

Subject Description Form

Subject Code	ABCT3273
Subject Title	APPLIED CHEMISTRY - POLYMER
Credit Value	3
Level	3
Pre-requisite	None
Co-requisite	ORGANIC CHEMISTRY I
Exclusion	None
Objectives	The course aims to teach fundamental principles of polymerization reactions, polymer properties and their characterization methods. Current production technologies of a variety of industrially important polymers and their applications in our daily life will be discussed.
Intended Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> a. demonstrate good understanding on mechanisms of major polymerization methods; b. apply these synthetic methods for production of different types of polymers; c. predict polymer structure and property relationship d. utilize common characterization and testing techniques to evaluate polymer properties; e. correlate structure, properties and applications of some representative commercial polymers
Subject Synopsis/ Indicative Syllabus	<p>Definition of general terms and classification of polymers 2 hours</p> <p>Chain growth polymerization: free radical polymerization including initiation, propagation, termination and chain transfer; types of initiator; Stereochemistry of polymer; ceiling temperature; comparison of bulk, solution, suspension and emulsion polymerization systems; 8 hours</p> <p>Other chain growth polymerization: Anionic polymerization; cationic polymerization; coordination polymerization. 4 hours</p> <p>Step growth polymerization: Various condensation polymerization methods and their formation mechanism. 6 hours</p>

	<p>These include different commercially important polymers such as Phenol-, Urea-, and Melamine- Formaldehyde Resins; Polyesters; Polycarbonates; Polyamides; and polyurethanes</p> <p>Factors affecting polymer properties: types of average relative molar mass and methods to determine this property; crystalline and amorphous regions; phase transitions in polymers; intermolecular forces; glass transition and melting temperatures 6 hours</p> <p>Mechanical and thermal properties: thermal analysis; mechanical properties of polymers and their measurement 3 hours</p> <p>Fabrication techniques: injection moulding; compression moulding; extrusion; blow moulding; RIM; additives, degradation of polymers 4 hours</p>																																	
<p>Teaching/Learning Methodology</p>	<p>Basic principles will be introduced and discussed in lectures, and further consolidated through class exercise and tutorials. Fundamental knowledge gained will be applied through independent learning of a variety of commercial products. Student's competence in Polymer Chemistry will be developed through class presentation of selected commercial products and receiving feedback from fellow students.</p>																																	
<p>Assessment Methods in Alignment with Intended Learning Outcomes</p>	<table border="1" data-bbox="477 1308 1411 1770"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="5">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th>e</th> </tr> </thead> <tbody> <tr> <td>1. Continuous Assessment</td> <td>40%</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> </tr> <tr> <td>2. Examination</td> <td>60%</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> </tr> <tr> <td>Total</td> <td>100 %</td> <td colspan="5"></td> </tr> </tbody> </table> <p>Student performance will be assessed on the basis of three components:</p> <p>1) Mid-term test</p>	Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					a	b	c	d	e	1. Continuous Assessment	40%	√	√	√	√	√	2. Examination	60%	√	√	√	√	√	Total	100 %					
Specific assessment methods/tasks	% weighting			Intended subject learning outcomes to be assessed (Please tick as appropriate)																														
		a	b	c	d	e																												
1. Continuous Assessment	40%	√	√	√	√	√																												
2. Examination	60%	√	√	√	√	√																												
Total	100 %																																	

	<p>2) Group presentation</p> <p>3) Final examination</p> <p>Student's knowledge on polymerization mechanisms, characterization methods, processing technologies and structure/property relationship will be assessed through mid-term test and final examination. Their ability to comprehend commercial products using the polymer chemistry knowledge learnt in this course will be evaluated via group presentations of emerging commercial polymer products of their choices.</p>	
Student Study Effort Expected	Class contact:	
	▪ Lecture	33 Hrs.
	▪ Tutorial	6 Hrs.
	Other student study effort:	
	▪ Self-study	72 Hrs.
	Total student study effort	114 Hrs.
Reading List and References	<p><u>Essential</u></p> <p>Allcock H R Contemporary Polymer Prentice-Hall Lampe F W Chemistry 2003</p> <p>Seymour R B and Polymer Chemistry, an Marcel Dekker Carragher C E Jr introduction, 6nd ed. 2003</p> <p>Fred W. Billmeyer Textbook of Polymer John Wiley & Science Son 1984</p> <p>Malcolm P. Stevens Polymer Chemistry, An Oxford introduction University Press 3 rd 1999</p> <p><u>Supplementary</u></p> <p>Brydson J A Plastics Materials, 5th ed. Butterworth Scientific 1991</p> <p>Seymour R B & Structure-Properties Plenum Press Carralier C E Relationships in Polymers 1984</p> <p>Useful website : http://plc.cwru.edu http://www.psrc.usm.edu/macrog/index.htm</p>	

