

Course title: Nanomaterials: Introduction and Applications				
Course code: BBP113		No. of credits: 2	L-T-P: 19-06-06	Learning hours: 31
Pre-requisite course code and title (if any):				
Faculty: Dr Udit Soni			Department: Department of Biotechnology	
Course coordinator: Dr Udit Soni			Course instructor: Dr Udit Soni	
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Course type: Elective			Course offered in: Semester 2	
Course description: Nanotechnology is an interdisciplinary field and attracts students from various disciplines. This course is provides basic overview of nanomaterials and their applications. This course begins with a review of various types of nanomaterials and an introduction to general terminologies. Subsequently the course covers synthesis methodologies, physical and chemical characterization of nanomaterials. Finally, case studies illustrating application of nanomaterials in diverse fields will be discussed.				
Course objectives: 1. To understand the nature and properties of nanomaterials. 2. To provide scientific understanding of nanomaterials for utilization for various applications.				
Course contents				
S.No	Topic	L	T	P
1.	Nanomaterials; Introduction to nanomaterials: Three-, two-, one- and zero-dimensional nanomaterials (carbon nanotubes, carbon dots, quantum dots, graphene, metal and metal oxide based nanomaterials, semiconductor nanomaterials, hybrid and core shell nanomaterials, bio and polymer nanomaterials)	4	0	0
2.	Properties of nanomaterials; Crystal geometry and structure, chemical properties and surface functionalization, physical properties including photocatalytic, dielectric, magnetic, optical, mechanical, and structural.	4	0	0
3.	Synthetic methodologies; Top down and bottom up approaches for nanomaterial synthesis. Synthesis of nanoparticles by physical, chemical and biological methods.	3	0	2
4.	Characterization of nanomaterials; by various analytical methods, optical characterization, spectroscopy, structural characterization and imaging techniques.	4	2	4
5.	Applications of nanomaterials; health and disease diagnostics, biomedical, delivery vehicles, sensors and biosensors, cosmetics, agriculture, environment , food, energy and defence.	4	4	0
Evaluation criteria:				

<ol style="list-style-type: none"> 1. 2 minor tests : 20% each 2. 1 major test (end semester) : 50% 3. Assignment: 10%
<p>Learning outcomes:</p> <ol style="list-style-type: none"> 1. Familiarity with working principles, tools and techniques in the field of nanomaterials. 2. Understanding of the strengths, limitations and potential uses of nanomaterials.
<p>Pedagogical approach The course will be delivered through classroom lectures and experiments. Case studies related to application of nanomaterials.</p>
<p>Skill Set:</p> <ol style="list-style-type: none"> 1. Able to understand nanomaterial's types and properties. 2. Able to apply nanomaterials for application.
<p>Employability:</p> <ol style="list-style-type: none"> 1. Academic, industrial and research organization. 2. Industries based on material science, biotechnology, pharmacy, agriculture, and chemical.
<p>Materials: Suggested readings:</p> <ol style="list-style-type: none"> 1. A. L. Rogach, <i>Semiconductor nanocrystal quantum dots synthesis, assembly, spectroscopy and applications</i> (Springer, Wien; London, 2008). 2. E. Gazit, <i>Plenty of room for biology at the bottom: an introduction to bionanotechnology</i> (Imperial College Press ; Distributed by World Scientific Pub. in the USA, London : Hackensack, NJ, 2007). 3. G. E. J. Poinern, <i>A laboratory course in nanoscience and nanotechnology</i> (CRC Press, Taylor & Francis Group, Boca Raton, 2015). 4. C. A. Mirkin, C. M. Niemeyer, Eds., <i>More concepts and applications</i> (Wiley-VCH, Weinheim, 2007), <i>Nanobiotechnology</i>. 5. A. K. Mishra, Ed., <i>Application of nanotechnology in water research</i> (Wiley, Scrivener Publishing, Hoboken, New Jersey, 2014). 6. K. R. Nill, <i>Glossary of biotechnology and nanobiotechnology terms</i> (Taylor & Francis, Boca Raton, 4th ed., 2006). 7. J. Kim, Ed., <i>Advances in nanotechnology and the environment</i> (Pan Stanford, Singapore, 2012). <p>Websites Journals Other readings</p>
<p>Additional information (if any): Basic knowledge of science and engineering require.</p>
<p>Student responsibilities:</p> <ol style="list-style-type: none"> 1. Study of course materials as specified by the instructor 2. Timely submission of given class assignment

Course reviewed by:

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