Nano-Materials Credits: 4

Introduction What is Nano – Why Nano – Properties at Nano Scales, Advantages & Disadvantages, Application in comparison with bulk materials (Nano structure, nano wires, tubes, nano composites) State-of-art present nano – advanced – topic delivered by a student. **Nano Particles:** Introduction – Synthesis procedures – wet chemical approach & physical vapor synthesis approach etc – size effect & shape change and their properties – examples of systems involved – characterization techniques – properties & their applications (biological etc.); **Nano Wires:** Introduction – various synthesis procedures (template assisted method, VLS method and other synthesis methods) – properties of nano wires – characterization procedures & principles involved. Application of Nano wires.**Nano tubes: I**ntroduction – Different systems involved in nano tubes – single walled, multi-walled, Carbon based, metal incorporated tubes. Synthesis procedures (Solid & gaseous carbon source based production techniques etc.) Growth mechanism of carbon nano tubes – properties of carbon nano tubes – characterization – applications. **Nano Composites:**
Introduction-Synthesis procedures-various systems (metal-polymer, metal-ceramics and polymer-Ceramics). Characterization – procedures – Applications.**Micro/Nano Fabrication Techniques:** Introduction-Basic fabrication techniques (lithography, thin film deposition and doping) MEMS fabrication techniques-Nano fabrication techniques (E-Beam nano-imprint fabrication, Epitaxy and strain engineering. Scanned probe techniques) **Materials of Nano Technology:** Introduction - Si based Materials- Ge-based materials-metals – Ferro electric materials – Polymer materials-GaAs & InP (III – V) Group materials, Nano tribology and materials-characterization using Scanning Probe Microscope, AFM, FFM. **Nano Biomaterials:** Introduction-Biocompatibility – anti bacterial activity – principles involved – Applications.

TEXT BOOKS;

1. 1. Nano Materials A.K. Bandyopadyay/ New age Publications
2. Nano Essentials T Pradeep / TMH

Reference;

1. Springer Handbook of Nanotechnology
2. The Guest for new materials Auther S.T.Lakshmi Kumar, Published by Vigyan Prasar.
3. Nano – The Essentials C – Pradeep (IIcue Professor) , MC – Graw Hill
4. Nano Materials Synthersis, Properties and applications, 1996 Edlstein and Cammarate