



## UNIVERSITI TEKNOLOGI MARA

### FSG567: POLYMER PRODUCTION PROCESS AND ENVIRONMENT IMPACT

<b>Course Name (English)</b>	POLYMER PRODUCTION PROCESS AND ENVIRONMENT IMPACT <b>APPROVED</b>
<b>Course Code</b>	FSG567
<b>MQF Credit</b>	2
<b>Course Description</b>	This course enables students with sufficient chemical knowledge to gain an insight into molecular mechanism and develop knowledge of the control of reactions in the polymer industry. It demonstrates how polymer structural requirements are controlled in the polymer manufacturing industry. The students also discuss and resolve the complications related to the polymerization process and impact on environmental issues and social societies and their responsibilities to overcome them.
<b>Transferable Skills</b>	Not applicable
<b>Teaching Methodologies</b>	Lectures, Discussion
<b>CLO</b>	CLO1 Describe polymerization synthesis/ reaction (e.g: condensation (step growth) and addition (chain growth) polymerization) of various polymers CLO2 Distinguish between the various polymerization techniques/ methods and the reactor design to produce polymers that suitable to the industry CLO3 Solve problems related to the polymerization process and impact on environmental issues and social societies and their responsibilities to overcome them
<b>Pre-Requisite Courses</b>	No course recommendations
<b>Topics</b>	
<b>1. Introduction to Polymer in Industry</b> 1.1) 1.1 Upstream process in polymer	
<b>2. Polymerization Reaction</b> 2.1) 2.1 Step growth polymerization (condensation polymerization) 2.2) 2.1.1 Kinetics and statistical aspects (catalyst system) 2.3) 2.1.2 Stoichiometry balance 2.4) 2.1.3 Relative molecular mass control 2.5) 2.1.4 Special polymerization 2.6) 2.1.5 Theories of gelation 2.7) 2.8) 2.2 Chain growth polymerization (addition polymerization) 2.9) 2.2.1 Types of polymerization (free radical, ionic and coordination-steric factor) and structure control 2.10) 2.2.2 Chain reaction kinetics 2.11) 2.12) 2.3 Copolymerization (step and chain growth polymer) 2.13) 2.3.1 Concept of polymerization (block, alternate, graft & random) 2.14) 2.3.2 Reactivity ratio and control of copolymer composition 2.15) 2.3.3 Activation energy and Q-e scheme (monomer reactivity & polarity of radical)	
<b>3. Polymerization Reaction Techniques</b> 3.1) 3.1 Homogeneous and heterogeneous system 3.2) 3.2 Production for industrial polymers 3.3) 3.3 Reaction Process 3.4) 3.3.1 Rate of reaction 3.5) 3.3.2 Types and comparison of reactors 3.6) 3.3.3 Moles Balance and Conversion & Reactor Sizing	

#### **4. Environment Impact to Polymer Processes**

4.1) 4.1 Environmental Problems by Synthetic Polymer

4.2) 4.2 Plastic Recycling

4.3) 4.3 Wastewater Treatment Polymers

4.4) 4.4 Biodegradable Polymers

4.5) 4.5 Life Cycle Assessment and Environmental Impact of Polymeric Products

Assessment Breakdown	%
Continuous Assessment	50.00%
Final Assessment	50.00%

Details of Continuous Assessment	Assessment Type	Assessment Description	% of Total Mark	CLO
	Assignment	Assignment 1-Relates to Chapter 2.1	10%	CLO1
	Presentation	Group Presentation (Cover Chapter 4)	20%	CLO3
	Test	Test (Cover Chapter 2)	20%	CLO1

<b>Reading List</b>	This Course does not have any book resources
<b>Article/Paper List</b>	This Course does not have any article/paper resources
<b>Other References</b>	<ul style="list-style-type: none"> <li>• Book Conie, J.M.G 2014, <i>Polymer: Chemistry and Physic of Modern Mater</i> , Intext Education, New York</li> <li>• Book Parker, D.V.B. 1974, <i>Polymer Chemistry</i>, Elsevier Science Ltd., London</li> <li>• e-Book Fred J. Davis 2004, <i>Polymer Chemistry</i>, Oxford University Press Inc., New York</li> <li>• Book Young R.J. and Lovell P.A. 1991, <i>Introduction to Polymers</i>, CRC Press., New York.</li> <li>• Book Joel R. Fried 2007, <i>Polymer Science and Technology</i>, Prentice Hall International Editions, New Jersey</li> <li>• Book Raymond, B.S. 1987, <i>Polymer Chemistry: An Introduction</i>, Marcel Dekker Inc., New York</li> <li>• Book Billmeyer, F.W. 1971, <i>Text Book of Polymer Science</i>, Wiley-Interscience, New York  <a href="https://onlinelibrary.wiley.com/doi/abs/10.1002/pol.1972.110100721">https://onlinelibrary.wiley.com/doi/abs/10.1002/pol.1972.110100721</a></li> </ul>