OFFICE OF THE REGISTRAR :: DIBRUGARH UNIVERSITY :: DIBRUGARH

Ref. No. DU/DR-A/131st AC/Syllabus-Ph.D.CW-Chemistry/2024/1203 Date: 21.06.2024

NOTIFICATION

As recommended by the Board of Studies in Chemistry and Joint Meeting (Special) of the Under Graduate Board (128th) and Post Graduate Board (155th), Dibrugarh University held on 06.06.2024, the 131st Meeting (Special) of the Academic Council, Dibrugarh University held on 13.06.2024 vide ***Resolution No. 13*** has approved the syllabus for paper-III (Guide specific Course)-'Nanostructured Materials' of Ph.D. Course Work in Chemistry with effect from the academic session 2023-2024.

The syllabus is attached herewith.

Issued with due approval.

21/06/2024

Deputy Registrar (Academic)
Dibrugarh University

Copy for kind information and necessary action to:

1. The Hon'ble Vice-Chancellor, Dibrugarh University.
2. The Deans, Dibrugarh University.
3. The Registrar, Dibrugarh University.
4. The Head, Department of Chemistry, Dibrugarh University.
5. The Controller of Examinations i/c, Dibrugarh University.
6. The Joint / Deputy Controller of Examinations – 'B', 'C' & 'A', Dibrugarh University.
7. The Programmer, Dibrugarh University with a request to upload the notification in the Dibrugarh University Website.
8. File.

21/06/2024

Deputy Registrar (Academic)
Dibrugarh University

PhD Course work
(Guide Specific Course: Dr. Kalyanjyoti Deori)

Title of the Course	**:**	**Nanostructured Materials (PhD)**
Course Code	**:**	
Nature of the Course	**:**	**PhD Course work**
Total Credits	**:**	**4**
Distribution of Marks	**:**	**60 (End Sem) + 40 (In-Sem)**

Course Objectives:

1. To understand the fundamental concepts of nanoscience and nanotechnology
2. To master the techniques for synthesizing and characterizing nanostructured materials
3. To explore the applications of nanostructured materials in various fields

UNITS	CONTENTS	L	T	P	Total Hours
I (20 Marks)	**Introduction to Nanoscience and Nanotechnology:** Background to Nanoscience and nanotechnology, size effects, Advantages of nanomaterials, large surface to volume ratio, surface effects on the properties. Types of nanostructured materials, Dimensionality: One, Two, Three and Zero dimensional nanomaterials, Quantum Dots shell structures, metal oxides, semiconductors, composites, alloys, mechanical-physical-chemical properties. Quantum confinement effect and Surface plasmon resonance. Introduction to surface active agents: theory and applications, types of surfactants. Origin of colloidal particles.	22	0		22

29/05/2024

Dr. Kalyanjyoti Deori
Assistant Professor
Department of Chemistry
Dibrugarh University

II **(20 Marks)**	**Synthesis and characterization of nanostructured materials:** Synthesis of nanoparticles: Top-Down and Bottom-Up approach, experimental procedure (coprecipitation, Sol-gel, Hydrothermal, colloidal etc.), precipitates and precipitating reagents: Colloidal and Crystalline Precipitates, nucleation (homogeneous and heterogeneous), crystal growth. Basic characterizations for structural purity and morphology study. Powder XRD, TEM, SEM, XPS, elemental analysis, UV-vis spectroscopy, BET etc.	**21**	**0**	-	**21**
III **(20 Marks)**	**Application of nanostructured materials:** Applications of nanoparticles in catalysis (photocatalysis, electrocatalysis etc.), crystallography and morphology effect. Nanostructured materials based on perovskite, MOF, single atom, graphene oxide, graphitic carbon nitrides etc. in energy applications (water splitting reaction, photovoltaics, capacitor, fuel cell etc.) and in sensing application. Basic application of cyclic voltammetry (CV) and fluorescence techniques.	**21**	**0**		**21**
	Total	**64**	**0**	**0**	**64**

Learning Outcomes:

1. By the end of the course, students will be able to synthesize nanostructured materials using various methods and characterize their structural and morphological properties using advanced techniques.
2. Students will be capable of applying their understanding of nanostructured materials to solve real-world problems in fields such as catalysis, energy production, and sensor technology.
3. The course will equip students with the ability to critically analyze scientific literature and experimental data related to nanotechnology, allowing them to propose innovative solutions and advancements in the field of nanostructured materials.

29/05/2024

Dr. Kalyanjyoti Deori
Assistant Professor
Department of Chemistry
Dibrugarh University