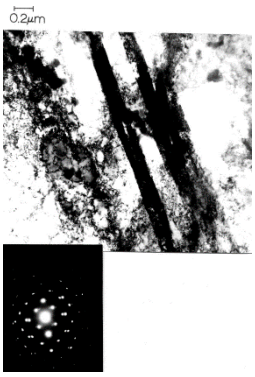
MASE 6402/MME 5401 Microstructural & Microchemical Characterization

Fall 2023

Course		CRN
MASE	6402	10759
MME	5401	10658



Instructor: David A. Roberson, Ph.D., droberson@utep.edu

Days, Time and Location of Lecture: MW 10:30 am-11:50 am CRBL C304

Day, Time and Location of Lab: M 1:30 pm-4:20 pm Varies

Office Hours: R 12:00-2:00 or by appointment

T.A.: Zayra Dorado zndorado@miners.utep.edu

COURSE DESCRIPTION

MASE 6402/MME 5401 is a required course for the MASE Ph.D. Program as well as the MS Program in MME. The application of modern instrumentation and techniques to structural characterization problems. Both theory and operation will be stressed. Optical microscopy, X-Ray analysis, electron microscopy (TEM-SEM), surface characterization, optical emission spectroscopy will be included. Real-world examples of the use of characterization equipment will be given based on my experience in the semiconductor industry. The equipment we will cover in this class are the tools you will most likely use to perform your job whether you decide to pursue an academic career or a career in industry.

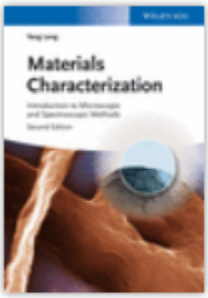
COURSE OBJECTIVES OR EXPECTED LEARNING OUTCOMES

After completing this course, students will be able to:

- Explain basic concepts of crystallography.
- Understand the concepts of spectroscopy techniques such as Fourier-transform Infrared Spectroscopy (FTIR)

- Articulate basic concepts of optical microscopy as used in metallurgical as well as other applications
- Understand the use of X-Rays in materials characterization applications such as crystallographic analysis
- Apply the concepts of backscatter and secondary electron generation towards the interpretation of electron micrographs
- Interpret contrast mechanisms in TEM micrographs

Textbook:



Materials Characterization: Introduction to Microscopic and Spectroscopic Methods, Second Edition

Author(s): Prof. Yang Leng
First published: 2 August 2013
Print ISBN: 9783527334636 | Online ISBN: 9783527670772 | DOI: 10.1002/9783527670772

SEE THIS BOOK ON AMAZON

Other useful Texts:
ASM Metals Handbook Volume 10
Elements of X-Ray Diffraction by B.D. Cullity

You will also need regular access to a computer, stable, consistent internet, Blackboard, a UTEP VPN connection and your UTEP email account.

Several articles will also be used in this class. They should be accessible through UTEP VPN.

COURSE CONTENT DELIVERY

This course will be delivered in a traditional lecture setting. Supplemental materials will be available on Blackboard.

COURSE ASSIGNMENTS AND GRADING

Some Assignments for this course are assessed according to a designated Grading Rubric with crucial information that could affect your grade for each activity. This is most pertinent for lab reports and/or project presentations. A rubric will be included on the assignment. Other assignments including derivations and mathematical calculations will also be included in this

course. Grading is based on how much work is shown as well as an explanation as to how you reached your conclusion if applicable.

Grade Distribution:

100-90 = A 89-80 = B 79-70 = C 69-60 = D 59 and Below = F

- **Lab Reports** **30%**
- **Homework/Quizzes** **20%**
- **Tests** **20%**
- **Final Project/Final Exam** **30%**

- **NOTE Final Exam and/or Presentation will be Friday December 15, 2023 from 10:00 am to 12:45 pm**
- **Also note that tests are scheduled on the course calendar document. I will do my best to stick to the schedule so folks know when tests are.**

LAB COMPONENT

Labs will be given in person starting Week 3 of the course. Lab groups will be constructed at random. Please use applicable PPE. A lab report will be due, generally one week after the lab activity is performed.

COURSE CALENDAR

A detailed calendar for this course is provided as a separate document on Blackboard titled **"MASE 6402/MME 5401 Course Calendar."** A brief ***and tentative*** outline is below:

1. Course Introduction
    a. Elastic vs. Inelastic Interactions
    b. Microstructure and Effect on Physical Properties
    c. Basic Crystallography
2. Spectroscopy
    a. Fourier-Transform Infrared Spectroscopy
    b. Optical Emission Spectroscopy
3. X-Ray Diffraction
    a. Bragg's Law
    b. Interpretation of spectra
    c. SAXS and WAXS
4. Optical Microscopy
    a. Metallography
5. Scanning Electron Microscopy
    a. Contrast mechanisms and electron types
    b. Use of X-Rays
6. Transmission Electron Microscopy
    a. Contrast Mechanisms
    b. Specimen Prep

ATTENDANCE POLICY

Attendance is not taken, but there are several in-person assignments and activities. If you cannot attend class on a given day, please do your best to let me know prior to missing class. **If you are sick, please stay home both for your own recovery and for the health of others around you.**

TECHNOLOGY REQUIREMENTS

Content for this course is delivered via the Internet through the Blackboard learning management system (LMS). Ensure your UTEP e-mail account is working and that you have access to the Web and a stable web browser. Mozilla Firefox and Google Chrome are the most supported browsers for Blackboard; other browsers may cause complications with the LMS. When having technical difficulties, update your browser, clear your cache, or try switching to another browser.

You will need to have or have access to a computer/laptop. You will need to download or update the following software: Microsoft Office, Adobe, Flashplayer, Windows Media Player, QuickTime, and Java. Check that your computer hardware and software are up-to-date and able to access all parts of the course.

If you encounter technical difficulties beyond your scope of troubleshooting, please contact the Help Desk as they are trained specifically in assisting with technological needs of students.

LATE WORK POLICY

Please do your best to complete assignments by the due date assigned. If you will miss an assignment because you are ill or have some sort of emergency, please let me know and we can work something out.

DROP POLICY

In order to drop this class, please contact the Registrar's Office to initiate the drop process. If you cannot complete this course for whatever reason, please contact me. If you do not, you are at risk of receiving an "F" for the course. **The drop deadline for the Fall 2023 semester is November 3, 2023.**

Other important dates can be found by clicking HERE

ACCOMMODATIONS POLICY

The University is committed to providing reasonable accommodations and auxiliary services to students, staff, faculty, job applicants, applicants for admissions, and other beneficiaries of University programs, services and activities with documented disabilities in order to provide them with equal opportunities to participate in programs, services, and activities in compliance with sections 503 and 504 of the Rehabilitation Act of 1973, as amended, and the Americans with Disabilities Act (ADA) of 1990 and the Americans with Disabilities Act Amendments Act (ADAAA) of 2008. Reasonable accommodations will be made unless it is determined that doing so would cause undue hardship on the University. Students requesting an accommodation based on a disability must register with the UTEP Center for Accommodations and Support Services.

SCHOLASTIC INTEGRITY

Cheating, Plagiarism, Scholastic Dishonesty, and Student Discipline

Students who engage in scholastic dishonesty will be subject to disciplinary action as stated in the UTEP-HoOP:

> "Scholastic dishonesty (which includes the attempt of any student to present the work of another as his or her own, or any work which s(he) has not honestly performed, or attempting to pass any examination by improper means) is a serious offense and will subject the student to disciplinary action. The aiding and abetting of a student in any dishonesty is held to be an equally serious offense. All alleged acts of scholastic dishonesty should be reported to the Dean of Students for disposition. It is the Dean of Students' responsibility to investigate each allegation, dismiss the allegation, or proceed with disciplinary action in a manner which provides the accused student his or her rights of due process."

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 HOOP: Student Conduct and Discipline.

STUDENT RESOURCES

UTEP provides a variety of student services and support:

- UTEP Library: Access a wide range of resources including online, full-text access to thousands of journals and eBooks plus reference service and librarian assistance for enrolled students.
- Help Desk: Students experiencing technological challenges (email, Blackboard, software, etc.) can submit a ticket to the UTEP Helpdesk for assistance. Contact the Helpdesk via phone, email, chat, website, or in person if on campus.
- University Writing Center (UWC): Submit papers here for assistance with writing style and formatting, ask a tutor for help and explore other writing resources.
- Math Tutoring Center (MaRCS): Ask a tutor for help and explore other available math resources.

- History Tutoring Center (HTC): Receive assistance with writing history papers, get help from a tutor and explore other history resources.
- Military Student Success Center: UTEP welcomes military-affiliated students to its degree programs, and the Military Student Success Center and its dedicated staff (many of whom are veterans and students themselves) are here to help personnel in any branch of service to reach their educational goals.
- RefWorks: A bibliographic citation tool; check out the RefWorks tutorial and Fact Sheet and Quick-Start Guide.