



## UNIVERSITI TEKNOLOGI MARA

### CMT608: CHEMISTRY AND TECHNOLOGY OF POLYMERS

<b>Course Name (English)</b>	CHEMISTRY AND TECHNOLOGY OF POLYMERS <b>APPROVED</b>
<b>Course Code</b>	CMT608
<b>MQF Credit</b>	3
<b>Course Description</b>	Course Description This course is an elective course in polymer chemistry for degree in applied chemistry. At the beginning of study, this course introduces the history of polymer and the types of structure involved. And then the syllabus starts to covers the study of the more important industrially useful polymerization reactions such as the condensation and addition polymerization. From the polymerization reactions, student could be familiarizing by the types of polymer, which are involved in both of that reactions. The syllabus is continuing by further explanation on rubber and various methods of polymer characterization.
<b>Transferable Skills</b>	Analysis skill, Critical thinking skill, Information searching skill
<b>Teaching Methodologies</b>	Lectures, Tutorial, Presentation, Directed Self-learning
<b>CLO</b>	CLO1 To understand and recall the fundamental terms, terminology, classification, chemical and physical properties of polymers. CLO2 To distinguish and apply theory and mechanisms of various types of polymerization and polymerization techniques. CLO3 To present understanding on current need, development, characterization in polymer chemistry and technology.
<b>Pre-Requisite Courses</b>	No course recommendations
<b>Topics</b>	
<b>1. Introduction to macromolecules</b> 1.1) Monomer, Oligomer, Polymer 1.2) Terminology Involved (repeating units, Dp, etc) 1.3) Classification of Polymer 1.4) Thermoplastic and thermoset 1.5) Glass transition temperature, T <sub>g</sub> and melting point, T <sub>m</sub> 1.6) Crystallinity (amorphous, semi-crystalline, crystalline), Molecular weight (M <sub>n</sub> , M <sub>w</sub> , and MWD)	
<b>2. Types of Polymerization</b> 2.1) Step growth polymerization (Condensation polymerization) 2.2) Polymerization reaction (catalyzed and uncatalyzed) 2.3) Direct polymerization / Special polymerization system 2.4) Ring opening polymerization 2.5) Chain growth polymerization (Addition polymerization) 2.6) Free radical polymerization initiator, polymerization step (initiation, propagation, termination) 2.7) Ionic (cationic & anionic polymerization) 2.8) Living polymerization 2.9) Coordination polymerization 2.10) Copolymerization 2.11) Types of polymerization (block, alternate, random, graft)	
<b>3. Polymerization Techniques / Methods</b> 3.1) Homogeneous System 3.2) Heterogeneous System	
<b>4. Plastic Materials</b> 4.1) Commodity Thermoplastics (Polyolefins, Vinyl Polymers, Thermoplastic Polyesters) 4.2) Engineering Thermoplastics (Polyamides, ABS, PC, Engineering Polyesters) 4.3) Elastomers (Diene Elastomers, Nondiene Elastomers, Thermoplastic Elastomers) 4.4) Thermosets (Epoxies, Unsaturated Polyesters, Formaldehyde Resins)	

**5. Rubber**

- 5.1) Natural rubber -. structure, physical and chemical properties
- 5.2) Synthetic rubber : preparation and physical and chemical properties
- 5.3) Advantage and disadvantages of natural rubber against synthetic rubber
- 5.4) Vulcanization : theory and types
- 5.5) Natural rubber latex: composition, properties and uses
- 5.6) Advantage and disadvantages of natural rubber latex against synthetic dry rubber

**6. Polymer Characterization**

- 6.1) Determination of functional groups
- 6.2) Determination of the glass transition temperature ( $T_g$ ) and the melting temperature ( $T_m$ ) of a polymer
- 6.3) Determine the morphology of polymers

Assessment Breakdown	%
Continuous Assessment	60.00%
Final Assessment	40.00%

Details of Continuous Assessment	Assessment Type	Assessment Description	% of Total Mark	CLO
	Assignment	mini project	10%	CLO3
	Presentation	Group Assignment	15%	CLO3
	Quiz	Quiz 1	1%	CLO1
	Quiz	Quiz 2	2%	CLO1 , CLO2
	Quiz	Quiz 3	2%	CLO2
	Test	Test 1	10%	CLO1
	Test	Test 2	10%	CLO1 , CLO2
	Test	Test 3	10%	CLO2

Reading List	Recommended Text	<ul style="list-style-type: none"> <li>Ravve, Abraham 2012, <i>Principles of Polymer Chemistry</i>, Springer</li> <li>Carraher Jr, Charles E. 2012, <i>Introduction to Polymer Chemistry</i>, CRC Press Llc</li> </ul>
Article/Paper List	This Course does not have any article/paper resources	
Other References	This Course does not have any other resources	