



MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AN AUTONOMOUS INSTITUTION)

(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)

Accredited by NAAC with 'A' Grade & Recognized Under Section 2(f) & 12(B) of the UGC act, 1956

COURSE CONTENT

FUNDAMENTALS OF NANO TECHNOLOGY								
III Semester: CSE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
2435503	Foundation	L	T	P	C	CIA	SEE	Total
		3	0	0	3	40	60	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
Prerequisites: cryptographic techniques to secure digital data.								

Course Overview:

This course introduces advanced computing paradigms including grid, cluster, pervasive, and quantum computing with their architectures and real-world applications. It explains the design and implementation of distributed and high-performance systems using grid and cluster technologies. The course covers job scheduling, resource management, and communication mechanisms in cluster environments. It also explores pervasive computing concepts such as device connectivity and human-machine interaction. Finally, it presents the fundamentals of quantum computing, including logic gates, circuits, and basic algorithms.

Course Objectives:

1. Imparting the basic knowledge in Nano Science and Technology.
2. Discuss how nanotechnology can help in the global energy crisis
3. Describe how nanoscale particles (quantum dots) can be synthesized, characterized and utilized.
4. Understand and predict nanoscale devices and behavior and communicate
5. Learn independently and self-critically.

Course Outcomes: After Completion of the Course, Students should be able to

1. Analyze combinational and sequential circuit design
2. To familiarize about the various properties of nanostructures.
3. To bring out the differences between nano and macro structures.
4. To discuss applications specific properties of nano materials.
5. Will give insight into many aspects of Nanoscience, technology and their applications in the prospective of materials science.

UNIT - I:

overview of Nanotechnology: Definition-historical development -properties, design and fabrication Nano systems, Working principle, applications and advantages of nano system. Nano materials - ordered oxides - Nano arrays - potential health effects

UNIT- II:

Nano Defects, Nano Partiles and Nanolayers: Nano Defects in crystals -applications - Nuclear

Track nano defects. Fabrication of nano particles - LASER ablation - sol gels - precipitation of quantum dots. Nano layers - PVD, CVD, Epitaxy and ion implantation - formation of Silicon oxide- chemical composition- doping properties - optical properties

UNIT-III:

Nano structuring: Nano Photolithography - introduction - techniques - optical - electron beam - ion beam - X-ray and Synchrotron - nanolithography for microelectronic industry - nanopolishing of Diamond- Etching of Nano structures - Nano imprinting technology - Focused ion beams - LASER interference Lithography nanoarrays -Near-Field Optics - case studies and Trends

UNIT – IV:

Science and Synthesis of Nano Materials: Classification of nano structures - Effects of nano scale dimensions on various properties - structural, thermal, chemical, magnetic, optical and electronic properties fluid dynamics - Effect of nano scale dimensions on mechanical properties - vibration, bending fracture Nanoparticles, Sol - Gel Synthesis, Inert Gas Condensation, High energy Ball Milling, Plasma Synthesis, Electro deposition and other techniques. Synthesis of Carbon nanotubes - Solid carbon source-based production techniques - Gaseous carbon source-based production techniques - Diamond like carbon coating. Top down and bottom-up processes

UNIT-V:

Characterization of Nano Materials: Nano - processing systems - Nano measuring systems - characterization - analytical imaging techniques - microscopy techniques, electron microscopy scanning microscopy, confocal LASER scanning microscopy - transmission electron microscopy. transmission electron microscopy, scanning tunneling microscopy, atomic force microscopy, diffraction techniques - spectroscopy techniques - Raman spectroscopy, 3D surface analysis - Mechanical, Magnetic and thermal properties - Nano positioning systems.

Textbooks:

1. Joshy Joseph and Craig Fellenstein, Grid Computing, Pearson Education.
2. Rajkumar Buyya, High Performance Cluster Computing, Pearson Education.
3. J. Burkhardt et al., Pervasive Computing, Pearson Education.
4. Marivesar, Approaching Quantum Computing, Pearson Education.

References:

1. J. Joseph and C. Fellenstein, Grid Computing, Pearson Education.
2. Rajkumar Buyya, High Performance Cluster Computing, Pearson Education.
3. J. Burkhardt et al., Pervasive Computing, Pearson Education.
4. Marivesar, Approaching Quantum Computing, Pearson Education.
5. Michael A. Nielsen and Isaac L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press.

ELECTRONIC RESOURCES:

1. https://nptel.ac.in/courses/113104081?utm_source=chatgpt.com
2. https://ocw.mit.edu/?utm_source=chatgpt.com
3. <https://www.thermofisher.com/in/en/home/materials-science/learning-center/microscopy-resource-center/scanning-electron-microscopy-sem.html>
4. https://www.nature.com/nnano/?utm_source=chatgpt.com
5. https://www.cnf.cornell.edu/?utm_source=chatgpt.com

MATERIALS ONLINE:

1. Course template
2. Tutorial question bank
3. Tech talk and Concept Video topics
4. Open-ended experiments
5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper – II
9. Lecture notes
10. E-Learning Readiness Videos (ELRV)

