

### **UNIT-I**

Importance of Nano-technology, Emergence of Nano-Technology, Bottom-up and Top-down approaches, challenges in NanoTechnology.

**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, nanomaterials preparation, Sintering of SiC, X-ray Diffraction data, electron microscopy sintering of nanoparticles, Nanoparticles of Alumina and Zirconia: Nanomaterials preparation, Characterization, Wear materials and nanocomposites.

### **UNIT-III**

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

### **UNIT-IV**

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

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

### **UNIT-V**

Processes of synthesis of nanopowders, Electrodeposition, Important nano materials Investigating and manipulating materials in the nanoscale: Electron microscopes, scanning probe microscopes, optical microscopes for nanoscience and technology, X-ray diffraction.

### **TEXTBOOKS:**

1. A.K. Bandyopadhyay, "NanoMaterials", 1<sup>st</sup> Edition, New Age Publishers, 2009
2. T. Pradeep, "Nanotechnology Essentials", 3<sup>rd</sup> Edition, Tata McGraw Hill, 2009

### **REFERENCE BOOKS**

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1. Guozhong Cao, "Nanostructures and NanoMaterials: Synthesis, Properties and Applications", 1<sup>st</sup> Edition, Imperial College Press, 2004.
2. Bharat Bhushan, "Springer's Handbook of Nano-technology", 2<sup>nd</sup> Edition, Springer Publishers, 2007.

## **17MD020 CONDITION MONITORING AND FAULT DIAGNOSIS OF MACHINES**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
17MD020	CONDITION MONITORING AND FAULT DIAGNOSIS OF MACHINES				

### **Course Description and Objectives:**

To provide a basic understanding with case studies on different surface NDE techniques and apply them for inspecting materials in accordance with industry specifications and standards.

1. To provide knowledge and enrich ideas about the conventional NDT techniques
2. develop a strong hands on experience for inspecting and evaluating components in accordance with industry specifications
3. To develop a fundamental knowledge about the advanced techniques and the recent developments in non-destructive testing so as to control the quality in manufacturing engineering components.

### **Course Outcomes:**

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

1. To have a basic knowledge of surface NDE techniques which enables to carry out various inspection in accordance with the established procedures.
2. To calibrate the instrument and inspect for in-service damage in the components.
3. Differentiate various defect types and select the appropriate NDT methods for better evaluation.
4. Ability to communicate their conclusions clearly to specialist and non-specialist audiences.
5. Documentation of the testing and evaluation of the results for further analysis.

### **SKILLS ACQUIRED:**

1. Analyzing engineering problems, selecting and using mathematical and theoretical data to provide suitable NDT solutions with consideration of the entire inspection cycle
2. Apply their engineering knowledge to the development, operation, maintenance and progression of technologies used for NDT
3. Observe, record and draw conclusions from data and experimental evidence, recognizing inherent uncertainties and limitations
4. Applying design processes, including materials selection that meet NDT standards