



STRUCTURAL ANALYSIS OF NANOMATERIALS

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INTENDED AUDIENCE : UG & PG students of Metallurgy, Nano Science & Nanotechnology, Chemical Engg, Chemistry, Physics, Aerospace Engg, Material Science and Mechanical Engg.etc. , R&D personals in industries

INDUSTRIES APPLICABLE TO : Nanotech based industries: Nanoshel; Adnano Technologies; Mittal Enterprises; Ultrananotech; Reinste Nano Ventures; etc.

COURSE OUTLINE :

Structural analysis of nanomaterials is an important part of Materials Science and Nanoscience & Nanotechnology which deals with the study of crystal structure of materials and their defects. It is a prerequisite for the understanding of properties of nanomaterials to have a detailed knowledge of the structure from the atomic/molecular (local) level to the crystal structure and to the microstructure (mesoscopic scale and defect structure). The primary goal of structural analysis of nanomaterials is aiming at both investigating the structure-property relationship and discovering new properties, in order to achieve relevant improvements in current state-of-the art materials.

ABOUT INSTRUCTOR :

Prof. Kaushik Pal is an Associate Professor in Department of Mechanical and Industrial Engineering, IIT Roorkee since 2012. He has obtained his Ph.D Degree (2009) from IIT, Kharagpur and then joined to Gyeongsang National University, South Korea for pursuing Post-Doc research. His fields of interests are surface modification of nano-materials and use of such materials in different electronic, mechanical and bio-medical applications. Currently, he is acting as reviewer of several internationally known journals and an active member of National Academy of Sciences, American Chemical Society (ACS) and Royal Society of Chemistry (RSC). Also, he is the recipient of Brain Korea (BK-21) fellowship award and DAAD fellowship award.

COURSE PLAN :

- Week 01 :** Introduction: Fundamental concepts of atomic structure and interatomic bonding, Structure of materials, Defects in structure of materials, Phase diagram: Determination of phases, Transformation of phases.
- Week 02 :** Basic properties: Metals, Basic properties: Ceramics , Basic properties: Polymers, Selection of nanomaterials, Structure property relationship of advanced nanomaterials.
- Week 03 :** Introduction to X-Ray Spectroscopy, Diffraction direction and methods of XRD, Determination of crystal structures by XRD Pattern, Precise parameter measurements, Orientation of single crystals.
- Week 04 :** Qualitative analysis by diffraction, Quantitative analysis by diffraction, Microscopic structural analysis of nanomaterials-I, Microscopic structural analysis of nanomaterials-II, Other characterization used.