CH S 555: POLYMER CHEMISTRY

COURSE OUTCOME:

- This is an introductory course on highly useful materials, namely the polymers. The course content is of interdisciplinary interest.
- It deals with types, techniques of preparation and characterization of plastics, rubber and fibre materials.
- The applications of these materials in daily life, engineering and biomedical field have been emphasized.
- The students are exposed to the problems of polymer waste management and the strategies developed to minimize plastic pollution.

UNIT- I: [12 Hours]

Terminology and basic concepts: Monomers, Functionality, repeat UNITs, degree of polymerization. General structure and naming of polymers. **Classification** based on various considerations-source, preparation methods, thermal behavior, chain structure etc**.**

Types –Homopolymers and copolymers; Linear, branched and network polymers.

Techniques of polymerization: Techniques of preparation of addition and condensation polymers.

Kinetics of polymerization: Kinetics of addition and condensation polymerization. Kinetics of copolymerization.

UNIT- II: [12 Hours]

Stereochemistry of polymers: Geometric and optical isomerism in polymers. Structure, properties and preparation of stereoregular polymers.

Expressions for average molecular weighs. Molecular weight distribution and Polydispersity**.**

Determination of molecular weight: Osmometry, viscometry, ultracentrifugation and GPC methods

Thermal Characterization: Glass Transition and melting-correlation with structure- Factors affecting Tg and Tm. Techniques of thermal characterization: DSC, DTA, DTG and TGA techniques.

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

Structural features, properties and uses of commercial polymers: polyethylene, polypropylene, polystyrene, PVC, polyesters, polyamides, polyurethanes and polycarbonates and regenerated cellulose.

Properties and uses of Specialty polymers- Composites, Conducting polymers and Biomedical polymers.

Polymer degradation and stability-thermal, oxidative, photo, chemical and radiation affected degradation. Plastic waste management-incineration, recycling and biodegradation.

Polymer processing Techniques-Compounding- role of additives. Casting, calendaring, moulding , foaming, reinforcing and spinning techniques.

REFERENCES:-

1. Text book of Polymers- F.W.Billmeyer (Wiley)
2. Contemporary Polymer Chemistry-H.R. Allcock and F.W. Lampe (Prentice Hall).
3. Polymer Science and Technology-J.R. Frird (Prentice Hall).
4. Polymer Science: V.R. Gowariker, N.V.Viswanathan & T.Sreedhar
5. Principles of Polymer Science- P.Bahadur and N.V.Sastry (Narosa Publishers)