

Program Educational Objectives (PEO's):

- ❖ PEO1: Apply the scientific knowledge of Physics, Mathematics, Chemistry, and Engineering for deeper understanding of the matter at nanoscale.
- ❖ PEO2: Identify, formulate, research literature, and analyze advanced scientific problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- ❖ PEO3: Design solutions for advanced scientific problems and design system components or processes.
- ❖ PEO4: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- ❖ PEO5 :Create, select, and apply appropriate techniques, resources, and modern scientific and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- ❖ PEO6: Apply reasoning informed by the contextual knowledge to assess societal, health,safety, legal and cultural issues and the consequent responsibilities relevant to the professional scientific practice.
- ❖ PEO7: Communicate effectively on complex Scientific/Technological activities with the Scientific/engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- ❖ PEO8:Recognize the need for, and have the preparation and ability to engage in independent and life-long learning.

Programme Outcomes (PO's) :

- ❖ PO1:Apply principles of basic science concepts in understanding, analysis and prediction of matter at Nano scale.
- ❖ PO2 :To introduce interdisciplinary areas for interdisciplinary application of Science and engineering concepts.
- ❖ PO3: To introduce advanced ideas and techniques required in emerging areas in nanotechnology.
- ❖ PO4: To develop human resource with specialization in theoretical and experimental techniques required for career in academia and Nano technology driven industry.
- ❖ PO5: Engage in lifelong learning and adapt to changing professional and societal needs.

Program Specific Outcomes: (PSO's):

- ❖ PSO1: Understand and apply principles of physics, chemistry and engineering for understanding the scientific phenomenon in nano domain.
- ❖ PSO2: Understand and apply Theoretical concepts on experimental learning of Nanosystems for describing and deeper understanding.
- ❖ PSO3: Provide exposure in various specialization of Nanotechnology
- ❖ PSO4: Provide exposure to advanced experimental/theoretical methods for measurement, observation, and fundamental understanding of phenomenon at nano scale and nano systems.
- ❖ PSO5: Engage in research and life-long learning to adapt to changing environment.

Course Outcomes

M.Tech-I Semester (NanoTechnology)

Programme Core-I

INTPC01 SYNTHESIS AND PROPERTIES OF NANOSTRUCTURES

Course Outcomes:

1. Beginners will be able to acquaintance themselves with fundamentals of nanostructures.
2. To know the importance of top-down approach synthesis method and their optimization.
3. Students can be able to acquire knowledge on bottom-up synthesis route and may optimize the properties and implement new results.
4. To understand and address various influencing the optical, Morphology and Structural properties of nanomaterials.
5. To provide sound understanding of various concepts involving thermal, magnetic, and mechanical properties of nanomaterials.

Programme Core-II

INTPC02 MATERIALS CHARACTERIZATION TECHNIQUES

Course Outcomes:

1. To demonstrate and understand various spectroscopic techniques.
2. To distinguish various compositional and structural characterization techniques.
3. To understand the processing and advanced microscope techniques.
4. To obtain knowledge on electrical and magnetic characterization techniques.
5. To obtain knowledge on characterization techniques involved in Thermal and Mechanical.

Programme Elective-I

INTPE03 STRUCTURE, BONDING AND QUANTUM MECHANICS

Course Outcomes:

1. Student can able to theorize the importance of crystal structure for property evaluation.
2. Student can assess different types of chemical bonding in materials.
3. To evaluate nanostructured in quantum mechanical approaches.
4. Students can able to distinguish between classical electromagnetic theory and quantum mechanics.
5. To predict the free electron gas theory of metals and in Hydrogen atom.

Programme Elective-I

1NTPE03 PHYSICS AND CHEMISTRY OF MATERIALS

Course Outcomes:

1. To obtain knowledge on physical properties of materials.
2. Students can be able to acquire knowledge on chemistry involved in solid surfaces.
3. To know the importance of chemistry aspects within the material.
4. To understand the mechanism within nanostructures.
5. To demonstrate and understand various growth factors in nanosystems.

Programme Elective-I

1NTPE03 PHOTONICS (QUANTUM CONFINED MATERIALS)

Course Outcomes:

1. Students can be able to acquire knowledge on luminescence materials.
2. To understand and address the importance of plasmonic properties.
3. To obtain knowledge on new approaches in nanophotonics.
4. To provide sound understanding of various concepts of Biophotonics.
5. To visualize the concept of photonic crystals.

Programme Elective-I

1NTPE03 STATISTICAL THERMODYNAMICS FOR NANOSYSTEMS

Course Outcomes:

1. To obtain knowledge on thermodynamics systems.
2. Students can be able to acquire knowledge on Nanothermodynamics.
3. To understand the importance of Nonequilibrium thermodynamics.
4. To demonstrate and understand concepts of Nonequilibrium systems.
5. To provide sound understanding of thermodynamics of biological systems.

Programme Elective-I

1NTPE03 GREEN NANOTECHNOLOGY

Course Outcomes:

1. To make the students familiar with the field of traditional manufacturing to green manufacturing.
2. To familiarize with various processing of sustainable green manufacturing.
3. To develop knowledge on alternate energy systems.
4. To familiarize with different types of waste management.
5. To develop the knowledge about the basic concepts of Industrial ecology.

Programme Elective-II

1NTPE04 NANO-BIOMEDICAL APPLIATIONS

Course Outcomes:

1. To familiarize students with biological systems, materials and building blocks.
2. To understand the concepts of Biological Nanostructures.
3. To study various Nanopharmacology and Drug targeting system using nanotechnology.
4. To prioritize the role of nano structured materials in diagnosis.
5. To familiarize about Biomedical applications.

Programme Elective-II

1NTPE04 NANO BIO-TECHNOLOGY

Course Outcomes:

1. Students can able to develop deep understanding of Biomedical Application.
2. Student can able to compile all the Drug Delivery Systems.
3. To know the importance of Cell Behavior Toward Nanostructured Surfaces.
4. To prioritize the role of Orthopedic Interface.
5. To gain the improvements in Tissue Engineering/Regenerative Medicine.

Programme Elective-II

1NTPE04 BIONANOSTRUCTURES

Course Outcomes:

1. Students can able to develop deep understanding of bio nanotechnology, Nanomotors and proteins.
2. To familiarize with various applications of Biosensors.
3. To understand the importance of Biomimicry.
4. To demonstrate and understand applications of nanomaterials in cancer diagnosis.
5. Students can able to acquire knowledge on Nano Artificial Cells

1A01 RESEARCH METHODOLOGY & IPR

Course Outcomes:

1. Analyze research related information
2. Follow research ethics
3. Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
4. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
5. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

1NTL05 SYNTHESIS OF NANOMATERIALS LAB

Course Outcomes:

1. Gain knowledge on the synthesis techniques involved in experiments.
2. To construct a practical knowledge on the experiment.
3. The ability to write and present the laboratory reports.
4. To maximize knowledge regarding synthesis and processing of nanomaterials.
5. To acquire knowledge on synthesis parameters.

1NTL06 FABRICATION AND CHARACTERIZATION OF NANOMATERIALS

Course Outcomes:

1. Gain knowledge on the fabrication and characterization techniques of nanomaterials.
2. Students can acquire knowledge on equipment handling like XRD, PSA, UV etc.
3. To construct a theoretical knowledge
4. The ability to write and present the laboratory reports.
5. To maximize knowledge regarding fabrication and characterization of nanomaterials.

Course Outcomes

M.Tech-II Semester (NanoTechnology)

Programme Core-III

2NTPC07 NANO SENSORS AND DEVICES

Course Outcomes:

1. To develop knowledge about Sensors, Characteristics, design and its applications.
2. To persuade about the Physical Effects of Sensor.
3. To visualize the concept of Mass Sensitivity and Conductive Sensors.
4. To understand the importance of Electro Chemical Sensors and its measurement types.
5. Student can able attain knowledge on Thermometric & Optical sensors.

Programme Core-IV

2NTPC08 INDUSTRIAL TRENDS AND APPLICATIONS OF NANOTECHNOLOGY

Course Outcomes:

1. To elucidate on advantages of nanotechnology-based applications in industries.
2. To provide instances of contemporary industrial applications of nanotechnology.
3. To provide an overview of future technological advancements and increasing role of nanotechnology in Industries.
4. To understand the importance of Nanotechnology in textiles and cosmetics.
5. To visualize the concept of Nanotechnology in Space and Defence.

Programme Elective-III

2NTPE09 NANO TECHNOLOGY FOR ENERGY SYSTEMS

Course Outcomes:

1. Study the basic Energy need and role of Battery materials
2. To grade up knowledge of Super Capacitors, and its applications.
3. Study the role of nano structured material to meet Energy Challenges.
4. Learn about the concept of Hydrogen Storage Technology.
5. Gain knowledge on role of Fuel Cell Technology.

Programme Elective-III

2NTPE09 NANO ELECTRONICS AND NANO PHOTONICS

Course Outcomes:

1. To assess knowledge on Single Electron and few Electron phenomenon.
2. To determine theory behind Scanning Tunneling Microscope by Applications of Tunneling.
3. Study the basics of coulomb blockade in Quantum mechanics.
4. To persuade Single Electron Transistor and Carbon Nano tube transistor.
5. To extend the knowledge on Spintronics and Nano photonics.

Programme Elective-III

2NTPE09 NANO COMPOSITES DESIGN AND SYNTHESIS

Course Outcomes:

1. Student can able to discuss the basic concepts of Nano Composites.
2. Student can able to prioritize the role of Ceramic Metal Composites in Nano Technology.
3. To understand the role of Synthesis Methods for various Nano Composite materials.
4. Learn about the concepts of Indentations and types of Indentations.
5. Correlate the applications of Polymer Nano Composites and Impregnation Techniques.

Programme Elective-III

2NTPE09 NANOTRIBOLOGY

Course Outcomes:

1. To provide sound understanding of various concepts related to tribology.
2. Students can able to acquire knowledge on surface forces and measuring techniques.
3. To know the importance of Lubrication, friction, and wear.
4. To develop knowledge on Scale Effects in Mechanical Properties and Tribology.
5. To get awareness on applications of tribology.

Programme Elective-IV

2NTPE10 SCIENCE AND TECHNOLOGY OF THIN FILMS

Course Outcomes:

1. To develop deep understanding on Vacuum Technology.
2. To compile all the Conditions for formation of thin films.
3. To know the importance of Physical Vapor Deposition techniques.
4. To prioritize the role of Electrical discharges used in Thin Film Deposition.
5. To improve the understanding of deposition using CVD.

Programme Elective-IV

2NTPE10 LITHOGRAPHIC TECHNIQUES

Course Outcomes:

1. To discuss about Lithography and Optical Lithography
2. To formulate the role of Electron Lithography
3. To construct the idea of X-ray Lithography
4. To improve our knowledge in Ion Lithography
5. To understand the importance of Lithography based on Surface Instabilities

Programme Elective-IV
2NTPE10 MEMS/NEMS DESIGN AND APPLICATIONS

Course Outcomes:

1. To improve the understanding of MEMS/NEMS.
2. To provide silicon micro fabrication techniques etc.
3. To understand the importance of MEMS Sensors, Design and Processing
4. To bring out scaling and packaging issues of physical system.
5. To provide understanding of MEMS/NEMS applications.

2NTL11 NANOSTRUCTURED MATERIAL APPLICATION LAB

Course Outcomes:

1. To gain overall knowledge on synthesis, characterization, and application of nanomaterials.
2. Students can acquire knowledge on equipment handling like Cyclic voltammetry, Anti-bacterial applications, gas sensor etc.
3. To construct a theoretical knowledge on the experiment.
4. The ability to write and present the laboratory reports.
5. To maximize knowledge regarding synthesis, characterization, and applications of nanomaterials.

2NTL12 SIMULATION LAB

Course Outcomes:

1. To familiarize students about applying various material design and data analysis.
2. Quantum structures using online in- browser simulation tools.
3. To gain knowledge on design and construction of carbon molecules.
4. Student can develop math work and gain knowledge on Mat-Lab.
5. To maximize knowledge regarding 3D Printing and components.

AUDIT COURSE:

1A02/2A03 ENGLISH FOR RESEARCH PAPER WRITING

Course Outcomes:

Students will be able to:

1. Understand that how to improve your writing skills and level of readability.
2. Learn about what to write in each section.
3. Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission.

AUDIT COURSE

1A02/2A03 DISASTER MANAGEMENT

Course Outcomes:

Students will be able to:

1. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. Develop an understanding of standards of humanitarian response and practical Relevance in specific types of disasters and conflict situations.
4. Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in.

AUDIT COURSE

1A02/2A03 SANSKRIT FOR TECHNICAL KNOWLEDGE

Course Outcomes:

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world.
2. Learning of Sanskrit to improve brain functioning.
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects.
4. Enhancing the memory power.
5. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

AUDIT COURSE

1A02/2A03 VALUE EDUCATION

Outcomes:

Students will be able to

1. Understand value of education and self- development
2. Imbibe good values in students
3. Let they should know about the importance of character.
4. Knowledge of self-development.
5. Learn the importance of Human values.
6. Developing the overall personality

AUDIT COURSE

1A02/2A03 CONSTITUTION OF INDIA

Course Outcomes:

Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a Civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals 'constitutional role and entitlement.to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.
4. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
5. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
6. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
7. Discuss the passage of the Hindu Code Bill of 1956.

AUDIT COURSE

1A02/2A03 PEDAGOGY STUDIES

Course Outcomes:

Students will be able to:

1. Review existing evidence on the review topic to inform Programme design and policy making undertaken by the DfID, other agencies and researchers.
2. Identify critical evidence gaps to guide the development.
3. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
4. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
5. How can teacher education (curriculum and practicum) and the school curriculum and Guidance materials best support effective pedagogy?

AUDIT COURSE

1A02/2A03 STRESS MANAGEMENT BY YOGA

Course Outcomes:

Students will be able to:

1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency

AUDIT COURSE

1A02/2A03 PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

Course Outcomes:

Students will be able to

1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life.
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity.
3. Study of Neetishatakam will help in developing versatile personality of students.

Course Outcomes

M.Tech-III Semester (NanoTechnology)

Program Elective -V

3NTPE14 NANOTOXICOLOGY

Course Outcomes:

- 1.To provide knowledge on social impact of nano industry.
- 2.To design and conduct experiments, as well as to analyze the results.
- 3.To enhance the various analytical techniques and to identify and solve problems.
- 4.To understand the socio-ethical responsibility.
- 5.To know the importance of Dosimetry, Epidemiology and Toxicology of Nanoparticles.

Program Elective -V

3NTPE14 SOCIETAL IMPACTS OF NANOTECHNOLOGY

Course Outcomes:

1. To provide awareness to the engineering students about socio economic impact of nanotechnology and to handle the techniques effectively.
2. Understand the various social impacts of nanotechnology trend and research.
3. To enhance the nanotechnology research by taking ethics and public opinion into consideration.
4. To understand of professional and ethical responsibility.
5. To get awareness on Public Perceptions & Education

Program Elective -V

3NTPE14 SEMICONDUCTOR DEVICE TECHNOLOGY

Course Outcomes:

Students will be able to

1. To get sound awareness on semiconductor.
2. Students can able to acquire acquire knowledge of Metal-Semiconductor Contacts and Schottky Diodes.
3. To know the importance of Nanotechnology Pathways to Next-Generation Photovoltaics.
4. To develop knowledge on societal impact of semiconductor device technology.
5. To understand about Semiconductor Growth Technologies.

Open Elective

3NTOE15 APPLICATIONS OF NANOTECHNOLOGY

Course Outcomes:

1. To discuss the basic concepts of nano technology.
2. To understand the importance of nano biotechnology
3. To study the influence of nanotechnology in the field of environment and toxicology.
4. To evaluate the concepts of nano electronics.
5. To classify the applications of nano materials.