Nano Acclimatizing programme- 2025

(Certificate course in Nanoscience and Nanotechnology)

Programme aim and overview:

The programme targets to instill the philosophy of entry level knowledge of nanoscience and nanotechnology into the mind of budding scientists having the thirst of knowledge. It focuses on the nurturing the mind of those who are interested in this exciting and exponentially growing field.

Course structure:

Module 1: Introduction to Nanoscience and Nanotechnology

Chapter 1: Introduction and Definition of Nanotechnology
Chapter 2: History of Nanotechnology
Chapter 3: Future of Nanotechnology

Module 2: Nanomaterials: Types, Synthesis, and Characterization

Chapter 1: Types of nanomaterials: Nanoparticles, nanowires, nanotubes, and thin films
Chapter 2: Methods of synthesis: Top-down *vs*. Bottom-up approaches
Chapter 3: Characterization techniques: Electron microscopy, XPS, XRD *etc*.
Chapter 4: Surface properties of nanomaterials
Chapter 5: Nanolithography
Chapter 6: Green and sustainable methods of nanomaterial synthesis

Module 3: Nanofabrication and Nanolithography and nanodevices

Chapter 1: Lithographic methods
Chapter 2: 3D printing
Chapter 3: Nanorobotics

Module 4: Applications of Nanotechnology in Medicine and Healthcare

Chapter 1: Basics of Pharmaceutical Sciences
Chapter 2: Principles of Drug Delivery Systems
Chapter 3: Nanocarriers for drug and gene delivery
Chapter 4: Targeted Drug Delivery
Chapter 5: Nanoparticles and Cancer Therapy

Module 5: Nanotechnology in Electronics and Energy Systems

Chapter 1: Quantum mechanics at the nanoscale

Chapter 2: Optical properties of nanomaterials: Photonic and plasmonic phenomena
Chapter 3: Nanoelectronics and nanophotonic: From semiconductors to quantum dots
Chapter 4: Nano-enabled sensors and devices
Chapter 5: Nanomaterials in energy harvesting and storage: Solar cells, batteries, and supercapacitors

Module 6: Ethical Issues and Future Trends in Nanotechnology

Chapter 1: Ethics in nanotechnological research
Chapter 2: Future perspective

Laboratory/Practical Work: Hands-on experience with synthesis and characterization of nanomaterials.