Semester	AUG 2022
Open to semester	7,13,21
Course code	**CH4134/CH6184**
Course title	**Polymer Chemistry**
Credits	4 /4
Course Coordinator & participating faculty (if any)	M. Jayakannan
Nature of Course	Lectures and Tutorials
Pre-requisites	N/A
Objectives (goals, type of students for whom useful, outcome etc)	This course is emphasized to provide fundamental knowledge in polymer chemistry. This course is very important for all the students who wish to learn and practice chemistry. The students will be benefited with new scientific concepts of larger and macromolecular science
Course contents (details of topics /sections with no. of lectures for each)	Section #1- Concepts: (5 hours) Topics: Molecular Weight distribution, Number and weight average molecular weight, Linear, Branched, Cross-linked, grafted- Polymers, Polymer Crystallization, Glass Transition, Solution and Melt viscosity, Polymer Rheology and Thermal properties, Isothermal and Non-isothermal crystallization Section #2: Step Polymerization: (5 hours) Topics: Reactivity of Functional Groups, Kinetics of Step Polymerization and Molecular Weight Control. Examples- polyesters, polyethers polyamides, polyurethanes, polyurea, polycarbonate and other condensation polymers. Section #3: Addition Polymerization: (5 hours) Topics: Radical Chain Polymerization, Rate of Radical Chain Polymerization, Initiation, propagation, Termination, Chain Transfer, Autoacceleration, Molecular Weight Distribution, Controlled or Living Radical Polymerization, TEMPO-mediated polymerization and atom Transfer radical Polymerization (ATRP). Section #4: Ionic Polymerization: (5 hours) Topics: Comparison of Radical and Ionic Polymerization, Cationic and Anionic Polymerization of the Carbon-Carbon Double, Distinguishing Radical, Cationic, and Anionic Polymerizations and Applications of ionic or living polymerizations for Block polymers and Other Polymer

	Architectures. Section # 5: Miscellaneous Topics: (5 hours) Topics: Ring-Opening Polymerization, NMR and FT-IR spectroscopy of polymers, stereochemistry of Polymers and polymer nano-architectures. Section # 6: Copolymers: (2 hours) Topics: Concepts, Alternative, random and block copolymers. Section # 7: Liquid Crystalline Polymers: (2 hours) Topics: Main chain and side chain, Nematic, smectic and cholestric Phases and application. Section # 8: Conducting Polymers: (5 hours) Topics: Concepts of conducting polymers, discovery, polyaniline, Polyfluorene, polythiophene, polypyrrole, poly(phenylenevinylenes), polyphenylene, low band gap polymers and other examples, Synthetic methodologies, characterization, Applications in opto-electronic devices and sensors, one and three dimensional conducting nano-materials and their applications. Section # 9: Non-linear Polymers: (3 hours) Topics: Dendrimers, hyperbranched polymers, random branched polymers, branching density, influence of branching on the melt, viscosity, rheological and thermal properties of polymers. Section # 10: Polymer Blends and Composites: (3 hours) Topics: Physical and Reactive blends, Phase separation, Nano-composites and synthetic-natural fiber composites.
Evaluation /assessment	End-Sem Examination-35% Mid-Sem Examination-35% Others-30%
Suggested readings (with full list of authors, publisher, year, edn etc.)	1. Principles of Polymerization: G. Odian 2. Text Book of Polymer Science – Billmeyer 3. Polymers: Chemistry and Physics of Modern Materials - J. M. G. Cowie 4. Review articles and research papers will be provided for specific & emerging topics