



॥ विद्या विनयेन शोभते ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

**CHANGU KANA THAKUR**

**ARTS, COMMERCE AND SCIENCE COLLEGE, NEW PANVEL**

**(AUTONOMOUS)**

Re-accredited 'A+' Grade by NAAC (3<sup>rd</sup> Cycle - CGPA 3.61)

'College with Potential for Excellence' Status Awarded by UGC

'Best College Award' by University of Mumbai

## Department of Physics

**F.Y.BSC 23-24**

**Course Outcomes (COs)**

**SEM I**

**Course:** Physics Major-1,

**Classical Physics, Mathematical Physics**

**Course Code:** USC1PH1

- CO1 Summarize properties of matter, vectors algebra.
- CO2 Apply laws of vector algebra, elasticity, fluid dynamics concepts in various physical situations.
- CO3 Explain crystal system, crystal planes and its direction, different coordinate system and interconversion between them, mechanical properties of matter and fluid with its application
- CO4 Solve sums based on miller indices, Bravais lattices, vector algebra, elasticity, fluid dynamics

**Course:** Physics Major-1,

**Practical**

**Course Code:** USC1PHP1

- CO1 Understand measuring devices such as Vernier Calliper, Screw Gauge, Travelling Microscope.
- CO2 Measure different mechanical properties of Solids like the Moment of Inertia, Modulus of Elasticity, Coefficient of Viscosity, temperature coefficient of resistance of Thermistor and Joule's Constant
- CO3 Demonstrate experiments related to mechanics & crystal



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**Course: OE**

**Basics of Electricity for wiring**

**Course Code: UOE1BEW**

- CO1 Learn and acquire hands-on experience in the usage of multimeters, soldering iron, oscilloscopes, power supplies.
- CO2 Design and trouble shoots the basic electrical circuits through hands-on mode
- CO3 Identify the basic components used for Electronic & Electrical experiments

**Course: Physics Major 2,**

**D. C. Circuits and Digital Electronics**

**Course Code: USC1PH2**

- CO1 Apply Thevenin's Theorem and Norton's Theorem to simplify complex circuits and calculate equivalent circuits with respect to a specific load.
- CO2 develop critical thinking skills by analyzing various circuit configurations and choosing appropriate methods to solve complex circuit problems.
- CO3 differentiate between series and parallel D.C. circuits, calculating equivalent resistances and current/voltage distribution..
- CO4 develop strong problem-solving skills in circuit analysis, enabling them to approach complex D.C. circuit problems methodically and confidently
- CO5 analyze logic gates (AND, OR, NOT, XOR, etc.).
- CO6 Design combinational logic circuits using logic gates



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**Course:** Physics Major-2,  
Practical

**Course Code:** USC1PHP2

- |     |   |
|-----|---|
| CO1 | Analyze complex circuits and simplify them using Thevenin equivalents.  |
| CO2 | Analyze the rectification process in AC to DC conversion.   |
| CO3 | Understand the basic concepts of logic gates, including their types (AND, OR, NOT, NAND, NOR, XOR, etc.) and how they function. |
| CO4 | Design voltage regulation circuits using Zener diodes.  |

**Course:** OE (B. COM)

**Computer Hardware-1**

**Course Code:** UOE1CH

- |     |   |
|-----|---|
| CO1 | analyze simple electronic circuits using Ohm's law and Kirchhoff's laws, calculating voltages, currents, and resistances. |
| CO2 | develop critical thinking skills by diagnosing and rectifying common electronic circuit issues and malfunctions.          |
| CO3 | measure voltage and current accurately using appropriate tools such as multimeters.                                       |



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**Course:** Vocational Skill Course Theory

**Fundamentals of Arduino using simulations**

**Course Code:** UVSC1FAS

- |     |   |
|-----|---|
| CO1 | Explain basic components used with Arduino kit like breadboard, various basic electrical Components & Arduino |
| CO2 | Acquire basic of basic electrical circuits, basic Arduino programs using simulations.                         |
| CO3 | Design the basic Arduino programs for practical applications  |

**Course:** Vocational Skill Course (practical)

**Fundamentals of Arduino using simulations**

**Course Code:** UVSC1FAS

- |     |  |
|-----|--|
| CO1 | Acquire hands-on experience in the usage of breadboard, various basic electrical Components.       |
| CO2 | Design and trouble shoots the basic electrical circuits, basic Arduino programs using simulations. |
| CO3 | Design the basic Arduino programs for practical applications and execute it                        |

**Course :Skill Enhancement Course (Theory )**

**Instrumentation Techniques in Physics**

**Course Code:** USCSEC1P

- |     |   |
|-----|---|
| CO1 | Learn and acquire the knowledge of various measuring instruments and their uses.  |
| CO2 | To acquire basic working knowledge of Oscillation , fluid dynamics  |
| CO3 | Learn and acquire skill to use mechanical tools to make simple measurement of length, height, time, area and volume & to use spectrometer, lens |



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**Course :Skill Enhancement Course (practical )**

**Instrumentation Techniques in Physics**

**Course Code: USCSEC1PHP**

- |     |   |
|-----|---|
| CO1 | To get hands-on experience in usage of optical devices.   |
| CO2 | To acquire basic working knowledge of Oscillation , fluid dynamics  |
| CO3 | Learn and acquire skill to use mechanical tools to make simple measurement of length, height, time, area and volume & to use spectrometer, lens |

**Course: ( IKS) Theory**

**Ancient Indian Astronomy**

**Course Code: UIKS1AIA**

- |     |   |
|-----|---|
| CO1 | analyze ancient Indian astronomical sources, evaluating the accuracy of observations, theories, and calculations based on the available historical records. |
| CO2 | compare contrast ancient Indian astronomical theories with those from other civilizations, understanding the cultural and scientific contexts.              |
| CO3 | Develop skills in analyzing ancient Indian astronomical observations,including star positions, planetary motions, eclipses, and celestial events.           |



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**F.Y.BSC 23-24**

**Course Outcomes (COs)**

**SEM II**

**Course: Physics Major-1,  
Optics, Applied Mathematics  
Course Code: USC2PH1**

- |     |  |
|-----|--|
| CO1 | Apply lens maker equation, concepts of differential equation in circuits.  |
| CO2 | Deduct current, charge in LR, RC circuit in terms of equation and graph, equivalent focal length, cardinal points for thin and thick lens. |
| CO3 | Discuss natural physical processes related to light waves, lens system, aberration   |
| CO4 | Solve numerical problems related to homogenous and inhomogenous equations, lens, Aberration  |

**Course: Physics Major-1,  
Practical  
Course Code: USC2PH1**

- |     |   |
|-----|---|
| CO1 | Utilise Optical Instruments such as the Spectrometer, Prism, Lenses for finding Optical properties like the Refractive Index of the material of the Prism, equivalent focal length. |
| CO2 | Determine moment of inertia & acceleration due to gravity.  |
| CO3 | Apply skills experiment to optics and mechanics practicals  |





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**Course: OE**

**Solar Energy- Fundamentals & Its Applications-I**

**Course Code:UOE2SE**

- |     |   |
|-----|---|
| CO1 | Learn and acquire knowledge the solar energy and its relevance.   |
| CO2 | Design basic solar systems  |
| CO3 | Identify the basic components used for Solar systems  |
| CO4 | Learn and acquire hands-on experience in the handling Solar / PV cells.   |
| CO5 | Design and trouble shoots the basic electrical circuits through hands-on mode                                       |
| CO6 | Familiarize Learners To determine the effect of several variables on the output of a photovoltaic cell.             |
| CO7 | Learners explores energy from the sun in terms of radiant energy to expand on the concept of electricity generation |

**Course: Physics Major 2,**

**A.C.Circuits and Modern Physics**

**Course Code: USC1PH2**

- |     |  |
|-----|--|
| CO1 | compare quantum mechanics with classical mechanics, recognizing the limitations of classical physics and the novel concepts introduced by quantum mechanics. |
| CO2 | explain how the Compton Effect is applied in fields such as X-ray crystallography, where it contributes to understanding the structure of materials.         |
| CO3 | analyze AC circuits, including phasor representation, impedance, admittance, and the concept of complex numbers..  |
| CO4 | Understand the working principles of AC bridges and their significance in precise measurement of resistance, capacitance, and inductance.                    |



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**Course:** Physics Major-2,  
Practical

**Course Code:** USC1PH2

- |     |   |
|-----|---|
| CO1 | Understand the working principle of Light Dependent Resistors (LDRs).                           |
| CO2 | Calculate the angular and spatial distribution of light intensity in the diffraction pattern.   |
| CO3 | Measure the frequency of the AC mains using appropriate equipment.                              |
| CO4 | Measure the unknown capacitance using de Sauty's bridge and compare it with theoretical values. |

**Course:** OE (B. COM)

**Computer Hardware- 2**

**Course Code:** UOE1CH

- |     |  |
|-----|--|
| CO1 | develop problem-solving skills to diagnose and troubleshoot common hardware issues, both in hardware and software interactions.                          |
| CO2 | understand the fundamental concepts of computer architecture, including the organization and structure of various hardware components.                   |
| CO3 | explain recent advancements in computer hardware, including trends in processors, memory technologies, storage solutions, and energy-efficient designs.. |

**Course:** Vocational Skill course(Theory)

**Practical Applications Of Arduino based device -I**

**Course Code:** UVSC2FAD

- |     |   |
|-----|---|
| CO1 | Explain various Sensors, program code of Arduino.   |
| CO2 | Acquire basic working knowledge of program code of Arduino UNO  |
| CO3 | Design program code in practical life using various basic sensors, various electronic outputs devices |





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**Course: Vocational Skill Course(Practical)**

**Practical Applications Of Arduino based device -I**

**Course Code: UVSC2FAD**

- |     |   |
|-----|---|
| CO1 | To get hands-on experience in usage of various Sensors.                                     |
| CO2 | To acquire basic working knowledge of program code of Arduino UNO.                          |
| CO3 | Learn and acquire skill to apply program code in practical life using various basic sensors |

**Course: Skill Enhancement Course(Theory )**

**Basic of Electronics**

**Course Code:USCSEC2P**

CO1	Learn and acquire hands-on experience in the usage of multimeters, soldering iron, oscilloscopes, power supplies.
CO2	Design and trouble shoots the basic electrical circuits through hands-on mode .
CO3	Identify the basic components used for Electronic & Electrical experiments.

**Course: Skill Enhancement Course (Practical)**

**Basic of Electronics**

**Course Code: USCSEC2PHP**

- |     |   |
|-----|---|
| CO1 | Learn and acquire hands-on experience in the usage of multimeters, soldering iron, oscilloscopes, power supplies. |
| CO2 | Design and trouble shoots the basic electrical circuits through hands-on mode                                     |
| CO3 | Identify the basic components used for Electronic & Electrical experiments  |



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**Course: Physics Minor(Theory )**

**Optics, Modern Physics and Analog Electronics**

**Course Code:USC2MIDE**

- |     |  |
|-----|--|
| CO1 | Comprehend the fundamental principles of logic gates, including AND, OR, NOT, NAND, NOR, and XOR gates. They will grasp the concept of digital logic and its applications in various electronic devices and systems.                                     |
| CO2 | Gain a thorough understanding of different number systems, including binary, octal, decimal, and hexadecimal. They will learn to convert numbers between these systems and understand their significance in computer programming and digital electronics |
| CO3 | Perform basic arithmetic operations (addition, subtraction, multiplication, and division) using binary numbers. They will also learn about binary-coded decimal (BCD) and its applications   |

**Course: Physics Minor(Practical)**

**Optics, Modern Physics and Analog Electronics**

**Course Code: USC2MIDE**

- |     |  |
|-----|--|
| CO1 | construct truth tables of basic logic gates and understand their behavior. |
| CO2 | Design combinational logic circuits using logic gates.                     |



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**S.Y.Bsc 2023-24**

**Course Outcomes (COs)**

**SEM III**

**Course:** Physics-1,  
Mechanics and Thermodynamics

**Course Code:** USC3PH1

- |     |  |
|-----|--|
| CO1 | explain the laws of conservation of momentum & energy, compound pendulum, damped & forced harmonic oscillator, basics of theory of measurement   |
| CO2 | formulate equations for the motion of the rocket, conditions for forced & damped harmonic oscillator, time period of compound pendulum, The Normal Distribution  |
| CO3 | solve numerical problems based on laws of conservation of momentum & energy, compound pendulum, damped harmonic oscillator, forced harmonic oscillator, Fractional Uncertainty, Significant Digits, The Estimation of Errors in means and in Single Measurement. |
| CO4 | distinguish between thermodynamic processes, Otto Engine & Diesel Engine, Simple Pendulum & Compound Pendulum, Damped Oscillations & Forced Oscillations, Absolute Errors and Relative Errors  |

**Course:** Physics-2,  
Mathematical Physics, Analog Electronics

**Course Code:** USC3PH2

- |     |  |
|-----|--|
| CO1 | Solve vector calculus and Fundamental Theorem of Line Integrals, Green's Theorem, Divergence Theorem to evaluate integrals,  |
| CO2 | Determine the operating point, stability factor for different transistor biasing methods, frequency of oscillator, voltage gain of opamp in different applications |
| CO3 | Discuss basic of Semiconductor and its Application, Transistors, Oscillators, Opamp, Gradient, Curl, Divergence terms & its applications.                          |
| CO4 | Design basic circuits using Op-amp, transistor, oscillator   |



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**Course:** Physics-3

Applied Physics & Geophysics

**Course Code:** USC3PH3

- |     |   |
|-----|---|
| CO1 | explain the factors affecting Acoustics of buildings, Principle of operation of LASER and Propagation of light through Optical Fiber, variation of Physical and Chemical properties in the interior of the Earth, Continental drift, Plate tectonics, Types of plates and Cause of Earthquake |
| CO2 | understand the concept of relativistic simultaneity, how events that are simultaneous in one frame of reference may not be simultaneous in another frame.   |
| CO3 | discuss the concept of mass-energy equivalence as introduced by the Special Theory of Relativity, including the famous equation $E=mc^2$ .  |
| CO4 | compare the materials on the basis of Electrical conductivity and relative magnetic permeability.   |

**Course:** Practicals III

**Course Code:** USC3PHP

- |     |  |
|-----|--|
| CO1 | Experiment with bridge rectifiers, oscillators, Ballistic galvanometers.   |
| CO2 | Inspect Stefan's law, Brewster's law, $e/m$ by Thomson's method, passive filters, applications of op-amp, CE amplifier, NAND & NOR as Universal Building Block |
| CO3 | Construct electronic circuits using resistor, capacitor, diode, transistor, IC-741 (Op-Amp), logic gates.  |
| CO4 | Estimate physical constants related to solids.   |



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## SEM IV

**Course:** Physics-1,

Wave Optics

**Course Code:** USC4PH1

- |     |  |
|-----|--|
| CO1 | Understand the laws of electrodynamics and be able to perform calculations using them and explain the Construction and Working of Michelson's Interferometer, Fresnel's class of Diffraction and the phenomenon of polarization.   |
| CO2 | Develop quantitative problem solving skills of Electrostatics, solve numerical problems related to Michelson's Interferometer, Fresnel's Diffraction and Brewster's law  |
| CO3 | formulate equations for Coulomb & Gauss Law, Gauss Law in Dielectrics, the wavelength of light, difference in wavelength of light, refractive index of gases using Michelson's Interferometer, separation between diffraction minima & maxima in Fresnel's class of Diffraction. |
| CO4 | distinguish between the Poisson's Equation and Laplace's Equation, Interference and Diffractions, unpolarized light, plane polarized light, circularly polarized light & elliptically polarized light.   |

**Course:** Physics-2,

Quantum Mechanics

**Course Code:** USC4PH2

- |     |   |
|-----|---|
| CO1 | Explain postulates of quantum mechanics, operators, expectation values in quantum mechanics and Schrodinger's equation. |
| CO2 | Apply boundary conditions to calculate the transmission and reflection coefficients for free & bound states.            |
| CO3 | Solve the Schrodinger steady state equation in free and bound state.  |
| CO4 | Elaborate Schrodinger's equation to radioactive decay and harmonic oscillator.  |



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**Course:** Physics-3,

Digital Electronics & Radio Communication

**Course Code:** USC4PH3

- |     |   |
|-----|---|
| CO1 | explain Flip-Flop, 555 timer, 8085 microprocessor architecture and modulation techniques used in wireless communication system              |
| CO2 | explore the use of the 555 timer in generating PWM signals for applications such as motor speed control, LED dimming, and audio modulation. |
| CO3 | elaborate the circuits using Flip-Flop and logic gates.   |
| CO4 | design a programme logic for an 8085-microprocessor using various 8085 instructions.  |

**Course:** Practicals IV

**Course Code:** USC4PHP

- |     |  |
|-----|--|
| CO1 | Determine physical constants of solids, the Resolving power of telescope & grating, wavelength of the monochromatic light, refractive index.   |
| CO2 | Design & construct MS-JK flip flop (IC 7476), Latch (IC 7400/IC 7402) , 8:3 Priority Encoder (IC 74LS148) and 3:8 Decoder (IC 74LS138), shift register, oscillator, Half adder and full adder using EX-OR gate, Op-amp as a Differentiator and Integrator. |
| CO3 | develop a programme using 8085 microprocessor  |
| CO4 | Experiment with IC-7486, IC-7408, IC-7476, IC-7400, IC-7402, IC-74148, IC-74138, IC-74194, IC-741, spectrometer, telescope.  |