



SYLLABUS

OPTI 200-001 (3 units) **Light, Color, and Vision**

MWF 2:00 pm – 2:50 pm
Meinel (a.k.a. "Optical Sciences"), Room 422

Description of Course

This course will introduce students to optical technology and phenomena, including color and vision, light in art and nature, lasers, telescopes, cameras and fiber optics. This course, designed for non-science majors, will feature demonstrations and hands-on learning, with only basic math.

Course Prerequisites or Co-requisites

Basic Math.

(Any student who has successfully completed the Math Foundations requirement is prepared for the math used in OPTI 200. The only math we use is the solution of simple, linear, algebraic equations, and y vs. x data-plotting.)

Instructor and Contact Information

Instructor

Prof. Michael Nofziger ("Dr. Mike")
Office: Meinel 412A
520-626-8363
nofziger@optics.arizona.edu
Office Hours: Thur. 1:00–3:00 pm, or by appointment (email me!)

Teaching Assistant

Matt Nero
nero@email.arizona.edu
Office Hours: (TBD...)

Course Content/Website

(All course materials, including lecture notes, are on our D2L class site for OPTI 200)

Course Format and Teaching Methods

The course will meet in-person. NOTE: ***Class format may change depending on current U of A Guidelines in regards to COVID-19.***

The course is curriculum-centered with content presentations and lectures, demos, and in-class labs.

Course Objectives

This course provides the fundamental background to understand the basic principles of the following topics (shown in no particular order!):

Light	Shadows	Plane Mirrors	Photography
Electromagnetic Radiation	Reflections	Kaleidoscopes	Eye and Vision
Properties of Waves	Refraction	Spherical Mirrors	Optical Instruments
Resonance	Optical Fibers	Spherical Lenses	Color
Artificial Lighting	Dispersion	Fresnel Lenses	Art and Optics
Light Sources	Rainbows	Magnification	Infrared
The Laser	Real vs. Virtual Images	Aberrations	UV

Expected Learning Outcomes

Upon successful completion of this course, students will:

- have a good understanding of what light is and how it is used.
- learn about various light sources.
- be able to explain how lasers work.
- understand and explain how optical images (real and virtual) are formed.
- understand the reflection, refraction, and dispersion of light.
- be able to make calculations that describe the images formed by lenses and mirrors.
- be able to trace rays of light that describe the images formed by lenses and mirrors.
- understand and explain the optics of the human eye; understand the Snellen eye chart.
- understand why we need to wear eyeglasses or contacts to correct vision.
- have an understanding of what the LASIK procedure is and does.
- understand how various optical instruments work
(telescopes, binoculars, microscopes, DVD players, pulse oximeters, etc.).
- understand the optics of photography.
- be able to explain how a digital camera works.
- have a fundamental understanding of color (additive and subtractive).
- be able to explain how rainbows are formed.
- have been introduced to the world of infrared optics.
- be able to apply the basic technology of optics in own careers!

Absence and Class Participation Policy

The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at: <http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop>

The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable,
<http://policy.arizona.edu/human-resources/religious-accommodation-policy>.

Absences pre-approved by the UA Dean of Students will be honored.
See: <https://deanofstudents.arizona.edu/absences>

Participating in the course, and attending lectures are vital to the learning process and critical to being successful in this course. Our class lectures and discussions will add information and details to our textbook and our online lecture notes. You are expected to attend each (in-class) lab session, as they cannot be made up.

To summarize: attendance is expected, but not required, at all lectures. Absences will likely affect your learning of the material, and therefore your final course grade. If you are unable to participate in class activities for whatever reason, please contact me (Dr. Mike) as soon as possible. Do ***not*** wait until the end of the semester!

COVID-19: University of Arizona's latest COVID-19 Guidelines are at: www.covid19.arizona.edu
▶ **As of 8/15/22, UA policy states: "...masks are recommended, but not required, in most indoor spaces including classrooms."**

Required Texts or Readings

- All lecture notes are available through our class D2L webpage in our "**Course Schedule**".
- Required textbooks:

Seeing the Light: Optics in Nature, Photography, Color Vision and Holography,
(Falk, Brill, and Stork) Hardcover, Publisher: John Wiley & Sons Inc.
1st ed., © 1986, 446 pages, ISBN: 0-471-60385-6 ...or...
2nd ed., © 2019, 456 pages, ISBN: 978-1-62654-109-2
Available for purchase at the UA Bookstore (either edition is fine for our course)

Optics Made Clear: The nature of light and how we use it,
(William L. Wolfe, Professor Emeritus, College of Optical Sciences)
Paperback, 264 pages, © 2007, Publisher: SPIE Press ISBN: 0819463078
Available on-line (free)! (click on "Library Tools" at our D2L page)

Required or Special Materials

Calculator (cell-phone calculator OK), Graph Paper (free online)

Assignments and Examinations: Schedule/Due Dates

Homework:

- ALL homework assignments, all DUE dates, exam schedules, lecture notes, etc. will be posted on-line at our D2L site in our "**Course Schedule**".
- Turn in your homework in class, on paper. Homework scores will be posted on D2L.
- You will have (a minimum of) one week to do each homework set.
- Late Homework submissions will be accepted, but will be graded with a penalty. (see "Late Policy" for details).
- Corrections to errors in grading will only be considered within one week following the return of the homework assignment or exam.

LATE POLICY:

All work is due by the date and time posted for that assignment, as shown on our D2L class site.

Homework will be accepted late (up to one week after it was due),
but will be graded at 50% off.

Quizzes:

- We will have one quiz per week. The quizzes will be administered and graded through our D2L class site. No paper quizzes.
- Each weekly quiz will be available on D2L from 5:00 pm (Fridays) until 11:59 pm (Sundays). Expect to spend 15-20 minutes on each quiz.
(NOTE: some of the quizzes may have a time limit, others not.)
- The purpose of the quizzes is to help you “monitor” your basic understanding of the material presented in class, as well as to encourage you to “keep up” with your learning of new material—all on a weekly basis.
- You may use your notes, textbook, etc. to do the quizzes.
- Quizzes will be graded only for ‘completion’ and not scored.
- ***Missed quizzes cannot be made up.***

Exams:

- ▶ 1 Midterm exam (50 min. in-class)
- ▶ Final exam (Friday, Dec. 9, 1:00-3:00 pm, in-class)
- ▶ *The only electronic device allowed during the exams will be a calculator.* Any student who uses any other electronic device (laptop, cell phone, cell phone camera, etc.) will receive a zero (0%) for that exam.

Scheduled Topics/Activities

See the “Class Schedule” on our D2L site for the complete list of:

- Class topics
- Lecture notes (all are password-protected; password given out on the first day of class)
- Activities
- Assignments and Due Dates, etc.

The “Class Schedule” is our day-to-day calendar for the semester.

Important Dates:

Date	Event	Comments
8/22/2022	Classes Begin	
10/10/2022	Review session for Midterm	
10/12/2022	Midterm Exam	Material through 10/10
11/24,25/2022	Thanksgiving	No Class on Wed. 11/23!
12/9/2022	Final Exam	1:00 pm – 3:00 pm

Writing Assignments:

All Tier One and Tier Two General Education Courses are intended to be writing intensive! (<https://gened.arizona.edu/course-guidelines/writing-requirement>). Our course includes the following writing assignments:

Research paper

The requirement is a 10-page paper, double-spaced, with at least 5 references. I grade these for length, spelling, grammar, technical content, and the clarity and quality of the writing. In addition to the final paper, the assignment includes the writing of (a) an outline, (b) an annotated bibliography, (c) the opening paragraph, and (d) the actual research paper plus an abstract.

The opening paragraph will be graded as a rough-draft, giving you the opportunity to re-write and re-submit it.

The research paper must be uploaded to and checked for originality by "Turnitin.com" (done through our D2L class site). Papers that are plagiarized will result in a grade of "Incomplete" (I) for the course. To receive a different grade, you will be required to submit a new research paper on a completely different topic.

Lab Notebook

The course includes a number of lab exercises and demos that we do during normal class time (in our sophomore optics teaching lab). I will give you handouts which ask you to make both general and specific written observations, to record numerical data, and to answer specific questions. Part of these activities may include basic calculations and data plotting.

As an example, after we have studied various light sources in the lab, the follow-on assignment is to go out into the world to observe and write about various light sources that you encounter. Your writing assignment is to describe the physical and spectral nature of each light source.

Journal Writing

You will be required to maintain a personal journal, making written entries on specific topics relevant to our course of study. The topics are only intended to provide a starting point—their actual writing, content, style, approach, and specifics are totally open-ended. This allows for creative writing, scientific writing, poetry, etc. Topics may change from semester to semester, but recent topics from the course have included: 'infinity', 'luminous', 'shadows', 'images', and 'color'.

You only need one notebook for the lab exercises, in-class demos, and journal writings.

Miscellaneous Writing Assignments

One assignment I normally make in this course is to have you go to the Center for Creative Photography, and make observations of the current photography exhibit. You are asked to write about 2 or 3 photographs on display, from the current exhibition. To relate to topics we've discussed in class, you are required to observe and discuss various aspects of optics in the photos (the use of light and shadows, the resolution of details, etc.)

Grading Scale and Policies:

- ▶ Homework 25%
 - ▶ In-class Labs and Demos 10%
 - ▶ Research Paper 25%
(includes all assignments relating to the research paper)
 - ▶ Journal Writing 10%
 - ▶ Midterm Exam 10%
 - ▶ Final Exam 10%
 - ▶ Quizzes 10%
- ▶ **Final grading will be done on a curve.**
- ▶ Corrections to errors in grading will only be considered within one week following the return of the homework assignment or exam.
- ▶ Extra credit, if offered to the entire class, will only be added to your Homework point total. Extra credit points can only increase your total homework score up to the maximum possible points before extra credit.

Incomplete (I) or Withdrawl (W)

“**Requests for incomplete (I) or withdrawal (W)** must be made in accordance with University policies, which are available at <http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete> and <http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal> respectively.”

(31 October) LAST DAY TO WITHDRAW FROM A CLASS ONLINE THROUGH UACCESS

Classroom Behavior Policy

“To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).”

Please refrain from disruptive conversations with people sitting around you during our class (which includes whispering with your neighbor). Students observed engaging in disruptive activity will be asked to cease this behavior. Those who continue to disrupt the class will be asked to leave the classroom. However, I strongly encourage questions during class!

Threatening Behavior Policy

“The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See <http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students>.”

Accessibility and Accommodations

“At the University of Arizona we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, <https://drc.arizona.edu>) to establish reasonable accommodations.”

Code of Academic Integrity

"Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See:

<http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity>.

The University Libraries have some excellent tips for avoiding plagiarism, available at

<http://new.library.arizona.edu/research/citing/plagiarism>.

Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor's express written consent. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions.

Additionally, students who use D2L or UA e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement."

UA Nondiscrimination and Anti-harassment Policy

"The University is committed to creating and maintaining an environment free of discrimination; see <http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy>

Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others."

Additional Resources for Students

UA Academic policies and procedures are available at <http://catalog.arizona.edu/policies>

Student Assistance and Advocacy information is available at

<http://deanofstudents.arizona.edu/student-assistance/students/student-assistance>

Confidentiality of Student Records

<http://www.registrar.arizona.edu/personal-information/family-educational-rights-and-privacy-act-1974-ferpa?topic=ferpa>

Subject to Change Statement

Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.

Honors Students

Students taking the course for Honors credit are required to include the following in their Honors contract for this course:

Required Honors Assignments:

For OPTI 200, the following activities will be required of all Honors students, assigned as part of their individualized Honors Contract:

- Give a 15minute presentation (“mini-lecture”) to the entire OPTI 200 class on your own selected topic of interest in optics. This can include:

- any topic in optics that interests you, of your choice. Research it to include 10 references, 5 from professionally-published papers. Use Power Point slides, with graphics and scientific data, to teach the class about this topic.

..... or

- If you are working in a campus lab or in a local company (in a science or engineering field), present your work in a 15-minute mini-lecture to the OPTI 200 class. Relate it to some aspect of optics. Use Power Point slides, with graphics and scientific data, to teach the class the basics of your work and how it relates to light and optics.

- All of the required lab work that everyone does.
- All of the homework that everyone does.
- The 10-page research paper (rough draft and final copy) that everyone does.
- All of the journal writing.
- The midterm and final exam.

Additional Honors Assignment (pick one):

For OPTI 200, the following activities are available to Honors students. Pick one of the following, to be assigned as part of your individualized Honors Contract:

- Attend any of the talks, seminars, etc. given in our building, throughout the semester. This can include our Friday Community Speaker Series (optics undergraduate and graduate students present talks, many Fridays at noon), and our Thursday afternoon Colloquium Lecture Series.

Write a 1-page summary of 4 presentations, including a description of the relevance and real-world application of the optics and/or technology that was discussed.

- Meet with 3 members of our faculty to learn about their research. Write a 2-page summary of each meeting, including the relevance and real-world application of the optics involved.
- Visit 3 of our research labs to interact with our students doing research. Interview each student about the work they are doing. Read a published paper from each lab that pertains to the research they are doing. Write a 2-page summary of each meeting, including connections to the published paper. Discuss the relevance and real-world application of the optics involved.
- Customize your own assignment, per the approval of the instructor.