

PHYSICS 411/611, ECE 411/611
OPTICS FOR SCIENTISTS AND ENGINEERS
Syllabus, Fall Semester 2004

Lectures: 11:00-11:50 MWF

Room: South Engineering 118

Semester Credit Hours: 3

Instructors:

Department

Office:

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Office Hours: Your instructors schedule regular office hours that will be announced the first week of class.

TEXT: *Optics* (Fourth Edition) by Eugene Hecht

Physics/ECE 411 Prerequisite: Physics 252, University Physics II

Physics/ECE 611 Prerequisite: Physics 252, University Physics II or equivalent

Corequisite: Physics 411L/611L or ECE 411L/611L

Course Objective

The goal of this course is to provide students with the fundamentals necessary to enable them to successfully apply optics in their respective disciplines. This will be accomplished through hands-on use of state-of-the-art equipment in the co-requisite laboratory course in conjunction with classroom discussions to experience and understand the most important concepts and phenomena of optics.

Classroom Expectations

Students are expected to attend all class sessions except for valid excuses such as medical situations. Lecture attendance will not be directly factored into the final grade but active daily participation is essential. Students are expected to read the day's lesson prior to coming to class and to be prepared to discuss it in class. Material may be presented that is not in the text or it may be presented in a different way. Students are responsible for all material presented in class including that missed during excused absences. If you miss a class, it is your responsibility to obtain the notes from a classmate.

Attendance at exams is mandatory unless excused for a valid University approved reason. Do not attend if you are ill but instead obtain an excuse from the Medical Center. Excused absences must be made-up and zero credit will be awarded for unexcused absences.

If you are going to miss an exam for a valid excuse, telephone your instructor before the test or on the same day. Phone numbers are listed above.

Homework

Homework will be emphasized. Problems will be worked on 8 1/2" x 11" paper ONE SIDE ONLY. SHOW all work. GIVE ALL EQUATIONS before substituting numerical quantities into them and always give the UNITS INVOLVED. UNDERLINE all answers. Full credit can be received for work turned in late due to an excused absence such as sickness, etc. It is the student's responsibility to contact the instructor in such a case. Group study and homework solving is encouraged.

Composition of Final Course Grade

The final grade will be determined as follows:

Physics/ECE 411		Physics/ECE 611	
Exam 1	20%	Exam 1	20%
Exam 2	20%	Exam 2	20%
Exam 3	20%	Exam 3	20%
Homework	20%	Homework	10%
Project	20%	Project	30%

The exams will include conceptual questions requiring short answers, derivations, and quantitative problems similar to the assigned homework problems.

Graduate students will be graded separately on exams and will be expected to have a more comprehensive understanding of the material. They will also do a more extensive major related project.

Letter grade assignment will be determined at the end of the semester by the instructors based on the student's overall course percentage. The minimum percentage necessary for each letter grade is as follows: A (90.0%), B (80.0%), C (65.0%), and D (50.0%). **Grades of below 50% will generally be considered to be failing.** Further details on letter grade assignment will be discussed in class.

Special Needs

Any students who need special accommodations for learning or who have special needs are invited to share these concerns or requests with the instructors as soon as possible.

Academic Responsibility

All work in this course must be completed in a manner consistent with NDSU University Senate Policy, Section 335: Code of Academic Responsibility and Conduct
<http://www.ndsu.nodak.edu/policy/335.htm>

Cheating on an exam will result in an F for the course.

Other violations of this code will result in a penalty or penalties to be determined by the instructors to fit the gravity of the offense.

Course description

Today, light pervades our lives in ways that could not have been imagined a few decades ago. Light is at the core of technologies ranging from computing and communications to surgical techniques. Optics, the study of light, plays the role of an enabling science since it touches essentially every field of technology.

This is a 3 semester-credit-hour senior undergraduate/first year graduate level course with minimum course prerequisites (University Physics II, electricity and magnetism) and the co-requisite Physics/ECE 411L/611L. Lectures will be based on the text *Optics, Fourth Edition*, by Hecht to provide the background required for performing the experiments.

The anticipated schedule is as follows:

First twelve weeks—three one-hour lectures per week, except holidays

Three weeks—laboratory five-hours per week to work on major-related experiment

One week—students present results—three classroom hours

A major experiment related to the students academic major (engineering, chemistry, physics, etc.) using optics will be selected by each pair for the last four-week project. Students will write a research paper on this experiment and present their results to the class. Students will be graded in this course on their paper, their presentation and their explanation of the results and will receive a separate laboratory grade based on their experimental apparatus and approach.

Tentative Course Outline

Week	Topic	Text Assignment
1	Properties of waves	Ch 1, 2
2	EM nature of light	Ch 3.1-3.4
3	Dispersion	Ch 3.5-3.7
4	Index of refraction	Ch 4.1-4.5
4	Exam 1 Friday	Ch 1-3
5	Reflection S/P	Ch 4.6-4.9
6	Lenses, stops	Ch 5.1-5.3
7	Mirrors/prisms	Ch 5.4-5.5
8	Fiber optics and sensors	Ch 5.6
8	Exam 2 Friday	Ch 4-5
9	Vibrations. waves	Ch 7.1-7.2
10	Polarization	Ch 8.1-8.3 8.5-8.6
11	Interference	Ch 9
12	Diffraction	Ch 10
12	Exam 3 Friday	Ch 7-10
13	Major related project	
14	Major related project	
15	Major related project	
16	Present results	