Phys 4510 – Optics – Fall 2014

Instructor:

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Schedule:	Tu,Th 14:00 - 15:15, Duane G2B41
Office hour:	M 16:00 - 17:00, or by appointment

TA/grader:

Sven Dönges:

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Kyoung-Duck Park:

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Office hour:	W 09:00 - 10:00, or by appointment

Reading:
Required text: Eugene Hecht, Optics, 4th edition preferred, but older editions will do just fine. See www.bookfinder.com and you get copies of the 3rd edition from 1998, or the 2nd edition from 1987 real cheap.
Additional reading:
Grant R. Fowles, Introduction to Modern Optics (1st or 2nd edition), a real classic, I highly recommend to get a copy as well, copyright has long expired and you get this book for just a few $ new or used.
Born & Wolf, Principles of Optics (an all time classic, excellent reference book)
Saleh & Teich, Fundamentals of Photonics (good text with a stronger focus on applications)

Prerequisite: You should have a basic understanding of electrodynamics.

Clicker: No
Website: http://nano-optics.colorado.edu/index.php?id=56

Syllabus: In this course we will discuss the fundamental concepts of optics. This includes classical optics from a practical perspective (lenses, telescope, polarizer, etc.) as well as fundamental concept of light-matter interaction and spectroscopy of atoms, molecules, and solids. We will proceed as follows:
– Light as an electromagnetic wave.
– Coherence, interference, diffraction.
– Light-matter interaction and optics of solids.
– Thermal radiation and light quanta.
– Optical spectra of atoms and molecules.
– Laser, nonlinear optics.

Schedule: In addition to the in class lecture, we will do some hands on experiments. This will be scheduled as we go along. We will use the advanced physics undergraduate lab, or I will bring equipment to the class room.
As part of the class we will have at least one excursion to an optics company in Boulder to see development and manufacturing process of advanced optical components and coatings.
Unfortunately, I will be on conference and other business travel several times this semester. The TA's and postdocs of my group will substitute for me. I will have all lectures and homework assignments prepared

for them. While I apologize for the undesired disruption this brings with it, it is a good experience for you to see how different instructors present related scholarly material.

Homework: The homework problems are designed to strengthen your grasp of the fundamentals and to encourage further reading. One problem set will be handed out each week, on Tuesday, and is due one week later before class. Some problems require use of computational tools (e.g., Matlab, Mathematica). You are encouraged to collaborate but must submit your own solution. You can drop the problem set with the lowest score.

Term paper and presentation: Instead of the final exam we will have a term paper with in-class presentation. This will allow you to explore a specific topic in greater depth. The writeup should be about 10 page (details will be defined in class), and you will lecture for 15 minutes in class.

Grading: Midterm: 30%; Homework:30%, Term paper with presentation: 40%

Important dates:

Midterm:	Tu, October 27, during class hours
Term paper proposal ($\sim$ 1 page outline):	November 10
In class presentation:	last few weeks of class.
Term paper due date:	December 18.

Requirements for term paper: Your term paper will be graded on: (1) its scientific merit; (2) organization and content; (3) clear and accurate writing; and, (4) your level of understanding of the physics you present. We aim for a well-thought-out, well-written, and well-conceived paper. Some basic suggestions:

1. Use diagrams and pictures to simplify your work and to enable the reader to come to an easier understanding of the material. They should be simple and well labeled. The content or meaning of a graph or picture with its figure caption should be self-explanatory.

2. Footnote and endnote your sources. Advances in scientific knowledge and understanding often come from rephrasing and reorganizing ideas presented by other authors. Use your own words, based on your own understanding, credited to the appropriate source.

3. Your paper should have a title page, an abstract, a table of contents, the primary text, and a bibliography. Number pages. Please use 12 pt roman typeface, 1.1 line spacing (you will like it).

Requirements for the term paper presentation:

1. Use electronic slides (e.g., ppt, pdf). Sometimes more but less dense slides are adequate. Overall 8-10 should do.

2. Use graphs and pictures and key words but not long wordy sentences. Limit the number of equations, highlight the relevant relation, and walk the audience through carefully.

3. Clearly explain the underlying and basic science behind your work. Think: 'would I understand what I am taking about if I would hear it for the first time?' Not: If you can not convince your audience – confuse it ;-)

4. 'Less can be more': Limit your talk to the essence of your project. No more than 20 minutes per presentation. Don't try to speak faster to compensate a lack of time - speak more thoughtfully.

5. And for the audience: if you don't understand what the speaker is trying to explain or if you simply missed a point: ask a question.