

Minor Programme for All Branches
Theme: Chemistry for Engineering Application

Course Code: CYOM1302/ CYOM1402/ CYOM1502/ CYOM1602	Chemistry of Nanomaterials	Credits:04 (L:T:P:3:1:0)
--	-----------------------------------	-------------------------------------

Prerequisites: -

Course Outcome

COs	Outcomes
CO1	Introducing the students to nanomaterials and their size-dependent properties.
CO2	Enabling the students to learn about the various approaches/methods to synthesis nanomaterials.
CO3	Enabling the students to learn about characterization of nanomaterials.
CO4	Enabling the students to learn about surface modification and magnetism of nanomaterials.
CO5	Enabling the students to learn about applications of nanomaterials in industry.

Module	Content	Lectures
1.	Introduction to nanoscale phenomenon and nanomaterials; origin of size-dependent properties; zero, one, and two dimensional nanomaterials	5
2.	Synthesis of nanomaterials – top down and bottom up approaches (sol-gel method, reverse micellar method, electrolytic method and green synthetic methods);	8
3.	Characterization of nanomaterials (PXRD, Electron Microscopy, Surface Area Measurements, STM/AFM etc.);	7
4.	Surface modification; quantum confinement; surface plasmon; electronic structure; magnetism	5
5.	Nanocatalysts; nanocomposites; smart materials; self-healing materials; magnetic nanomaterials; hydrogels and aerogels; nanosensors	7

Books:

1. Nanoscale Materials in Chemistry, 2nd Edition Kenneth J. Klabunde (Editor), Ryan M. Richards (Editor), Wiley, November 2009, ISBN: 9780470222706
2. Nanostructures and Nanomaterials: Synthesis, Properties, and Applications, 2nd Edition, by Guozhong Cao and Ying Wang, World Scientific 2011, ISBN: 9814322504, 9789814322508
3. The Chemistry of Nanomaterials: Synthesis, Properties and Applications, C. N. R. Rao, Achim Müller, A. K. Cheetham, Wiley, 2004
4. Nanochemistry: A Chemical Approach to Nanomaterials, Geoffrey A Ozin, André Arsenault, Ludovico Cademartiri, RSC, 2009
5. Nanomaterials Chemistry: Recent Developments and New Directions, Achim Müller, Anthony K. Cheetham, Wiley, 2007
6. Chemistry of Nanomaterials: Fundamentals and Applications, Almas Bashir, Aqsa Tehseen, and Tahir Iqbal Awan, Elsevier, 2020
7. Nanomaterials and Nanochemistry, Catherine Brechignac, Philippe Houdy, Marcel Lahmani, Springer, 2007