20MD013 NANOTECHNOLOGY

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Course Description and Objectives:
This course deals with the concepts of nanotechnology, domain applications and its implications. The objective of this course is to familiarize the importance of nanotechnology in the integrated multi-disciplines such as material science, medicine, electronics and space applications etc.

Course Outcomes:
After successful completion of this course the student will be able to:

- Understand how basic nano systems work
- Distinguish top down and bottom up approaches
- Analyze the morphological characterization of nano materials using various tools
- Acquire knowledge of various domain applications of nanotechnology

UNIT – I L12

General Introduction: Basics of Quantum Mechanics, Harmonic oscillator, magnetic Phenomena, band structure in solids, Mossbauer and Spectroscopy, optical phenomena bonding in solids, Anisotropy. Importance of Nano-technology, Emergence of Nano-Technology, Bottom-up and Top-down approaches, challenges in NanoTechnology.

UNIT – II **L12**

Silicon Carbide: Application of Silicon carbide, nanomaterials preparation, Sintering of SiC, X-ray Diffraction data, electron microscopy sintering of nanoparticles, Nanoparticles of Alumina, Applications

Zirconia: Nanomaterials preparation, Characterization, Wear materials and nanocomposites, Applications

UNIT – III **L12**

Mechanical properties: Strength of nanocrystalline SiC, Preparation for strength measurements, Mechanical properties, Magnetic properties.

UNIT – IV **L12**

Electrical properties: Switching glasses with nanoparticles, Electronic conduction with nanoparticles.

Optical properties: Optical properties, special properties and the colored glasses.

UNIT – V **L12**

Material Characterization: Importance of material characterization, Classification of Characterization Techniques, SEM, TEM, AFM, DTA, DSC, FLIR

TEXT BOOKS:

1. A.K.Bandyopadhyay,"NanoMaterials",1st Edition,NewAgePublishers,2009
2. T. Pradeep, "Nano the Essentials",3rd Edition, Tata McGraw Hill, 2009

REFERENCE BOOKS:

1. Guozhong Cao, "Nanostructures and Nano Materials: Synthesis, Properties and Applicati ons",1st Edition, ImperialCollegePress,2004.
2. Bharat bhusan,"Springer's Handbook of Nano-technology", 2nd Edition, Spingers Publihsers, 2007.