

### MS2013 – Introduction to Polymer Science

<b>Course Code</b>	MS2013				
<b>Course Title</b>	Introduction to Polymer Science				
<b>Co-requisites</b>	MS1014	Materials Chemistry II			
	MS1016	Thermodynamics of Materials			
<b>Pre-requisite for</b>	MS3015	Materials Aspects in Design			
	MS4013	Biomaterials			
	MS4620	Polymer Technology			
	MS4622	Composite Materials			
	MS4666	Sustainable Development in Water, Agriculture and Aquaculture			
<b>No of AUs</b>	3				
<b>Contact Hours</b>	LECTURES	26	TUTORIALS	13 hrs	
		hrs			
<b>Course Aims</b>					
This is an advanced introductory level course, which is aimed to provide fundamental and also specialized knowledge in polymer science for Materials Engineering students. This course covers essential topics in both chemical and physical aspects of polymers.					
<b>Intended Learning Outcomes (ILO)</b>					
By the end of this course, you (as a student) should be able to:					
<ol style="list-style-type: none"> <li>1. Describe basic concept and classification of polymers, and their applications</li> <li>2. Understand the concept of molecular weight and molecular weight distribution; Explain and calculate molecular weight and distribution of polymers, and explain and illustrate methods of measurement of molecular weight</li> <li>3. Understand the basic principles of polymerization; Describe the basic and essential steps of different polymerization methods; Discuss and contrast their mechanisms and analyze kinetics of step growth and chain growth (free radical and ionic polymerization)</li> <li>4. Understand copolymer and copolymerization, and the concept of composition drift and composition control; Be abreast with the broader aspect and recent advances in polymerization</li> <li>5. Describe the basic chain conformations of polymers in solution.</li> <li>6. Understand the concept of viscosity of polymer solutions. Describe the basic principles of characterizing the molecular weight of polymers using size exclusion chromatography.</li> <li>7. Understand the basic thermodynamic principles of polymer solutions; discuss the polymer-solution interactions using the Flory-Huggins theory; explain and calculate the osmotic pressure of polymeric solutions.</li> <li>8. Distinguish amorphous and semi-crystalline polymers and evaluate the implications; define the important thermal transitions of polymers and the factors affecting the transitions.</li> <li>9. Illustrate the measurements of thermal transitions.</li> <li>10. Discuss the unique viscoelastic properties of polymers and the basic models.</li> </ol>					
<b>Reading and References</b>					
<ol style="list-style-type: none"> <li>1. RY Young and PA Lovell, Introduction to Polymers, 2nd Edition, Chapman and Hall</li> <li>2. SL Rosen, Fundamental Principles of Polymeric Materials, 2nd Edition, John Wiley</li> <li>3. <a href="https://pslc.ws/macrog/level4.htm">https://pslc.ws/macrog/level4.htm</a></li> </ol>					

4. Other reading material and online resources may be given specific to each selected topics.

### **Course Policies and Student Responsibilities**

You are required to abide by both the University Code of Conduct and the Student Code of Conduct. The Codes provide information on the responsibilities of all NTU students, as well as examples of misconduct and details about how students can report suspected misconduct. The university also has the Student Mental Health Policy. The Policy states the University's commitment to providing a supportive environment for the holistic development of students, including the improvement of mental health and wellbeing. These policies and codes concerning students can be found in the following link. <https://www.ntu.edu.sg/life-at-ntu/student-life/student-conduct>

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- (1) Attend all lectures and tutorials classes in person and/or online is strongly recommended. Lecture video recordings are to assist students' in their learning needs. Recordings are not to be viewed automatically as replacement of classes.
- (2) Go through additional reading material or video clips or online websites the professors may highlight during lecture classes.
- (3) Any absence from CAs must be supported by a medical certificate or other valid official documents.

### **Academic Integrity**

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognise your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the [academic integrity website](#) for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.