

**SYLLABUS – Updated 1/6/26**  
**OPTI 202L (1 unit)**  
**Geometrical and Instrumental Optics Lab II**  
**Spring 2026**

**Lab Schedule:** (Room 438, Meinel)

Tuesday	Wednesday	Thursday
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2:00-4:50 pm -- sec. B	1:00-3:50 pm -- sec. D	2:00-4:50 pm -- sec. G
5:00-7:50 pm -- sec. C	5:30-8:20 pm -- sec. E	---

**Lab Lecture:** Friday, 11:00-11:50 am – Meinel, Room 410

### Description of Course

This lab course closely follows OPTI 201R, "Geometrical and Instrumental Optics". It provides hands-on experience with most of the concepts and optical instruments studied in that course. If you are majoring in Optical Sciences & Engineering, then 202L is a required course. Note that OPTI 201R is a pre-requisite for this course! This course also contains labs related to OPTI 210, "Physical Optics I."

The overall "theme" of this lab course is to reverse-engineer a variety of optical instruments, and to use your knowledge of geometrical optics to study the paraxial properties of these instruments (magnifiers, eyepieces, telescopes, microscopes, binoculars, etc.). Optical lab techniques learned in OPTI 201L will be used to do this. In addition, we will do labs on opto-mechanics and laser beam alignment, aberrations, reflecting telescopes, microscopes, scanners, diffraction gratings, optical detectors (photoconductors and photodiodes), LED's, and diode lasers.

### Course Prerequisites or Co-requisites

Students must have already taken OPTI 201R, and should be currently enrolled in OPTI 210.

### Instructor and Contact Information

**Instructor:** Prof. Michael Nofziger ("Dr. Mike")

Meinel 412A; 520-626-8363;

Office Hours: Tue. 1:00–3:00 pm or by appointment

[nofziger@optics.arizona.edu](mailto:nofziger@optics.arizona.edu)

**Graduate Teaching Assistants:** Alisha Whitehead  
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**Web information:** Course notes may be found on the D2L site for this course, OPTI 202L.

### Course Format and Teaching Methods

Weekly Labs with a weekly Lab Lecture (all in-person).

### Course Objectives

The main course objectives are to reverse-engineer a variety of optical instruments studied in OPTI 201R (telescopes, microscopes, scanners, etc.) to study first-hand their paraxial optical properties, as well as providing an introduction to material related to OPTI 210 (basic physical optics).

## Expected Learning Outcomes, & Relationship to ABET Objectives

Upon successful completion of this course, students will be able to:

- use commercial opto-mechanical hardware to do first-order alignment of laser beams
- use an alignment microscope to position and align optical elements on an optical table
- use a nodal slide to measure the cardinal points of a multi-element lens
- make optical and mechanical measurements to 'reverse-engineer' various optical instruments (refracting and reflecting telescopes, microscopes, binoculars, etc.)
- explain how various optical instruments work (eyepieces, refracting and reflecting telescopes, microscopes, binoculars, etc.)
- explain the paraxial properties of camera lenses (telephoto and zoom lenses)

### Course Policies:

UA Policies on: Absence & Class Participation, Threatening Behavior, Accessibility & Accommodations, Code of Academic Integrity (plagiarism), Nondiscrimination & Anti-Harassment, Safety on Campus & in the Classroom, Subject to Change, are all found here: <https://catalog.arizona.edu/syllabus-policies>

Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See: <https://deanofstudents.arizona.edu/policies/attendance-policies-and-practices>

**Participating in the course, and attending lectures in-person 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 textbooks and our online lecture notes.**

As such, 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.

"If you are experiencing unexpected barriers to your success in your courses, please talk with your Undergraduate Academic Advisor. To request a disability-related accommodation to this attendance policy, please contact the Disability Resource Center at (520) 621-3268 or [drc-info@email.arizona.edu](mailto:drc-info@email.arizona.edu). The Dean of Students Office is a central support resource for all students and also may be helpful. The Dean of Students Office is located in the Robert L. Nugent Building, Room 100, or call 520-621-7057."

**Plagiarism: *Plagiarism is not allowed. Period! No Exceptions!!!***

### Required Texts or Readings

- All lab handouts and class notes will be made available through our class D2L webpage.
- You are required to keep lab notes, either in a notebook or electronically.

### Required or Special Materials

None.

## Assignments and Examinations: Schedule/Due Dates

### Weekly Lab Summary:

Due *one week* after you have done the lab. The Lab Summary is due on D2L at the start of the following week's lab. Each lab handout contains specific work tasks that need to be performed, and questions that need to be answered. They generally will be marked and easy to spot, but not always. Read the handout carefully and make sure you do all of the tasks, and answer all of the questions. The weekly Lab Summary that you turn in for a grade must include the following:

- One page of writing, in your own words, that contains the following 3 sections:
  - Objectives (describe the purpose of the lab)
  - Procedures and Equipment (a general description, NO step-by-step details!)
  - Summary (what was learned)

.....plus the following sections:

- All of your "raw" data (the actual readings you and your lab partner took in lab).
- All of your "processed" data (the results you calculated based on your raw data).
- Graphs of data (if appropriate—enlarge to fit at least half of a page).
- Results of computer work (if asked for).
- Answers to all of the questions (\* or otherwise) in the lab handout.

**Lab Summaries MUST be typed and double-spaced, uploaded to D2L as a single .pdf file. Scans of hand-written Summaries will NOT be accepted. Lab Summaries MUST be written individually, in your own words. You may use data taken by your lab group, but the Lab Summary must be entirely your own work. If written as a group effort, it will be considered as plagiarism by everybody involved, and will be dealt with accordingly. (This includes a "group-written" Summary where only a few words were changed—that does NOT make it your own work.)**

### Pre- and Post-Lab Questions:

These will be clearly marked in the lab handout:

(Q1) will mark a question.

- will mark something in the lab handout that needs to be included in the post-lab report (questions, observations, findings, etc.).

*Pre-lab questions are due at the start of your week's lab session.*

*Weekly Lab Summaries are due at the start of your following week's lab session.*

**All work is to be submitted as pdf files to the appropriate D2L dropbox.**

### Final Examination or Project

There is no final exam in this course. Instead, the Final Analysis assignment takes the place of a final exam:

#### Final Analysis:

This will take the place of a traditional final exam/lab report. Identify 3 specific things that you don't understand about material covered in OPTI **201R**, OPTI 202L, and/or OPTI 210. Think critically about what it is that you don't understand about each item, and why you have had trouble understanding it. Write at least a half page for each item, explaining this.

Full credit will be earned for length (writing at least half of a page for each item), and content (the extent to which you demonstrate 'critical' thinking about your misunderstandings, NOT just complaining about something).

**Final Lab Report and the Final Analysis--due by 5pm, Wed. May 6, 2026.**

## Grading Scale and Policies

<b>Labs</b> (100 points per Lab Summary x 13 labs) (including any pre-lab and/or post-lab questions) ( <u>minus lowest score</u> ):	<b>POINTS</b>	1200
<b>Final Analysis</b>		100
	<b>TOTAL</b>	<b>1300</b>

- ***You must be present and actually do the lab in order to receive a score for that lab.***
- ***Missing Lab Summaries count as a "0".***
- "No lab makeups will occur this semester. However, everyone gets one excused absence from lab. Your lowest score for the semester will be dropped, either the absence (a 0) or your lowest lab score. This may be modified for extenuating circumstances."
- Final grading for the class will be done on a curve. If your score falls "in-between" letter grades, input from your TA will be used to assess how you performed in lab, to make a final decision on your grade.
- **LATE POLICY: All Lab Summaries are due at the start of your lab session, one week after you did that particular lab. Late material will be accepted up to a week after it was due, and will be graded at 75% off. If you miss a lab for other than the one excused absence, no Lab Summary will be accepted.**

## 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."

## Scheduled Topics/Activities

- Week 0:**      **12 January 2026**  
**NO LABS this week**  
**Lab Lecture** on Friday, Jan. 16 to get started.
- Week 1:**      **19 January 2026**  
Lab 1:      **Opto-Mechanics and Optical Alignment: An Introduction**  
Co-alignment of 2 laser beams, cube beamsplitters, kinematic mirror mounts.
- Week 2:**      **26 January 2026**  
Lab 2:      **Aberrations**  
Chromatic, Spherical, Coma, Astigmatism
- Week 3:**      **2 February 2026**  
Lab 3:      **Reflecting Telescopes**  
Optical properties of the individual mirrors and of the system.  
Angular magnification, FOV, exit pupil.
- Week 4:**      **9 February 2026**  
Lab 4:      **ZEMAX Analysis of the Maksutov Telescope**

- Week 5: 16 February 2026**  
 Lab 5: **The Golfscope ("Reverse Engineering") ...**  
 Real-world example of a Keplerian Refracting telescope with a reticle.
- Week 6: 23 February 2026**  
**The Golfscope ("Reverse Engineering") ... continued.**  
 ....complete optical prescription in ZEMAX.
- Week 7: 2 March 2026**  
 Lab 6: **Scanners**  
 Angle Doubling, Scan Patterns of Supermarket Scanners, Laser Printers, Computer Flat-Bed Scanners
- Week 8: 9 March 2026**  
**NO Labs this week: Spring Break!**
- Week 9: 16 March 2026**  
 Lab 7: **Introduction to ZEMAX: Model of the Human Eye**  
 ZEMAX model of the cornea, the lens, the relaxed eye, the accommodated eye.
- Week 10: 23 March 2026**  
 Lab 8: **The Compound Microscope**  
 Magnification of the objective, the eyepiece, and the overall system. Telecentricity. Commercial microscopes.
- Week 11: 30 March 2026**  
 Lab 9: **Introduction to Physical Optics I**  
 Basics of Interference and Diffraction
- Week 12: 6 April 2026**  
 Lab 10: **Introduction to Physical Optics II**  
 Brewster's Angle, Malus's Law, The Airy Disc
- Week 13: 13 April 2026**  
 Lab 11: **Introduction to Physical Optics III**  
 Diffraction Gratings
- Week 14: 20 April 2026**  
 Lab 12: **Introduction to Optical Devices I**  
 Photoconductors and Basic Electrical Measurements
- Week 15: 27 April 2026**  
 Lab 13: **Introduction to Optical Devices II**  
 fPhotodiodes, Solar Cells, LED's and Diode Lasers
- Week 16: 4 May 2026**  
**NO LABS—Last Week of Classes**  
**Lab #13 Report and Final Analysis due by 5pm, Wed. May 6.**
- Week 17: 11 May 2026**  
**NO LABS--FINAL EXAM Week**

### **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.