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
Programmes offered

Academic Year	Programmes offered
2018-19	1) Mathematics, Physics, Chemistry (MPC) 2) Mathematics, Physics, Computer Science (MPCs)
2019-20	1) Mathematics, Physics, Chemistry (MPC) 2) Mathematics, Physics, Computer Science (MPCs)
2020-21	1) Mathematics, Physics, Chemistry (MPC) 2) Mathematics, Physics, Computer Science (MPCs)
2021-22	1) Mathematics, Physics, Chemistry (MPC) 2) Mathematics, Physics, Computer Science (MPCs)
2022-23	1) Mathematics, Physics, Chemistry (MPC) 2) Mathematics, Physics, Computer Science (MPCs)
2023-24	1) Physics Major 2) Physics Minor (Mathematics/Chemistry/Computers as Majors)
2024-25	1) Physics Major 2) Physics Minor (Mathematics/Chemistry/Computers as Majors)

AY 2018-19

S. No.	Semester	Paper	Title of the Paper
1	1	1	Mechanics & Properties of matter
2	2	II	Waves & Oscillations
3	3	III	Wave optics
4	4	IV	Thermodynamics & Radiation Physics
5	5	V	Electricity, Magnetism & Electronics
6	5	VI	Modern Physics
7	6	VII-C	Elective-Renewable Energy
8	6	VIII-C1	Cluster Elective-Solar, Thermal and Photo voltaic Aspects
9	6	VIII-C 2	Cluster Elective- Wind, Hydro and Ocean Energies
10	6	VIII-C 3	Cluster Elective- Energy Storage Devices

COURSE OUTCOMES-AY 2018-19

Semester 1		
Course code: PHY1302		**Mechanics and Properties of matter**
S. No.	**CO#**	**Description**
1	1	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.
2	2	Apply the rotational kinematic relations, the principle and working of gyroscope and its applications and the precessional motion of a freely rotating symmetric top.
3	3	Comprehend the general characteristics of central forces and the application ofKepler's laws to describe the motion of planets and satellite in circular orbit through the study of law of Gravitation.
4	4	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: PHY2302		**Waves and Oscillations**
1	1	Examine the phenomena of simple harmonic motion and the distinction between undamped, damped and forced oscillations and the concepts of resonance and quality factor with reference to damped harmonic oscillator.
2	2	Appreciate the formulation of the problem of coupled oscillations and solve them to obtain normal modes of oscillation and their frequencies in simple mechanicalsystems.
3	3	Figure out the formation of harmonics and overtones in a stretched string and acquire the knowledge on Ultrasonic waves, their production and detection and their applications in different fields.
Semester 3		
Course code: PHY3302		**Wave Optics**
1	1	Explain about the different aberrations in lenses and discuss the methods of minimizing them.
2	2	Understand the phenomenon of interference of light and its formation in (i) Lloyd's single mirror due to division of wave front and (ii) Thin films, Newton's rings and Michelson interferometer due to division of amplitude.
3	3	Distinguish between Fresnel's diffraction and Fraunhoffer diffraction and observe the diffraction patterns in the case of single slit and the diffraction grating and Describe the construction and working of zone plate and make the comparison of zone plate with convex lens.
4	4	Explain 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.
6	6	Understand the basic principles of fibre optic communication and explore the field of Holography and Nonlinear optics and their applications.

Semester 4		
Course code: PHY4302		**Thermodynamics and Radiation Physics**
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 lowtemperatures.
5	5	Examine the nature of black body radiations and the basic theories.
Semester 5		
Course code: PHY5303		**Electricity, Magnetism and Electronics**
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.
Course code: PHY5304		**Modern Physics**
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 6		
Course code: PHY6302		**Renewable Energy (Elective)**
1	1	Create awareness about the energy and its forms, power, utilization and its environmental effects.
2	2	Understand the Indian energy scene and analyze it with global energy scenario.
3	3	Understand the principles of solar and wind energy and their applications.
4	4	Knowledge about the principles of ocean energy and power generation, utilize hydrogen as fuel and its production.
5	5	Understand the biomass energy and its conversion into fuels.
Course code: PhCE20304		**Solar Thermal and Photovoltaic aspects (Cluster 1)**
1	1	Create awareness about the basics of solar radiation and radiative properties and characterization of materials.
2	2	Understand the concepts related to flat plate collectors and calculate efficiency.
3	3	Gain knowledge about the concepts of solar photovoltaic cell.
4	4	Understand the solar PV systems.
5	5	Gain knowledge and analyze solar thermal applications.
Course code: PhCE20305		**Wind, Hydro and Ocean Energies (Cluster 2)**
1	1	Gain knowledge about the concepts of wind energy, WECS and the characteristics of power, torque and speed.
2	2	Understand the wind energy conversion systems along with design theories and principles.
3	3	Understand the principles of wind energy generation, applications and environmental impact.
4	4	Understand the concepts of micro, mini and small hydro systems include hydrology, equipment used to generate power.
5	5	Create awareness about ocean thermal, wave and tidal energy systems along with working principles and generation of electricity.
Course code: PhCE20306		**Energy Storage Devices (Cluster 3)**
1	1	Create awareness about the need of energy storage, different modes of energy storage include chemical energy storage.
2	2	Gain knowledge about the electro chemical energy storage systems include batteries and advanced batteries.
3	3	Understand the magnetic and electric energy storage systems.
4	4	Analyze the fuel cell in comparison with battery, components of fuel cell and characteristics.
5	5	Classify various types of fuel cells.

AY 2019-20

S. No.	Semester	Paper	Title of the Paper
1	1	1	Mechanics & Properties of matter
2	2	II	Waves & Oscillations
3	3	III	Wave optics
4	4	IV	Thermodynamics & Radiation Physics
5	5	V	Electricity, Magnetism & Electronics
6	5	VI	Modern Physics
7	6	VII-C	Elective-Renewable Energy
8	6	VIII-C1	Cluster Elective-Solar, Thermal and Photo voltaic aspects
9	6	VIII-C 2	Cluster Elective- Wind, Hydro and Ocean Energies
10	6	VIII-C 3	Cluster Elective- Energy Storage Devices

COURSE OUTCOMES-AY 2019-20

Semester 1		
Course code: PHY1302		**Mechanics and Properties of matter**
S. No.	**CO#**	**Description**
1	1	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.
2	2	Apply the rotational kinematic relations, the principle and working of gyroscope and its applications and the precessional motion of a freely rotating symmetric top.
3	3	Comprehend the general characteristics of central forces and the application ofKepler's laws to describe the motion of planets and satellite in circular orbit through the study of law of Gravitation.
4	4	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: PHY2302		**Waves and Oscillations**
1	1	Examine the phenomena of simple harmonic motion and the distinction between undamped, damped and forced oscillations and the concepts of resonance and quality factor with reference to damped harmonic oscillator.
2	2	Appreciate the formulation of the problem of coupled oscillations and solve them to obtain normal modes of oscillation and their frequencies in simple mechanical systems.
3	3	Figure out the formation of harmonics and overtones in a stretched string and acquire the knowledge on Ultrasonic waves, their production and detection and their applications in different fields.
Semester 3		
Course code: PHY3302		**Wave Optics**
1	1	Explain about the different aberrations in lenses and discuss the methods of minimizing them.
2	2	Understand the phenomenon of interference of light and its formation in (i) Lloyd's single mirror due to division of wave front and (ii) Thin films, Newton's rings and Michelson interferometer due to division of amplitude.
3	3	Distinguish between Fresnel's diffraction and Fraunhoffer diffraction and observe the diffraction patterns in the case of single slit and the diffraction grating and Describe the construction and working of zone plate and make the comparison of zone plate with convex lens.
4	4	Explain 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.
6	6	Understand the basic principles of fibre optic communication and explore the field of Holography and Nonlinear optics and their applications.
Semester 4		
Course code: PHY4302		**Thermodynamics and Radiation Physics**
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 5		
Course code: PHY5303		**Electricity, Magnetism and Electronics**
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.
Course code: PHY5304		**Modern Physics**
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 andinteraction.
5	5	Get familiarized with crystal structures and to increase the awareness and appreciation of superconductors and their practical applications.

Semester 6		
Course code: PHY6302		**Renewable Energy (Elective)**
1	1	Create awareness about the energy and its forms, power, utilization and its environmental effects.
2	2	Understand the Indian energy scene and analyze it with global energy scenario.
3	3	Understand the principles of solar and wind energy and their applications.
4	4	Knowledge about the principles of ocean energy and power generation, utilize hydrogen as fuel and its production.
5	5	Understand the biomass energy and its conversion into fuels.
Course code: PhCE20304		**Solar Thermal and Photovoltaic aspects (Cluster 1)**
1	1	Create awareness about the basics of solar radiation and radiative properties and characterization of materials.
2	2	Understand the concepts related to flat plate collectors and calculate efficiency.
3	3	Gain knowledge about the concepts of solar photovoltaic cell.
4	4	Understand the solar PV systems.
5	5	Gain knowledge and analyze solar thermal applications.
Course code: PhCE20305		**Wind, Hydro and Ocean Energies (Cluster 2)**
1	1	Gain knowledge about the concepts of wind energy, WECS and the characteristics of power, torque and speed.
2	2	Understand the wind energy conversion systems along with design theories and principles.
3	3	Understand the principles of wind energy generation, applications and environmental impact.
4	4	Understand the concepts of micro, mini and small hydro systems include hydrology, equipment used to generate power.
5	5	Create awareness about ocean thermal, wave and tidal energy systems along with working principles and generation of electricity.
Course code: PhCE20306		**Energy Storage Devices (Cluster 3)**
1	1	Create awareness about the need of energy storage, different modes of energy storage include chemical energy storage.
2	2	Gain knowledge about the electro chemical energy storage systems include batteries and advanced batteries.
3	3	Understand the magnetic and electric energy storage systems.
4	4	Analyze the fuel cell in comparison with battery, components of fuel cell and characteristics.
5	5	Classify various types of fuel cells.

AY 2020-21

S. No.	Semester	Paper	Title of the Paper
1	1	I	Mechanics, Waves and Oscillations
2	2	II	Wave optics
3	3	III	Wave optics
4	4	IV	Thermodynamics & Radiation physics
5	5	V	Electricity, Magnetism & Electronics
6	5	V	Modern Physics
7	6	VI	Elective- Renewable Energy
8	6	VIIA	Cluster-1-Solar, Thermal & Photo voltaic Aspects
9	6	VIIB	Cluster-2-Wind, Hydro & Ocean Energies
10	6	VIIC	Cluster-3-Energy Storage Devices

COURSE OUTCOMES-AY 2020-21

Semester 1		
Course code: PHY201302		**Mechanics Waves and Oscillations**
S. No.	**CO#**	**Description**
1	1	To understand basic theories related with properties of matter and its applications to determine values of various physical quantities associated with matter.
2	2	Be able to apply knowledge of the properties of matter to explain natural physical processes and related technological advances.
3	3	To learn about fundamentals of verbal and mathematical concepts of waves and oscillations.
4	4	Create awareness among students to know their skills required to get the information from the syllabus and use them in a proper way.
Semester 2		
Course code: PHY202302		**Wave Optics**
1	1	Understand the nature of light and principles of Laser and holography.
2	2	Analyze the intensity variation of light due to interference, diffraction and polarization.
3	3	Solve problems in Optics by selecting the appropriate equations and performing numerical or analytical calculations.
4	4	Student can able to operation of optical devices including polarizers, interferometers and Lasers.
Semester 3		
Course code: PHY203302		**Heat and Thermodynamics**
1	1	Students will be able to Perform experiments and interpret the results of observation, including making an assessment of experimental uncertainties.
2	2	They develop the ability to apply the knowledge acquired in the classroom and laboratories to specific problems in theoretical and experimental Physics.
3	3	To apply the theories learnt and the skills acquired to solve real time problems.
4	4	To understand the concepts and significance of the various physical phenomena.
Semester 4		
Course code: PHY204303		**Electricity, Magnetism and Electronics**
1	1	To learn about Gauss law and solve the electric field and magnetic field for various geometric objects and to learn basic electronic concepts in analog and digital theory.
2	2	To be Explain all the topics of Experiments, Concepts and Derivations to the student.
3	3	Apply the principles of electronics in day to day life.
4	4	Encourage all the students to study higher educational courses in reputed institutesand to enrich the students with creative, logical and analytical skills and to motivate the students towards research side.
Course code: PHY204304		**Modern Physics**
1	1	To Create awareness on the topics of Atomic and Molecular Physics, Quantum mechanics, Nuclear Physics, and Solid state physics.
2	2	To be Explain all the topics of Experiments, Concepts and Derivations to thestudent.
3	3	Explain the basic principles of quantum mechanics and apply to Atomic, Molecular structure of energy levels etc.
4	4	Motivate all the students to pursue PG courses in reputed institutes and to endowthe students with creative and analytical skills; this will equip them to become entrepreneurs.

Semester 5		
Course code: PHY205303-6B		**Low Temperature Physics and Refrigeration**
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.
Course code: PHY205304-7B		**Solar Energy and Applications**
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.

AY 2021-22

S. No.	Semester	Paper	Title of the Paper
1	I	I	Mechanics, Waves & Oscillations
2	2	II	Wave Optics
3	3	III	Heat and Thermodynamics
4	4	IV	Electricity, Magnetism & Electronics
5	4	V	Modern Physics
6	5	V	Electricity, Magnetism & Electronics
7	5	VI	Modern Physics
7	6	VI	Elective- Renewable Energy
8	6	VIIA	Cluster-1-Solar, Thermal & Photo voltaic Aspects
9	6	VIIB	Cluster-2-Wind, Hydro & Ocean Energies
10	6	VIIC	Cluster-3-Energy Storage Devices

COURSE OUTCOMES-AY 2021-22

Semester 1		
Course code: PHY201302		**Mechanics Waves and Oscillations**
S. No.	**CO#**	**Description**
1	1	To understand basic theories related with properties of matter and its applications to determine values of various physical quantities associated with matter.
2	2	Be able to apply knowledge of the properties of matter to explain natural physical processes and related technological advances.
3	3	To learn about fundamentals of verbal and mathematical concepts of waves and oscillations.
4	4	Create awareness among students to know their skills required to get the information from the syllabus and use them in a proper way.
Semester 2		
Course code: PHY202302		**Wave Optics**
1	1	Understand the nature of light and principles of Laser and holography.
2	2	Analyze the intensity variation of light due to interference, diffraction and polarization.
3	3	Solve problems in Optics by selecting the appropriate equations and performing numerical or analytical calculations.
4	4	Student can able to operation of optical devices including polarizers, interferometers and Lasers.
Semester 3		
Course code: PHY203302		**Heat and Thermodynamics**
1	1	Students will be able to Perform experiments and interpret the results of observation, including making an assessment of experimental uncertainties.
2	2	They develop the ability to apply the knowledge acquired in the classroom and laboratories to specific problems in theoretical and experimental Physics.
3	3	To apply the theories learnt and the skills acquired to solve real time problems.
4	4	To understand the concepts and significance of the various physical phenomena.
Semester 4		
Course code: PHY204303		**Electricity, Magnetism and Electronics**
1	1	To learn about Gauss law and solve the electric field and magnetic field for various geometric objects and to learn basic electronic concepts in analog and digital theory.
2	2	To be Explain all the topics of Experiments, Concepts and Derivations to the student.
3	3	Apply the principles of electronics in day to day life.
4	4	Encourage all the students to study higher educational courses in reputed institutes and to enrich the students with creative, logical and analytical skills and to motivate the students towards research side.
Course code: PHY204304		**Modern Physics**
1	1	To Create awareness on the topics of Atomic and Molecular Physics, Quantum mechanics, Nuclear Physics, and Solid state physics.
2	2	To be Explain all the topics of Experiments, Concepts and Derivations to thestudent.
3	3	Explain the basic principles of quantum mechanics and apply to Atomic, Molecular structure of energy levels etc.
4	4	Motivate all the students to pursue PG courses in reputed institutes and to endow the students with creative and analytical skills; this will equip them to become entrepreneurs.

Semester 5		
Course code: PHY205303-6B		**Low Temperature Physics and Refrigeration**
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.
Course code: PHY205304-7B		**Solar Energy and Applications**
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.

AY 2022-23

S. No.	Semester	Paper	Title of the Paper
1	I	I	Mechanics, Waves & Oscillations
2	2	II	Wave Optics
3	3	III	Heat and Thermodynamics
4	4	IV	Electricity, Magnetism & Electronics
5	4	V	Modern Physics
6	5	VIB	Low Temperature Physics & Refrigeration

COURSE OUTCOMES-AY 2022-23

Semester 1		
Course code: PHY201302		**Mechanics Waves and Oscillations**
S. No.	**CO#**	**Description**
1	1	To understand basic theories related with properties of matter and its applications to determine values of various physical quantities associated with matter.
2	2	Be able to apply knowledge of the properties of matter to explain natural physical processes and related technological advances.
3	3	To learn about fundamentals of verbal and mathematical concepts of waves and oscillations.
4	4	Create awareness among students to know their skills required to get the information from the syllabus and use them in a proper way.
Semester 2		
Course code: PHY202302		**Wave Optics**
1	1	Understand the nature of light and principles of Laser and holography.
2	2	Analyze the intensity variation of light due to interference, diffraction and polarization.
3	3	Solve problems in Optics by selecting the appropriate equations and performing numerical or analytical calculations.
4	4	Student can able to operation of optical devices including polarizers, interferometers and Lasers.
Semester 3		
Course code: PHY203302		**Heat and Thermodynamics**
1	1	Students will be able to Perform experiments and interpret the results of observation, including making an assessment of experimental uncertainties.
2	2	They develop the ability to apply the knowledge acquired in the classroom and laboratories to specific problems in theoretical and experimental Physics.
3	3	To apply the theories learnt and the skills acquired to solve real time problems.
4	4	To understand the concepts and significance of the various physical phenomena.
Semester 4		
Course code: PHY204303		**Electricity, Magnetism and Electronics**
1	1	To learn about Gauss law and solve the electric field and magnetic field for various geometric objects and to learn basic electronic concepts in analog and digital theory.
2	2	To be Explain all the topics of Experiments, Concepts and Derivations to the student.
3	3	Apply the principles of electronics in day to day life.
4	4	Encourage all the students to study higher educational courses in reputed institutes and to enrich the students with creative, logical and analytical skills and to motivate the students towards research side.
Course code: PHY204304		**Modern Physics**
1	1	To Create awareness on the topics of Atomic and Molecular Physics, Quantum mechanics, Nuclear Physics, and Solid state physics.
2	2	To be Explain all the topics of Experiments, Concepts and Derivations to the student.
3	3	Explain the basic principles of quantum mechanics and apply to Atomic, Molecular structure of energy levels etc.
4	4	Motivate all the students to pursue PG courses in reputed institutes and to endow the students with creative and analytical skills; this will equip them to become entrepreneurs.

Semester 5		
Course code: PHY205303-6B		**Low Temperature Physics and Refrigeration**
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.
Course code: PHY205304-7B		**Solar Energy and Applications**
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.

AY 2023-24

S. No.	Semester	Paper	Title of the Paper
1	1	C-1	Essentials and Applications in Mathematical, Physical & Chemical Sciences
2	1	C-2	Advances in Mathematical, Physical & Chemical Sciences
3	2	C-3	Mechanics & Properties of Matter
4	2	C-4	Waves & Oscillations
5	3	III	Heat and Thermodynamics
6	4	IV	Electricity, Magnetism & Electronics
7	4	V	Modern Physics
8	5	VIB	Low Temperature Physics & Refrigeration

COURSE OUTCOMES -AY 2023-2024

Semester 1		
Course code: **BSCM2410** **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 analogue and digital signals and understand their characteristics. Gain knowledge of different types of transmission media.

Semester 2		
Course code: **PHY 23201**		**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 23202**		**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	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	Figure out the formation of harmonics and overtones in a stretched string and vibrations in bars
5	5	acquire the knowledge on Ultrasonic waves, their production and detection and their applications in different fields.

Semester 3		
Course code : **PHY 203302**		**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 4		
Course code : **PHY 204303**		**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 204304**		**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 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

AY 2024-25

S. No	Semester	Paper	Title of the Paper
1	1	C-1	Essentials and Applications in Mathematical, Physical & Chemical Sciences
2	1	C-2	Advances in Mathematical, Physical & Chemical Sciences
3	2	C-3 &M-1	Mechanics & Properties of Matter
4	2	C-4	Waves & Oscillations
5	3	C-5 & M-2	Optics
6	3	C-6	Heat and Thermodynamics
7	3	C-7	Electronic Devices and Circuits
8	3	C-8	Analog and Digital Electronics
9	4	C-9 & M-3	Electricity, Magnetism & Electronics
10	4	C-10 &M-4	Modern Physics
11	4	C-11	Introduction to Nuclear and Particle Physics
12	5	VIB	Low Temperature Physics & Refrigeration
13	5	VIIB	Solar Energy & Applications
14	6		Long Internship

COURSE OUTCOMES -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 analogue 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 Fraunhoffer 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 behaviour of P-N junction diodes in forward and reverse bias conditions and analyse the impact of junction capacitance on diode characteristics.
2	2	Analyse 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 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 analyse logic processes and implement logical operations using combinational logic circuits.
5	5	To understand the concepts of sequential circuits and to analyse 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