Natural Science I: Exploration of Light and Color          V55.0205  
Summer 2005         Meyer 122

Monday through Thursday, 9:45 – 11:20 a.m.

Lecturer
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Laboratory Instructor
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Course Description
We introduce the properties of light, color, optics, the anatomy of the eye and perception, to understand aspects of the human visual system. While the function of the eye is to produce a high quality image on the retina, the job of the neural tissue at the back of the eye is not image transmission to the brain, but image processing into information a person can use to navigate through their environment. We will discuss some everyday devices that use light, including optical storage media (CD’s, DVD’s and Blu-Ray Disks) and lasers. The course has a laboratory component, with experiments that demonstrate important course concepts. There will be projects on optics, a pinhole camera, a cow’s eye dissection, and color mixing and classification.

There will be one midterm exam and a cumulative final exam. Questions from the exams will be based on the lectures and homework problems. You will also need to bring a calculator and a ruler with centimeter markings to all exams.

Course texts
3. Interaction of Color, Josef Albers, Yale University Press.

Course Grade
Midterm Examination 25%  June 2, 9:45 a.m. – 11:20 a.m.
Laboratory 40%  
Final examination (cumulative) 35%  June 23, 9:45 a.m. – 11:20 a.m.

Missed Exams
There is no make-up for the midterm exam for this course. If you miss the midterm examination, for a valid reason, your grade will be based on the following allocations:

Laboratory 40%
Final examination (cumulative) 60%

Final Exam
A make-up for the final examination will be given under exceptional circumstances, which must be discussed with Prof. Adler before the examination. In this case a grade of incomplete will be assigned and the make-up will be scheduled for the Fall 2005 semester. Please avoid making travel plans before the date of the final exam.

05/18/05
Laboratory Sessions
You will have to submit a short lab report documenting your observations, data and conclusions. The lab report will be due at the following lab session after the experiment has been performed. The laboratory sessions will be held in Silver 203 and will begin the first day of class. Laboratory sessions meet at the following days and times:

<table>
<thead>
<tr>
<th>Section</th>
<th>Day</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Monday and Wednesday</td>
<td>11:30 – 1:30 p.m.</td>
</tr>
<tr>
<td>3</td>
<td>Monday and Wednesday</td>
<td>1:45 – 3:45 p.m.</td>
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Attendance
If you arrive at least 10 minutes late for the lab credit will be deducted from your lab score.

Absence Policy
Excused absences will only be given in the case of illness (with a doctor’s note) or observation of a religious holiday. All other absences will be considered unexcused and will result in a lab grade of zero.

Late Assignments
Late assignments will be penalized.

Topics
Part I of the course: Waldman, chapters 1 through 6, Livingstone, chapter 1. Electromagnetic nature of light; Wave properties of light; Wave interference; How CD’s and DVD’s work; Polarization; Image formation by a pinhole; Geometrical optics: mirrors and lenses; Photography: The camera, exposure, reciprocity, optics, f-number, developing; How lasers work.

Part II of the course: Livingstone, chapters 2 through 12; Waldman, chapters 8, 9 and 10. Albers The anatomy of the eye; the optics of the eye; Defects of the eye (nearsightedness, farsightedness, and astigmatism). The retina and how it processes light; Luminance; Visual acuity and spatial resolution; Color mixing and trichromacy; Color classifying; Simultaneous brightness contrast; Simultaneous color contrast; Color perception mechanisms. From 3-D to 2-D: perspective, shading, chiaroscuro and stereopsis; Illusions of motion; Television, movies and computer graphics.

Blackboard Class Website
There is a class website on Blackboard for this course. You can access it through your NYU Home account or by going directly to http://classes.nyu.edu. Laboratory descriptions will be posted to Blackboard.
Laboratory Schedule

Descriptions of each laboratory experiment will be posted to the Blackboard course website. Before coming to lab you will have to go to Blackboard and print out the laboratory activities and bring it with you to lab.

<table>
<thead>
<tr>
<th>Date</th>
<th>Laboratory Project</th>
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<tbody>
<tr>
<td>M May 16</td>
<td>Math Review</td>
</tr>
<tr>
<td>W May 18</td>
<td>Measuring the Wavelength of Light</td>
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<tr>
<td>M May 23</td>
<td>Spectroscopic Analysis of Light</td>
</tr>
<tr>
<td>W May 25</td>
<td>Reflection, Refraction and Dispersion</td>
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<tr>
<td>M May 30</td>
<td>Geometrical Optics</td>
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<tr>
<td>W Jun  1</td>
<td>Review for Midterm</td>
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<tr>
<td>M Jun  6</td>
<td>Polarization of Light</td>
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<td>W Jun  8</td>
<td>Bovine Eye Dissection</td>
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<tr>
<td>M Jun 13</td>
<td>Additive and Subtractive Color Mixing</td>
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<tr>
<td>W Jun 15</td>
<td>Color Contrast</td>
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<tr>
<td>M Jun 20</td>
<td>The Pinhole Camera/Telescope</td>
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<tr>
<td>W Jun 22</td>
<td>Review for Final</td>
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