**School of Chemical Sciences**

**Devi Ahilya Vishwavidyalaya, Indore**

**M.Sc. Chemistry**

**SEMESTER IV**

**MCH-403: SOLID STATE CHEMISTRY & NANOSCIENCE**

**Credits 4**

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| **Unit- I** | **Solid State Reactions**  General Principles,Experimental procedure, Coprecipitation as a procedure to solid state reactions, Crystallization of solutions and gels (zeolite synthesis ),melts,and glasses, Vapor phase transport methods, Modification of existing structures by intercalation and Ion exchange reactions, preparation of thin films - electrochemical methods, chemical vapour deposition; Growth of single Crystals – Czochralski method, Bridgman & Stokbarger methods, zone melting. |
| **Unit -II** | **Crystal defects and Non- stoichiometry**  Stoichiometric Defects: Perfect and imperfect crystals, Types of defects, Point defects Schottky defect , Frenkel defects ,The concentration of defects: Law of Mass action and statistical thermodynamic approaches, Numericals  Non-Stoichiometric Defects: Origin of non-stoichiometry, Colour centers: F-centre,H-centre,V-centre. |
| **Unit- III** | **Superconductors**  Superconductivity: occurrence of superconductivity, destruction of superconductivity by magnetic fields (Meissner effect), BCS theory of superconductivity,  **Organic Superconductors**: Brief introduction, Types , Examples and their Applications  **Optical properties**: Luminescence and phosphors; Configurational coordinate model, Antistoke phosphors, Lasers — ruby and neodymium |
| **Unit- IV** | **Nanotechnology & Nanomaterials**  Basic concepts of Nanoscience -nanotechnology and their role in various fields, Synthesis of nanoparticles (Top-down -Nanolithography, CVD; Bottom-up -Sol-get processing, chemical synthesis) , Chemistry involved in the synthesis of inorganic (metal oxides, metals, quantum-dots) nanostructured materials, and their characterization techniques, Properties of nanostructured materials: optical, magnetic and chemical properties. Applications in the multiple domains of nanotechnology (environment, energy, medical, optics, lab-on-chip)  Nanometerials: Introduction, Carbon-based materials-Fullerenes, Carbon nanotubes, Quantum well, Quantum wires, Quantum dots, Dendrimers |