			CO 2: Understand the Pauli Exclusionprinciple and electron configuration.
			CO 3: Understand the LS and JJ coupling schemes.
			CO 4: Understand the normal and anomalous zeemaneffect and Stark effect.
			CO 5: Understand the application of X ray spectroscopy.
			CO 6: Understand the molecular spectroscopy and raman spectroscopy.

Class	Subject code	Title	Cos: After successful completion of this course, student will be able to
	PHY-355	Computational Physics	CO 1: Properties of algorithms,a for kinematic equations, free fall, equation of state, factorial of anumber.
			CO 2: Develop the program using C Programming.
			CO 3: Understand the use of Graphics in C programing.
			CO 4: Understand the errors in computation
			CO 5: Write C program for trapezoidalruleandSimpson's 1/3rd rule.
			CO 6: Understand the Operators and Expressions
	PHY-356(B)	Elements of Materials Science	CO 1: Understand the defects in solids.
			CO 2 Understand the elastic deformation and plastic deformation.
			CO 3: Understand the cross linked polymer vulcanization of rubber.
			CO 4: Understand the errors in computation.
			CO 5 Understand the Phase Diagram importance and objective.
			CO 6: Understand the Properties and applications of smart materials.
	PHY-3510(H)	Energy studies	CO 1: understand the comparative aspects, advantages and disadvantages of various sources of energy
			CO 2: Learn the basic principles involved and technologies developed in the uses of solar energy, biomass energy, wind energy, fuel cells
			CO 3: Understand the challenges and opportunities in conversion of energy from one form to another, generation of electricity and mechanical work using different energy sources.
			CO 4: Imagine about future road maps in the fields of energy conversion and storage technologies.
	PHY-3511(K)	Physics Workshop Skill	CO 1: Handle and test various instruments.
			CO 2: Understand the various aspects of instruments and their usage through hands-on mode.
			CO 3: Understand the construction of CRT, Electron gun, electrostatic focusing and acceleration.
			CO 4: Measure the distortion of a RF signal generator using distortion factor meter.
T.Y.B. Sc Sem II	PHY-361	Solid State Physics	CO 1: Understand Lattice, Basis, Translational vectors, Primitive unit cell, Symmetry operations, Different typesoflattices and crystal structures.
	PHY-362	Quantum	CO 2: Understand X ray Diffraction and Other Characterization Techniques.

Class	Subject code	Title	Cos: After successful completion of this course, student will be able to
		Mechanics	CO 3: Understand Free Electron and importance of Band Theory of Metals.
			CO 4: Understand the magnetic properties of materials.
			CO 5: To understand the Langevin theory of Diamagnetism, Application of diamagnetic material: (Superconductor)Occurrence of Superconductivity
			CO 1: Understand the concept of wave packet, phase velocity, group velocity.
			CO 2: Understand the Heisenberg's uncertainty principle with thought experiment.
	PHY-368 PHY-363	Physics Laboratory-4B Thermodynamics and Statistical Physics	CO 3: Understand the physical interpretation of wave function, Schrodinger time dependent and independent equations.
			CO 4: Apply the Schrodinger Steady state equation to study the motion of particles.
			CO 5: Understand the importance of Operators in Quantum Mechanics.
			CO 6: Understand theConcept of reciprocal lattice and its properties with proof.
			CO 1: Understand the Kinetic theory of gases.
			CO 2: Understand the Maxwell Relations and Application.
	PHY-369 PHY-364	Physics Project-II Nuclear Physics	CO 3: Understand the Statistical Distribution of System of Particles.
			CO 4: Understand the Canonical ensembles and micro canonical Ensembles.
			CO 5: Understand the importance of Maxwell-Boltzmann's statistics, Bose-Einstein Statistics, Fermi-Dirac Statistics.
			CO 6: Understand the Maxwell-Boltzmann's statistics and Bose-Einstein Statistics
			CO 1: Understand the Basic Properties of Nucleus.
			CO 2: Understand the Properties of α, β,γ-rays.
	PHY-365	Electronics-II	CO 3: Understand the Properties of nuclear forces.
			CO 4: Understand the use of Gas filled Detectors and Solid state detectors.
			CO 5: Understand the concept regarding nuclear fission, chain reaction and critical mass and nuclear reactor.
			CO 1: Understand the application of light emitting diode.
			CO 2: Understand the working principle of different

Class	Subject code	Title	Cos: After successful completion of this course, student will be able to
			Transistor amplifiers.
	PHCT-112 PHY-366(P)	Classical Mechanics Physics of Nanomaterials	CO 3: Draw the IV characteristics of JFET,MOSFET (DEMOSFET and E only MOSFET)
			CO 4: Understand the application of Op-Amp in integrator, Differentiator, Comparator, Schmitt Trigger.
			CO 5: Understand the working of Astable, monostable and bistablemultivibrator using IC555.
			CO 1: Understand the history of nanomaterialsand challenges in nanotechnology.
			CO 2: Understand the different methods of synthesis of nanomaterials and their importance.
			CO 3: Understand the different characterization techniques use to study nanomaterials.
	PHCT-113 PHY-3610(V)	Electronics Solar PV System: Installation, Repairing and Maintenance	CO 4: Understand the Mechanical, Electrical, Thermal, Optical, solubility, melting point and Magnetic
			CO 5: Properties of nanomaterials.
			CO 6: Understand the application of nanomaterials in Medical, Biological, Automobiles, Space, Defense, Sports, Cosmetics and Cloth industry.
			CO 1: study basics of solar photovoltaic (PV) cells, modules, and syetem components.
			CO 2: Design and sizing of off-grid PV system for homes, apartments as well as commercial offices.
			CO 3: Understand energy conversion from sunlight to electricity, and working with solar conversion equipment.
	PHY-3611(Y)	Lasers and Applications Microcontrollers	CO 1: Understand Intel 8051 Microcontroller: Block Diagram and Functions of each block, Pinout details.
			CO 2: Understand 8051 Assembly programming, 8051 data types and assembler directives
			CO 3: Different Addressing modes
			CO 4: Understand Data Transfer instructions, Arithmetic Instructions, Logic and compare instructions, rotate instructions, Branch (Jump, Call RET) instructions.

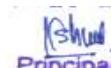| Class	Subject code	Title	Cos: After successful completion of this course, student will be able to
			CO 5: Understand Basics of Serial Data Communication, Types of Serial Data Communication, Concept of Baud Rate, RS 232 Standards, 8051 connection to RS 232, Functions of SBUF and SCON Registers.
			CO 6: Understand the LCD and Keyboard interfacing,ADC and DAC
	PHCT-122	Atoms and Molecules	CO 1: understand the coupling schemes, two electron spectra, fine structure and hyperfine structure of spectra.
			CO 2: understand the spectra of diatomic
			CO 3: molecules, vibration course structure, vibrational analysis of band system, Frank Condon principle.
			CO 4: understand the principle of Microwave Spectroscopy, Infrared spectroscopy and Raman spectroscopy.
			CO 5: understand the principles of ESR, ESR spectrometer, NMR.
	PHCT-123	Quantum Mechanics	CO 1: understand the self adjoint operators, eigen
			CO 2: functions and eigen values, degeneracy, Dirac delta function, Completeness and closure property.
			CO 3: understand the Dirac's bra and ket notation, dynamical variables and linear operators, projection operators, unit operator, unitary operator, matrix representation of an operator
			CO 4: understand the computation of Clebsch-Gordon coefficients.
			CO 5: understand the time dependent and independent Perturbation theory, WKB approximation.
	PHOT-124	Physics of Nanomaterials	CO 1: understand the effect of reduction of dimension and quantum size effect.
			CO 2: understand and know the different synthesis methods of the nanomaterials.
			CO 3: understand the mechanical, thermal, electrical, optical and magnetic Properties of nanomaterials.
			CO 4: study the properties of fullerine, graphine and carbon nonotubes.

HoD, Physics   IQAC Coordinator