



**ANNAVARAM SATHYAVATHI DEVI GOVERNMENT DEGREE COLLEGE
FOR WOMEN**

(An Autonomous Institute accredited with NACC with "B" Grade in Cycle III)
Church Square Park, Jagannaickpur, Kakinada, Andhra Pradesh

Department of physics

Programme Outcomes (POs) -AY 2024-2025

Programme Outcomes (POs) are what knowledge, skills and attitudes a graduate should have at the time of graduation.

Students of Undergraduate Programmes (B. Sc., B.Com., BA) at the time of graduation will be able to:

PO1.Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO2. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in at least one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.

PO3. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings.

PO4. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

PO5. Effective Citizenship: Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO6. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

PO7.Problem solving skills: Identify, formulate, and analyse complex problems, reaching substantiated conclusions by applying the knowledge and skills acquired during undergraduate study for the welfare of individuals and society.

PO8. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO9. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio technological changes.

PO10. Higher Progression, Employability and Entrepreneurship: Progress towards higher education / become potential workforce by enhancing employability through skill-based education / become good entrepreneur



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Department of physics

COURSE OUTCOME -AY 2024-2025

Semester 1		
Course code: BSCM24101		
Essentials and applications of Mathematical, Physical, chemical and computer science		
S.No	CO	Description
1	1	To Apply critical thinking skills to solve complex problems involving complex numbers, trigonometric ratios, vectors, and statistical measures
2	2	To Explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to Connect their knowledge of physics to everyday situations
3	3	Understand the interplay and connections between mathematics, physics, and chemistry in various applications.
4	4	Understand the interplay and connections between mathematics, physics, and chemistry in various applications. Recognize how mathematical models and physical and chemical principles can be used to explain and predict phenomena in different contexts
5	5	To explore the history and evolution of the Internet and to gain an understanding of network security concepts, including threats, vulnerabilities, and countermeasures

Semester 1		
Course code: BSCM24102		
Advances in Mathematical, Physical and Chemical sciences		
S.No	CO	Description
1	1	Explore the applications of mathematics in various fields of physics and chemistry, to understand how mathematical concepts are used to model and solve real-world problems
2	2	To Explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to Connect their knowledge of physics to everyday situations.
3	3	Understand the different sources of renewable energy and their generation and advances in nano materials. To study the emerging field of quantum communication and biophysics.
4	4	Understand the interplay and connections between mathematics, physics, and chemistry in various advanced applications
5	5	Understand and convert between different number systems, Differentiate between analog and digital signals and understand their characteristics. Gain knowledge of different types of transmission media.

Semester 2		
Course code: PHY 24201		
Mechanics and Properties of matter		
S.No	CO	Description
1	1	Understand and apply the concepts of scalar and vector fields, calculate the gradient of a scalar field, determine the divergence and curl of a vector field.
2	2	Understand Newton's laws of motion and motion of variable mass system and its application to rocket motion and the concepts of impact parameter, scattering cross section.
3	3	Apply the rotational kinematic relations, the principle and working of gyroscope and its applications and the precessional motion of a freely rotating symmetric top.
4	4	Comprehend the general characteristics of central forces and the application of Kepler's laws to describe the motion of planets and satellite in circular orbit through the study of law of Gravitation.
5	5	Understand postulates of Special theory of relativity and its consequences such as length contraction, time dilation, relativistic mass and mass-energy equivalence.
Semester 2		
Course code : PHY 24202		
Waves and Oscillations		
S.No	CO	Description
1	1	To describe the basic characteristics of waves such as frequency, wavelength, amplitude, period, and speed .Examine the phenomena of simple harmonic motion
2	2	To distinction between undamped, damped and forced oscillations and the concepts of resonance
3	3	To get the knowledge about how to construct and analysis the square waves, saw tooth waves, etc. from Fourier analysis
4	4	To Figure out the formation of harmonics and overtones in a stretched string and vibrations in bars
5	5	To acquire the knowledge on Ultrasonic waves, their production and detection and their applications in different fields.

Semester 3		
Course code : PHY 23301		
OPTICS		
S.No	CO	Description
1	1	To Understand about the different aberrations in lenses and discuss the methods of minimizing them.
2	2	Understand the phenomenon of interference of light.
3	3	Distinguish between Fresnel's diffraction and Fraunhofer diffraction and observe the diffraction patterns in the case of single slit and the diffraction grating and to describe the construction and working of zone plate and make the comparison of zone plate with convex lens .
4	4	The various methods of production of plane, circularly and polarized light and their detection and the concept of optical activity.
5	5	Comprehend the basic principle of laser, the working of He-Ne laser and Ruby lasers and their applications in different fields. To understand the basic principles of fibre optic communication and explore the field of Holography and Nonlinear optics and their applications.

Semester 3		
Course code : PHY 23302		
Heat and Thermodynamics		
S.No	CO	Description
1	1	Understand the basic aspects of kinetic theory of gases, Maxwell-Boltzman distribution law, equipartition of energies, mean free path of molecular collisions and the transport phenomenon in ideal gases
2	2	Gain knowledge on the basic concepts of thermodynamics, the first and the second law of thermodynamics, the basic principles of refrigeration, the concept of entropy, the thermodynamic potentials and their physical interpretations and to Understand the working of Carnot's ideal heat engine, Carnot cycle and its efficiency.
3	3	Develop critical understanding of concept of Thermodynamic potentials, the formulation of Maxwell's equations and its applications.
4	4	Differentiate between principles and methods to produce low temperature and liquefy air and also understand the practical applications of substances at low temperatures.
5	5	Examine the nature of black body radiations and the basic theories.

Semester 3		
Course code : PHY 23303		
Electronic Devices and Circuits		
S.No	CO	Description
1	1	Understand the behavior of P-N junction diodes in forward and reverse bias conditions and analyze the impact of junction capacitance on diode characteristics.
2	2	Analyze and compare the characteristics and operation of different BJT configurations (CB, CE, and CC) and demonstrate proficiency in biasing techniques.
3	3	Comprehend the operation and characteristics of FETs, including JFETs and MOSFETs, and explain the working principles and characteristics of UJT.
4	4	Describe the operation and applications of various photoelectric devices such as LEDs, photo diodes, phototransistors, and LDRs.
5	5	Understand the operation of rectifiers (half-wave, full-wave, and bridge), analyze the ripple factor and efficiency, and demonstrate knowledge of different filter types and three-terminal voltage regulators .
Semester 3		
Course code : PHY 23304		
Analog and Digital Electronics		
S.No	CO	Description
1	1	Understand Principles and Working of Operational Amplifier
2	2	Apply their knowledge on OP-Amp in different Applications
3	3	To understand the number systems, Binary codes and Complements.
4	4	To understand the Boolean algebra and simplification of Boolean expressions and to analyze logic processes and implement logical operations using combinational logic circuits.
5	5	To understand the concepts of sequential circuits and to analyze sequential systems in terms of state machines

Semester 4		
Course code : PHY 23401 Electricity, Magnetism & Electronics		
S.No	CO	Description
1	1	Understand the Gauss law and its application to obtain electric field in different cases and formulate the relationship between electric displacement vector, electric polarization, Susceptibility, Permittivity and Dielectric constant.
2	2	Understand Biot and Savart's law and Ampere's circuital law to describe and explain the generation of magnetic fields by electrical currents and to distinguish between the magnetic effect of electric current and electromagnetic induction and apply the related laws in appropriate circumstances.
3	3	Phenomenon of resonance in LCR AC-circuits, sharpness of resonance, Q- factor, Power factor and the comparative study of series and parallel resonant circuits and to Develop an understanding on the unification of electric and magnetic fields and Maxwell's equations governing electromagnetic waves.
4	4	Describe the operation of p-n junction diodes, zener diodes, light emitting diodes and transistors
5	5	Understand the operation of basic logic gates and universal gates and their truth tables.

Semester 4		
Course code : PHY 23402 Modern Physics		
S.No	CO	Description
1	1	Develop an understanding on the concepts of Atomic and Modern Physics, basic elementary quantum mechanics and nuclear physics.
2	2	Develop critical understanding of concept of Matter waves and Uncertainty principle.
3	3	Get familiarized with the principles of quantum mechanics and the formulation of Schrodinger wave equation and its applications.
4	4	Examine the basic properties of nuclei, characteristics of Nuclear forces, salient features of Nuclear models and different nuclear radiation detectors and to classify Elementary particles based on their mass, charge, spin, half-life and interaction.
5	5	Get familiarized with crystal structures and to increase the awareness and appreciation of superconductors and their practical applications

Semester 4		
Course code : PHY 23403		
Introduction to Nuclear and Particle Physics		
S.No	CO	Description
1	1	To know about high energy particles and their applications which prepares them for further study and research in particle physics.
2	2	Students can explain important concepts on nucleon-nucleon interaction, such as its short-range, spin dependence, isospin, and tensors.
3	3	Students can show the potential shapes from nucleon nucleon interactions.
4	4	Students can explain the single particle model, its strengths, and weaknesses
5	5	Students can explain magic numbers based on this model

Semester 5		
Course code: PHY 205303-6B		
Low Temperature Physics & Refrigeration		
S.No	CO	Description
1	1	Identify various methods and techniques used to produce low temperatures in the Laboratory.
2	2	Acquire a critical knowledge on refrigeration and air conditioning.
3	3	Demonstrate skills of Refrigerators through hands on experience and learns about refrigeration components and their accessories.
4	4	Understand the classification, properties of refrigerants and their effects on environment.
5	5	Comprehend the applications of Low Temperature Physics and refrigeration.

Semester 5		
Course code : PHY 205304-7B		
Solar Energy and Applications		
S.No	CO	Description
1	1	Understand Sun structure, forms of energy coming from the Sun and its measurement.
2	2	Acquire a critical knowledge on the working of thermal and photovoltaic collectors.
3	3	Demonstrate skills related to PV cells through hands on experience.
4	4	Understand testing procedures and fault analysis of thermal collectors and PV modules.
5	5	Comprehend applications of thermal collectors and PV modules



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Department of physics

PSO's of MPC-AY 2024-2025

1. Enable to acquire strong foundation in Algebra, Real Analysis, Calculus and Linear Algebra.
2. Develop logical, analytical, critical thinking skills by solving maths problems which assists to solve real life problems in related areas.
3. Develop the knowledge and skills in the areas of Mechanics, Thermal Physics, Optics, Electromagnetism, Quantum Physics, Solid state Physics for pursuing higher education and research.
4. Knowledge in energy and matter enables fabrication of new devices.
5. Attain sound knowledge and skill in Inorganic chemistry, Physical Chemistry, which leading to develop new technologies including catalysis, new advanced materials and energy storage devices like lithium batteries etc. It leads better quality of life and sustainable world.
6. Develop knowledge on organic reactions and their mechanisms which in turn plays major role in the synthesis and development of new Chiral drugs/drugs which impact our quality of lives by addressing global society issue health.
7. Achieve the ability to analyse qualitatively, to estimate quantitatively, to synthesize, separate, and characterize compounds using experimental and instrumentation techniques.
8. Pursue higher studies and research in interdisciplinary areas.



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Department of physics

PSO's of MPCs-AY 2024-2025

PSO1. To understand the importance of Mathematics in learning Physics and Computer Science and vice – versa.

PSO2 To understand the inter – relationship between mathematics and computer science with regard to algorithms, computations and excel calculations, data presentation and data analysis.

PSO3 To understand the inter – relationship between Physics and Computer Science in the design and architecture of computers.

PSO4 To apply the knowledge of Mathematics and Computer Science in solving problems in real life situations.

PSO5 To create employment opportunities in interdisciplinary areas such as data analyst, statistician, computer – assisted instrument operator etc.



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Department of physics

PSO's of PHYSICS -Major-AY 2024-2025

A student completing this program will be able to:

PSO1: Graduates will acquire a comprehensive knowledge and sound understanding of fundamentals of Physics.

PSO2: Graduates will develop practical, analytical and mathematical skills in Physics. Which enabling them to take measurements in a physics laboratory and analyze the measurements to draw valid conclusions.

PSO3 Illustrate the principles of mechanics and properties of matter, electricity, magnetism, thermodynamics, optics, spectroscopy, and can Design, construct and analyze basic electronic and digital circuits. be able to apply this knowledge to analyze a variety of physical phenomena.

PSO4 Through experimental skills and independent work culture through a series of experiments that compliment theories and projects, they develop the capability of oral and written scientific communication and will prove that they can think critically..

PSO5: Graduates will acquire necessary skills to enable them to crack competitive examination for career progression or seeking employment. will be capable of oral and written scientific communication and will prove that they can think critically and work independently.



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PO6. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

PO7.Problem solving skills: Identify, formulate, and analyse complex problems, reaching substantiated conclusions by applying the knowledge and skills acquired during undergraduate study for the welfare of individuals and society.

PO8. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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Department of physics

COURSE OUTCOME -AY 2025-2026

Semester 1		
Course code:		
Introduction to Mathematical physics		
S.No	CO	Description
1	1	Apply concepts of vector differentiation and integration to analyze physical fields and prove integral theorems
2	2	Use matrix operations and eigenvalue techniques to solve linear systems in physics.
3	3	Represent and manipulate complex numbers in various forms for solving AC circuit problems.
4	4	Interpret and apply basic probability concepts and distributions to model physical phenomena
5	5	Analyze periodic signals using Fourier series and evaluate Fourier coefficients for common waveforms.

Semester 1		
Course code:		
Mechanics and Properties of matter		
S.No	CO	Description
1	1	Apply Newton's laws to variable mass systems and analyze particle collisions using conservation laws and scattering theory.
2	2	Describe motion under central forces and derive orbital dynamics including Kepler's laws and satellite motion
3	3	Explain elastic behavior of materials using stress-strain relations, and analyze the bending of beams and torsional motion
4	4	Interpret fluid dynamics concepts such as streamline flow, Bernoulli's principle, and viscosity with practical applications
5	5	Understand the key postulates of special relativity and apply Lorentz transformations to problems involving time dilation, length contraction, and mass-energy equivalence

Semester 2		
Course code: Wavea and Optics		
S.No	CO	Description
1	1	Describe the basic characteristics of waves such as frequency, wavelength, amplitude, period, and speed and utilize mathematical relationships related to wave characteristics.
2	2	Distinguish between Longitudinal and Transverse waves
3	3	Understand the phenomenon of interference of light and its formation in Thin films and Newton's rings.
4	4	Distinguish between Fresnel's diffraction and Fraunhofer diffraction and observe the diffraction patterns in the case of single slit and the diffraction grating and to describe the construction and working of zone plate and make the comparison of zone plate with convex lens
5	5	Explain the various methods of production of plane, circularly and polarized light and their detection and the concept of optical activity.
Semester 2		
Course code : Heat and Thermodynamics		
S.No	CO	Description
1	1	Understand the basic aspects of kinetic theory of gases, Maxwell-Boltzmann distribution law, equipartition of energies, mean free path of molecular collisions and the transport phenomenon in ideal gases
2	2	Gain knowledge on the basic concepts of thermodynamics, the first and the second law of thermodynamics, the basic principles of refrigeration, the concept of entropy, the thermodynamic potentials and their physical interpretations. Understand the working of Carnot's ideal heat engine, Carnot cycle and its efficiency
3	3	Develop critical understanding of concept of Thermodynamic potentials, the formulation of Maxwell's equations and its applications
4	4	Differentiate between principles and methods to produce low temperature, liquefy air, and understand the practical applications of substances at low temperatures
5	5	Examine the nature of black body radiations and the basic theories.

Semester 3		
Course code : PHY 24301 OPTICS		
S.No	CO	Description
1	1	To Understand about the different aberrations in lenses and discuss the methods of minimizing them.
2	2	Understand the phenomenon of interference of light.
3	3	Distinguish between Fresnel's diffraction and Fraunhofer diffraction and observe the diffraction patterns in the case of single slit and the diffraction grating and to describe the construction and working of zone plate and make the comparison of zone plate with convex lens .
4	4	The various methods of production of plane, circularly and polarized light and their detection and the concept of optical activity.
5	5	Comprehend the basic principle of laser, the working of He-Ne laser and Ruby lasers and their applications in different fields. To understand the basic principles of fibre optic communication and explore the field of Holography and Nonlinear optics and their applications.

Semester 3		
Course code : PHY 24302 Heat and Thermodynamics		
S.No	CO	Description
1	1	Understand the basic aspects of kinetic theory of gases, Maxwell-Boltzman distribution law, equipartition of energies, mean free path of molecular collisions and the transport phenomenon in ideal gases
2	2	Gain knowledge on the basic concepts of thermodynamics, the first and the second law of thermodynamics, the basic principles of refrigeration, the concept of entropy, the thermodynamic potentials and their physical interpretations and to Understand the working of Carnot's ideal heat engine, Carnot cycle and its efficiency.
3	3	Develop critical understanding of concept of Thermodynamic potentials, the formulation of Maxwell's equations and its applications.
4	4	Differentiate between principles and methods to produce low temperature and liquefy air and also understand the practical applications of substances at low temperatures.
5	5	Examine the nature of black body radiations and the basic theories.

Semester 3		
Course code : PHY 24303 Electronic Devices and Circuits		
S.No	CO	Description
1	1	Understand the behavior of P-N junction diodes in forward and reverse bias conditions and analyze the impact of junction capacitance on diode characteristics.
2	2	Analyze and compare the characteristics and operation of different BJT configurations (CB, CE, and CC) and demonstrate proficiency in biasing techniques.
3	3	Comprehend the operation and characteristics of FETs, including JFETs and MOSFETs, and explain the working principles and characteristics of UJTs.
4	4	Describe the operation and applications of various photoelectric devices such as LEDs, photo diodes, phototransistors, and LDRs.
5	5	Understand the operation of rectifiers (half-wave, full-wave, and bridge), analyze the ripple factor and efficiency, and demonstrate knowledge of different filter types and three-terminal voltage regulators .
Semester 3		
Course code : PHY 24304 Analog and Digital Electronics		
S.No	CO	Description
1	1	Understand Principles and Working of Operational Amplifier
2	2	Apply their knowledge on OP-Amp in different Applications
3	3	To understand the number systems, Binary codes and Complements.
4	4	To understand the Boolean algebra and simplification of Boolean expressions and to analyze logic processes and implement logical operations using combinational logic circuits.
5	5	To understand the concepts of sequential circuits and to analyze sequential systems in terms of state machines

Semester 4		
Course code : PHY 24401 Electricity and Magnetism		
S.No	CO	Description
1	1	Understand the Gauss law and its application to obtain electric field in different cases and formulate the relationship between electric displacement vector, electric polarization, Susceptibility, Permittivity and Dielectric constant.
2	2	Understand Biot and Savart's law and Ampere's circuital law to describe and explain the generation of magnetic fields by electrical currents and to distinguish between the magnetic effect of electric current and electromagnetic induction and apply the related laws in appropriate circumstances.
3	3	Phenomenon of resonance in LCR AC-circuits, sharpness of resonance, Q-factor, Power factor and the comparative study of series and parallel resonant circuits and to Develop an understanding on the unification of electric and magnetic fields and Maxwell's equations governing electromagnetic waves.
4	4	Describe the operation of p-n junction diodes, zener diodes, light emitting diodes and transistors
5	5	Understand the operation of basic logic gates and universal gates and their truth tables.

Semester 4		
Course code : PHY 24402 Modern Physics		
S.No	CO	Description
1	1	Develop an understanding on the concepts of Atomic and Modern Physics, basic elementary quantum mechanics and nuclear physics.
2	2	Develop critical understanding of concept of Matter waves and Uncertainty principle.
3	3	Get familiarized with the principles of quantum mechanics and the formulation of Schrodinger wave equation and its applications.
4	4	Examine the basic properties of nuclei, characteristics of Nuclear forces, salient features of Nuclear models and different nuclear radiation detectors and to classify Elementary particles based on their mass, charge, spin, half-life and interaction.
5	5	Get familiarized with crystal structures and to increase the awareness and appreciation of superconductors and their practical applications

Semester 4		
Course code : PHY 24403 Introduction to Nuclear and Particle Physics		
S.No	CO	Description
1	1	To know about high energy particles and their applications which prepares them for further study and research in particle physics.
2	2	Students can explain important concepts on nucleon-nucleon interaction, such as its short-range, spin dependence, isospin, and tensors.
3	3	Students can show the potential shapes from nucleon nucleon interactions.
4	4	Students can explain the single particle model, its strengths, and weaknesses
5	5	Students can explain magic numbers based on this model

Semester 5		
Course code: PHY 23501-12 Major & Minor Applications of Electricity and Electronics		
S.No	CO	Description
1	1	Identify various components present in Electricity& Electronics Laboratory
2	2	Acquire a critical knowledge of each component and its utility (like resistors, capacitors, inductors, power sources etc.).
3	3	Demonstrate skills of constructing simple electronic circuits consisting of basic circuit elements.
4	4	Understand the need & Functionality of various DC & AC Power sources.
5	5	Comprehend the design, applications and practices of various electrical & Electronic devices and also their trouble shooting.

Semester 5		
Course code : PHY 23502-13 Electronic Instrumentation		
S.No	CO	Description
1	1	Identify various facilities required to set up a basic Instrumentation Laboratory.
2	2	Acquire a critical knowledge of various Electrical Instruments used in the Laboratory.

3	3	Demonstrate skills of using instruments like CRO, Function Generator, Multimeter etc. through hands on experience
4	4	Understand the Principle and operation of different display devices used in the display systems and different transducers
5	5	Comprehend the applications of various biomedical instruments in daily life like B.P. meter, ECG, Pulse oximeter etc. and know the handling procedures with safety and security.

Semester 5		
Course code: PHY 23503-14A Optical Instrumentation and Optometry		
S.No	CO	Description
1	1	Understand the construction and working principles of various optical instruments used in daily life.
2	2	Acquire a critical knowledge on the various defects of eye and their correcting methods with suitable lenses.
3	3	Demonstrate skills of using biological microscope through hands on experience
4	4	Understand the various techniques used in optometry and computer based eye testing.
5	5	Comprehend the various applications of microscopes and telescopes

Semester 5		
Course code: PHY 23504-15A Low temperature physics and Refrigeration		
S.No	CO	Description
1	1	Identify various methods and techniques used to produce low temperatures in the Laboratory.
2	2	Acquire a critical knowledge on refrigeration and air conditioning.
3	3	Demonstrate skills of Refrigerators through hands on experience and learns about refrigeration components and their accessories.
4	4	Understand the classification, properties of refrigerants and their effects on environment
5	5	Comprehend the applications of Low Temperature Physics and refrigeration



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A student completing this program will be able to:

PSO1: Graduates will acquire a comprehensive knowledge and sound understanding of fundamentals of Physics.

PSO2: Graduates will develop practical, analytical and mathematical skills in Physics. Which enabling them to take measurements in a physics laboratory and analyze the measurements to draw valid conclusions.

PSO3 Illustrate the principles of mechanics and properties of matter, electricity, magnetism, thermodynamics, optics, spectroscopy, and can Design, construct and analyze basic electronic and digital circuits. be able to apply this knowledge to analyze a variety of physical phenomena.

PSO4 Through experimental skills and independent work culture through a series of experiments that compliment theories and projects, they develop the capability of oral and written scientific communication and will prove that they can think critically..

PSO5: Graduates will acquire necessary skills to enable them to crack competitive examination for career progression or seeking employment. will be capable of oral and written scientific communication and will prove that they can think critically and work independently.