SUBJECT NO-CH62045, SUBJECT NAME- CHEMICAL ENGINEERING PRINCIPLES IN POLYMER PROCESSING

LTP- 4-0-0,CRD- 4

SYLLABUS :-

Prerequisite – None

Fundamentals of polymer and processing: Polymer structure and properties, Classification of polymers, Molecular weight distribution, polymer rheologies, thermal properties, PVT diagram, morphology, Experimental techniques to determine important polymer properties, Role of additives in polymer processing

Chemical Engineering principles in polymer processing:
Polymer melt rheology- linear viscoelasticity, GNF and CEF equations, experimental determination of viscosity, elongational flow, Correlations
Flow of polymer melts-equation of continuity, equation of motion, flow of viscous polymeric melt. drag and pressure induced flow
Mixing- concepts, mechanisms, characterization, distributive and laminar mixing, melt mixing, Mixing in roll mills, internal batch mixing
Heat transfer in polymer processing – basic equations, viscous heating, polymer melting, heat removal and polymer cooling process, cooling and crystallization kinetics
Pressurization and pumping: viscous pressurization, screw pumps and rotating rolls
Other unit operations such as grinding, solid mixing and conveying

Polymer processing techniques:
Continuous process-Extrusion, calendaring
Cyclic process-compression molding, injection molding
Transforming process-thermoforming, cold forming, blow molding
Other treatment of polymers-welding, adhesive bonding, coating, surface treatment

Text Book:
1. Fundamentals of Polymer Processing by Stanley Middleman
2. Understanding Rheology by Faith A. Morrison
3. Principles of Polymer Processing by Z. Tadmor and C. G. Gogos
Reference Book:
1. Transport Phenomena by Bird, R.B., W.E. Stewart and E.N. Lightfoot,
2. Dynamics of Polymeric Liquids, Volume 1, by Bird, R.B., R.C. Armstrong and O. Hassager
3. Polymer Processing Principles and Design, by Baird, D.G. and D.I. Collias
4. Polymer Processing Fundamentals by Osswald, T.A.