INNOVATIVE TECHNOLOGY & BIO-SCIENCE AS-105

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Course Objectives

- ***CO1***: Understanding the concept of nanotechnology.
- ***CO2***: Learning the application of nanotechnology in multiple disciplines.
- ***CO3***: Understanding the concepts of biological sciences, genetics, biological indicators and biosensors.
- ***CO4***: Exploring the field of advanced biological sciences and biotechnology.
- ***CO5***: Exploring nano-biotechnology and its various application.

Unit-I Introduction to Nanotechnology

Introduction to Nanotechnology, Theoretical Basis of nanotechnology, Quantum confinement and size effect, Classification of Nanomaterials: Nanowires, Quantum Well and Quantum Dots, Properties of Nanomaterials, Carbonaceous Nanomaterials and their examples. Molecular Nanotechnology, Green Nanotechnology.

Unit-II Applications of Nanotechnology

Microelectromechanical Systems (MEMS) & Nanoeletromechanical Systems (NEMS), Nanorobotics, Nano-fluidics, Micro-gears and Nano-gears, Nanocomposites and their applications, Nanomaterials for Civil Engineers, Nano-paints, Light and flexible Civil Engg. structures based on carbon Nanomaterials, Nano-memories. Nano-sensors. Nano-transistors, Introduction to organic electronics.

Unit-III Introduction to Biological Sciences

Introduction to the cell as a unit of life, Principles involved in the maintenance of life processes, Ultra-structure and function of cellular components-Prokaryotic and Eukaryotic cells, cell-wall, plasma membrane, endoplasmic reticulum, Biomolecules- Carbohydrates. Lipids, Amino Acids, Proteins, Nucleic Acids, Tissue Systems. Metabolism, Chromosomes and Cell Division. Basic Genetics-biological indicators, bio-sensors, Mutation-causes, types and effect.

Unit-IV Advanced Biological Sciences

Introduction to microbiology, Industrial microbiology, Introduction to immunology, Introduction to molecular genetics, Structure of RNA aid DNA, Concept of Gene, Gene regulation, Basic concepts of biotechnology: Totipotency and cell manipulation, Classifications of biotechnologies.

Unit-V Nanobiotechnology

Introduction to Nanobiotechnology, Nanobiotechnology in medicine: regenerative medicine, Targeted drug delivery. Nanotechnology in pharmacy, Nanobiotechnology in Ayurveda, Alternative medicines. Nanobiotechnology in Agricultural, Industrial Nanobiotechnology, Nanoimaging, Cancer treatment using Nanotechnology.

Reference Books-

Introduction to Nanotechnology – by Risal Singh and Shipra Mital Gupta
Nanotechnology- An Introduction – by Ramsden
Introduction to Nanotechnology – by Charles P Poole Jr, Frank J Owens
Nanostructure & Nanomaterials- Synthesis, properties & Applications – by Guozhong Cao