Instructor: Prof. Wei Jiang  
Time & Place: T.Th 6:40pm-8:00pm; EE 240  
Office Hours: T.Th 4-5pm (or by appointment), EE 215  
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Course Catalog Description: 14:332:466 Optoelectronic Devices (3)  
Pre-Requisite Courses: 14:332:361 Electronic Devices, 14:332:382 Electromagnetic Fields;  
(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. A mini-lab session is designed to offer hands-on experience.

Homework: Homework and exams will be based on class notes, which will be available in pdf  
version on the class web site. Note: this course is collocated with 16:332:591. However,  
homework and exam problems will be different for undergraduate and graduate sections of this  
course.

Textbook & Materials:  
- All teaching materials will be covered in lectures notes and will be posted on the course  
  website at http://sakai.rutgers.edu

References:  
- S. O. Kasap, Optoelectronics and photonics: principles and practices, Prentice-Hall,  
- Pallab Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall; 2nd edition  

Overall Educational Objective: To introduce the students to basics of optoelectronic devices,  
which are appearing everywhere in our daily life, including lasers, LEDs, optical fibers and fiber-  
optic communication devices, LCDs, photodetectors (including CCD image sensors), and solar  
cells. The emphasis is placed on the basic device structures, operating principles, and real-  
world application (Blu-ray discs, Fiber-To-The-Home, LED lighting, etc.). One mini-lab will be  
included for undergraduates to gain hands-on experiences.

Week-by-Week Syllabus  
Week 1: Introduction and Applications of Optoelectronics  
Week 2: Basics of EM waves  
Week 3: Waveguides, optical fibers and their applications: Fiber-to-the-home (FTTH)  
Week 4: Basics of quantum mechanics; semiconductor physics and materials  
Week 5: Fundamentals of optical transitions. Optical Amplifiers  
Week 6: Optical Resonators & Lasers: Threshold conditions  
Week 7: LED designs and applications: lighting and display. Other display: LCD, etc. (brief)  
Week 8: Semiconductor lasers: fundamental device structures and characteristics  
Week 9: Various types of lasers;
Week 10: Applications of Lasers: Blu-ray discs & medicine, etc., Mini-lab: laser measurements;
Week 11: Modulators: Internal modulation; external modulators (Mach-Zehnder etc)
Week 12: Electroabsorption modulators; optical switches;
Week 13: Photo-detectors: basic physics, noise; Various types; CCD cameras.
Week 14: Other devices (e.g. Wavelength-division-multiplexing)
Week 15: Solar cell; Review for final exam

Computer Usage: Simulations using MATLAB.
Laboratory Experiences: There is a laboratory session.