



**RAYAT SHIKSHAN SANSTHA'S  
ARTS, SCIENCE AND COMMERCE COLLEGE, MOKHADA, DIST.  
PALGHAR  
DEPARTMENT OF PHYSICS**

**BRIEF INFORMATION**

The department of Physics was established on June 2013 in this college to provide knowledge of Physics. The department served tribal society by producing at least 10 Physics graduates per year. Many of our students are progressed to higher education. The department is serving to the tribal students for the betterment of society. The department is well acquainted with the traditional and advanced instruments including CRO, Power Supply, Computers, etc.

**VISION, MISSION AND OBJECTIVES**

- **Vision**
  - "To support & empower youth from socially deprived Tribal Region through modern higher education facility & bridge socio-economical gap between Tribal and mainstream society".
- **Mission**
  - To provide quality Physics education to the tribal students
  - To inculcate soft skills regarding applied branches of Physics among tribal students
  - To motivate students for research
- **Objectives**
  - To provide detailed information on Modern Physics.
  - To provide basic and applied knowledge of various branches of Physics.
  - To develop competent man power with deep awareness in human values and ethics - creating globally acceptable high quality skilled, potential, professional individuals for Industries, Academics and Society
  - To inculcate scientific culture and research attitude among the Tribal students.

## OFFERED PROGRAM

- **B.Sc. Physics**

## STUDENT ENROLLED (2022-2023)

- **FY BSC: 52**
- **SY BSC: 09**
- **TY BSC: 09**

## OUR STAFF

| Sr. No. | Name of the Teacher | Designation              | Qualification | Experience |
|---------|---------------------|--------------------------|---------------|------------|
| 1.      | Mr. S. K. Vitnor    | Associate Professor      | M.Sc.         | 33         |
| 2.      | Mr. S. A. Funde     | Asst. Professor and Head | M.Sc. SET     | 3          |

## PROGRAM SPECIFIC OUTCOME

At the completion of B.Sc. (Physics) the learner will be graduated with following outcomes:

- 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
- Students are also expected to develop written and oral communication skills in communicating physics-related topics.
- 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.
- Students will learn the applications of numerical techniques for modeling physical systems for which analytical methods are inappropriate or of limited utility.
- Apply conceptual understanding of the physics to general real-world situations.
- Discover of physics concepts in other disciplines such as mathematics, computer science, engineering, and chemistry.
- Develop the following experimental tools: Numerically model simple physical systems using Euler's method, curve fitting, and error analysis.
- Learn to minimize contributing variables and recognize the limitations of Equipment.

The learner will be well acquainted with the knowledge which will help them to become entrepreneur and/or to serve the nation for the betterment of society

COURSE OUTCOMES

| <b>Semester</b> | <b>Course</b>                              | <b>Outcomes</b>   |
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| <b>I</b>        | <b>USPH101 Classical Physics</b>           | <p>After successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> <li>1. Understand Newton's laws and apply them in calculations of the motion of simple systems.</li> <li>2. Use the free body diagrams to analyze the forces on the object.</li> <li>3. Understand the concepts of friction and the concepts of elasticity, fluid mechanics and be able to perform calculations using them.</li> <li>4. Understand the concepts of lens system and interference.</li> <li>5. Apply the laws of thermodynamics to formulate the relations necessary to analyze a thermodynamic process.</li> <li>6. Demonstrate quantitative problem solving skills in all the topics covered.</li> </ol> |
| <b>I</b>        | <b>USPH102 Modern Physics</b>              | <ol style="list-style-type: none"> <li>1. Understand nuclear properties and nuclear behavior.</li> <li>2. Understand the type isotopes and their applications.</li> <li>3. Demonstrate and understand the quantum mechanical concepts.</li> <li>4. Demonstrate quantitative problem solving skills in all the topics covered.</li> </ol>  |
| <b>I</b>        | <b>USPHP1 Practical I</b>                  | <ol style="list-style-type: none"> <li>i) To demonstrate their practical skills.</li> <li>ii) To understand and practice the skills while doing physics practical.</li> <li>iii) To understand the use of apparatus and their use without fear.</li> <li>iv) To correlate their physics theory concepts through practical.</li> <li>v) Understand the concepts of errors and their estimation.</li> </ol>   |
| <b>II</b>       | <b>USPH201 Mathematical Physics</b>        | <ol style="list-style-type: none"> <li>1. Understand the basic mathematical concepts and applications of them in physical situations.</li> <li>2. Demonstrate quantitative problem solving skills in all the topics covered.</li> </ol>   |
| <b>II</b>       | <b>USPH202 Electricity and Electronics</b> | <ol style="list-style-type: none"> <li>1. After the completion of the course learners will get knowledge about Quantum Physics, Geophysics, and Electrodynamics.</li> <li>2. This course will also develop the skills among the learners to handle D.C. circuits and</li> </ol>   |

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|            |  | <p>Digital Circuits</p> <p>3. Learners will be able to do the circuit analysis using various network theorems.</p> <p>4. Learners will understand the concept of Electrostatic field in detail.</p> <p>5. Learners will understand the concept of Magnetic fields in detail.</p>  |
| <b>II</b>  | <b>USPHP2 Practical II</b>                               | <p>1. To understand and practice the skills while doing physics practical.</p> <p>2. To understand the use of apparatus and their use without fear.</p> <p>3. To correlate their physics theory concepts through practical.</p> <p>4. Understand the concepts of errors and their estimation.</p>   |
| <b>III</b> | <b>USPH301: Classical Mechanics &amp; Thermodynamics</b> | <p>On successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> <li>1. Understand the basic mathematical concepts and applications of them in physical situations</li> <li>2. Understand the concepts of mechanics, acoustics and the Properties of matter and be able to perform calculations using them.</li> <li>3. Demonstrate quantitative problem solving skills in all the topics Covered.</li> <li>4. Learners will understand the Simple Harmonic Motion and the effect of Damping forces on such motions and equation of motion related to particles performing Damped Simple Harmonic Motion.</li> <li>5. Learners will understand the Forced Damped Simple Harmonic Motion and Resonance.</li> <li>6. Learners will understand various Laws of Thermodynamics and their implications in daily life.</li> <li>7. Learners will understand various Thermodynamic Processes and various Thermodynamic Cycles (P-V graph).</li> <li>8. Learners will understand the Construction &amp; Working of different types of Heat Engines and the Thermodynamical Processes inside the heat engines.</li> </ol> |
| <b>III</b> | <b>USPH-302: Vector Calculus, Analog Electronics</b>     | <p>On successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> <li>1. Understand the basic mathematical physics concepts and applications of them in physical</li> </ol>   |

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|            |   | <p>situations</p> <ol style="list-style-type: none"> <li>2. Understand the basic laws of electrostatics and magneto statics and applications of them and be able to perform calculations using them.</li> <li>3. Demonstrate quantitative problem solving skills in all the topics covered.</li> <li>4. Understand learners the basic concepts of Mathematical physics and their applications in physical situations</li> <li>5. Understand different types of oscillator and find its frequency.</li> <li>6. Apply Fundamental Theorem of Line Integrals, Green's Theorem, Stokes' Theorem, or Divergence Theorem to evaluate integrals</li> <li>7. Design basic amplifier circuits using Op-amp</li> </ol>  |
| <b>III</b> | <b>USPH303:<br/>Acoustics, Laser,<br/>Fibre optics,<br/>Crystal Physics,<br/>Material Physics,<br/>Geophysics</b> | <p>On successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> <li>1. After the completion of the course learners will understand the Factors affecting Acoustics and use of fibre in optical communication</li> <li>2. learners will also understand the different types of crystal structures</li> <li>3. Learners will understand propagation of light through Optical Fiber, Different types of fibre and Application of Optical Fiber.</li> <li>4. Learners will understand working of Laser and also application of Laser in Holography.</li> <li>5. Learners will understand the Electrical and Magnetic properties of the materials</li> <li>6. Learners will understand the concepts of Continental drift, Plate tectonics and cause of Earthquake</li> </ol> |
| <b>III</b> | <b>USPHP3P:<br/>Practical course</b>  | <p>On successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> <li>1. To demonstrate their practical skills more effectively.</li> <li>2. To understand and practice the skills while doing physics practical.</li> <li>3. To understand the use of apparatus and their use without fear.</li> <li>4. To correlate their physics theory concepts through practical.</li> <li>5. Understand the concepts of errors and their estimation.</li> </ol>   |
| <b>IV</b>  | <b>USPH401: Optics</b>  | <b>On successful completion of this course</b>  |

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|           |   | <p><b>students will be able to:</b></p> <ol style="list-style-type: none"> <li>1. Understand the diffraction and polarization processes and applications of them in physical situations.</li> <li>2. Understand the applications of interference in design and working of interferometers.</li> <li>3. Understand the resolving power of different optical instruments.</li> <li>4. Demonstrate quantitative problem solving skills in all the topics covered.</li> </ol>   |
| <b>IV</b> | <b>USPH402:<br/>Quantum<br/>Mechanics</b>                         | <ol style="list-style-type: none"> <li>1. Able to understand the postulate of Quantum Mechanics</li> <li>2. Use of Quantum Mechanics, its relevance in explaining significant Phenomena in Physics</li> <li>3. Solve the time-independent Schrodinger equation as an intermediate step to solve the time-dependent Schrodinger equation.</li> <li>4. Apply boundary conditions to constraint the set of possible states.</li> <li>5. Find the transmission and reflection coefficients for one-dimensional Barriers</li> </ol>  |
| <b>IV</b> | <b>USPH 403: Digital<br/>Electronics, Radio<br/>Communication</b> | <ol style="list-style-type: none"> <li>1. Learners will understand the different types of Number systems like Binary, Octal, Hexadecimal</li> <li>2. After the completion of the course learners will develop the skill of programming using microprocessor 8085</li> <li>3. Learners will also understand the various modulation techniques used in the communication system</li> <li>4. Learners will understand different types of Flip-Flops</li> <li>5. Learners will understand the working of shift registers and counters</li> <li>6. Learners will understand different types of Addressing modes used in microprocessor 8085</li> </ol> |
| <b>IV</b> | <b>USPHP4P:<br/>Practical course</b>                              | <ol style="list-style-type: none"> <li>1. Learners will get the demonstration of Waveform generator using Op-amp</li> <li>2. Learners will develop the skill of Error analysis of Physics experiments</li> <li>3. Learners will be able to determine the Resolving power of telescope, Resolving power of grating</li> </ol>  |

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|   |   | <p>4. Learners will understand the working of MS-JK flip flop (IC 7476), Latch (IC 7400/IC 7402)</p> <p>5. Learners will be able to do Programming using 8085 microprocessor</p> <p>6. Learners will understand the working of Op-amp as a Differentiator and Integrator</p> <p>7. Learners will understand the working of 8:3 Priority Encoder (IC74LS148) and 3:8 Decoder (IC 74LS138)</p> <p>8. Learners will be able to determine the wavelength of the monochromatic light using Cylindrical obstacle and Fresnel's biprism</p> <p>9. Learners will understand the working of Half adder and full adder using EX-OR gate</p>  |
| V | <b>USPH501: Mathematical, Thermal and Statistical Physics</b> | <p>1. From this course, the students are expected to learn some mathematical techniques required to understand the physical phenomena at the undergraduate level and get exposure to important ideas of statistical mechanics.</p> <p>2. The students are expected to be able to solve simple problems in probability.</p> <p>3. Understand the concept of independent events and work with standard continuous distributions.</p> <p>4. The students will have idea of the functions of complex variables; solve nonhomogeneous differential equations and partial differential equations using simple methods.</p> <p>5. The units on statistical mechanics would introduce the students to the concept of microstates, Boltzmann distribution and statistical origins of entropy. It is also expected that the student will understand the difference between different statistics, classical as well as quantum.</p> |
| V | <b>USPH502: Solid State Physics</b>                           | <p>On successful completion of this course students will be able to:</p> <p>1. Understand the basics of crystallography, Electrical properties of metals, Band Theory of solids, demarcation among the types of materials, Semiconductor Physics and Superconductivity.</p> <p>2. Understand the basic concepts of Fermi probability distribution function, Density of states, conduction in semiconductors and BCS theory of superconductivity.</p>   |

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|   |   | 3. Demonstrate quantitative problem solving skills in all the topics covered.   |
| V | <b>USPH503: Atomic and Molecular Physics</b>                      | <p>Upon successful completion of this course, the student will understand</p> <ol style="list-style-type: none"> <li>1.The application of quantum mechanics in atomic physics</li> <li>2.The importance of electron spin, symmetric and antisymmetric wave functions and vector atom model</li> <li>3. Effect of magnetic field on atoms and its application</li> <li>4. Learn Molecular physics and its applications.</li> <li>5.This course will be useful to get an insight into spectroscopy.</li> </ol>  |
| V | <b>USPH504: Electrodynamics</b>                                   | <p>On successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> <li>1) Understand the laws of electrodynamics and be able to perform calculations using them.</li> <li>2) Understand Maxwell's electrodynamics and its relation to relativity</li> <li>3) Understand how optical laws can be derived from electromagnetic principles.</li> <li>4) Develop quantitative problem solving skills.</li> </ol>   |
| V | <b>PRACTICALS<br/>USPHP05 &amp;<br/>USPHP06</b>                   | <ol style="list-style-type: none"> <li>1. Understanding relevant concepts.</li> <li>2. Planning of the experiments</li> <li>3. Layout and adjustments of the equipments</li> <li>4. Understanding designing of the experiments</li> <li>5. Attempts to make the experiments open ended</li> <li>6. Recording of observations and plotting of graphs</li> <li>7. Calculation of results and estimation of possible errors in the observation of results</li> </ol>   |
| V | <b>Applied Component:<br/>Environmental Science and Pollution</b> | <p>Learner shall comprehend the impact of the interrelationship between various components of environment.</p> <ul style="list-style-type: none"> <li>• Learner will apply the knowledge of pollutants to undertake research projects/studies.</li> </ul> <ol style="list-style-type: none"> <li>1.1 Components of environment; biotic and abiotic. Composition of various segments of environment—atmosphere, hydrosphere, lithosphere, biosphere (with respect to composition and interrelationship).</li> <li>1.2 Types of pollution <ol style="list-style-type: none"> <li>1.2.1 Water pollution: Pesticides and heavy</li> </ol> </li> </ol> |



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|           |  | <p>metals.</p> <p>1.2.2 Air pollution: Challenges posed by present day pollutants.</p> <p>1.2.3 Others- Noise and nuclear pollution.</p> <p>2.1 Solar energy, wind energy, tidal energy, nuclear energy.</p> <p>2.2 Biomass &amp; bio-fuels, petro crops.</p> <p>2.3 Use of wastes: Water-based biomass, energy from waste &amp; solid waste.</p> <p>Learner and facilitator both will develop conceptual clarity on pollution control and green environmental auditing, besides gaining knowledge about these programmes in the Indian scenario. Learner will develop an acumen to tap the potential for entrepreneurship with respect to environment related products and indoor plants. Learner will comprehend and develop better acumen so as to, take wise and necessary decisions while participating in environment related projects or framing policies/assessing environmental damages/carrying out entrepreneurial activities beneficial to environment.</p> |
| <b>V</b>  | <b>Practicals Course Code USACEVS5P1</b> | <p>Estimation of Pollution: BOD &amp; COD.</p> <p>Measurement of intensity of light by Lux meter</p> <p>Study of types of pollution: water, air, land.</p> <p>Study of applications of various Spectroscopy (any 4), Chromatography and Electrophoresis instruments.</p> <p>Study of product derived by application of green chemistry ( Laundry detergents, Polylactic acid packaging, Green paints, Pharmaceutical drugs- Ibuprofen)</p>  |
| <b>VI</b> | <b>USPH601: Classical Mechanics</b>      | <ol style="list-style-type: none"> <li>1. This course will introduce the students to different aspects of classical mechanics.</li> <li>2. They would understand the kinds of motions that can occur under a central potential and their applications to planetary orbits.</li> <li>3. The students should also appreciate the effect of moving coordinate system, rectilinear as well as rotating.</li> <li>4. The students are expected to learn the concepts needed for the important formalism of Lagrange's equations and derive the equations using D'Alembert's principle.</li> <li>5. They should also be able to solve simple</li> </ol>   |

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|           |  | <p>examples using this formalism.</p> <p>6. The introduction to simple concepts from fluid mechanics and understanding of the dynamics of rigid bodies is also expected.</p> <p>7. Finally, they should appreciate the drastic effect of adding nonlinear corrections to usual problems of mechanics and nonlinear mechanics can help understand the irregularity we observe around us in nature.</p>   |
| <b>VI</b> | <b>USPH602: Electronics</b>                  | <p>On successful completion of this course students will be able to:</p> <ol style="list-style-type: none"> <li>1. Understand the basics of semiconductor devices and their applications.</li> <li>2. Understand the basic concepts of operational amplifier: its prototype and applications as instrumentation amplifier, active filters, comparators and waveform generation.</li> <li>3. Understand the basic concepts of timing pulse generation and regulated power supplies</li> <li>4. Understand the basic electronic circuits for universal logic building blocks and basic concepts of digital communication.</li> <li>5. Develop quantitative problem solving skills in all the topics covered.</li> </ol> |
| <b>VI</b> | <b>USPH603: Nuclear Physics</b>              | <ol style="list-style-type: none"> <li>1. Upon successful completion of this course, the student will be able to understand the fundamental principles and concepts governing classical nuclear and particle physics and have a knowledge of their applications interactions of ionizing radiation with matter the key techniques for particle accelerators the physical processes involved in nuclear power generation.</li> <li>2. Knowledge on elementary particles will help students to understand the fundamental constituents of matter and lay foundation for the understanding of unsolved questions about dark matter, antimatter and other research oriented topics.</li> </ol>                            |
| <b>VI</b> | <b>USPH604: Special Theory of Relativity</b> | <p>This course introduces students to the essence of special relativity which revolutionized the concept of physics in the last century by unifying space and time, mass and energy, electricity and magnetism. This course also gives a very brief introduction of general relativity. After the completion of the course the student should be able to</p>  |

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|           |  | <p>1. Understand the significance of Michelson Morley experiment and failure of the existing theories to explain the null result</p> <p>2. Understand the importance of postulates of special relativity, Lorentz transformation equations and how it changed the way we look at space and time, Absolutism and relativity, Common sense versus Einstein concept of Space and time.</p> <p>3. Understand the transformation equations for: Space and time, velocity, frequency, mass, momentum, force, Energy, Charge and current density, electric and magnetic fields.</p> <p>4. Solve problems based on length contraction, time dilation, velocity addition, Doppler effect, mass energy relation and resolve paradoxes in relativity like twin paradox etc.</p>  |
| <b>VI</b> | <b>USACEVS601<br/>Applied<br/>Component:<br/>Environmental<br/>Science and<br/>Pollution</b> | <p>Learner will gain knowledge about environmental testing and monitoring laboratories, air, water quality.</p> <ul style="list-style-type: none"> <li>• Learner will be exposed to the know-how regarding establishing environmental testing and monitoring laboratories. Learner will study and comprehend the treatment practices applied for domestic waste water and industrial effluents.</li> <li>• Learner will be equipped with the knowledge of some alternatives to conventional resources. Learner will gain an insight into the basics of costing, book keeping and accountancy.</li> <li>• Learner will be equipped to apply the concepts in his entrepreneurial ventures. Learner will develop aptitude to examine and assess the outcome of the framework of current biodiversity hotspots and biosphere reserves.</li> <li>• Learner will be able to list the different aspects of wildlife photography and inspect the positive and negative aspects of it, also be able to recommend how wildlife photography can support biodiversity conservation.</li> <li>• Learner will be able to assess the future challenges that ecotourism can generate for biodiversity conservation. Learner will ponder upon and find out the what, why, where, whom and which of climate change and global warming.</li> </ul> |
| <b>VI</b> | <b>USACEVS6P1</b>  | Study of physical properties of soil:   |

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|  | <b>Practical</b> | Temperature, moisture, & texture of soil.<br>Population analysis by Quadrant method & Line transect method. Study of air & noise pollution monitoring device, geospatial instrument.<br>Problems on accounting/costing<br>Study of biodegradable plastic products, bio pesticides brands.<br>Learner will be able to identify and evaluate the effects of the different sources of greenhouse substances. |
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#### SHORT TERM COURSES OF THE DEPARTMENT (2021-2022)

1. Certificate Course in Electrical Appliances Maintenance & Repair

#### EXTENSION ACTIVITIES (2021-2022)

1. Guest lecture on “Career after 12<sup>th</sup> Science ” at RCSM Aashramshala, Adoshi, Tal. Mokhada, Dist. Palghar

#### BEST PRACTICE (2021-2022)

- Certificate Course Electrical Appliances Maintenance & Repair

#### INNOVATIVE PROJECT

- Solar DC Water Pumping System

#### FUTURE PLAN

- To start Masters’ degree program
- To Organize International Conference
- To Start more Career Oriented Course of physics