COURSE INFORMATON					
Course Title	*Code*	*Semester*	*L+P Hour*	*Credits*	*ECTS*
ADVANCED POLYMER CHEMISTRY	CHBE 581	1	3 + 0	3	10

Prerequisites	-

Language of Instruction	English
Course Level	Graduate Degree
Course Type	Technical Elective
Course Coordinator	Assoc. Prof. Erde Can
Instructors	Assoc. Prof. Erde Can
Assistants	-
Goals	The aim of this course is to provide students with an advanced knowledge of polymer chemistry, polymerization reactions, polymer types, polymer structure - property relationships, polymerization and polymer characterization techniques and polymer applications
Content	Basic principles of polymer chemistry, polymer classifications, the chemical structures of a variety of polymers, polymerization reactions, mechanisms and kinetics, polymer structure - property relationships, polymerization techniques, techniques for molecular and morphological and physical property characterization, applications of polymers. Term project.

Learning Outcomes	**Program Learning Outcomes**	**Teaching Methods**	**Assessment Methods**
1) Expanded and in-depth information of the basic principles of polymer chemistry, polymer classifications, the chemical structures of a variety of polymers, polymerization reactions, mechanisms and kinetics, polymer structure - property relationships and ability to use theoretical and applied information in these areas to solve polymer engineering problems	4	1,2	A
2) Expanded knowledge of the various applications of polymers	3	1,12	A,D
3) Expanded knowledge of advanced polymeric materials used in current applications (polymer nano-composites, fire-resistant polymers, liquid crystalline polymers, conductive polymers,	1,3	12	D

biodegradable polymers, biocompatible polymers for medical applications..) and ability to access information and to follow developments in these areas.			
4) Polymerization techniques, techniques for polymer molecular, morphological and physical property characterization and their respective constraints.	2	1,2	A
5) Knowledge about the global and societal effects of polymer engineering practices on health (eg.biomedical applications of polymers) and environment and contemporary issues (eg. plastic wastes, recyclable and biodegradable polymers..)	10	1,12	D
6) Ability to work efficiently in intra-disciplinary teams in project assignments and ability to communicate effectively both orally and in writing in English (and ability to communicate stages and results of his/her studies in a systematic and clear manner orally and in writing in intradisciplinary national and international settings) via preparation of project reports and presentations on novel and developing applications of polymeric materials	1,3,8	2,12	D

Teaching Methods:	1: Lecture, 2: Question-Answer, 12: Case Study
Assessment Methods:	A: Testing, D: Project

COURSE CONTENT

Week	Topics	Study Materials
1	Introduction to Polymer Science *(Basic concepts, classification of polymers,* natural and synthetic polymers..)	Textbook-Lecture Notes
2	Polymer structure, molecular weight and molecular weight distributions	Textbook-Lecture Notes
3	Step-Reaction Polymerization – Condensation Polymerization *(Mechanisms and kinetics)*	Textbook-Lecture Notes
4	Addition Polymerization - Radical Chain Polymerization *(Mechanisms and kinetics)*	Textbook-Lecture Notes
5	Ionic and Coordination Polymerizations *(Mechanisms and kinetics)*	Textbook-Lecture Notes
6	Copolymerization	Textbook-Lecture Notes
7	MIDTERM EXAM I	Textbook-

		Lecture Notes
8	Polymerization Techniques *(Bulk, solution, suspension, emulsion polymerization and polymerization in supercritical fluids)*	Textbook-Lecture Notes
9	Polymer structure and physical properties I *(Morphology and Order in Crystalline Polymers, Rheology and the Mechanical Properties of Polymers, viscous flow, rubber elasticity, viscoelasticity, glassy state and the glass transition)*	Textbook-Lecture Notes
10	Polymer structure and physical properties II *(Mechanical properties of crystalline polymers, and the crystalline melting point)*	Textbook-Lecture Notes
11	Polymer conformation, solutions and Chain Dimensions	Textbook-Lecture Notes
12	Polymer characterization techniques *(*Methods for polymer molecular, morphological and physical property characterization*)*	Textbook-Lecture Notes
13	Industrially Important Polymers and Applications *(Commodity thermoplastics, elastomers, thermosets and engineering and specialty polymers)*	Textbook-Lecture Notes
14	Project presentataions	-

RECOMMENDED SOURCES	
Textbook	"Principles of Polymerization", G. Odian,3rd Edition, John Wiley&Sons Inc, New York, 1991 "Polymer Science and Technology", J.R. Fried, 2nd Edition, Prentice Hall, NJ, 2008
Additional Resources	"Principles of Polymer Engineering", N.G.McCrum, C.P.Buckley, C.B.Bucknall, 2nd Edition, Oxford University Press, New York

MATERIAL SHARING	
Documents	
Assignments	
Exams	

ASSESSMENT		
IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Mid-terms	1	64

Project	1	36
Total		**100**
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		40
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		60
Total		**100**

COURSE CATEGORY	Expertise/Field Courses

COURSE'S CONTRIBUTION TO PROGRAM

No	Program Learning Outcomes	Contribution				
		1	2	3	4	5
1	Acquire expanded and in-depth information via performing scientific research in the field of Chemical Engineering, evaluate, interpret and implement knowledge.					X
2	Be knowledgable in the contemporary techniques and methods applied in Chemical Engineering and their respective constraints.					X
3	Be cognizant of the novel and developing applications of his/her profession, study and learn them as required.					X
4	Formulate Chemical Engineering problems, develop methods to solve them and implement innovative techniques in solutions				X	
5	Design and conduct analytical modeling and experimental research, analyze and interpret complex problems encountered in this process.					
6	Develop novel and/or original ideas and methods; conceive innovative solutions in systems, component and process design					
7	Complete information via processing limited or incomplete data by the use of scientific methods and implement it; integrate knowledge from different disciplines					
8	Communicate in at least one foreign language at the level of European Language Portfolio B2 orally and in writing.					X
9	Communicate stages and results of his/her studies in a systematic and clear manner orally or in writing in intra or interdisciplinary national and international settings.					
10	Defines societal and environmental aspects of Chemical Engineering applications				X	
11	Observe social, scientific and ethical values during collection, interpretation, and dissemination of data and in all professional activities.					
12	Lead multidisciplinary teams, develop solution methodologies for complex problems and take responsibility					

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION			
Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (Excluding the exam weeks: 13x Total course hours)	13	3	39
Hours for off-the-classroom study (Pre-study, practice)	14	6	84
Midterm examination	1	(15+2)	17
Project	1	85	85
Final examination	1	(20+2)	22
Total Work Load			247
Total Work Load / 25 (h)			9.9
ECTS Credit of the Course			10