

課程名稱 (英)	Polymer Materials Science		
授課教師資訊	姓名: 鄒海雄 所屬單位: 工學院化學工程學系所 E-mail: atsou29@gmail.com 電話: 0918230316		
開課時間	109學年 <input type="checkbox"/> 一學年 <input checked="" type="checkbox"/> 第二學期	必/選修	<input type="checkbox"/> 必修 <input checked="" type="checkbox"/> 選修
課程識別碼	ChemE5068 524 U2270	班次	
預計修課人數	60	學分數	3
課程屬性	<input checked="" type="checkbox"/> 新開課程 (未曾開授之英語授課課程) <input type="checkbox"/> 續開課程		
檢附資料	<input type="checkbox"/> 續開課程請檢附上次開課期末教學意見調查結果		
Course Syllabus in English			
Course Description	<p>Polymers are long chain molecules used for plastics, rubbers, elastomers, adhesives, fibers, and coatings. In addition, they are the organic material components in fabrications of semi-conductor devices, optoelectronic displays, and electrochemical batteries.</p> <p>This course is to develop the understandings of the interrelationships between polymer structure, morphology, and mechanical/dielectric/photo-physical behavior. In other words, this course is to establish the fundamental structure-property relationships of polymers.</p>		
Course Requirements	Thermodynamics, Mass and energy balance, Organic chemistry, Physical chemistry (First two years of Chemical Engineering required classes)		
Course Objectives	<p>This course will prepare the students to work in the various chemical, pharmaceutical, biochemical, electronic, and optoelectronic industries that employ and use of polymeric materials either in fabrications and manufacturing or in applications and usages. The course's purpose is to establish the structure-property relationships of polymeric materials to the students who will use the polymers, but not necessarily in the research, development, or manufacturing of polymers. Most students would encounter polymers in their future work, from traditional manufacturing, such as making tires, shoes, and other plastic/rubber/adhesive products, to high tech manufacturing, such as making displays, integrated circuitry, batteries, or other electronic products. It is important for the students to understand the fundamental structure-property relationships of polymers for them to know how to select the proper polymer and how to use them in their lines of work, and how to find out the issues and corresponding solutions when running into manufacturing or application problems involving polymeric materials. This course will also teach the students to apply chemical engineering fundamentals, thermodynamics, fluid dynamics, mechanics, mathematics, and physical chemistry to the polymer materials science.</p>		
Learning Outcomes	<p>Students will have the basic understanding of the structure-property relationships of polymers which would provide them with the abilities to select the right polymer and the right grade for that polymer in their application needs (from microelectronics, optoelectronic, electrochemical, biochemical, pharmaceutical, chemical, to traditional</p>		

	<p>plastic, rubber, and adhesive industries depending on the student's future career path). Additionally, the students would be able to characterize and control key properties of these incoming polymers to ensure consistent quality in usage. They would know how to use these polymers in fabrications, casting/coating, deposition, or other processing equipment to arrive at the final polymer "parts" with desirable geometry and properties in their materials constructions. If the students would want to further pursue a career in polymers, this course would provide them with the structure-property relationship foundation to design and synthesize the next generation polymers.</p>		
Required Readings	<p>L. H. Sperling, "Introduction to Physical Polymer Science", 4th Ed, Wiley Interscience, 2006</p> <p>bibliography: "Introduction to Macromolecular Science", P. Munk, Wiley, 1989. "Polymer Physics", M. Rubinstein and R. H. Colby, Oxford, 200 "Polymeric Liquids and Networks: Structure and Properties", W. W. Graessley, Garland Science, 2004. "Introduction to Polymer Viscoelasticity", J. J. Aklonis and W. J. MacKnight, 2nd Ed., Wiley, 1983. "The Structure and Rheology of Complex Fluids", R. G. Larson, Oxford, 1999. "Dynamics of Polymeric Liquids", R. B. Bird, R. C. Armstrong, and O. Hassager, Wiley, 1987. "An Introduction to the Mechanical Properties of Solid Polymers", I. M. Ward and D. W. Hadley, Wiley, 1993. "Handbook of Polymer Crystallization", E. Piorkowska and G. C. Rutledge, Wiley, 2013. "Understanding Polymer Morphology", A. E. Woodward, Hanser, 1995</p>		
Grading	(Grading- Homework (20%), Midterm (35%), Final (45%))		
Course Schedule in English			
Week	Date	Topic	Lecturer
Week 1	2/22,/26	Introduction to polymer science	鄒海雄
Week 2	3/2,3/5	Chain structures and configuration	鄒海雄
Week 3	3/8,3/12	Diluted solution thermodynamics	鄒海雄
Week 4	3/15,3/19	Molecular weight and polymer size	鄒海雄
Week 5	3/22,3/26	Concentrated polymer solutions	鄒海雄
Week 6	3/29,4/2	The amorphous state	鄒海雄
Week 7	4/7,4/9	The crystalline state	鄒海雄
Week 8	4/12,4/16	Liquid crystalline state	鄒海雄
Week 9	4/19,4/23	Mid-term Exam	鄒海雄

Week 10	4/26,4/30	Glass-rubber transition	鄒海雄
Week 11	5/3,5/7	The glassy state and aging	鄒海雄
Week 12	5/10,5/14	Rubber elasticity and crosslinked polymers	鄒海雄
Week 13	5/17,5/21	Polymer viscoelasticity and rheology	鄒海雄
Week 14	5/24,5/28	Mechanical behavior of polymers	鄒海雄
Week 15	5/31,6/4	Polymer surfaces and interfaces	鄒海雄
Week 16	6/7,6/11	Multicomponent polymeric materials	鄒海雄
Week 17	6/14,6/18	Recent polymer topics	鄒海雄
Week 18	6/21,6/25	期末考	鄒海雄