



बिरसा मुंडा ट्रायबल युनिवर्सिटी Birsa Munda Tribal University

राजपिपला, जि० नर्मदा Rajpipla, Dist. Narmda

Established by Tribal Development Department, Govt. of Gujarat

School of Science

B.Sc. (Chemistry) Programme

Subject Code & Name: BS03MDCHE1 Nanomaterials & Nanotechnology

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage (%)			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
3	-	1	4	35	15	35	15

Programme Name	B.Sc.
Semester	III
Course Code	BS03MDCHE1
Course Title	Nanomaterials & Nanotechnology
Course Content Type (Th./Pr.)	Theory & Practical
Course Credit	3 + 1
Sessions+ Lab. Per Week	3 +2
Total Teaching/Lab. Hours	45 Theory Hours + 30 Practical Hours
* 2 Laboratory = 1 Session	

Learning Objectives

1. Grasp the basic principles of Nano chemistry, including the unique physical, chemical and biological properties of material at the Nano scale due to quantum effects and high surface to volume ratios.
2. Study how size, shape and surface chemistry influence the optical, electrical, magnetic and mechanical properties of nanomaterial's.
3. Evaluate the environmental, health and social impacts of nanomaterial's including toxicity, safe handling and ethical considerations.

Prerequisites (if any)

Learning Outcomes

On the Completion of this course, students will able to:

1. Understanding of Nanomaterials and Nanotechnology and their chemistry.
2. Knowledge of preparation, materials.
3. Characterization techniques and application of nonmaterial.





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Detailed Contents		
UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	Introduction to Nanomaterials <ul style="list-style-type: none"> ➤ Introduction to Nanomaterials, Optical, magnetic and chemical properties of Nanomaterials, ➤ Preparation of Nanoparticles: Chemical and Physical Approaches & General Introduction: Chemical reduction ➤ Sonochemical synthesis ➤ Sol-Gel Synthesis ➤ Self-assembly. 	15
II	Nanostructure and Nanomaterial <ul style="list-style-type: none"> ➤ Introduction about characterization techniques: XRD, SEM, TEM etcs, ➤ Quantum dots, wells & wires ➤ Carbon Nanotubes (CNTs) ➤ Single walled carbon nanotubes (SWNTs), ➤ Multiwalled carbon nanotubes (MWNTs), ➤ Graphenes, Fullerenes Nanorods, Nanotubes and Nanofibres 	15
III	Application of Nanomaterials: <ul style="list-style-type: none"> ➤ Applications Solar energy conversion and catalysis, ➤ Polymers with a special architecture, ➤ Liquid crystalline systems, Applications in displays and other devices, ➤ Advanced organic materials for data storage 	15
Text Book(s)		
Reference Books		
<ol style="list-style-type: none"> 1. Introduction to Nanotechnology: Charles P. Poole, Jr. and Frank J. Owens; Wiley Student Edition, 2008 2. 2Nanostructures and Nanomaterials: Synthesis, Properties and Applications: G. Cao, ICP, London, 2004. 		





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3. Nanobiotechnology, Concepts, Applications and perspectives: C. M. Niemeyer and C. A. Mirkin, WILEY-VCH, Verlag GmbH & Co, 2004.
4. Optical Properties of semiconductor nanocrystals: S. P. Gaponenko, Cambridge University Press, 1980.
5. Nanotechnology: Mark Ratner and Daniel Ratner, Pearson Education.

Web Resources

Required Software(s) (if any)

Practical(s) (if any)

1. Synthesis of different metals nanoparticles.
2. Synthesis of nanoparticles using different chemical process

30

L:: Lecture, **T::** Tutorial, **P::** Practical

CCE:: Continuous and Comprehensive Evaluation

(CCE Theory includes Mid Semester Examination, Assignment, MCQ quizzes, Seminar, Reflective notes, class participation, case analysis and presentation, slip tests (announced/surprised), attendance etc. or any combination of these)

PWE:: Practical Work Examination

(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.)

SEE:: Semester End Evaluation

