

MET 480: Transmission Electron Microscopy

Course Information:

Course title: Transmission Electron Microscopy

Course number: MET 480

Course credits: 3 credits

Instructor Information:

Instructor: Dr. Fusheng Sun

Office: McClure 409

Office Phone: 885-4284

Office Time: (T, Th; 2:00pm-4:00pm)

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Course Scope:

The course will address the fundamentals of elastic and inelastic electron scattering, TEM instruments, TEM samples preparation, reciprocal space, diffraction patterns, indexing diffraction patterns, Kikuchi diffraction, convergent-Beam technologies, planar defects and dislocations analysis, weak beam dark-field microscopy, high resolution imaging (HRTEM), and different spectrometry methods.

Assigned Text:

Transmission Electron Microscopy (Volume I-IV), David B. Williams and C. Barry Carter, Plenum Publishing Corporation, 1996.

Reference Texts:

1. *Fundamental of Transmission Electron Microscopy*, R. D Heidenreich, John Wiley & Sons, New York, 1964.
2. *Introduction to Analytical Electron Microscopy*, C. J. Humphreys, Plenum Press, New York, 1979.
3. *The Principles and Practice of Electron Microscopy*, I. M. Watt, Cambridge University Press, New York, 1987.
4. *Practical Analytical Electron Microscopy in Materials Science, 2nd Ed.*, D.B. Williams, Philips Electron Optics Publishing Group, Mahwah, New Jersey, 1987.

Course Learning Objectives:

1. To understand the generic behavior of elastic and inelastic electron scattering, the physics of transmission electron microscopy.
2. To know the fundament for TEM instruments and principle for operating TEM

3. To know the methods for preparing powder and solid types TEM samples.
4. To understand relationship of crystal structure and reciprocal space.
5. To utilize knowledge of diffraction patterns to indexing a specific material.
6. To introduce general knowledge of Kikuchi diffraction and applications.
7. To interpret planar defects and dislocations in TEM images.
8. To introduce and understand the principles of high-resolution imaging (HRTEM).
9. To introduce and understand convergent-Beam technologies.
10. To introduce different spectrometry.

Course Topics:

1. The fundamentals of elastic and inelastic electron scattering, the physics of TEM
2. The basic of TEM instruments and operating TEM
3. Methods for preparing TEM samples
4. Reciprocal space
5. Diffraction patterns and indexing
6. Kikuchi diffraction
7. Convergent-Beam technologies
8. Planar defects and dislocations analysis
9. Weak beam dark-field microscopy
10. High resolution imaging (HRTEM)
11. Different spectrometry

Course Calendar/Schedule: General, each class for one chapter.

Getting Help:

Need help, or have a question, perhaps of interest to the whole class? Want to offer feedback, or get more explanation of a concept (in or out of class)? Take advantage of the classroom. Come to office hours. Whether individuals or groups, office hours are there to help. You can also send e-mail.

Grading Policy:

- **Homework (+ any Quizzes) 20% of total grade**

Homework will be collected on a weekly basis and will only be done in class. No late homework will be accepted. Students may work in groups of no more than three (3). Answers may come from sources other than the assigned text. Only a subset of homework will be graded.

- **Midterm exam is 35% of Grade.**
- **Final exam is 45% of Grade.**

Exam questions are mostly taken from homework with modification, extensions, etc. You should do well if you have done homework (not copied) and understand concepts through individual efforts, asking questions in class or office hours.

Standard University of Idaho grading and academic honesty policies apply.

Disability Support Services Reasonable Accommodations Statement:

Reasonable accommodations are available for students who have a documented disability. Please notify the instructor during the first week of class of any accommodation(s) needed for the course. Late notification may mean that requested accommodations might not be available. All accommodations must be approved through Disability Support Services located in the Idaho Commons Building, Room 333.

- **885-7200**
- **email at <dss@uidaho.edu>**
- **website at <www.access.uidaho.edu> or <www.webs.uidaho.edu/aap>**