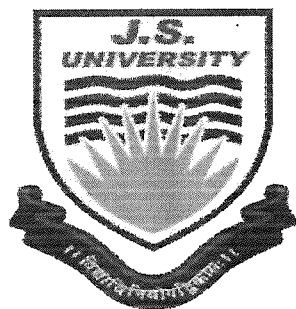


J.S. University, Shikohabad

Established by UP Govt. Act No. 07 of 2015

Recognized by U.G.C. under section 2 (f) of Act-1956




Value Added Course

VAC-188

**(RECENT DEVELOPMENT IN
NANOTECHNOLOGY)**

**Faculty of Physics
(2022-23)**

	J.S. University, Shikohabad Faculty of Physics	Value Added Course
		AY: 2022-23

(RECENT DEVELOPMENT IN NANOTECHNOLOGY)

Learning Objectives:


- To learn basics of Nanotechnology.
- To recognize the structures and class of nanomaterials.
- To familiarize the properties of nanomaterials.
- To elaborate the importance of nanomaterials.

Duration: 30 Hours. (Theory and Practical)

Perquisites:

Assessment Criteria/ Award of certification:

Participants who secured 90% attendance and secured 80% marks in final quiz shall be awarded the completion of certificate


	J.S. University, Shikohabad Faculty of Physics	Value Added Course
		AY: 2022-23

Course Outcomes: -

Maximum Exposure has to be given on Practical Oriented

By the end of the course, the students will be able to

- 1) Interpret the Fundamentals of Nanotechnology.
- 2) Expert to classified the nanomaterials.
- 3) Differentiate the nanomaterials on the basis of their properties.
- 4) Use the nanomaterials in daily life.

	J.S. University, Shikohabad Faculty of Physics	Value Added Course
		AY: 2022-23

Sr.No	Content	Duration (30 Hrs)
1	Fundamentals of Nanotechnology	06
2	Structures & Classification of Nanomaterials	06
3	Quantum Theory of Nanomaterials Development of Quantum theory of Nanomaterials	06
4	Nanomaterials and properties	06
5	Applications of Nanomaterials	06

SYLLABUS OUTLINE

1. Module-1

Fundamentals of Nanotechnology

Introduction to Nano-science and Nano-technology, Nano-scale material, implications for Physics, Chemistry, Engineering & Biology, and Motivation for Nanotechnology study. History & development of Nano-science and Nano-technology with an emphasis on the history of Nano-metals, Chalcogenides & Boron Nitride, and Carbon Nanomaterials.

2. Module-2

Structures & Classification of Nanomaterials

Nano-structures: various types of nano-structures and nano-crystals. Classification: of bulk Nanostructured materials, 0D, 1D, 2D structures – Size Effects – Fraction of Surface Atoms – specific Surface Energy and Surface Stress – Effect on the Lattice Parameter – Phonon Density of States Nano-particles, Quantum dots, Nano-wires, Ultra-thin films, Multi-layered materials.

3. Module-3

Quantum Theory of Nanomaterials Development of Quantum theory of Nanomaterials

Application of Block functions in Nanomaterials. Quantum Dots: (a) Semiconductor Quantum Dots, (b) Introduction to lasers (c) Quantum Dot lasers (d) Quantum

Cascade lasers, and (e) Quantum Dot optical memory.

4. Module-2

Nanomaterials and properties

Carbon Nanotubes (CNT) - Metals (Au, Ag) - Metal oxides (TiO₂, CeO₂, ZnO) - Semiconductors (Si, Ge, CdS, ZnSe) - Ceramics and Composites - Dilute magnetic semiconductor - Biological system - DNA and RNA - Lipids - Size-dependent properties - Mechanical, Physical and Chemical properties.

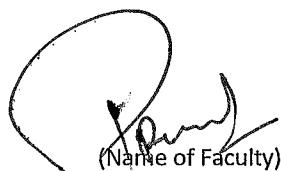
5. Module-5

Applications of Nanomaterials

Molecular electronics and Nano electronics – Quantum electronic devices - CNT-based transistor and Field Emission Display - Biological applications - Biochemical sensor - Membrane-based water purification.

References: -

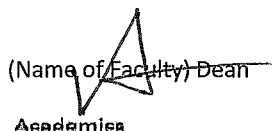
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(Name of Faculty)

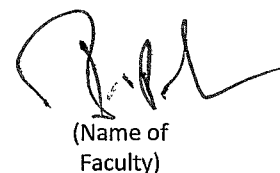
Course Coordinator

Dr. Pranod Rajput



(Name of Faculty) Dean
Academics

Dr. Akhilesh



(Name of Faculty)

Director/Principle/Dean of
Faculty/Department

Dr. B.P. S. Chauhan