

NIU Department of Physics
Course Syllabus for **PHYS 495** ---*Introduction to basic Electron
Microscopy and Related Techniques for Nanomaterials*

Spring Semester, 2015, Fridays 12:30 pm - 1:45 pm. (Lab sessions TBA).

Abstract:

This independent study course is an introductory course for basic Transmission Electron Microscopy (TEM). The course consists of a series of lectures and practical lab sessions. Especially, we focus on Fourier Transforms and its applications. Students will gain basic knowledge of theory and operational skills of TEM.

At the end of the course, students successfully completed the course will be given a certificate, which may be recognized at the Electron Microscopy Center at ANL for further training for their advanced instruments.

The students expected to have undergraduate level of E&M and Modern Physics (especially solid state/materials physics). The knowledge of optics and Fourier transformation is certainly an advantage but not required at the beginning.

Credit hours: 2

Class room: TBA. **Lab:** La Tourette Hall 101 (Electron Microscopy Lab)

Laboratories: Electron Microscopy labs at Physics, Chemistry, (Biology) Department

Instructor: Yasuo Ito. FW 218 and/or FW101 (Electron Microscopy Lab)

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Office Hours: Tuesdays, Thursdays, Fridays 2:00 pm – 3:00 pm; Other hours by an appointment.

Text book: Transmission Electron Microscopy, 2nd ed., D.B. Williams and B. Carter (required). ***Please read your textbook before coming to the class!!***

Grading (tentative):

40% Homework, 30% final presentation, 30% Final report .

To pass this course, you must score at least **50% on the homework AND at least 40% overall.**

For disabled students:

“NIU abides by Section 504 of the Rehabilitation Act of 1973 which mandates reasonable accommodations be provided for qualified students with disabilities. If you have a disability and may require some type of instructional and/or examination accommodation, please contact me early in the semester so that I can provide or facilitate in providing accommodations you may need. If you have not already done so, you will need to register with the Center for Access-Ability Resources (CAAR), the designated office on campus to provide services and administer exams with accommodations for students with disabilities. The CAAR office is located on the 4th floor of the University Health Services building (815-753-1303). I look forward to talking with you soon to learn how I may be helpful in enhancing your academic success in this course.”

Outline:

1. In class
 - a. Instrumentation
 - b. Electron scattering in matters
 - c. Diffraction and Fourier transform theory
 - d. Imaging
 - e. Applications in electron microscopy and spectroscopy
2. TEM laboratory
 - a. TEM laboratory safety
 - b. Sample preparation and specimen loading.
 - c. Basic TEM alignment procedure
 - d. Basic Imaging
 - e. Basic Diffraction
 - f. High resolution imaging
 - g. Application/individual small projects