PH3210 Geometrical and Physical Optics
(http://www.phy.mtu.edu[curriculum/PH3210.html])

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Teaching assistant: Mr. Jitendra Menda (office:HH, phone:7-3215. Email:jmenda@mtu.edu).

Office hours: Any time by arrangement.

A) Instruction: 12.05-12.55 pm (MWF), Fisher Rm131.
B) Laboratory: 3:30-6:30 Thursday

Course Description:
This course is designed to introduce the important concepts on geometrical and physical optics. The course consists of two sections: A) instruction and B) laboratory. Topics in geometrical optics include ray analysis, lenses, prisms, and optical fibers. Topics in physical optics include polarization, interference, interferometry, and diffraction. In the laboratory section, we will explore optics through experiments in lenses, fiber optics, optical communication, interferometry, diffraction, grating, filters, and laser frequency conversion.


Course Rationale:
Provides an in-depth look at classical and modern optics, including a lab experience. This course is required for physics and applied physics majors.

Grading:
The grade of this course will be evaluated based on your academic performance, effort, and learning attitude in both the instruction and laboratory sections.

A) Instruction (50%):
You are required to read the text before attending each lecture (at least 1 hour) and complete the given assignment. You are expected to provide the answers on paper, which will be collected before the lectures. These assignments will be discussed in the class. You should also review your text after the lectures (at least 1 hour). Reading and writing will be the essential routes to integrate your knowledge on optics.

Both mid-term and final exams will be scheduled. Questions in the exams will be based on the important concepts that you have learned in both the instruction and laboratory sections.

Class participation, learning attitude, and exams will contribute to the grade of this section.

B) Laboratory (50%):
You are required to read up the assignment and be prepared before working on each experiment. All experiment requires a report written in a format to be discussed. Reports are due one week after completion: before the beginning of the next experiment.

Oral exam will be scheduled before the end of the term (during lab sections). In the exam, you will be asked about the fundamental concept involved in your experiments. Your interpretation on the experimental phenomena occurred will be evaluated. Your grade for this section is based on your lab participation, attitude in the lab, reports and oral exam.
Grading:
The weight attributed to each segment of the course is as follows:

- Assignment, class participation, and learning attitude in the instruction section 15%
- Mid-term exam 10%
- Final exam 25%
- Lab participation, attitude in the lab, and quality of your reports 40%
- Oral Exam 10%

For each of the four segments of your grade, you will be given a numerical score from 0 to 100. For an indication of your standing relative to the class, you may use the following table:

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Score Range</th>
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<tbody>
<tr>
<td>A</td>
<td>90-100</td>
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<tr>
<td>AB</td>
<td>85-89</td>
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<tr>
<td>B</td>
<td>78-84</td>
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<td>BC</td>
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<td>C</td>
<td>67-72</td>
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<td>CD</td>
<td>62-66</td>
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<tr>
<td>D</td>
<td>54-61</td>
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<tr>
<td>F</td>
<td>0-53</td>
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</tbody>
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Letter grades for the course will be based on the above scheme with the provision that the cutoffs are subject to change. All questions regarding the grading policy for the course should be addressed to the lecturer. Questions regarding the grading of lab participation, attitude in the lab, and effort on your reports should be addressed to your recitation instructor.

Notice MTU complies with all federal and state laws and regulations regarding discrimination, including the Americans with Disabilities Act of 1990 (ADA). If you have a disability and need a reasonable accommodation for equal access to education or services at MTU, please call Dr. Gloria Melton, Associate Dean of Students, at 7-2212. For other concerns about discrimination, you may contact your advisor, department chair, or the Affirmative Action office.
Course Syllabus and Schedule (2003 Fall)

This is a guideline on the topics to be covered in the instruction and the schedule for exams. Modification is anticipated to account for students’ interest in certain topics.

1) The nature of light: Waves and photons  
   (Aug 25, 27, 29, and Sept 3)  
   (Chapter 2 and 3)  
   Wk-1&2

2) Interaction between light and matters: Dispersion, absorption and scattering  
   (Sept 8, 10, 12, 15)  
   (Chapter 3)  
   Wk-3&4

3) The propagation of light: Transmission, reflection, refraction  
   (Sept 17, 19, 22, 24)  
   (Chapter 4)  
   Wk-4&5

4) Geometrical Optics: lenses, prism, optical fiber etc  
   (Sept 26, 29, and Oct 1, 3, 6, 8)  
   (Chapter 5)  
   Wk-6to7

5) Review and Midterm Exam  
   (Oct 10)  
   (Chapter 2 to 5)  
   Wk-7

6) Midterm Exam  (Oct 13)  
   (Chapter 2 to 5)  
   Wk-8

7) Continue on Geometrical Optics  
   (Oct 15, 17)  
   (Chapter 5)  
   Wk-8

   Physical optics:

8) The superposition of waves and Fourier analysis  
   (Oct 20, 22, 24)  
   (Chapter 7)  
   Wk-9

9) Polarization  
   (Oct 27, 29, 31 and Nov 3, 5, 7, 10, 12, 14)  
   (Chapter 8)  
   Wk-10 to 12

10) Interference  
    (Nov 17, 19, 21)  
    (Chapter 9)  
    Wk-13

11) Oral Exam  
    (Nov 20)  
    -Thanks giving Recess-

12) Diffraction  
    (Dec 1, 3, 5)  
    (Chapter 10)  
    Wk-14

13) Workshop on laser, nonlinear optics, and applications  
    (Dec 4)  
    Wk-14

14) Modern optics: laser and nonlinear optics  
    (Dec 8, 10, 12)  
    (Chapter 13)  
    Wk-15

15) Final Exam (Chapter 5, 7-10, 13): December 17, 2:45 pm to 4:45 pm