

SYLLABUS
OPTICAL PROPERTIES OF SOLIDS
PHYS 6374, FALL 2005
INSTRUCTOR: ROBERT GLOSSER

Class meets Mondays and Wednesdays from 7:00 to 8:15 pm in CB1.102. Last class day is Monday, November 28.

This course will develop a microscopic picture of the interactions of optical radiation with solids and describe various techniques that exploit this to obtain information on the electronic and lattice structure of solids. In turn, we will study this information as it can be applied to materials and devices.

PREREQUISITES: Course work in quantum mechanics, electricity and magnetism and completion of PHYS 5371, Introduction to Solid State Physics or the equivalent.

Grading will be on the basis of a term paper or class presentation to be arranged between student and instructor. The term paper or presentation is intended to reflect the student's own topic of interest relative to the scope of the course.

RECOMMENDED TEXT: Fundamentals of Semiconductors, by Yu and Cardona

Other material will either be supplied or made available in the library.

TOPICS TO BE COVERED

1. Fresnel equations applied to the behavior of E-M waves at a vacuum-absorbing solid interface.
2. Absorption and dispersion
 - a. Lorentz model
 - b. Drude model
 - c. Quantum mechanical picture
3. Kramers-Kronig dispersion relations and causality; sum rules
4. Band structure and interband transitions
5. Plasmons
6. Excitons
7. Phonons, polaritons
8. Other excitations
9. Applications and Techniques:
 - a. Absorption and reflection,
 - b. Ellipsometry,
 - c. Modulation spectroscopy,
 - d. Photoemission,
 - e. Photoluminescence,
 - f. Raman spectroscopy
10. Other topics as time permits.