IV B.TECH - II Semester
NANO TECHNOLOGY

Course Code: ME8T3C **Credits: 3**
Lecture: 3periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- Study the material property changes that changes with size, scale and dimensions
- Recognize the characterization techniques of nano materials
- Demonstrate manufacturing methods of nano particles and powders
- Acquire the knowledge effectiveness of nano scale dimensions
- Study all the basic sciences that are the foundation to Nano Technology
- Illustrate the applications of Nano technology in different fields

COURSE OUTCOMES:
Upon completion of this course the student will be able to:

1. Recognize the importance of nano materials.
2. Demonstrate material property dependence on size, scale and dimension.
3. Characterize nano materials by electron microscopy, scanning probes and X Ray Diffraction
4. List the applications and manufacturing methods of nano particles, powders
5. Identify different applications of nano materials

Prerequisites: Physics, Chemistry, Material Science.

UNIT I
INTRODUCTION TO NANO MATERILAS:
Basics of Quantum Mechanics, Harmonic oscillator, magnetic Phenomena, band structure in solids, Mossbauer and Spectroscopy, optical phenomena bonding in solids, Anisotropy.
Application of Silicon carbide, nano materials preparation, Sintering of SiC, X-ray Diffraction data, electron microscopy sintering of nano particles, Nano particles of Alumina and Zirconia Nano materials preparation, Characterization

UNIT II
MECHANICAL PROPERTIES:
Strength of nano crystalline SiC, Preparation for strength measurements, Mechanical properties, Magnetic properties,
ELECTRICAL PROPERTIES:
Switching glasses with nano particles, Electronic conduction with nano particles Optical properties: Optical properties, special properties and the colored glasses.

UNIT III
SYNTHESIS OF NANO MATERIALS: Process of synthesis of nano powders, Electro deposition
CHARACTERIZATION OF NANO MATERIALS: Electron microscopic, scanning probe microscopic, optical microscopic for nano science and technology, X-ray diffraction.

UNIT IV

NANO BIOLOGY : Interaction between bimolecular and nano particle surface, Different types of inorganic materials used for the synthesis of hybrid nano-bio assemblies, Application of nano in biology, nano probes for Analytical Applications-A new Methodology in medical diagnostics and Biotechnology, Current status of nano Biotechnology, Future perspectives of Nano biology, Nano sensors.

UNIT V

NANO MEDICINES : Developing of Nano medicines Nano systems in use, Protocols for nano drug Administration, Nanotechnology in Diagnostics applications, materials for used in Diagnostics and Therapeutic applications, Molecular Nano mechanics, Molecular devices, Nano tribology, studying tribology at nano scale, Nano tribology applications.

Learning Resources

Text Books:

1. A. K. Bandyopadhyay, "Nano Materials", New Age International, 2007.
2. T.Pradeep, "Nano: The Essentials, Understanding Nanoscience and Nanotechnology", TMH publications, 2007.

Reference Books:

1. Nanotechnology–A gentle Introduction to the next big idea by Mark Ratner and Daniel Ratner,Prentice Hall Professional, 2003.
2. Introduction to Nanotechnology–Charles P Poole Jr, Frank J Owens, Wiley Interscience– JohnWiley & sons.
3. Nanotechnology for Dummies–Richard Booker, Earl Boysen, Wiley Publishing Inc