

## MSE 320: Materials Structure-Properties Laboratory

*Course description:* Principles and techniques of optical metallography and other laboratory methods used in modern materials science and engineering.

*Number of credits:* 3 (1-6). This is required.

*Course Coordinator:* Yuehe Lin and Collin Merriman

*Prerequisites by course:* MSE 201 or concurrent enrollment

*Prerequisites by topic:*

1. Crystal structures.
2. Polycrystalline nature of engineering alloys.
3. Phase diagrams.
4. Links between structure, processing, and properties

*Postrequisites:* MSE 323: Materials Characterization Laboratory (recommended)

*Textbooks/other required materials:* Callister. *Materials Science & Engineering an Introduction*. Wiley

*Course objectives:*

1. Develop techniques that will allow students to operate in a modern metallographic laboratory and analyze structures of a wide range of materials.
2. Explore structure - processing - properties relationships in a wide variety of materials.
3. Produce professional quality lab reports.

*Topics covered:*

1. Optical microscopy and stereology.
2. Heat treating.
3. Phase identification.
4. Sample preparation for optical microscopy.
5. Basic mechanical testing.

*Expected learning outcomes:*

1. Ability to prepare standard metallographic samples on a wide range of materials.
2. Ability to interpret microstructures in engineering materials (metals, ceramics, and polymers, and polymer matrix composites) using an optical microscope.
3. Ability to perform quantitative metallography, including grain size and volume fraction calculations.
4. Perform hardness and microhardness testing.
5. Relate phase diagram to resulting microstructures.
6. Interpret TTT curves.
7. Ability to incorporate diffusivity data into structure – properties relationships.
8. Prepare semiconductor and circuit board samples for structural analysis.

*Class schedule:* 1 hour lecture per week, for one semester

*Laboratory schedule:* Two 3-hour laboratory sessions per week, for one semester.

*Contribution to meeting the professional component:* Engineering Topics  
Other (development of technical writing skills)

*Relationship of course to student outcomes:*  
3 strongly supported; 2 supported; 1 minimally supported

Student Outcomes Pre-Fall 2018  
(ABET EC2000)

Student Outcomes Fall 2018 forward  
(ABET EC2019)

<b>a</b>	<b>b</b>	<b>c</b>	<b>d</b>	<b>e</b>	<b>f</b>	<b>g</b>	<b>h</b>	<b>i</b>	<b>j</b>	<b>k</b>	<b>l</b>	<b>m</b>	<b>n</b>	<b>o</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>
	2			2		2				2		2		1	2		3		3	2	2	2	2	3	3

*Prepared by:* Andrea Butcherite and Dr. Yuehe Lin      *Date:* May 30, 2018