SARDAR PATEL UNIVERSITY

NAAC 'A' Grade (10-01-2023 To 09-01-2028)

Vallabh Vidyanagar

Gujarat

Academic Program Structure

&

Curriculum

(Aligned with NEP-2020)

[M.Sc. Applied Physics]

NHEQF Level: 6.5

Entry NHEQF Level	:	5.5/6
Duration	:	Two Years (Four Semesters)
Total Courses	:	24
Total Learning Hours	:	2640
Total Credits	:	88
Total Marks	:	2200

Graduate Attributes (GAs):

Upon successful completion of M.Sc. Applied Physics programme, graduates are expected to attain the following Graduate Attributes:

GA1Knowledge and Understanding (Core Discipline Competence)

- Demonstrate advanced knowledge of fundamental and applied concepts in physics, including classical mechanics, electromagnetism, quantum mechanics, thermodynamics, condensed matter physics, and statistical mechanics.
- Apply principles of physics to solve real-world problems in industry, research, and technological applications.

GA2 Critical Thinking and Problem-Solving Skills

- Analyze complex physical systems and phenomena using appropriate scientific methods, mathematical models, and computational tools.
- Evaluate, interpret, and critically assess experimental and theoretical results in physics.
- Identify and propose innovative solutions to practical physics problems, particularly in multidisciplinary contexts.

GA3 Research and Inquiry Skills

- Conduct independent research in applied physics, including the ability to formulate research questions, hypotheses, and experimental designs.
- Utilize advanced laboratory techniques and modern instrumentation to gather, analyze, and interpret data.
- Demonstrate proficiency in computational modelling and simulations relevant to physical systems.
- Contribute to scholarly publications and present findings in academic and professional settings.

GA4 Practical and Technical Skills

- Master the use of laboratory equipment and experimental techniques commonly used in applied physics research and industry.
- Implement computational methods and software for data analysis, simulation, and problem-solving.
- Work effectively with advanced scientific instrumentation, such as spectrometers, oscilloscopes, and vacuum systems and other sophisticated equipments.
- Apply concepts of material science and nanotechnology to design and develop new materials and devices.

GA5 Communication Skills

- Communicate complex scientific ideas and research findings clearly and concisely, both in writing and orally, to various audiences, including experts and non-experts.
- Prepare and present technical reports, research papers, and posters in professional and academic contexts.
- Engage in interdisciplinary discussions and collaborate effectively with peers, researchers, and industry professionals.
- Demonstrate the ability to explain technical concepts to individuals with diverse academic and professional backgrounds.

GA6 Ethical and Professional Responsibilities

- Understand and uphold ethical standards in scientific research, including integrity in data collection, analysis, and reporting.
- Demonstrate professional behaviour and responsibility in both academic and industrial settings.
- Foster sustainable practices and safety protocols in laboratory and research environments.

GA7 Teamwork and Leadership Skills

- Collaborate effectively in diverse, multidisciplinary teams to solve complex problems and advance knowledge in applied physics.
- Take initiative and demonstrate leadership in research projects, academic activities, and community outreach.
- Demonstrate the ability to work in a team, managing conflicts, contributing constructively, and supporting the success of group objectives.

GA8 Lifelong Learning and Continuous Professional Development

- Demonstrate the ability to engage in lifelong learning to stay current with advancements in applied physics and related fields.
- Participate in professional development activities, including workshops, conferences, and training in emerging technologies.
- Adopt a reflective approach to personal and professional growth, seeking opportunities to improve and enhance technical expertise.

Programme Educational Objectives (PEOs):

Within 3-5 years of completing the M.Sc. Applied Physics programme, graduate will be able to:

PEO 1:

Acquire advanced theoretical and practical knowledge of applied physics and related interdisciplinary domains, enabling them to analyze, design, and solve complex scientific and technological problems.

PEO 2:

Develop strong research aptitude, including experimental design, data analysis, computational methods, and scientific communication, preparing them for research careers, doctoral studies, and innovation-driven industries.

PEO 3:

Pursue professional careers in industry, R&D organizations, academia, and government sectors by applying physics principles to real-world applications, emerging technologies, and problem-solving contexts.

PEO 4:

Demonstrate the ability to integrate knowledge from physics, materials science, electronics, computation, and allied disciplines, and engage in lifelong learning to adapt to rapidly evolving scientific and technological advancements.

PEO 5:

Uphold professional ethics, scientific integrity, and social responsibility, and contribute to sustainable development by considering environmental, societal and safety aspects in applied physics practices.

PEO 6:

Effectively communicate scientific ideas, lead and collaborate in multidisciplinary teams, and contribute meaningfully to academic, industrial, and societal initiatives at national and global levels.

Program Learning Outcomes (PLOs):

PLO 1:

Demonstrate **advanced and integrated knowledge** of applied physics, including solid-state physics, materials science, electronics, photonics, nanoscience, instrumentation, and computational techniques, with a clear understanding of their theoretical foundations and practical relevance.

PLO 2:

Apply **advanced analytical, mathematical, and computational methods** to formulate, model, and solve complex problems in applied physics, including real-world and interdisciplinary contexts.

PLO 3:

Design, execute, and interpret **advanced experiments and simulations**, using modern laboratory instruments, characterization tools, and software, while adhering to safety, precision, and quality standards.

PLO 4:

Independently **plan and conduct research** by identifying problems, reviewing literature, selecting appropriate methodologies, analyzing data, and drawing valid conclusions, leading to a dissertation or project that reflects originality and rigor.

PLO 5:

Evaluate scientific data, models, and technologies **critically and systematically**, making informed judgments in the presence of incomplete or uncertain information, while considering technical, environmental, and societal implications.

PLO 6:

Apply principles of applied physics to **develop, optimize, or improve technologies and processes** relevant to industry, research organizations, and emerging sectors such as renewable energy, sensors, advanced materials, and electronics.

PLO 7:

Communicate complex scientific ideas, research findings, and technical information **clearly and effectively** through written reports, presentations, and discussions with both specialist and non-specialist audiences.

PLO 8:

Demonstrate **ethical conduct, integrity, and professionalism** in academic, research, and industrial practices, including responsible data handling, intellectual property awareness, and respect for sustainability and societal well-being.

PLO 9:

Work **effectively as an individual and as a member or leader of multidisciplinary teams**, contributing constructively to collaborative problem-solving and project management.

PLO 10:

Exhibit readiness for **independent, self-directed, and lifelong learning**, adapting to new technologies, research advances, and professional challenges in applied physics and related fields.

Program Specific Learning Outcomes (PSLOs):

PSLO1: - NA

PSLO2: - NA

PSLO3: - NA

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NEP-2020 aligned Curriculum with effect from Academic Year 2026-27

[M.Sc. Applied Physics]

Semester-I

Course Type	Course Code	Course Title	Teaching-Learning Scheme		Credits	Assessment Scheme & Marks				
			L-P-T	Total Notional Hours		Internal Assessment			External Assessment	Total Marks
						FA	SA	Total		
DSC	P2T01NCAPH01	Basic Mathematical Tools	4-0-0	120	4	30	20	50	50	100
DSC	P2T01NCAPH02	Physics of Atomic and Molecular Spectroscopy and Statistical Mechanics	4-0-0	120	4	30	20	50	50	100
DSC	P2T01NCAPH03	Applied Electronics	4-0-0	120	4	30	20	50	50	100
DSC	P2T01NCAPH04	Practical based on P2T01NCAPH01& P2T01NCAPH02	0-8-0	120	4	30	20	50	50	100
DSC	P2T01NCAPH05	Practical based on P2T01NCAPH03 & P2T01NCAPH06	0-8-0	120	4	30	20	50	50	100
DSC	P2T01NCAPH06	Nanoscience and Applied Materials	2-0-0	60	2	15	10	25	25	50
				660	**22**	**165**	**110**	**275**	**275**	**550**

DSC: Discipline Specific Core **DSE**: Discipline Specific Elective **L**: Lecture **P**: Practical **T**: Tutorial

FA: Formative Assessment **SA**: Summative Assessment

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Semester-II

Course Type	Course Code	Course Title	Teaching-Learning Scheme		Credits	Assessment Scheme & Marks				
			L-P-T	Total Notional Hours		Internal Assessment			External Assessment	Total Marks
						FA	SA	Total		
DSC	P2T02NCAPH01	Classical Mechanics and Quantum Mechanics	4-0-0	120	4	30	20	50	50	100
DSC	P2T02NCAPH02	Electrodynamics	4-0-0	120	4	30	20	50	50	100
DSC	P2T02NCAPH03	Elements of Applied Physics	4-0-0	120	4	30	20	50	50	100
DSC	P2T02NCAPH04	Practical based on P2T02NCAPH01& P2T02NCAPH02	0-8-0	120	4	30	20	50	50	100
DSC	P2T02NCAPH05	Practical based on P2T02NCAPH03 & P2T02NCAPH06	0-8-0	120	4	30	20	50	50	100
DSC	P2T02NCAPH06	Fundamentals of Materials Science	2-0-0	60	2	15	10	25	25	50
				660	**22**	**165**	**110**	**275**	**275**	**550**

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