FCYC-----903	Polymer Chemistry	3-0-0	3 credits

Module I **[12 Lectures]**

Fundamental concepts - functionality - principle of polymerisation - addition, condensation polymerisation - ring opening polymerisation - classification - production from coal tar and petrochemicals - Techniques of polymerisation - gas polymerisation, - bulk, solution, suspension and emulsion - melt condensation.

Mechanism of polymerisation and general characteristics - free radical - cationic, anionic and coordination polymerisation (Ziegler-Natta catalyst) autoacceleration - Kinetic chain length - degree of polymerisation kinetics of polymerisation (Detailed study) - copolymerisation.

Module II **[14 Lectures]**

Polymer characterisation - molecular weight, MWD - Mn, Mw, Mv and Mz - end group analysis - viscometry - osmometry - Light scattering - spectral analysis-Thermal properties – Electrical properties, Mechanical and dynamic properties - polymer degradation. Phase transitions of polymers, crystallization and glass transition, mechanism of glass transition, methods of determining Tg.

Module III **[12 Lectures]**

Studies of individual polymers - plastics - polyolefins, polystyrenes, acrylics, polyesters, polyamides, cellulose, polyurethanes, Inorganic polymers, FIR plastics - GRplastics. Alkyd resins, epoxy resins - phenolics - Melamine resins - compounding of plastics - rubber elastomer - vulcanisation, compression mouldings - injection mouldings - lamination . Biopolymers - Biomaterials - medicinal applications of polymers - High temperature and fire resistant polymers. Polymer concrete - polymer impregnated concrete - conducting polymers, polymeric reagents.

Text books

1. P.J. Flory, 'Principles of Polymer Chemistry', Cornell Press (Recent Edition).
2. Jr. Billmeyer, 'Test Book of Polymer Science', Fred, W. John Wiley & Sons, New York, l984.
3. Dan Campbell, Richard A. Pethrick, Jim R. White, Polymer Characterization: Physical Techniques, 2nd Edition, CRC Press, 2012.

References

1. F. Rodrigues, 'Principles of Polymer Systems', M. Elpaw Hill Book Company, 2nd Edn, l982.
2. K.J.Saunders, 'Organic Polymer Chemistry', Chapman & Hall, London, l973.
3. Sabu Thomas & Dominique Durand, Handbook of Biopolymer-Based Materials: From Blends and Composites to Gels and Complex Networks, Wiley – VCH, 2013