

CY241 Nano-scale Science and Technology

Credit: 3-0-0-3

Approval: Approved in 1st senate

Prerequisites: None.

Students intended for: B. Tech. 2nd Year onward

Elective or Compulsory: Elective

Semester: Odd/Even: Any

Course Objective:

This course will offer fundamental knowledge of the nanoscale science and technology. The course will provide insight into the scientific aspects due to which nanomaterials are gaining considerable attention worldwide. Some of the synthetic strategies and characterization techniques will be introduced to the students. Knowledge about some of the most interesting nanomaterials will be provided and their technological applications will be discussed

Course Description:

Properties of materials with nanoscale dimensions. 4 hrs

Nanostructures: Zero, one, two and three-dimensional nanomaterials. 2 hrs

General methods of synthesis of nanomaterials and nanostructures 5 hrs

Characterisation techniques: Optical spectroscopy and microscopy, scanning probe microscopy, scanning electron microscopy, transmission electron microscopy and X-ray diffraction. 8 hrs

Inorganic nanomaterials: Metallic nanocrystals with special emphasis on coinage metals, semiconductor nanocrystals, quantum dots, magnetic materials 6 hrs

Carbon nanostructures: Carbon nanotubes, graphene and fullerenes. 4 hrs

Organic and biological nanostructures. 4 hrs

Applications: Catalysts, sensors, actuators, display systems, molecular devices and nanobiotechnology. 7 hrs

Quiz I & Quiz II 2 hrs

Suggested Text Books:

C. P. Poole (Jr.) and F. J. Owens, *Introduction to Nanotechnology*, Wiley Interscience, John Wiley and Sons, Hoboken, New Jersey.

G. A. Ozin and A. C. Arsenault, *Nanochemistry: A Chemical Approach to Nanomaterials*, RSC Publishing, Royal Society of Chemistry, U.K.

M.D. Ventra, S. Evoy, J.R. Heflin Jr. (Eds.), *Introduction to Nanoscale Science and Technology*, Kluwer Academic Publishers, Boston.

G. Cao, *Nanostructures & Nanomaterials: Synthesis, Properties & Applications*, Imperial College Press, 2004.

Reference Books

L. M. Liz-Marsan and P. V. Kamat, *Nanoscale Materials*, Kluwer Academic Publishers, Boston, USA.

D. A. Bonnel, *Scanning Probe Microscopy and Spectroscopy: Theory, Techniques and Applications*. 2nd Edition. New York, Wiley-VCH.

S. Amelinckx, *Electron Microscopy: Principles and Fundamentals*, Weinheim, VCH.

Proposed by: Prem Felix Siril

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