4/4 B.Tech. EIGHTH SEMESTER

ME8T3C **NANOTECHNOLOGY** **Credits: 4**

Lecture:- 4 periods/week **Internal assessment: 30marks**
Tutorial: -- **Semester end examination: 70 marks**

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

Learning outcomes:

At the end of course the students 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 nanomaterials

Prerequisites:

Basic sciences, Material Science.

UNIT-I
GENERAL INTRODUCTION:
Basics of Quantum Mechanics, Harmonic oscillator, magnetic Phenomena, band structure in solids, Mossbauer and Spectroscopy, optical phenomena bonding in solids, Anisotropy.

UNIT-II

SILICON CARBIDE:

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, Wear materials and nano composites,

UNIT-III

MECHANICAL PROPERTIES:

Strength of nano crystalline SiC, Preparation for strength measurements, Mechanical properties, Magnetic properties,

Unit -IV

ELECTRICAL PROPERTIES:

Switching glasses with nanoparticles,Electronic conduction with nano particles

Optical properties: Optical properties, special properties and the coloured glasses

UNIT-V

Process of synthesis of nano powders, Electro deposition, Important naon materials

UNIT-VI:

INVESTIGAING AND MANIPULATING MATERIALS IN THE NANOSCALE:

Electron microscopics, scanning probe microscopics, optical microscopics for nano science and technology, X-ray diffraction.

UNIT-VII

NANOBIOLOGY :

Interaction between bimolecules and naoparticle surface, Different types of inorganic materials used for the synthesis of hybrid nano-bio assemblies, Application of nano in biology, naoprobes for Analytical Applications-A new Methodology in medical diagnostics and Biotechnology, Current status of nano Biotechnology, Future perspectives of Nanobiology, Nanosensors.

UNIT-VIII

NANOMEDICENS :

Developing of Nanomedicens Nanosytems in use, Protocols for nanodrug Administration, Nanotechnology in Diagnostics applications, materials for used in Diagnostics and Therapeutic applications, Molecular Nanomechanics, Molecular devices, Nanotribology, studying tribology at nanoscale, Nanotribology applications.

Learning resources

Text books:

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