



SILVER OAK UNIVERSITY

Silver Oak Institute of Science

Bachelor of Science Physics

Course Name: Nanotechnology Fundamentals and Applications

Course Code: 2050263106

Semester: 2nd

Prerequisite:

1. Basic knowledge of significance of Nanomaterials.

Course Objectives:

1. To make students understand the basic concept of nanotechnology, its characterizations and applications.

Teaching Scheme:

Teaching Scheme				
L	T	P	Contact Hours	Credit
4	0	0	4	4

Contents:

Unit	Topics	Teaching Hours	% Weightage
1	Introduction to Nanomaterials: Classification and nomenclature of nanomaterials, Types of Nanostructure: one dimensional (1D), two dimensional (2D), three dimensional (3D) Nanostructured materials, Quantum dots, Quantum wire, Quantum sheet structures, Carbon nanotubes (CNT).	14	25
2	Synthesis of nanomaterials: Macroscopic to microscopic crystals and nanocrystals, large surface to volume ratio, top-down and bottom-up approaches, Physical Methods: Physical Vapour Deposition (PVD), Inert gas condensation, Arc discharge, DC sputtering, Ion sputtering, Electro-deposition, Chemical Methods: Metal nanocrystals by reduction, Sol-gel, Solvothermal synthesis, Photochemical synthesis, Electrochemical synthesis.	14	25
3	Characterization of Nanomaterials: Techniques of characterization of size of nano powders/ particles using BET method and laser diffraction. Various spectroscopic techniques like optical spectroscopy. UV visible and Infrared spectroscopy. Raman spectroscopy. X-ray photoelectron spectroscopy. Basic understanding of each technique with special emphasis on characterization at nano scale. X-ray Fluorescence (XRF), X-ray diffraction (XRD) and Small Angle X-ray Scattering principles.	14	25
4	Applications of Nanomaterials: Mechanical, magnetic, electrical, optical, biocompatibility, toxicity, chemical, emergent quantum properties. Nanoelectronics, Nano-optics, Nano magnetic-, chemical-and biosensing, energy applications, textiles, cosmetic, biotechnology, medical, construction, defense, and other contemporary applications.	14	25

Course Outcomes:

Sr. No.	CO Statement	Unit
CO-1	Gain the basic Knowledge of Fundamentals of nanomaterials & its different concepts.	1
CO-2	Knowing about several methods for nanomaterial synthesis.	2
CO-3	Understand how nanomaterials are characterized using different instrumental techniques.	3
CO-4	Gain knowledge about how nanotechnology is applicable and useful to different fields.	4

Teaching & Learning Methodology:

1. Problem based Learning
2. Cooperative based Learning
3. Competency based Learning
4. Experiment centric teaching methods
5. Case studies
6. Interactive Lectures

Books Recommended: -

1. Robert Vajtai, Springer Handbook of Nanomaterials.
2. Rao, C.N.R., Müller, A. and Cheentham, A.K. (Eds.), "Chemistry of Nanomaterials", Wiley – VCH. 2005
3. Nanomaterials and Nanochemistry by Brechignac C., P. Houdy, M. Lahmani, Springer publication, 2007.
4. T. Pradeep, Nano: The essentials, understanding Nanoscience and Nanotechnology, Tata McGraw Hill, 2007.

List of Open-Source Software/learning website:

1. <http://silveroakuni.ac.in/video-lecture>

CO-PO-PSO Matrix:

CO. No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO-1	3	2	3	2	2	3	3	2			2	3	3
CO-2	3	2	3	2	2	3	3	2			2	3	3
CO-3	3	2	2	2	2	2	3	2			2	3	3
CO-4	3	3	2	2	2	3	3	3			3	3	3