



INTRODUCTION TO POLYMER SCIENCE

PROF. DIBAKAR DHARA

Department of Chemistry
IIT Kharagpur

TYPE OF COURSE : New | Core | UG/PG
COURSE DURATION : 8 weeks (20 Jul' 20 - 11 Sep' 20)
EXAM DATE : 27 Sep 2020

PRE-REQUISITES : Basic knowledge of Chemistry (1st year level)

INTENDED AUDIENCE : Chemistry; Chemical Engineering; Material Science and Engineering; Physics; Polymer Science and Technology

INDUSTRIES APPLICABLE TO : SABIC; Solvay; Asian Paints, Hindustan Unilever; Shell; Dupont; BASF; Reliance; ITC, Tata Chemicals; Dow Chemicals, GM and many others.

COURSE OUTLINE :

This course will educate the students about one of the most important materials of present viz. Polymers. The course will introduce polymers including the importance, present challenges in polymer research followed by classes on synthesis, characterization, properties and applications of polymers.

ABOUT INSTRUCTOR :

After completing B.Sc. (Hons.) and M. Sc. in Chemistry from Jadavpur University, Kolkata, Prof. Dibakar Dhara carried out his doctoral research at Indian Institute of Chemical Technology, Hyderabad. He had couple of year of postdoctoral research experience at Department of Chemical Engineering, University of Florida, Gainesville, Florida before joining as Polymer Engineer at General Electrics Global Research Centre at Bangalore. After spending nearly seven years at GE, he moved to IIT Kharagpur as a faculty in Chemistry department where he is working for last eleven years. His present research interests are in the following topics Polymer Synthesis, Physical Chemistry of Polymers, Colloids and Nanomaterials.

COURSE PLAN :

- Week 1:** Introduction: Background, Nomenclature, Classifications, Molecular Weight, Examples of Applications, Principles of Polymerization
- Week 2:** Synthesis of Polymers: Step-Growth Polymerization
- Week 3:** Synthesis of Polymers: Radical Chain Polymerization, Controlled Radical Polymerization
- Week 4:** Synthesis of Polymers: Chain Copolymerization, Emulsion Polymerization, Ionic Chain Polymerization, Ring-Opening Polymerization, Stereo-Regular Polymerization
- Week 5:** Characterization of Polymers: Polymers in Solution, Determination of Molecular Weight
- Week 6:** Characterization of Polymers: Determination of Molecular Weight (cont.) Determination of Hydrodynamic Size, Chemical Composition
- Week 7:** Phase Structure and Morphology of Bulk Polymers: Amorphous and Crystalline States, Viscoelasticity, Multicomponent Polymer Systems
- Week 8:** Properties of Bulk Polymers: Polymer Characteristics, Mechanical, Optical, Electrical and Other Industrially Relevant Properties