Introduction and General Comments

Course Information.

Physics 426/526

Lab: Willamette Rm 12
Times: 1:30-3:30 MW

Instructor: Hallin Wang
274 Willamette
346-4758
Office Hours: drop by

Nature of the course.

Physics 426/526 is a laboratory only course designed to familiarize students with many aspects of modern optics, laboratory electronics, and instrumentation. Each student, working as part of a team, will work through four of the experiments available in the laboratory. Teams will therefore have four three-hour laboratory sessions to complete the work on each experiment. To make effective use of the laboratory time available, students should do background preparation before coming to the laboratory.

Each team will be provided with a notebook that should be used to describe in great detail the team’s experimental work. Students should record setups employed, procedures followed, and measurements made. Carbon copies of the notebook pages used are to be left in the laboratory after each session.

Each student will be required to submit an individual report on each experiment. This report should contain:

* A statement of the experiment's objective.
* A description of each experimental subsection completed. The description should include detailed experimental schematics, procedures followed, and results obtained.
* A comparison of results obtained in the various subsections with appropriate theory.
* A rigorous estimate as to the accuracy of all measurements performed.
Course Development.

The modern optics teaching laboratory is under active development. Your comments and suggestions regarding the experimental write-ups and experimental procedures would be highly valued. May we suggest that you make notes related to possible improvements on your experimental handout and that you turn it in or a copy of it in with your joint laboratory reports.

Available Experiments.

Geometrical Optics and Polarization
Acousto- and Electro-Optic Modulators
Fiber Optics
Resonator modes of a He-Ne laser

General Hints on Optical Beam Setup.

Caution: When inserting optics into laser beams you will generate reflections. These reflections could cause eye damage. Think before you insert! Make sure that no one will be struck by the reflections before inserting the optics into the beam.

Planning. Before actually implementing an optical setup, make a drawing of the setup and work out bugs in it.

Beam Control. In any of your experiments where you must align a laser beam with some other optics or devices it is recommended that you insert a pair of mirrors to facilitate beam control. With two successive mirrors you will obtain complete control over the position and direction of the light beam.

Inserting lenses into laser beams. Simple lenses typically present the smallest aberration to light incident near their center and along their axes. To position a lenses in a laser beam so that it is aligned in this manner, first note the position of the laser beam at some distant point without the lens. Then insert the lens and move it transversely so that the laser beam is again at the originally noted position. Finally, rotate the lens so that its reflection retroreflects along the direction of the laser. Iterate the procedure until the lens has introduced no angular deflection of the laser and the lens reflections retroreflect.
Bibliography

Primary References:


Secondary References:

Optical Fiber Communications, John Senior, Prentice-Hall Intl., 1985 (TK5105.59)


Optical Waves in Crystals, Amnon Yariv and Pochi Yeh, John Wiley & Sons, 1984 (TA1677.Y37)

Note 1: In the individual laboratory write-ups, these texts will be referred to by the first author's last name.