Course Title : **Polymerization Engineering**

Unit	Hour	Pre-requisite	Simultaneous	Semester	Course type	Unit type
3	48	Physical Chemistry of Polymers-Chemical Reactions Engineering-Modeling of Polymeric Systems	-	-	Specialized	Theoretical

Goal: An introduction to molecular engineering calculations in polymerization reactors, kinetic equations and the molecular architecture

Syllabus(course outline):

An introduction to structure-properties relationship in polymers

An introduction to the factors affecting the molecular architecture in polymerization reactors(Step-growth and Chain-growth(radical,ion,catalytic) homopolymerization and copolymerization , Physical polymer reaction engineering(Bulk polymerization, Emulsion polymerization, Solution polymerization, Suspension polymerization, Dispersive polymerization, Precipitation polymerization and Interfacial polymerization, polymerization process(continuous, semi-batch, batch)**)**

An introduction to molecular engineering calculations in polymerization reactors(statistical method and cumulative method**)**

An introduction to modeling factors for polymer structure(molecular weight averages, molecular weight distributions, branching and networking, tacticity and crystallinity**)**

Step-growth homopolymerization Modeling(kinetic equations, polymer molecular weight control equations(Degree of conversion-Time equations, Degree of Polymerization - Degree of conversion equations, Degree of Polymerization-Time equations, Temperature-Rate equations, Temperature- Degree of Polymerization equations, Degree of conversion-Volume equations), Structure control in (linear, branching, networking) step polymerization, molecular weight distributions equations(statistical(general) equations and cumulative(particular) equations), kinetic equations after gel point(diffusion-controlled reaction by gel and glass effect)**)**

Chain-growth homopolymerization Modeling (radical chain polymerization, controlled/living chain polymerization(kinetic equation, molecular weight control equations(Degree of conversion-Time equations, Degree of Polymerization - Degree of conversion equations, Degree of Polymerization-Time equations, Temperature-Rate equations, Temperature- Degree of Polymerization equations, Degree of conversion-Volume equations))**,** Structure control in (linear, branching, networking) chain polymerization, molecular weight distributions equations, kinetic equations after gel point(diffusion-controlled reaction by gel and glass effect),Ionic polymerization(kinetic equation and molecular weight control equations in anionic and cationic chain polymerization)**)**

Copolymerization Modeling (combination equations of radical copolymerization, copolymer structure, copolymer composition changes with conversion, total copolymer composition, Sequence length distribution, kinetic equation, molecular weight control equations(Degree of conversion-Time equations, Degree of Polymerization - Degree of conversion equations, Degree of Polymerization-Time equations, Temperature-Rate equations, Temperature- Degree of Polymerization equations, Degree of conversion-Volume equations)**)**

References:

Haddadi-Asl V., Principle of Polymerization Engineering(I):Polymer Technology,7th ed, Tehran,Amir Kabir University Publishing Center,1395.

Haddadi-Asl V., Principle of Polymerization Engineering(II):Polymerization reactions,7th ed, Tehran,Amir Kabir University Publishing Center,1395.