CH H 503: SOLID STATE CHEMISTRY

COURSE OUTCOME:

- It is an interdisciplinary course falling at the boundary of physics and chemistry.
- It is aimed at understanding the properties of solids and their possible applications in materials science as superconductors, semiconductors, liquid crystal materials and as magnetic materials.
- Importance has been given to the methods of preparation of solids, understanding the structure-property relationships and their possible applications.
- Importance has also been given to the advanced topics of nanomaterials.

UNIT–I: **[15 hours]**

Surface morphology: Structure of solid surfaces and adsorbed layers. Mechanism of surface reactions. 3hrs.

Crystal Defects and Non-Stoichiometry: Imperfections and defects in crystals.Vacancy,Schottky and Frenkel defects. Thermodynamics of Schottky and Frenkel defect formation, colour centres, non-stoichiometry and defects–Structures of UO2, FeO and TiO2. 4hrs. **Solid State Reactions**: General Principles, Wagner's theory. Order- disorder transitions in solids- Bragg- William's theory Mechanism of diffusion , Kirkendall effect.3 hrs **Preparative Methods:** Ceramic, sol-gel, precursor and chemical vapour deposition (CVD)methods. Nucleation & crystal growth techniques-pulling, zoning, flame fusion & skull melting. Basic methods of preparation of thin films. 5 hrs

UNIT–II: **[15 hours]**

Electronic Properties and Band Theory: Free electron theory to band theory of solids, electrical conductivity, Hall effect. Metals, Insulators and Semiconductors. Intrinsic and extrinsic semiconductors, hopping semiconductors. Metal – semiconductor and p-n junctions. 6 hrs

Magnetic properties: Classification of magnetic materials–dia, para, ferro, ferri, antiferro & antiferri magnetic types Langevin diamagnetism. Selected magnetic materials such as spinels & garnets. 4hrs **Ionic Conductors:** Types of ionic conductors, mechanism of ionic conduction, diffusionsuperionic conductors; phase transitions and mechanism of conduction in superionic conductors, examples-□-alumina, AgI, halide and oxide ion conductors 5 hrs

UNIT - III : **[15 Hours]**

Superconductivity: Meissner effects; Types I and II superconductors, Features of super-conductors, isotope effect, high Tc materials. Basics of low temperature superconductivity. 5hrs. **Liquid Crystals:** Mesomorphic behaviour, thermotropic liquid crystals, positional order, bond orientational order, nematic and smectic mesophases; smectic – nematic transition and clearing temperature- homeotropic, planar and schlieren textures, twisted nematics chiral nematics, molecular arrangements in smectic A & C phases. Optical properties of liquid crystals 5hrs. **Nanomaterials**: Introduction–importance and characterization of nanomaterials–stability of nanoparticles In solutions – synthesis of metal nanomaterials: Physical methods (Laser Ablation, Evaporation, sputtering and solvated metal dispersion) chemical methods (Thermolysis,
Sonochemical approach, reduction of metal ions by hydrogen and methanol) 5hrs.

REFERENCES:
1. D. K. Chakrabarty, Solid state chemistry (New Age) 1996.
2. H.V.Keer, Principles of the solid state (Wiley Eastern) 1993.
3. A.R.West, Solid state chemistry and its applications (Wiley) 1984.
4. L.Smart and E. Moore, Solid State Chemistry –An Introduction (Chapman &Hall)1992.
5. L. Azaroff, An Introduction to Solids (Mc Graw Hill).
6. V. Raghavan, Material science and Engineering (3rd Ed), (Prentice Hall India)1993.
7. Thermotropic Liquid Crystals, Ed. G.W. Gray, Wiley.
8. S. Chandrasekhar, Liquid Crystals, Cambridge University Press (2nded), 1994.
9. Chemical Kinetics, K. J. Laidler, Pearson Education, Anand Sons(India) 3rd edition (2008)
10. Physical Chemistry at surfaces, 6th ed., A.W Adamson and A P Gast, John Wiley, Canada, 1997.
11. C.P.Poole and F.K.Owens Introduction to Nanotechnology, (2004).
12. T.Pradeep, Nano: The Essential, Tata McGraw Hill Publishing Company Ld., New Delhi, (20080.

CH S 504: Medicinal and Natural Products Chemistry

COURSE OUTCOME:

- Students will gain an understanding on the classification and nomenclature of drugs, modern theories of drug action and drug design.
- Students will able to know classification, synthesis and mode of action of antipyretic analgesis drugs, general anesthetics, local anesthetics, cardiovascular drugs, antineoplastic agents and antiviral drugs with suitable examples.
- Students will get a good understanding of isolation, classification,
- methods of structure elucidation and synthesis of various types of alkaloids, terpenoids and steroids with suitable examples.

UNIT- I: **[12 Hours]**

Drugs: Introduction, Classification and nomenclature of drugs. Theories of drug action- Occupancy theory, Induced fit theory and Perturbation theory. Analogues and Prodrugs, Factors governing drug design. Rational approach to drug design, Variation method of drug designing, Physico-Chemical factors, stereochemistry and biological activities. Factors governing the ability of drugs.

Antipyretic Analgesics: Classification, synthesis & mode of action of Phenacetin, Aspirin, Cinchophen, Phenazone and Mefenamic acid.

General Anesthetics: Introduction and classification, synthesis & mode of action of methoxy fluorane, Thiopental sodium and Fentanyl citrate.

Local anesthetics: Introduction and classification, synthesis & mode of action of benzocaine, α-Eucaine, Lignocaine hydrochloride and Dibucaine hydrochloride.

UNIT- II: **[12 hours]**

Cardiovascular drugs: Introduction & classification, Synthesis & mode of action of Hydralazine, Methyldopa, Diazoxide, Procainamide, Propranolol, Prenylamine.

Antimalarials: Introduction and classification, Synthesis & mode of action of Chloroquinephosphate, Pamaquine and pyrimethanin.

Antineoplastic agents: Introduction and classification, Synthesis & mode of action of Mechlorethamine hydrochloride, Busalfan triethylenemelamine, Methotrexate and