

Approval: 9th Senate Meeting

Course Name: Science and Technology of Nanomaterials

Course Number: CY 554

Credits: 3-0-0-3

Prerequisites: None

Intended for: UG/PG

Distribution: Elective for B.Tech (all Branches), M.Sc. (Chemistry) & Ph.D.

Semester: Odd/Even

Preamble

The word 'nano' has recently become a buzz word as the properties of materials shows abrupt changes when the particle size is reduced to the nanometer length scales. The exciting opportunity to tune material properties by manipulating the particle size opens up plethora of novel applications. Nanotechnology became a billion dollar industry in a very short span of time and it is even proposed that this could become the driver for the next industrial revolution.

Outline

The course is designed to impart knowledge on a range of aspects of nanoscience and nanotechnology starting from the fundamental science to practical applications.

Details of the Course:

Modules	Contact Hours
Fundamentals of nanoscience, surface and volume, surface energy, classification of nanostructures	10
Synthesis of nanomaterials, Top down, bottom up, particle stabilization in colloids, thin film deposition technologies; CVD, PVD, PLD, ALD	7
Advanced Characterisation techniques: scanning probe microscopy, scanning electron microscopy, transmission electron microscopy	7
Interesting nanomaterials: metals, semiconductors, metal oxides, Fullerenes, Carbon nanotubes, graphene	6
Applications: Energy materials, Catalysts, sensors, display systems, nanobiotechnology, Biomimetics.	8
Societal implications of nanotechnology: Ethical aspects, Nanotoxicology	2
Quiz I & Quiz II	2
Total	42

Suggested Text Books:

S.No.	Name of Books/Authors/Publisher
1.	C. P. Poole (Jr.) and F. J. Owens, <i>Introduction to Nanotechnology</i> , Wiley Interscience, John Wiley and Sons, Hoboken, New Jersey.
2.	M.D. Ventra, S. Evoy, J.R. Heflin Jr. (Eds.), <i>Introduction to Nanoscale Science and Technology</i> , Kluwer Academic Publishers, Boston.
Reference Books	
1.	L. M. Liz-Marsan and P. V. Kamat, <i>Nanoscale Materials</i> , Kluwer Academic Publishers, Boston, USA.
2.	G. L. Hornyak , H.F. Tibbals, J. Dutta and J. J. Moore, <i>Introduction to Nanoscience and Nanotechnology</i> , CRC Press
3.	G. Cao, <i>Nanostructures & Nanomaterials: Synthesis, Properties & Applications</i> , Imperial College Press, 2004.
4.	D. A. Bonnel, <i>Scanning Probe Microscopy and Spectroscopy: Theory, Techniques and Applications</i> . 2nd Edition. New York, Wiley-VCH.
5.	D. B. Williams & C. B. Carter <i>Transmission Electron Microscopy: A Textbook for Materials Science</i> , Springer 2nd Ed. 2009