

गुरु घासीदास विश्वविद्यालय
(केन्द्रीय विश्वविद्यालय अधिनियम 2009 अ. 25 से अंतर्गत स्थापित केन्द्रीय विश्वविद्यालय)
कोनी, बिलासपुर - 495009 (छ.ग.)



Guru Ghasidas Vishwavidyalaya
(A Central University Established by the Central Universities Act 2009 No. 25 of 2009)
Koni, Bilaspur - 495009 (C.G.)

List of Courses which focuses on Professional Ethics, Gender, Human Values, Environment & Sustainability and other value framework

Department : Pure and Applied Physics

Programme Name : *M.Sc (Physics)*

Academic Year : 2021-2022

Courses which focuses on Professional Ethics, Gender, Human Values, Environment & Sustainability and other value framework:

Sr. No.	Course Code	Name of the Course
01.	OPNPPT1	Nanomaterials and its Applications



Scheme and Syllabus

Sem	Course Opted	Course Code	Name of the course	Credit	L:T:P	Internal	External	Total	
I	Core-1	PPPATT1	Classical Mechanics	5	4+1+0	30	70	100	
	Core -2	PPPATT2	Quantum Mechanics	4	3+1+0	30	70	100	
		PPPALT2	Quantum Mechanics Lab	1	0+0+1	30	70	100	
	Core -3	PPPATT3	Electronic and Experimental Methods	3	3+0+0	30	70	100	
		PPPALT3	Electronic and Experimental Methods Lab	2	0+0+2	30	70	100	
	Open Elective		Opted from the pool and offered by other departments	5		30	70	100	
	Other if any								
			TOTAL		20				500
			Open Elective offered by department						
	Open Elective	OPNPPT1	Nanomaterials and its Applications	3	3+0+0	30	70	100	
OPNPPL1		Nanomaterials and its Applications Lab	2	0+0+2	30	70	100		
Open Elective	OPNPPT2	Advanced characterization and computational techniques in Physics	3	3+0+0	30	70	100		
	OPNPPL2	Advanced Characterization and Computational Techniques in Physics Lab	2	0+0+2	30	70	100		
II	Core-4	PPPBT1	Concepts of Mathematical Physics	5	4+1+0	30	70	100	
	Core -5	PPPBT2	Advanced Quantum Mechanics	4	3+1+0	30	70	100	
		PPPBLT2	Advanced Quantum Mechanics Lab	1	0+0+1	30	70	100	
	Core -6	PPPBT3	Statistical Mechanics	5	4+1+0	30	70	100	
	Discipline Specific elective 1	PPPBD1	Computational Physics and Programming	3	3+0+0	30	70	100	
		PPPBLD1	Computational Physics and Programming Lab	2	0+0+2	30	70	100	
	Other if any								
		TOTAL		20				1000	



Open Elective: Nanomaterials and Its Applications

Course Code: OPNPPT1

(3+0+0)

Credits = 3

Course Objectives:

The objective of the subject is that the student acquires knowledge

- To foundational knowledge of the Nanomaterials and related fields.
- To understand the influence of dimensionality of the object at nanoscale on their properties
- To make the students acquire an understanding the basic Nanoscience/Nanotechnology and their Applications .
- Students gain knowledge about the principles of various synthesis techniques.

Learning Outcomes:

After completing this course students will be able to:

- Learn about the background on Nanoscience
- Understand the various synthesis methods of Nanomaterials and their application and the impact of Nanomaterials on environment
- Apply their learned knowledge to develop new Nanomaterial's.

Unit – I: History of nano- materials, Ancient Indian Culture and Nanotechnology, Role of Feynman in development of Present Nano-sciences, what are Nanoscience and Nanotechnology? Atomic structure and atom size and their effects, Types of 1D, 2D, 3D Nano-structured materials, Influence of nano over micro/macro.

Unit – II: Properties of Nano materials: Physical, Magnetic, Optical, Thermal, Mechanical, Electrical for nano materials and Chemical Properties, Size effects, Surface Effects and Surface to Volume ratio.

Unit – III : Type of Nanomaterials: different type of nano materials, Carbon nanotube, Fullerene, Type of CNT: SWNT (Single wall nano tube), Multi wall nano tubes. 2D nano material, Graphite and Graphene, metal nano particle silver and gold, ZnO and TiO₂ metal oxides, Semiconductors, Nano-composites, Creating nanoparticles by using software.

Unit – IV: Synthesis of nano materials: Top- down or bottom up approach, Physical Methods, PLD, Sputtering, Thermal evaporation, Chemical Methods – CVD, Sol-gel, Hydrothermal, Biological Methods – Green Synthesis, mechanical milling, sputtering and microwave plasma, chemical reduction and oxidation, hydrothermal, micelles, sol-gel processes, photolysis, and metal organic chemical vapor deposition

Reference Books:

1. Introduction to Nano Science and Nano Technology – K.K. Chattopadhyay & AN Banerjee PHI Pvt. Ltd., 2009.
 2. Nano technology: Principles and practices - Sulabha K. Kulkarni, Capital Publisher Co., 2015.
 3. Introduction to nano technology: Charles P. Poole, Jr. Frank J. Owen, Wiley, Interscience Pub., May, 2003.
 4. Nanostructures & Nanomaterials Synthesis Properties & Applications. Guozhong Cao, Imperial College Press London. 2004
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