

16:332:591:01 Optoelectronics I

Fall 2012

Instructor: Dr. Wei Jiang
Time: T.Th 6:40pm-8:00pm
Classroom: EE 240
Office Hours: T.Th 4-5pm (or by appointment), EE 215
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Prerequisites: 332:580 Electromagnetic waves and 332:583 semiconductor devices or solid state electronics (please contact the instructor if you are not sure).

Course Description: Waveguides and optical fibers, optical resonators, principles of laser action, light emitting diodes, semiconductor lasers, other lasers, optical amplifiers, optical modulators and switches, photodetectors, wavelength-division-multiplexing (brief), solar cell (brief), and other optical devices.

Homework: Homework and exams will be based on class notes, which will be available in pdf version on the class web site. Additional research papers and reports may be given as "supplemental reading".

Week-by-Week Syllabus

- Week 1:** Introduction and Applications; Optical waveguides
- Week 2:** Optical waveguides & fibers;
- Week 3:** Basics of quantum mechanics
- Week 4:** Basics of semiconductor physics and materials
- Week 5:** Review 1; EXAM 1
- Week 6:** Optical Amplifiers
- Week 7:** Optical Resonators and optical gain
- Week 8:** Lasers: Threshold conditions & fundamental device characteristics
- Week 9:** LEDs & Various types of lasers
- Week 10:** Modulators: Internal modulation; external modulators (Mach-Zehnder etc)
- Week 11:** Electroabsorption modulators; optical switches; Review 2
- Week 12:** EXAM 2 (no class on Thur for Thanksgiving)
- Week 13:** Photo-detectors: basic physics, noise; Various types: (PIN, MSM, APD)
- Week 14:** Other devices (e.g. Wavelength-division-multiplexing, Solar cell--brief)
- Week 15:** Review for final exam

Textbooks

(just for references, all materials will be covered in lectures notes and posted on the course website* <http://sakai.rutgers.edu>)

- B. E. A. Saleh & M. C. Teich, Fundamentals of Photonics, Wiley-Interscience, 2nd edition (2007), ISBN 0471358320. (primary text)
- Pallab Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall; 2nd edition (1996), ISBN 0134956567.
- Amnon Yariv, Quantum Electronics, Wiley, ISBN 0471609978.

Assignments: 5 homeworks. 2 exams and 1 final (instructor will provide formula sheets).

*Tentatively, notes are placed at <http://www.ece.rutgers.edu/~wjiangnj>

Note: this course will be collocated with 14:332:466 Optoelectronic Devices