MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA

A College with Potential for Excellence

NAAC Accredited & ISO 21001: 2018 Certified

PROGRAMME REGISTER: 2023-26

DEPARTMENT OF PHYSICS

INDEX

PROGRAMME OUTCOMES (POs)

2023-26

Students of all Undergraduate Programmes at the time of graduation will be able to possess

PO1: Essential Knowledge:

Have comprehensive discipline knowledge and understanding, the ability to engage with different schools of thought and to apply their knowledge in practice including in multidisciplinary or multi-professional contexts.

PO2: Creative, Critical Thinking and Problem-Solving Abilities:

Be effective problem-solvers, able to apply critical and evidence-based thinking to conceive innovative responses to future challenges.

PO3: Teamwork and Communication Skills:

Convey ideas and information effectively to a range of audiences for a variety of purposes and contribute in a positive and collaborative manner to achieving common goals.

PO4: Motivated, Self-directed, and Life-long Learning:

Exhibit life-long skills; broad-based multiple career oriented general skills; self and field-based learning skills; digital skills; preparedness for living, learning and working in any environment.

PO5: Professionalism and Leadership Readiness:

Engage in professional behaviour and have the potential to be entrepreneurial and take leadership roles in their chosen occupations and communities.

PO6: Intercultural and Ethical Competency:

Be responsible and effective global citizens whose personal values and practices are consistent with their roles as responsible members of society.

PO7: Self-awareness and Emotional Intelligence:

Be self-aware and reflective, flexible and resilient and act with integrity and take responsibility for their actions as empowered women.

PO8: Social Responsibility and Effective Citizenship:

Exhibit social responsibility and compassionate commitment; Be sensitive to and demonstrate institution in matters of environment, gender and other social issues to promote an equitable society and sustainable development.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

2023-26

At the end of the programme students will be able to possess/exhibit:

PSO1: Quantitative Analysis:

Interpret principles, classifications, concepts, theories and mechanisms learnt.

PSO2: Practical and Analytical Skills:

Analyze hypotheses, procedures, properties, experimental facts and draw conclusions.

PSO3: Logical and Critical Thinking:

Apply knowledge and techniques in sample analysis, problem-solving, results, and production.

PSO4: Teamwork and Communication:

Develop communicative competence, creative and critical thinking, practical, technical and employability skills, social sensibility and responsibility.

Course Outcomes (COs)

2023-26

S.No.	Sem	Course Code	Course Title	Course Outcomes (COs)
1	I	23SCCCEA14	Essentials and Applications of Mathematical, Physical & Chemical Sciences	**CO1:** Apply mathematical principles to solve various problems across complex numbers, trigonometry, vectors, and statistical analysis involving data sets.
				CO2: Summarize key physics principles, including measurements, motion, thermodynamics, wave behaviour, electromagnetism, atomic structure, and theories of the universe.
				CO3: Outline the fundamental concepts of chemistry and their relevance in daily life.
				CO4: Elaborate the interconnectedness of math, physics and chemistry and explain how they predict phenomena in diverse contexts.
				CO5: Discuss about computer evolution, including the internet, network types and understand ethical issues in network security, cryptography, privacy and data protection.
2	I	23SCCCAS14	Advances in Mathematical Physical & Chemical Sciences	**CO1:** Identify the applications of mathematics in physics and chemistry to solve real-world problems.
				CO2: Explain renewable energy generation, storage, energy-efficient materials and recent advancements in nanotechnology, biophysics, medical physics, and materials science.
				CO3: Outline computer-aided drug design, Nano sensors, chemical biology, the impact of chemical pollutants on ecosystems and human health, and methods for dye removal using catalysis.
				CO4: Elaborate the interconnectedness of math, physics and chemistry and apply these principles to explain phenomena in diverse contexts.
				CO5: Summarize the advanced computer science topics, such as number systems, signals, error detection and correction, multiplexing, transmission media, and networking devices.
3	I	23MDCPP12	Principles of Physical Sciences	**CO1**: To know the core principles and concepts in physical sciences.

				CO2: To analyze scientific information and data related to physical sciences.
				CO3: To apply physical science principles to solve real - world problems.
4	II	23PHCCMM23	Mechanics & Properties of Matter - Minor	**CO1:** Determine the gradient of a scalar field, divergence, and curl of a vector field using the concepts of scalar and vector fields.
				CO2: : Solve equations of motion for variable mass systems using the laws of motion.
				CO3: Derive equations of motion for rotating rigid bodies, and analyze the precessional motion.
				CO4: Discuss the characteristics, conservative nature of central forces and equations of motion of bodies
				CO5: Outline various concepts of theory of relativity and solve problems.
5	II	23PHP1MM21	Mechanics & Properties of Matter- Practical – Minor	**CO1:** List out, identify and handle laboratory instruments related to Mechanics & Properties of Matter.
				CO2: Describe the experimental techniques to measure properties of matter and analyze mechanical systems
				CO3: Demonstrate experimental skills to accurately record, analyze experimental data and determine the respective physical parameters.
6	II	23PHCCWO23	Waves & Oscillations	**CO1:** Describe the basic characteristics of waves
				CO2: Relate wave parameters in terms of mathematical relationships.
				CO3: Compare particle motion and wave motion in different types of waves.
				CO4: Distinguish between Longitudinal and Transverse waves.
				CO5: Analyze the square waves, saw tooth waves, etc. using Fourier theorem
7	II	23PHP2WO21	Waves & Oscillations - Practical	**CO1:** List out, identify and handle laboratory instruments related to Waves & Oscillations.
				CO2: Describe the experimental techniques and equipment to investigate and analyze topics related to Waves & Oscillations.

				CO3: Demonstrate experimental skills to accurately record, analyze. experimental data and determine the respective physical parameters.
8	III	23PHCCOP33	Optics - Minor	**CO1:** Discuss different aberrations and methods of minimizing them in lenses.
				CO2: Explain the principles and theory of interference and its applications.
				CO3: Distinguish between the concepts of Fraunhofer and Fresnel diffraction.
				CO4: Summarize the concepts of polarization, specific rotation and applications.
				CO5: Outline the characteristics, working principles of LASERS and Holography and their applications.
9	III	23PHP3OP31	Optics – Practical - Minor	**CO1:** List out, identify and handle various instruments related to Optics.
				CO2: Describe the operational procedures of various experiments in Optics.
				CO3: Demonstrate experimental skills and determine the respective physical parameters.
10	III	23PHCCHT33	Heat & Thermodynamics	**CO1**: Describe the postulates of kinetic theory of gases and transport phenomena.
				CO2: Outline the fundamental ideas, laws of thermodynamics, reversible and irreversible processes, entropy of the universe and their applications.
				CO3: Describe thermodynamic potentials and derive Maxwell's equations and their applications.
				CO4: Summarize the fundamentals of low temperature physics and their applications
				CO5: Discuss the postulates of Quantum theory of radiation and their applications.
11	III	23PHP4HT31	Heat & Thermodynamics - Practical	**CO1:** List out, identify and handle various instruments related to Heat &Thermodynamics.
				CO2: Describe the operational procedures of various experiments in Heat &Thermodynamics.
				CO3: Demonstrate experimental skills and determine the respective physical parameters.

12	III	23PHCCED33	Electronic Devices & Circuits	**CO1:** Know the behavior of P-N junction diodes in forward and reverse bias conditions and the impact of junction capacitance on diode characteristics.
				CO2: Analyze the operation and characteristics of different BJT configurations (CB, CE and CC) and biasing.
				CO3: Comprehend the operation and characteristics of FETs, and UJTs.
				CO4: Describe the operation and applications of various photoelectric devices.
				CO5: Investigate the theoretical concepts and operation of rectifiers (half-wave, full-wave, and bridge), different filters and three-terminal voltage regulators.
13	III	23PHP5ED31	Electronic Devices & Circuits - Practical	**CO1:** List out, identify and handle various instruments related to Electronic Devices & Circuits.
				CO2: Describe the operational procedures of various experiments in Electronic Devices & Circuits.
				CO3: Demonstrate experimental skills and determine the respective physical parameters.
14	III	23PHCCAD33	Analog & Digital Electronics	**CO1:** Learn the principles and working of operational amplifiers.
				CO2: Apply knowledge of operational amplifiers in various applications.
				CO3: Attain proficiency in number systems, binary codes, and complements.
				CO4: Analyse logic processes and implement logical operations using combinational logic circuits.
				CO5: Summarize the concepts of sequential circuits and analyze sequential systems in terms of state machines.
15	III	23PHP6AD31	Analog & Digital Electronics - Practical	**CO1:** List out, identify and handle various instruments related to Analog & Digital Electronics.
				CO2: Describe the operational procedures of various experiments in Analog & Digital Electronics
				CO3: Demonstrate experimental skills and determine the respective physical parameters.
16	III	23MDCBE32	Basic Electronics	**CO1:** Describe various electrical parameters like voltage, current, resistance, electrical power and safety measures when dealing with electricity.

				CO2: Classify solid materials based on electrical conductivity and their applications.
				CO3: Discuss the basics of communication systems and their advanced applications in everyday life.
17	IV	23PHCCEM43	Electricity & Magnetism - Minor	**CO1:** Apply Gauss's law to get relations connecting dielectric parameters.
				CO2: Solve problems using loop analysis, Nodal analysis, Thevenin's theorem, Norton's theorem, and the Superposition theorem.
				CO3: Discuss the applications of Biot Savart Law and distinguish self and mutual inductance Phenomena.
				CO4: Compute Maxwell's electromagnetic wave equations governing electromagnetic waves using basic laws of electricity and magnetism.
				CO5: Describe phenomenon of resonance and compare series and parallel resonant circuits.
18	IV	23PHP7EM41	Electricity & Magnetism - Practical - Minor	**CO1:** List out, identify and handle various instruments related to Electricity & Magnetism.
				CO2: Describe the operational procedures of various experiments in Electricity & Magnetism.
				CO3: Demonstrate experimental skills and determine the respective physical parameters.
19	IV	23PHCCMP43	Modern Physics - Minor	**CO1:** Apply the knowledge of vector atom model to understand the principles of atomic structure and spectroscopy.
				CO2: Apply the knowledge of vector atom model to understand the principles of molecular structure and spectroscopy.
				CO3: Outline the concepts of de Broglie matter waves and Heisenberg's uncertainty Principle.
				CO4: Familiarize with the principles of quantum mechanics and the formulation of Schrodinger wave equation and its applications.
				CO5: Discuss the basics of the phenomenon of Superconductivity and its applications.
20	IV	23PHP8MP41	Modern Physics - Practical -	**CO1:** List out, identify and handle various instruments related to Modern Physics.

			Minor	**CO2:** Describe the operational procedures of various experiments in Modern Physics.
				CO3: Demonstrate experimental skills and determine the respective physical parameters.
21	IV	23PHCCNP43	Introduction to Nuclear & Particle Physics	**CO1:** Discuss high energy particles and their applications.
				CO2: Explain concepts on nucleon-nucleon interaction, such as its short-range, spin dependence, isospin, and tensors.
				CO3: Draw the potential shapes from nucleon interactions
				CO4: Summarize the concepts of single particle model, its strengths, and weaknesses.
				CO5: Describe magic numbers based on single particle model.
22	IV	23PHP9NP41	Introduction to Nuclear & Particle Physics - Practical	**CO1:** List out, identify and handle various instruments related to Introduction to Nuclear & Particle Physics.
				CO2: Describe the operational procedures of various experiments in Introduction to Nuclear & Particle Physics.
				CO3: Demonstrate experimental skills and determine the respective physical parameters.
23	IV	23MDCIN42	Introduction to Nanotechnology	**CO1:** Describe the fundamentals of nanotechnology.
				CO2: Summarize the fabrication and characterization techniques in nanotechnology.
				CO3: Evaluate the ethical and societal implications of nanotechnology.
24	V	23PHCCAE53	Applications of Electricity & Electronics - Minor	**CO1:** Analyze the working principles, classifications, and applications of passive elements.
				CO2: Apply DC network theorems to solve and optimize electrical circuits.
				CO3: Explain the operation and applications of AC/DC generators, transformers, and single-phase motors.
				CO4: Demonstrate amplitude and frequency modulation and analyze AM and FM transmitters and receivers.
				CO5: Design and troubleshoot DC motors, power supplies, and simple FM radio circuits.
25	V	23PHP10AE51	Applications of Electricity &	**CO1:** List out, identify and handle laboratory instruments related to applications of Electricity & Magnetism

			Electronics – Practical - Minor	**CO2:** Describe the experimental techniques to measure parameters of Electricity & Magnetism.
				CO3: Demonstrate experimental skills to accurately record, analyze experimental data and determine the respective physical parameters.
26	V	23PHCCEI53	Electronic Instrumentation – Minor	**CO1:** Understand the working of analog and digital instruments for accurate measurements.
				CO2: Demonstrate the skill of using oscilloscopes for measuring voltage, frequency, and time.
				CO3: Outline the working of transducers and bridges for measurements.
				CO4: Apply ADC/DAC and display technologies for signal conversion
				CO5: Analyze amplifiers, oscillators, and biomedical instruments.
27	V	23PHP11EI51	Electronic Instrumentation - Practical - Minor	**CO1:** List out, identify and handle laboratory instruments related to Electronic Instrumentation.
				CO2: Describe the experimental techniques to measure parameters of Electronic Instrumentation.
				CO3: Demonstrate experimental skills to accurately record, analyze experimental data and determine the respective physical parameters.
28	V	23PHEC11OI53	Optical Instruments & Optometry	**CO1:** Identify different types of cameras and camera lenses according to different purposes.
				CO2: Determine focal length of the different types of lenses
				CO3: Outline the natural and artificial sources of light and their application in Photography.
				CO4: Demonstrate skills on camera usage especially Digital Cameras.
				CO5: Outline the concept of different shooting techniques, techniques of Image development and editing.
29	V	23PHP1211OI51	Optical Instruments & Optometry - Practical	**CO1:** List out, identify and handle various optical instruments.
				CO2: Describe the operational procedures of various experiments in Optical Instruments & Optometry.

				CO3: Demonstrate experimental skills and determine the respective physical parameters.
30	V	23PHEC12OP53	Optical Imaging & Photography	**CO1:** Identify different types of cameras and camera lenses according to different purposes.
				CO2: Determine focal length of the different types of lenses.
				CO3: Outline the natural and artificial sources of light and their application in Photography.
				CO4: Demonstrate skills on camera usage especially Digital Cameras
				CO5: Outline the concept of different shooting techniques, techniques of Image development and editing.
31	V	23PHP1312OP51	Optical Imaging & Photography - Practical	**CO1:** List out, identify and handle various instruments related to optical imaging and Photography.
				CO2: Describe the operational procedures of various experiments in Optical Imaging & Photography.
				CO3: Demonstrate experimental skills and determine the respective physical parameters.
32	V	23PHEC21LT53	Low Temperature Physics & Refrigeration	**CO1:** Summarize the procedures of various methods and techniques used to produce low temperatures in the Laboratory.
				CO2: Explain the principles of refrigeration, air conditioning and cold storage.
				CO3: Describe the working of refrigeration, air conditioning and cold storage.
				CO4: Outline the classification, properties of refrigerants and their effects on the environment.
				CO5: Comprehend the applications of Low Temperature Physics.
33	V	23PHP1421LT51	Low Temperature Physics & Refrigeration-Practical	**CO1:** List out, identify and handle various instruments related to Low Temperature Physics.
				CO2: Describe the operational procedures of various experiments in Low Temperature Physics & Applications.
				CO3: Demonstrate experimental skills and determine the respective physical parameters.

34	V	23PHEC22SE53	Solar Energy & Applications	**CO1:** Summarize the basic concepts of solar radiation principles, collecting techniques and its storage.
				CO2: Explain the principles and working of solar thermal collectors and applications.
				CO3: Describe the fundamental concepts and working of solar cells and applications.
				CO4: Outline the types of solar cells, characteristics, fabrication steps and modules.
				CO5: Comprehend the knowledge on solar photovoltaic systems and applications.
35	V	23PHP1522SE51	Solar Energy & Applications - Practical	**CO1:** List out, identify and handle various instruments related to Solar energy.
				CO2: Describe the operational procedures of various experiments in Solar Energy & Applications.
				CO3: Demonstrate experimental skills and determine the respective physical parameters

Mapping of COs with PSOs & POs

S.No.	Sem	Course Code	Course Title	COs	PSOs	POs
1	I	23SCCCEA14	Essentials and Applications of Mathematical, Physical & Chemical Sciences	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
2	I	23SCCCAS14	Advances in Mathematical Physical & Chemical Sciences	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
3	I	23MDCPP12	Principles of Physical Sciences	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
4	II	23PHCCMM23	Mechanics & Properties of Matter - Minor	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
5	II	23PHP1MM21	Mechanics & Properties of Matter- Practical – Minor	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
6	II	23PHCCWO23	Waves & Oscillations	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4

7	II	23PHP2WO21	Waves & Oscillations - Practical	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
8	III	23PHCCOP33	Optics - Minor	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
9	III	23PHP3OP31	Optics – Practical - Minor	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
10	III	23PHCCHT33	Heat & Thermodynamics	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
11	III	23PHP4HT31	Heat & Thermodynamics - Practical	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
12	III	23PHCCED33	Electronic Devices & Circuits	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
13	III	23PHP5ED31	Electronic Devices & Circuits - Practical	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
14	III	23PHCCAD33	Analog & Digital Electronics	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4

				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
15	III	23PHP6AD31	Analog & Digital Electronics - Practical	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
16	III	23MDCBE32	Basic Electronics	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
17	IV	23PHCCEM43	Electricity & Magnetism - Minor	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
18	IV	23PHP7EM41	Electricity & Magnetism - Practical - Minor	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
19	IV	23PHCCMP43	Modern Physics - Minor	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4

				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
20	IV	23PHP8MP41	Modern Physics - Practical - Minor	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
21	IV	23PHCCNP43	Introduction to Nuclear & Particle Physics	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
22	IV	23PHP9NP41	Introduction to Nuclear & Particle Physics - Practical	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
23	IV	23MDCIN42	Introduction to Nanotechnology	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
24	V	23PHCCAE53	Applications of Electricity &	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4

			Electronics - Minor	CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
25	V	23PHP10AE51	Applications of Electricity & Electronics – Practical - Minor	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
26	V	23PHCCEI53	Electronic Instrumentation – Minor	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
27	V	23PHP11EI51	Electronic Instrumentation - Practical - Minor	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
28	V	23PHEC11OI53	Optical Instruments & Optometry	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4

				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
29	V	23PHP1211OI51	Optical Instruments & Optometry - Practical	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
30	V	23PHEC12OP53	Optical Imaging & Photography	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
31	V	23PHP1312OP51	Optical Imaging & Photography - Practical	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
32	V	23PHEC21LT53	Low Temperature Physics & Refrigeration	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
33	V	23PHP1421LT51	Low Temperature Physics & Refrigeration-	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4

			Practical	CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
34	V	23PHEC22SE53	Solar Energy & Applications	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
35	V	23PHP1522SE51	Solar Energy & Applications - Practical	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4

Mapping of Courses with PSOs

Course Title	PSO1 Quantitative Analysis	PSO2 Practical and Analytical Skills	PSO3 Logical, Critical Thinking	PSO4 Teamwork and Communication
Essentials and Applications of Mathematical, Physical & Chemical Sciences (EA)	✔	✔	✔	✔
Advances in Mathematical Physical & Chemical Sciences (AS)	✔	✔	✔	✔
Principles of Physical Sciences (PP)	✔	✔	✔	✔
Mechanics & Properties of Matter – Minor (MM)	✔	✔	✔	✔
Mechanics & Properties of Matter- Practical – Minor (MM-P1)	✔	✔	✔	✔
Waves & Oscillations (WO)	✔	✔	✔	✔
Waves & Oscillations – Practical (WO-P2)	✔	✔	✔	✔
Optics – Minor (OP)	✔	✔	✔	✔
Optics – Practical – Minor (OP-3)	✔	✔	✔	✔
Heat & Thermodynamics (HT)	✔	✔	✔	✔
Heat & Thermodynamics – Practical (HT-P4)	✔	✔	✔	✔
Electronic Devices & Circuits (ED)	✔	✔	✔	✔
Electronic Devices & Circuits – Practical (ED-P5)	✔	✔	✔	✔
Analog & Digital Electronics (AD)	✔	✔	✔	✔
Analog & Digital Electronics – Practical (AD-P6)	✔	✔	✔	✔
Basic Electronics (BE)	✔	✔	✔	✔
Electricity & Magnetism – Minor (EM)	✔	✔	✔	✔
Electricity & Magnetism - Practical – Minor (EM-P7)	✔	✔	✔	✔
Modern Physics – Minor (MP)	✔	✔	✔	✔
Modern Physics - Practical –Minor (MP-P8)	✔	✔	✔	✔

Introduction to Nuclear & Particle Physics (NP)	✔	✔	✔	✔
Introduction to Nuclear & Particle Physics -Practical (NP-P9)	✔	✔	✔	✔
Introduction to Nanotechnology (IN)	✔	✔	✔	✔
Applications of Electricity & Electronics – Minor (AE)	✔	✔	✔	✔
Applications of Electricity & Electronics – Practical – Minor (AE-P10)	✔	✔	✔	✔
Electronic Instrumentation – Minor (EI)	✔	✔	✔	✔
Electronic Instrumentation - Practical – Minor (EI-P11)	✔	✔	✔	✔
Optical Instruments & Optometry (OI)	✔	✔	✔	✔
Optical Instruments & Optometry – Practical (OI-P12)	✔	✔	✔	✔
Optical Imaging & Photography (OP)	✔	✔	✔	✔
Optical Imaging & Photography – Practical (OP-P13)	✔	✔	✔	✔
Low Temperature Physics & Refrigeration (LT)	✔	✔	✔	✔
Low Temperature Physics & Refrigeration-Practical (LT-P14)	✔	✔	✔	✔
Solar Energy & Applications (SE)	✔	✔	✔	✔
Solar Energy & Applications – Practical (SE-P15)	✔	✔	✔	✔

Mapping of Courses with POs

Course	PO1 Essential Knowledge	PO2 Creative, Critical thinking and Problem-solving abilities	PO3 Teamwork and Communication skills	PO4 Motivated, Self-directed and Life-long Learning	PO5 Professionalism and Leadership Readiness	PO6 Intercultural and Ethical Competency	PO7 Self-awareness and Emotional Intelligence	PO8 Social Responsibility and Effective Citizenship
EA	✔	✔	✔	✔				
AS	✔	✔	✔	✔				
PP	✔	✔	✔	✔				
MM	✔	✔	✔	✔				
MM-P1	✔	✔	✔	✔				
WO	✔	✔	✔	✔				
WO-P2	✔	✔	✔	✔				
OP	✔	✔	✔	✔				
OP-P3	✔	✔	✔	✔				
HT	✔	✔	✔	✔				
HT-P4	✔	✔	✔	✔				
ED	✔	✔	✔	✔				
ED-P5	✔	✔	✔	✔				
AD	✔	✔	✔	✔				
AD-P6	✔	✔	✔	✔				
BE	✔	✔	✔	✔				
EM	✔	✔	✔	✔				
EM-P7	✔	✔	✔	✔				
MP	✔	✔	✔	✔				
MP-P8	✔	✔	✔	✔				
NP	✔	✔	✔	✔				
NP-P9	✔	✔	✔	✔				

IN	✔	✔	✔	✔				
AE	✔	✔	✔	✔				
AE-P10	✔	✔	✔	✔				
EI	✔	✔	✔	✔				
EI-P11	✔	✔	✔	✔				
OI	✔	✔	✔	✔				
OI-P12	✔	✔	✔	✔				
OP	✔	✔	✔	✔				
OP-P13	✔	✔	✔	✔				
LT	✔	✔	✔	✔				
LT-P14	✔	✔	✔	✔				
SE	✔	✔	✔	✔				
SE-P15	✔	✔	✔	✔				