

Title	Nanoscience	Number	CYL2010
Department	Chemistry	L-T-P [C]	3-0-0 [3]
Offered for	B. Tech	Type	Program-linked Science Elective
Prerequisite	None		

Ojectives

The aim of this course is to provide

1. Strong foundation and basic knowledge of nanoscience.
2. Greater understanding of the underlying theory of material behaviour at nanoscale.

Learning Outcomes

The students will enable to:

1. Appreciate the science involved in the nanoscale phenomena.
2. Design a strategy for nanoscale synthesis.
3. Select nanomaterials for specific application.

Contents

Fundamentals of Nanoscience [14 Lectures]: Nanoscale processes, nanosystems, nanostructures, important nanomaterials (clusters, nanocrystals, nanotubes and nanowires).

Size-dependent properties [7 Lectures]: Quantum confinement, Band gap, Surface effects in nanosystems. Optical, mechanical, electronic and magnetic properties along with surface reactivity.

Principles involved in the synthesis of nanomaterials [7 Lectures]: Top-down and bottom-up, soft versus hard methods, chemical and physical methods, hybrid methods for synthesis of nanomaterials.

Analysis of nanoscale phenomena [7 Lectures]: X-ray and electron diffraction, gas adsorption and porosity analysis and zeta-potential analysis.

Applications of nanomaterials [7 Lectures]: Bionanomaterials, electronic nanomaterials, nanomaterials for energy and environmental applications.

Textbooks

1. Introduction to Nanoscience, Stuart Lindsay, 2009, Oxford, ISBN: 0199544212

Reference Books

1. Nanosciences and Nanotechnology, Jean-Michel Lourtioz , Marcel Lahmani, Claire Dupas-Haeberlin, Patrice Hesto, ISBN-10: 3319193597, Springer Nature, 2015.

Self Learning Material

1. IIT Kanpur, NPTEL: Nanostructures and Nanomaterials: Characterization and Properties <https://nptel.ac.in/courses/118/104/118104008/>