

## MSE 332: Polymeric Materials

Fall 2024, 10:10-11:00am, M/W/F, Sloan 150

Instructor: Prof. Katie Zhong, [Katie\\_zhong@wsu.edu](mailto:Katie_zhong@wsu.edu)

<i>Course description:</i>	Structures, syntheses, properties and processing of polymeric materials: relationships between structure and properties, viscoelasticity, deformation, and physical behavior of polymers.
<i>Number of credits:</i>	3
<i>Course Coordinator:</i>	W.H. Katie Zhong,
<i>Prerequisites by course:</i>	MSE 201
<i>Prerequisites by topic:</i>	<ol style="list-style-type: none"><li>1. Knowledge of thermodynamics, organic and inorganic chemical structures.</li><li>2. Knowledge of stress/strain, fracture and creep behavior of materials.</li><li>3. Understanding of basic crystal systems.</li></ol>
<i>Postrequisites:</i>	MSE 404
<i>Textbooks/other required materials:</i>	<ol style="list-style-type: none"><li>1. Rosen, S.L. <i>Fundamental Principles of Polymeric Materials</i>. Wiley, 3/e.</li></ol>
<i>Course objectives:</i>	<ol style="list-style-type: none"><li>1. Polymer characteristics, basic synthesis and molecular weight effects</li><li>2. Polymer structures and properties (mechanical, viscoelastic, thermal, etc.) as well as their relationship.</li><li>3. Polymer rheology concepts, processing and additives for engineering polymers</li></ol>
<i>Topics covered:</i>	<ol style="list-style-type: none"><li>1. Basics of polymer synthesis and classification of polymers.</li><li>2. Structures: crystallinity, molecular weight and their effects.</li><li>3. Properties: thermal transitions; solubility; viscoelasticity and rubber elasticity.</li><li>4. Processing: rheological behavior and basic methods: extrusion and injection.</li><li>5. Additives: types and effects.</li><li>6. Applications and developments of polymer materials</li></ol>
<i>Expected student outcomes:</i>	<ol style="list-style-type: none"><li>1. Know how polymers are made.</li><li>2. Be able to relate the mechanical qualities of polymeric materials to the type of primary or secondary bonding present.</li><li>3. Understand the relationship between crystalline structures and physical and mechanical properties of polymers.</li><li>4. Understand the importance of primary thermal transitions on polymer performance.</li><li>5. Understand concepts of viscoelasticity, solubility and rubber elasticity.</li><li>6. Understand effects of molecular weight on mechanical properties and processability of polymers.</li><li>7. Know basic processing for polymers.</li><li>8. Understand influences of additives.</li><li>9. Know different applications of polymer materials</li><li>10. Understand the global and societal impacts of polymer engineering and recycling</li><li>11. Gain knowledge of contemporary issues on polymer materials and processing</li></ol>
<i>Class schedule:</i>	Three 50-minute lecture sessions per week, for one semester.
<i>Laboratory schedule:</i>	None
<i>Contribution to meeting the professional component:</i>	Engineering Topics
<i>Relationship of course to program objectives:</i>	Meets: <ol style="list-style-type: none"><li>1. School of MME educational objectives: 1, 2</li></ol>

2. School of MME program outcomes: (a), (l), (h), (j)
3. ABET EC2000, Criterion 3 program outcomes: 1, 2, 4, 6 and 7

*Prepared by:* W.H. Katie Zhong and T. Fuller

*Date:* September 24, 2024