

**MSc Physics (Nanoscience) (2022-2023 AY & 2023-2024 AY)**

<b>Name of the course</b>	<b>Course code</b>	<b>Year of introduction</b>	<b>Activities/content with direct bearing on employability/ entrepreneurship/ skill development</b>
Classical Mechanics	NSP1C 01	2022	Enhance problem-solving skills by tackling complex challenges, develop critical thinking abilities by analyzing and interpreting classical mechanics principles
Electronics	NSP1C 02	2022	Develop innovative startup ideas leveraging physics & electronics expertise.
Mathematical Physics	NSP1C 03	2022	Master advanced mathematical techniques and skills
Quantum Mechanics -I	NSP1C 04	2022	Develop problem solving skills in quantum mechanics of different systems. Able to apply quantum mechanical treatment to various systems.
Physics and Chemistry of Solids	NSP1C 05	2022	Explore the various properties and behaviors of solids using different methods.
Practical-I	NSP1P 01	2022	Able to design electronics circuits for different purposes. Develop skills in troubleshooting and solving problems in experimental physics.
Ability Enhancement Course (AEC)	NSP1A 01	2022	Develop research aptitude & skills in effective communication
Statistical Mechanics	NSP2C 06	2022	Explore the properties like entropy, free energy & specific heat using statistical mechanics techniques. Develop skills to explore properties of various thermodynamic systems.
Electrodynamics	NSP2C 07	2022	Apply electrodynamics principles to design and optimize electromagnetic systems, devices, and applications. Develop problem-solving and critical

			thinking skills to tackle complex electromagnetic problems.
Quantum Mechanics -II	NSP2C 08	2022	Learn the method of solving problems quantum mechanically. Develop skills in applications of group theory in spectroscopy and chemical bonding
Introduction to Nanomaterials	NSP2C 09	2022	Apply nanomaterials knowledge to develop new materials and products. Design and develop nanoscale electronic devices. Develop innovative nanomaterials -based products or solutions. Learn to synthesize and characterize nanomaterials.
Spectroscopy	NSP2C 10	2022	Develop skills of solving problems for different molecular systems. Able to explore spectroscopic methods to study & investigate various chemical systems.
Practical – II	NSP2P 02	2022	Able to design electronics circuits for different purposes. Develop skills in troubleshooting and solving problems in experimental physics.
Professional Competency Course (PCC)	NSP2A 02	2022	Develop skills in scientific writing. Understand ethics in research and technology transfer
Nuclear and Particle Physics	NSP3C 11	2022	Develop the skills of solving problems of different nuclear models and particle physics. Examine the kinetics of nuclear reactions including reaction rates and cross section. Studying particle physics can inspire young mind to enquire the fundamental nature of matter and universe.
Advanced Analytical Techniques	NSP3C 12	2022	Working principle and instrumentation of various instruments used for the characterization of nanomaterials. Analyze experimental data obtained from different instrumentation techniques.

Design, Synthesis and Properties of Nanomaterials	NSP3C 13	2022	Design experiments for the preparation and property tuning of various nanomaterials. Evaluate the structure-property relationship of nanomaterials.
Computational Nanotechnology	NSP3C 14	2022	Familiarize with simulations and modelling using computational tools. Building up of z-matrix
Practical-III	NSP3P 03	2022	Develop practical skills on synthetic approaches for Nanomaterials. Hands on experience on using various sophisticated instruments, data collection and analysis.
Project	NSP4PR 01	2022	Skills in literature survey, designing research problem and experiments, data collection and interpretation, publishing research papers.
Nanostructured Solar Cells	NSP4E 01	2022	Design potential nanomaterials and device architectures for efficient energy production.
Nanomaterials for Photocatalysis and Solar Fuel Generation	NSP4E 02	2022	Develop efficient nanostructured photocatalysts for various applications.
Micro/Nano Electro-mechanical Systems (MEMS/NEMS)	NSP4E 03	2022	Fabrication methods, characterization and applications of MEMS/NEMS
Sustainable Nanomaterials	NSP4E 04	2022	Recognize environmental impacts of nanomaterials. Develop green methods for synthesis and applications of nanomaterials
Nanomaterials for Supercapacitor Applications	NSP4E 05	2022	Design novel nanomaterials and device architectures for supercapacitor applications. Knowledge in material and device characterization
Computational Studies on Bioactive Compounds	NSP4E 06	2022	Understand and apply various computational tools in studying bioactive compounds.
Precision Nanoclusters: Origin and Applications	NSP4E 07	2022	Knowledge in structure, property, synthesis and characterization of precision nanoclusters. Design and develop promising nanoclusters for potential applications.

Materials in Medicine	NSP4E 08	2022	Knowledge in nanomaterials used for biomedical applications. Evaluate and recognize potential nano-biomaterials for specific applications.
Solid State Physics of Materials	NSP4E 09	2022	Apply the basic properties for realizing the applications, Apply the knowledge of band structures to estimate the bandgap of nanomaterials, Apply the fundamental knowledge of bulk solids to enumerate and evaluate the properties of nanostructured materials

**MSc Physics (Nanoscience) (2024-2025 AY onwards)**

<b>Name of the course</b>	<b>Course code</b>	<b>Year of introduction</b>	<b>Activities/content with direct bearing on employability/ entrepreneurship/ skill development</b>
Classical Mechanics	NSP7C 501	2024	Enhance problem-solving skills by tackling complex challenges, develop critical thinking abilities by analyzing and interpreting classical mechanics principles
Electronics	NSP7C 502	2024	Develop innovative startup ideas leveraging physics & electronics expertise.
Mathematical Physics	NSP7C 503	2024	Master advanced mathematical techniques and skills
Physics and Chemistry of Solids	NSP7E 501	2024	Explore the various properties and behaviors of solids using different methods.
Structure and Properties of Materials	NSP7E 502	2024	Application in microscopic techniques for material characterization, analyze mechanical properties and comprehend the optical and magnetic properties
Surface Energy and Growth Kinetics of Nanomaterials	NSP7E 503	2024	Analyze the phase transformation process and understand how to control that process for nanostructure creation, apply the kinetics of phase transformation in nano-systems.
Everyday Materials: Understanding Their Science and Impact	NSP7E 504	2024	Explore the role of materials in technology and industry, investigate emerging trends and innovations in materials science, Analyze and evaluate the role of different materials for technological advancements
Physics in Everyday Life	NSP7E 505	2024	Apply Physics concepts to the real-world problems and scenarios, Explore the role of Physics in technology, Identify the

			role of Physics in addressing global challenges and issues
MOOC -I	NSP7M 501	2024	
Statistical Mechanics	NSP8C 504	2024	Explore the properties like entropy, free energy & specific heat using statistical mechanics techniques. Develop skills to explore properties of various thermodynamic systems.
Electrodynamics	NSP8C 505	2024	Apply electrodynamics principles to design and optimize electromagnetic systems, devices, and applications. Develop problem-solving and critical thinking skills to tackle complex electromagnetic problems.
Quantum Mechanics -I	NSP8C 506	2024	Develop problem solving skills in quantum mechanics of different systems. Able to apply quantum mechanical treatment to various systems.
Precision Nanoclusters: Origin and Applications	NSP8E 506	2024	Knowledge in structure, property, synthesis and characterization of precision nanoclusters. Design and develop promising nanoclusters for potential applications.
Nanostructured Solar Cells	NSP8E 507	2024	Design potential nanomaterials and device architectures for efficient energy production
Solid State Physics of Materials	NSP8E 508	2024	Apply the basic properties for realizing the applications, Apply the knowledge of band structures to estimate the bandgap of nanomaterials, Apply the fundamental knowledge of bulk solids to enumerate and evaluate the properties of nanostructured materials
MOOC-II	NSP8M 502	2024	
Nuclear and Particle Physics	NSP9C 601	2024	Develop the skills of solving problems of different nuclear models and particle physics. Examine the kinetics of nuclear reactions including reaction rates and cross section. Studying

			particle physics can inspire young mind to enquire the fundamental nature of matter and universe.
Quantum Mechanics -II	NSP9C 602	2024	Learn the method of solving problems quantum mechanically. Develop skills in applications of group theory in spectroscopy and chemical bonding.
Molecular Spectroscopy	NSP9C 603	2024	Expertise in microwave, IR, Raman, electronic & resonance spectroscopy, characterize by using FTIR, Raman, NMR, UV-Vis & XRD techniques.
Advanced Analytical Techniques	NSP9E 601	2024	Working principle and instrumentation of various instruments used for the characterization of nanomaterials. Analyze experimental data obtained from different instrumentation techniques.
Micro/Nano Electromechanical Systems (MEMS/NEMS)	NSP9E 602	2024	Fabrication methods, characterization and applications of MEMS/NEMS
Computational Nanotechnology	NSP9E 603	2024	Familiarize with simulations and modelling using computational tools. Building up of z-matrix
Design, Synthesis and Properties of Nanomaterials	NSP9E 604	2024	Design experiments for the preparation and property tuning of various nanomaterials. Evaluate the structure-property relationship of nanomaterials.
Project	NSP10P 601	2024	Skills in literature survey, designing research problem and experiments, data collection and interpretation, publishing research papers.
MOOC -III	NSP10M 601	2024	
Bio-Nanomaterials	NSP10C 604	2024	analyze the potentials of nanoprobe, create new functional nanoprobe for advanced applications, explore applications of various nanomaterials in biology
Advanced Nanomaterials	NSP10C 605	2024	apply the concepts of functionalization while designing CNT composites for a specific

			application, Nurture the ability of critical thinking towards the design and development nano-structured materials for a specific application.
Nanostructured Super Capacitors	NSP10C 606	2024	Analyze the performance of electric capacitors and understand their advantages and disadvantages, Analyze the importance of novel energy storage devices with improved performance using nanoscience
Nanomaterials for Sustainable Technology	NSP10C 607	2024	Apply the knowledge gained for developing efficient nano-structured photocatalysts, Apply the photocatalysis reaction mechanisms towards contaminant degradation, hydrogen evolution and carbon dioxide reduction
Computational Studies on Bio-active Compounds	NSP10C 608	2024	Employ different computational tools to evaluate different bio-active compounds, explore drug likeness and related parameters for drug discovery