

Nanoscience and nanotechnology

Instructor: Oksana Ostroverkhova, oksana@science.oregonstate.edu

Textbook: *no official textbook, but lecture notes, papers, and references*

References:

1. Semiconductor Optics and Transport Phenomena, W. Schafer and M. Wegener, Springer (2002)
2. Solid State Theory: an introduction, U. Rossler, Springer (2004)
3. Principles of nano-optics, L. Novotny and B. Hecht, Cambridge press, 2nd Ed. (2012).
4. Nanoscience, edited by C. Dupas, P. Houdy, and M. Lahmani, Springer (2007).
5. Semiconductor Optics, C. Klingshirn, Springer, 4th Ed. (2012).
6. Optical processes in semiconductors, J. Pankove, Dover (2010).
7. Optical properties of solids, M. Fox, Oxford University Press (2010)

Office hours: Weniger 413, upon request or stop by as needed

Course outline:

Semiconductors: bulk vs nanostructures (wells, wires, dots)	week 1-2
Transport and optical phenomena in bulk semiconductors and low-dimensional structures	week 2-3
Semiconductor optoelectronic devices: photodiodes, solar cells, LEDs, lasers	week 4-5
Metals: bulk vs nanoparticles	week 5-6
Molecules, carbon nanotubes, graphene	week 7-8
Nanofabrication, scanning microscopy (AFM, STM,...)	week 9
Advanced electron and optical microscopy	week 9-10

Homework:

Homework will be handed out every week. Solutions should be turned in at the beginning of the lecture on the due date, unless specified otherwise.

Paper:

Everyone will be expected to write a ~10-15-page paper reviewing a particular topic relevant to modern research in nanoscience and nanotechnology. List of suggested topics to choose from is provided, but you can choose any nanoscience-related topic (e.g. that is related to your research, just not too closely related). Please let me know the topic of your paper by the end of week 3. The paper should be organized as follows: abstract, introduction, theoretical background, materials and experiments, results, discussion, conclusions, references. The paper should present a self-contained overview of the topic of your choice (background material, exciting experiments or calculations, status of the field as of now, and potential applications). The paper will be due on Wednesday, December 3.

Exam:

We will have a take-home final exam during the week of December 8. The exam will include: 1) a new paper to read and answer questions, 2) a question related to some of the papers assigned throughout the course, and 3) an individual question on the paper you wrote.

Grading Policy:

Homework (total)	30%
Paper	40%
Final	30%