



UNIVERSITI TEKNOLOGI MARA

CHM572: POLYMER CHEMISTRY

Course Name (English)	POLYMER CHEMISTRY APPROVED
Course Code	CHM572
MQF Credit	3
Course Description	This course is an introduction to polymer chemistry which emphasis on natural rubber and synthetic polymers. Students classify polymers, define concepts of polymerization reactions, polymerization process and copolymerization; synthesis and characterize polymers, write a polymerization reaction mechanism and discuss the advantages and advantages of natural and synthetic rubber. The syllabus content will be delivered by lecture and laboratory experiments. The lecture sessions employ a mixture of lectures, exercises and discussions and the laboratory sessions will include polymer synthesis and characterizations. The outcomes shall be assessed through a variety of tools which include tests, final examination and lab reports.
Transferable Skills	Able to synthesize and characterize new or modified polymer materials in their working place
Teaching Methodologies	Lectures, Blended Learning, Lab Work
CLO	<p>CLO1 Explain the concepts of natural and synthetic polymers, polymer functionality, polymer isomerizations, types of molecular weight of polymer, polymerization reactions and processes, copolymerization and polymer characterizations. (C1)</p> <p>CLO2 Apply the concepts of polymer molecular weight, polymerization reactions and processes copolymerization and interpretations of some basic polymer characterizations. (C3)</p> <p>CLO3 Conduct and observe scientific investigation on various polymerization reactions and processes (P3)</p> <p>CLO4 Write scientific investigation on various polymerization reactions and processes (A4)</p>
Pre-Requisite Courses	No course recommendations
Topics	
1. Introduction 1.1) 1.1 Classification of polymers (natural and synthetic polymers) 1.2) 1.2 Molecular weight: Number average molecular weight (M_n) and weight average molecular weight (M_w) and polydispersity. Methods used to determine molecular weight of a polymer. 1.3) 1.3 Define and explain the functionality value of polymers. 1.4) 1.4 Isomerization of polymers (isotactic, syndiotactic and atactic)	
2. Polymerization Reaction 2.1) 2.1 Step polymerization (define. mechanism characteristic and example). 2.2) 2.2 Chain polymerization: free radical, ionic (anionic, cationic) and coordination polymerizations (define. Mechanism, properties and example). 2.3) 2.3 Differentiation between step and chain polymerization	
3. Polymerization Process 3.1) 3.1 Homogeneous (bulk and solution) : definition and characteristic 3.2) 3.2 Heterogeneous (suspension and emulsion) : definition and characteristic	
4. Basic Polymer Characterizations 4.1) 4.1 Determination of functional groups by FTIR 4.2) 4.2 Determination of the glass transition temperature (T_g) and the melting temperature (T_m) of a polymer by DSC 4.3) 4.3 Determination of the polymer stability by TGA 4.4) 4.4 Determination on the morphology of polymers by optical microscope, SEM.	

5. Copolymers

5.1) 5.1 Definition and types of copolymers

5.2) 5.2 Monomer reactivity ratios

6. Rubber

6.1) 6.1 Natural rubber : structure, physical and chemical properties

6.2) 6.2 Synthetic rubber : preparation and physical and chemical properties

6.3) 6.3 Advantage and disadvantages of natural rubber against synthetic rubber

6.4) 6.4 Vulcanization : theory and types

6.5) 6.5 Natural rubber latex: composition, properties and uses

6.6) 6.6 Advantage and disadvantages of natural rubber latex against synthetic dry rubber

Assessment Breakdown	%
Continuous Assessment	60.00%
Final Assessment	40.00%

Details of Continuous Assessment	Assessment Type	Assessment Description	% of Total Mark	CLO
	Practical	Report writing	10%	CLO4
	Practical	Lab Skill	10%	CLO3
	Test	TEST1	20%	CLO2
	Test	TEST2	20%	CLO2

Reading List	Recommended Text	<ul style="list-style-type: none"> • Allock H.R. & Lampe F.W. 1981, <i>Contemporary Polymer Chemistry</i>, 3rd Ed., Prentice Hall Eaglewood Cliffs, USA [ISBN: 978-013065056] • Odian G 2004, <i>Principles of Polymerization</i>, 4th Ed., John Wiley and Sons New York [ISBN: 978-0-471-274] • Malcolm P. Stevens 1998, <i>Polymer Chemistry : An Introduction</i>, 3rd Ed., Oxford Universiti Press [ISBN: 978-019512444] • Billmeyer F.W., JR 1984, <i>TextBook of Polymer Science</i>, 3rd Ed., John Wiley and Sons New York [ISBN: 978-047103196]
Article/Paper List	This Course does not have any article/paper resources	
Other References	This Course does not have any other resources	