# P2PNBC01 - NANOFABRICATION TECHNOLOGY

**Module I** (9 hours)

Physical Methods: Inert gas condensation, Arc discharge, RF-plasma, Plasma arc technique, Ion sputtering, Laser ablation, Laser pyrolysis, Ball Milling, Molecular beam epitaxy, Chemical vapour deposition method and other variants, Electrodeposition.

**Module II** (13 hours)

Chemical Methods: Metal nanocrystals by reduction, Solvothermal synthesis, Photochemical synthesis, Electrochemical synthesis, Nanocrystals of semiconductors and other materials by arrested precipitation, Thermolysis routes, Sonochemical routes, Liquid-liquid interface, Hybrid methods, Solvated metal atom dispersion, Post-synthetic size-selective processing. Sol- gel, Micelles and microemulsions, Cluster compounds.

**Module III** (12 hours)

Biological Methods: Use of bacteria, fungi, Actinomycetes for nanoparticle synthesis, Magnetotactic bacteria for natural synthesis of magnetic nanoparticles; Mechanism of formation; Viruses as components for the formation of nanostructured materials; Synthesis process and application, Role of plants in nanoparticle synthesis.

**Module IV** (10 hours)

Lithographic Techniques: AFM based nanolithography and nanomanipulation, E-beam lithography and SEM based nanolithography and nanomanipulation, Ion beam lithography, oxidation and metallization. Deep UV lithography, X-ray based lithography.

**Text Books**

1. Hari Singh Nalwa - Encyclopedia of Nanotechnology.

2. Introduction to Nanotechnology - Charles P. Poole Jr. and Franks. J. Qwens

3. Processing & properties of structural nanomaterials by Leon L. Shaw (editor)

**Reference Books**

1. Microfabrication and Nanomanufacturing- Mark James Jackson

2. Novel Nanocrystalline Alloys and Magnetic Nanomaterials- Brian Cantor

3. Nanomaterials Handbook- YuryGogotsi

4. Springer Handbook of Nanotechnology - Bharat Bhusan

5. Chemistry of nanomaterials: Synthesis, properties and applications by CNR Rao et.al.

6. Synthesis of Nanostructured Materials –Cao

7. Handbook of Nanoscience, Engineering- Goddard et al