MAHATMA GANDHI UNIVERSITY, KERALA

Abstract

Ph.D. Programme - Nanoscience and Nanotechnology - IIUCNN - Course II of Course Work - Syllabus - Approved - Orders Issued.

ACADEMIC A 10 SECTION

No. 4682/AC A 10/2023/MGU Priyadarsini Hills,Dated: 02.05.2023

Read:-1. Letter No. 28/REG/IIUCNN/2022-23 dated 08.11.2022 received from the Hon. Director, IIUCNN

2. U.O. No. 12714/AcA10/2022/MGU dated 15.12.2022

3. Report received from Dr. Beena Mathew, Professor, School of Chemical sciences, dated 19.04.2023

ORDER

The Hon'ble Director, International and Inter University Centre for Nanoscience and Nanotechnology (IIUCNN), vide paper cited (1) above, has requested to approve the Syllabus prepared of Course II for the Course Work of Ph.D Programme in Nanoscience and Technology. An expert committee was constituted with Dr. Beena Mathew, Professor, School of Chemical sciences, as Convenor, to examine the above syllabus, vide order cited (2) above.

The expert committee studied the syllabus and submitted a revised syllabus with modifications, vide paper read (3) above. Sanction has been accorded by the Vice-Chancellor to approve the syllabus of Course II for Course Work Examination of the research scholars registered in the discipline Nanoscience and Technology.

PH.D. COURSE WORK (SYLLABUS) - NANOSCIENCE AND NANOTECHNOLOGY,
COURSE II – NANOCOMPOSITES

Module I

Composite materials, classification, introduction to polymer composites, Classification based on the dimensionality: nanoparticles, nanoclusters, nanorods, nanotubes, nanowires, nanofibers and nanodots. Polymeric matrices, thermoplastics, thermosets and rubbers. Polymer nanocomposites: reinforcement, polymer-filler interactions, use of coupling and bonding agents.

Module II

Introduction of ceramic nanomaterials: TiO_2, SiO_2, ZnO, nanoclay, hBN, MoS_2, WS_2, preparation of polymer/ceramic nanocomposites. Modification of nanomaterials like CNT, Graphene and Clay for polymer nanocomposites.

Module III

Solution techniques, latex stage mixing, melt mixing and in-situ polymerization, precipitation. Polymer nanocomposite preparation by emulsion and suspension polymerization. Dispersion and nucleating effects, intercalation and exfoliation. Application of layered and non-layered nano particles in polymer modification. Electrospinning of polymer nanocomposites.

Module IV

Basics of regenerative engineering, Factors affecting regeneration, Scaffolds for tissue regeneration, Materials for scaffold fabrication. Advantages of nanomaterials as implants-biological response of implanted materials, desirable and undesirable reactions of the body with implanted materials. Bioactive nanomaterials, Biopolyemrs, Mechanical and thermal properties of elastomeric polymer nanocomposite. Nanosized fillers in polymer nanocomposite,

Module V

Nanomaterials Characterization, Characterization of electrical- optical- mechanical and magnetic properties of nanomaterials.: electrical and thermal conductivity-Detection of trace amounts of functional materials in metal nanocomposites by ICP-AES; Characterization of nanocomposites by XPS and XAS. Characterization of porous structures. Characterization Techniques of Nanomaterials, Structural and Morphological aspects.

REFERENCE

1. Handbook of composites, G. Lubin, Van Nostrand, (1982)
2. Chemical Functionalization of CarbonNanomaterials:Chemistry and Applications, Vijay Kumar Thakur, Manju Kumari Thakur, Taylor & Francis Group (2015)
3. Nanomaterials Handbook, YuryGogotsi, CRC Press (2006).
4. Polymer nanocomposites: Synthesis characterization and modeling, R. Krishnamoorti and R.A. Vaia,Americal Chemical Society (2002)
5. Polymer Clay Nanocomposites, Pinnavaia T.J. and Beall G.W., John Wiley (2000)
6. Nanoindentation, By Anthony C Fischercripps, Anthony C. , Springer science and Bussiness media publications, 2011
7. Nanomaterials, Nanotechnologies and Design: An Introduction for Engineers, Daniel L. Schodek, Paulo Ferreira, Michael F. Ashby, Elsevier, 2009.

Orders are issued accordingly.

HEMAKALA S

ASSISTANT REGISTRAR IV
(ACADEMIC)
For REGISTRAR

Copy To

1. PS to Vice-Chancellor / Pro - Vice Chancellor
2. Hon. Director IIUCNN
3. Dr. Beena Mathew, Professor, School of Chemical Sciences (Convenor, Expert Committee)
4. PA to Registrar / Director of Research
5. Research Supervisor / Research Scholar
6. Pro. (Dr.) Nandakumar Kalarikkal
7. Ac A 11 / 14 / 15 / PRO / Records Sections
8. IT Cell / University Website
9. Stock File / File No. 170851/AC A10-4/2022

Forwarded / By Order

Section Officer