Catalog Description: MTE 481. Analytical Methods for Materials (2-3) Three Hours. Crystallography, physics of X-rays, diffraction by crystalline materials, applications of X-ray, electron and neutron diffraction, and spectrometric analysis of materials. 3 hours.

Prerequisites: MTE 271 and 373 or permission of the instructor

Instructor: Mark L. Weaver; Room 1108 Bevill; 348-7073; email: mweaver@eng.ua.edu

Lectures: MWF 8:00 am – 8:50 am; 0058 Bevill

Labs: F 1:00 pm – 3:00 pm; F 3:00 pm – 5:00 pm

Office Hours: F 9:00 am – 11:00 am or by appointment

Course Objectives: At the conclusion of this course, students will be able to characterize the structures and chemistries of materials using traditional analytical experimental techniques.

List of Lecture Topics (Provisional):
1. Crystallography
2. X-ray diffraction
3. Light optical microscopy
4. Scanning electron microscopy
5. Transmission electron microscopy
6. X-ray spectroscopy for chemical analysis
7. X-ray photoelectron spectroscopy and auger electron spectroscopy
8. Technical Communication Skills

List of Laboratories (Provisional):
1. Crystal Structure Determination via X-ray Diffraction
2. Lattice Parameter Determination and Phase Diagram Determination
3. Determination of Crystallize/Grain Size and Lattice Strain
4. Quantitative Analysis of Powder Mixtures
5. Metallography and Optical Microscopy
7. Identification of an Unknown Material (Final Project)

Quizzes, Laboratories, Reports, and Grading
- **Quizzes:** (30% of grade) Up to four 50 minute quizzes (graduate students will have additional ‘take home’ sections for each exam).
- **Laboratories:** (30% of grade) Several laboratories will be conducted in this course. Most will involve X-ray Diffraction. **Individual written lab reports will be required for each laboratory.** Lab reports will be graded individually. As this is a W-designated course, all students must demonstrate the ability to write coherent, logical, properly edited sentences with proper referencing. Reports must be written in accord with Reporting Results by D.C. VanAken and W.F. Hosford. Reports will be assessed using the MTE 481 ABET rubrics. I will hand them out to the class.
- **Final Project:** (40% of grade) There will be one final project. This will be a group activity. There is a required group project report and group project presentation.
### Quizzes 30%  
### Laboratory Reports 30%  
### Final Project Report and Presentation 40%  
### Total 100%

#### Grading Scale:

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#### Class Policies:

- **Attendance at examinations and laboratories is mandatory.** If you must miss a scheduled laboratory or quiz due to serious illness, family death, accident, etc., notify Professor Weaver as soon as possible. Excuses of a non-urgent nature will not be accepted.

- Quiz questions will primarily be of the short answer variety.

- Cellular phones must be turned off during lectures, laboratories, and quizzes/examinations.

- Late items will not be accepted.

- **Do not plagiarize or cheat.** If you do, I will flunk you.

#### Disabilities:

- Students with disabilities who may require more time than is allotted for the exams/quizzes must contact the UA Office of Disability Services (ODS) to obtain PRIOR APPROVAL and THE PROPER PAPERWORK in accordance with the rules and regulations of The University of Alabama. Alternate exams/quizzes must be scheduled through the ODS (348-4285).

#### Required Text(s)


#### Other Reference Texts