

MSE 223L– Materials Processing Lab

Credits and contact hours:	2 credits
Indicate: math, basic science, engineering topic or other	Engineering topic
Instructor's or course coordinator's name:	Minkyu Kim
Textbook, title, author and year:	none
Other Supplemental materials:	Students must purchase a laboratory coat and laboratory notebook.
2020-2021 catalog description:	This course offers a series of laboratory modules, online field trips, and guest lectures that demonstrate specific materials properties and processing for clay, ceramics, glass, metals, and polymers.
Prerequisites:	none
Co-requisites:	none
Required, Elective, or Selected Elective:	Required
Instruction Outcomes:	The objectives of the course are (1) to give students hands-on experiences in order to familiarize them with the physical characteristics of materials and the processes used to form them, (2) to teach students critical problem solving skills, and (3) to give students experience with engineering design practices, i.e., to learn how to design materials to specific performance requirements.
Student Outcomes – Listed in Criterion 3 or any other outcomes are addressed by the course:	To produce graduates who can have: <ul style="list-style-type: none">• an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.✓ an ability to apply engineering design to produce solutions that meet specified needs with consideration of

- public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
- ✓ an ability to communicate effectively with a range of audiences.
 - ✓ an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
 - ✓ an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
 - ✓ an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions.
 - ✓ an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Topics covered:

1. Laboratory safety and research notebooks. (3)
2. SolidWorks and 3D printing. (6)
3. Biopolymers and injectable hydrogels. (6)
4. Clays and glazes, slip casting and shaping. (6)
5. Glass coloring and vitreous sintering. (6)
6. Plant tour 1 – glass lab at UA. (3)
7. Heat treating steel, quenching, hardness testing. (6)
8. Mid-term design project. (18)
9. Plant tour 2 - mirror lab at UA (casting, polishing, coating). (3)
10. Metallography. (6)
11. Mechanical testing of heat-treated steel. (3)
12. Metal casting. (3)
13. Composite materials (epoxy/glass or carbon fibers). (3)
14. Characterization of materials (SEM); Mechanical testing of composite materials. (6)
15. Final exam, assessment. (3)