

SYLLABUS

Metallography and Microstructural Interpretation Fall 2023

Pre-requisite: Senior standing and MME 3406

Course Description: This course is designed to emphasize the importance of proper metallographic sample preparation and microstructural characterization for various metals, alloys and/or material systems. This course is to provide students with the tools necessary to properly select samples for analysis including sectioning, mounting, polishing and etching using standard metallographic procedures. Metallographic samples prepared in class will be evaluated using stereomicroscopy, optical and scanning electron microscopy to aid with proper microstructural interpretation. The hands-on practice will give our future engineers experience in analyzing data and writing professional reports to describe pertinent microstructural features that can be used for routine work, failure analysis and research & development. Safe practices and ethical behavior in lab work will be emphasized.

Instructor: Dr. Christopher Bradley

Email: cbradley2@utep.edu (*preferred method of communication*)

Office: Metallurgy Suite, Room M201-C

Office Hours: W 10:30-12:00PM MST (*If you need to meet with me and are unable to attend normal office hours, please email me so that we can make other arrangements as needed*).

TA: Veronica Contreras-Guerrero

Email: vgcontreras@miners.utep.edu (*preferred method of communication*)

Office: TBD

Office hours: TBD

Required Textbook: No textbook is required for this course. However, there will be out-of-class research including books available in the library, online references and other materials that I will make available to you.

Grading:	Exams (2 paper + 10 quiz minimum)	50%
	Portfolio	40%
	• Report	• 25%
	• Final Presentation	• 10%
	• Project status reports	• 5%
	Assignments	10%

Honesty and Professionalism: Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures. It includes, but is not limited to, cheating, plagiarism, and collusion. Cheating may involve copying from or providing information to another student, possessing unauthorized materials during a test, or falsifying research data on laboratory reports. Plagiarism occurs when someone intentionally or knowingly represents the words or ideas of another as ones' own. Collusion involves collaborating with another person to commit any academically dishonest act. Any act of academic dishonesty attempted by a UTEP student is unacceptable and will not be tolerated. All suspected violations of academic integrity at The University of Texas at El Paso must be reported to the [Office of Student Conduct and Conflict Resolution \(OSCCR\)](#) for possible disciplinary action. To learn more, please visit [HOOP: Student Conduct and Discipline](#).

Classroom and Laboratory Etiquette: Part of being a professional is arriving on time and being prepared to participate. Another part is respecting the other people in the class, including the speaker. If you come late to class or have to leave early, please do so quietly. Please use professional discretion with your cell phone, and turn off the ringer during class. If you must answer the phone, please leave the class discreetly. You may return to the class once your call is finished.

COVID-19 Precautions: Please stay home if you have been diagnosed with COVID-19 or are experiencing COVID-19 symptoms. If you are feeling unwell, please let me know as soon as possible, so that we can work on appropriate accommodations. If you have tested positive for COVID-19, you are encouraged to report your results to covidaction@utep.edu, so that the Dean of Students Office can provide you with support and help with communication with your professors. The Student Health Center is equipped to provide COVID 19 testing.

The Center for Disease Control and Prevention recommends that people in areas of substantial or high COVID-19 transmission wear face masks when indoors in groups of people. The best way that Miners can take care of Miners is to get the vaccine. If you still need the vaccine, it is widely available in the El Paso area, and will be available at no charge on campus during the first week of classes. For more information about the current rates, testing, and vaccinations, please visit epstrong.org.

General Course Topics

- a. Familiarize students with the lab and its functions.
- b. Equipment training (use of abrasive cut-off wheel, precision saw and mounting equipment to include vacuum impregnation and TeraPress) for proper specimen sizes and sectioning techniques for various metals, alloys and material systems. Implementation of sample cleaning for optimal mounting results.
- c. Metallographic preparation focused on manual polishing techniques with discussions of semi-automated systems.
- d. Chemical etching and safety for various metals and alloy systems.
- e. Imaging techniques for light optical microscopy (LOM) and scanning electron microscopy (SEM).
- f. Analysis of metals, alloys and material systems.
- g. Engineering ethics, including honesty and “data ethics”.
- h. Statistical analysis of data and drawing conclusions from lab work.
- i. Writing concise and professional engineering reports.
- j. Enforcing laboratory, workplace, and chemical safety principles to ensure safe work environments and establish well-developed hands-on experience.

Proposed Course Outline (Topics may be subject to change)

Week #	Dates	Topics
1	8/30	Introduction to Metallography (<i>No Lab 1st Week</i>)
2	9/6	Metallographic Lab Safety
3	9/13	Sample Selection, Orientation, Sectioning and Mounting Techniques
4	9/20	Sample Preparation Using Standard Metallographic Procedures
5	9/27	Chemical Etching and Microscopy
6	10/4	Ferrous Alloys
7	10/11	Heat Treatment of Ferrous Alloys
8	10/18	Manufacturing Processes
9	10/25	Aluminum and Aluminum Alloys
10	11/1	Copper and Copper Alloys
11	11/8	Titanium Alloys
12	11/15	Superalloys
13	11/22	Thanksgiving Holiday (No Class or Lab)
14	11/29	In-Situ Metallography and Replication
15	12/6	Projects (<i>Dead Day December 8</i>)
16	12/11 - 12/15	Finals Week (Final Presentations: December 11 2023)