Syllabus

MS 132 Diffraction and Structure

Instructor

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Teaching Assistant

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Prerequisites

This is a core course for first-year graduate students in Materials Science or Applied Physics, but juniors and seniors are welcome.
Familiarity with very basic crystallography (directions, and Miller indices for planes). Concept of a unit cell and basis vectors. Wave mechanics, with some exposure to quantum mechanics. Some exposure to Fourier transforms would be very helpful, although some of this is done in the class itself.

Content

The course will follow the book, approximately linearly.
The corrected edition of the third edition is available to the Caltech community as a downloadable pdf file

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http://authors.library.caltech.edu/35111/
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The fourth edition has an extra chapter, and therefore a different numbering of the homework problems at the ends of the chapters.
The coverage is approximately one chapter per week, at least until Chapter 9. This is near the end of the term, and topics will then be selected from Chapters 9-13.

Required Text

B. Fultz and J.M. Howe, Transmission Electron Microscopy and Diffractometry of Materials, Fourth edition (Springer, 2013).

Other Books

B. E. Warren, X-Ray Diffraction, Dover
J. M. Cowley, Diffraction Physics, North Holland
D. B. Williams and C. B. Carter, Transmission Electron Microscopy (4 Vols), Plenum
J. Edington, Practical Electron Microscopy in Materials Science (4 Vols), Philips Electronic Instruments

Grading

15% Participation and moodle questions.
40% Homework (do not look at old assignments, late problem sets will receive 1/3 credit, students may collaborate on any written work).
45% Final Exam. Format to be determined, but likely 3 hour take-home with open book.

In 2017 the class time will be arranged as a flipped classroom

Tentative Class Format (times in minutes)

(* before class) I expect you to do a small amount of reading before coming to class, and answer a question on the moodle site the day before the classtime. The reading is assigned from the textbook, so you need the textbook to identify the pages and sections to read. This problem will be graded, but almost any reasonable answer will receive full credit.
(10) Fultz will start by discussing some of the moodle questions and answers as appropriate.
(30) Fultz will describe some of the concepts and approaches to be taken.
(20) Student groups will work problems and derivations in class. In addition to working the problems as group dynamics allows, there are specific roles to be filled. Tentatively:

One student is assigned to do the blackboard work in front of the whole class.
One student will be the scribe to post the solution (perhaps a photo of the board) on the moodle site.
One student manages the time of 20 minutes.

(30) Students work problems, derivations, or give explanations at the blackboard. Alternatively, Fultz will give a mini-lecture or lead a discussion.