Faculty of Science and Humanities
B.Sc. (Physics) (Semester - 5)
In Effect from Academic Year 2023-24

Branch Name:	Physics
Program Code:	SC105
Course Name:	**Nanoscience and Nanotechnology**
Course Code:	**2SC1050522**
Pre-requisite Course:	Basic knowledge of Nano Physics.

Course Objectives:

1. To develop an actual understanding of Nano material.
2. To know the basic concept of Synthesis of Nanomaterials.
3. To understand the use of Nanomaterials in various field.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
				Theory (Marks)		Practical (Marks)		
Lecture (L)	Tutorial (T)	Practical (P)	Credit	University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	Total (Marks)
2	--	--	2	35	15	--	--	50

Subject Contents:

Sr. No	Topic	Total Hours	Weightage (%)
1	**Introduction to Nanomaterials:** Introduction to nano-sized materials and structures, Definitions of nanomaterials, Brief history of Nanomaterials and challenges in Nanotechnology, Properties of Nanomaterials: Effect of reduction of dimensions, quantum size effects, Mechanical, Thermal, Optical and Magnetic properties of nanomaterials	12	50
2	**Methods of Synthesis of Nanomaterials:** Bottom-up and Top-down approaches - Mechanical method: High Energy Ball Milling, Methods based on evaporation (Physical Vapour Deposition), Chemical Vapour Deposition, Chemical Methods: Colloidal Method and Sol-gel Method Special Nanomaterials: Carbon Nanotubes (CNT), Types –Single walled, multiwalled CNT, Structures and properties of CNTs, Synthesis of carbon nanotubes	12	50

Reference Books:

1. Nanotechnology: Principles and Practices by Sulbha K Kulkarni, Capital Publishing Co. New Delhi.
2. Introduction to Nanotechnology, C.P. Poole Jr. and F.J. Ownes, Wiley Publication.
3. Nanoscience and Technology eds. R. W. Kelsall, I.W. Hemley & M. Geoghehan, John Wiley and sons
4. Introduction to Nanoscience and nanotechnology by K.K. Chattopadhyay and A.N. Banerjee
5. Origin and Development of Nanotechnology, P. K. Sharma, Vista International Publishing House

List of Open Source Software/learning website:

1. https://www.youtube.com/watch?v=Z51R49OOqAA
2. https://www.youtube.com/watch?v=ZS1QPndpD2w

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Describe the nano-sized materials and structures.	1 Remembering
CLO2	Discuss the history of Nanomaterials and challenges in Nanotechnology.	2 Understanding
CLO3	Solve the numerical based on Carbon Nanotubes.	3 Applying
CLO4	Explain Methods of Synthesis of Nanomaterials.	4 Analyzing
CLO5	Justify the use of CNT in various fields.	5 Evaluating
CLO6	Design new nano materials.	6 creating

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Programme Outcomes (POs)									Programme Specific Outcome (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CLO1	H									H	
CLO2		H									
CLO3			M							M	
CLO4							M				
CLO5				H							H
CLO6									L		

H: High, M: Medium, L: Low