



AMITY UNIVERSITY

— UTTAR PRADESH —

FORMAT FOR COURSE CURRICULUM

Course Title: Nanotechnology: Principles and Practices

LEVEL: Ph.D.

Course Code:

Credit Units: 4

L	T	P/S	SW/F W	TOTAL CREDIT UNITS
4	0	0	0	4

Course Objectives:

This course is intended to know provide fundamental and advance knowledge related to nanotechnology

Pre-requisites: The student should have knowledge of basic knowledge of material properties

Student Learning Outcomes:

Student will be able to:

1. Analyze the important of Nanotechnology,
2. Decide synthesis of nanomaterials,
3. Develop technological applications of nanomaterials
4. Create application of nanomaterials in different field.

Course Contents/Syllabus:

	Weightage (%)
Module I Quantum mechanics and Quantum Confinement	25 %
Descriptors/Topics Introduction to Quantum mechanics and Quantum confinement and application with reference to Quantum wells, Quantum wires, Quantum dots, Nano clusters and Nano crystals	
Module II : Synthesis of Nanomaterials	30%
Descriptors/Topics Introduction to Synthesis of Nanomaterials: Types and strategies for synthesis of nanomaterials depending on end	

<p>applications. Zero-Dimensional Nanostructures: Nanoparticles: Introduction, different strategies for synthesis of 0D nanomaterials and their technological applications. One-Dimensional Nanostructures: Nanorods and Nanowires: Introduction, different strategies for synthesis of 1D nanomaterials and their technological applications. Two-Dimensional Nanostructures: Thin Film: Introduction, different strategies for synthesis of 2D nanomaterials and their technological applications. Three-Dimensional Nanostructures: Nanostructure assembly: Introduction, different strategies for synthesis of 3D nanomaterials and technological applications. Special Nanomaterials and applications: Introduction, different strategies for synthesis of special nanomaterials (e.g. carbon, micro and mesoporous, zeolites, core-shell structures, hybrid nanomaterials etc. and their technological applications.</p>	
<p>Module III : Characterization techniques of nanomaterials</p>	30%
<p>Descriptors/Topics Characterization and characterization techniques of nanomaterials : Introduction, structural characterization, X-ray diffraction (XRD-Powder/Single crystal), Small angle X-ray scattering (SAXS), scanning electron microscopy (SEM), transmission electron microscopy (TEM), energy dispersive X-ray analysis (EDAX), Low Energy Electron Diffraction (LEED), scanning probe microscopy (SPM) -principle of operation, instrumentation and probes, Atomic force microscopy (AFM), Optical spectroscopy, luminescence spectroscopy, UV-vis spectroscopy (liquid and solid state), UV Photo electron spectroscopy (UPS), Infrared spectroscopy, Raman spectroscopy, XPS, ESCA, Auger, Thermal Analysis Methods etc.</p>	
<p>Module IV: Applications of Nanotechnology in various fields</p>	15%
<p>Descriptors/Topics . □ Materials manufacturing and automobile, Computers, electronics and communication □ Analytical, Pharma and Environmental sciences □ Defense, Aerospace and Marine Nanotechnology □ MEMS, NEMS and different structure</p>	

Pedagogy for Course Delivery: Course delivery will involve power point presentations and explanation on board as required.

Lab/ Practicals details, if applicable: NIL

Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)	End Term Examination
100		100

Theory Assessment (L&T):

Continuous Assessment/Internal Assessment	End Term Examination
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Components (Drop down)	Home Assignment	Class Test	Seminar/ Quiz/ Viva	Attendance	Theory
Weightage (%)	5	15	5	5	70

Lab/ Practical/ Studio Assessment: NIL

	Continuous Assessment/Internal Assessment				End Term Examination		
Components (Drop down)							
Weightage (%)							

Text & References:

1. P. W. Atkins and R.S. Friedman, "Molecular Quantum Mechanics", 3rd Edition, Oxford, 2004. (A good reference book for quantum mechanics)
2. Wiesner M.R. and Bottero J.Y., "Environmental Nano technology: Applications and Impacts of nanomaterials", Tata McGraw-Hill, 2007.
3. Karkare I.K. , "Nanotechnology- Fundamentals and Applications", IK Intern.Publ.,2008.
4. Allhoff F., "What is Nanotechnology", Wiley, 2010 Nanobiotechnology I &II: Edited by Chad A. Mirkin and Christof M. Niemeyer