EE 232 Lightwave Devices
-- Course Logistics

Instructor: Ming C. Wu

University of California, Berkeley
Electrical Engineering and Computer Sciences Dept.

Course Objective

- This course is designed to give an introduction and overview of the fundamentals of optoelectronic devices
  - Light-matter interaction in semiconductors
- Topics such as optical gain and absorption spectra, quantization effects, strained quantum wells, optical waveguiding and coupling, and hetero p-n junction will be covered.
- This course will focus on basic physics and design principles of semiconductor diode lasers, light emitting diodes, photodetectors and integrated optics.
- Practical applications of the devices will be also discussed.

Course Information

- Websites:
  - **Course website**: lecture notes, HW assignments
  - **bCourses**: HW and exam solutions and all grades
  - **Piazza**: Discussion, Q&A
- Instructor:
  - Professor Ming C. Wu, wu@eecs.berkeley.edu
  - OH: Tue 2-3 pm @ 511 Sutardja Dai Hall
  - Lecture: Tue/Thu 12:30 to 2:00 pm @ 293 Cory
- GSI:
  - Niciolas Andrade, nicolas_andrade@berkeley.edu
  - OH: TBD
  - Discussion: Wed,. 4:00 to 5:00 pm @ 228 Dwinelle

About Me


1988 PhD
UC Berkeley
2004 - now
UC Berkeley
1993-2004
UCLA
1988-1992
AT&T Bell Labs
United States
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NM
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VA
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TX
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Textbooks

- Textbook
  - S.L. Chuang, Physics of Photonic Devices, 2nd Edition, John Wiley and Sons, 2009
- Reference Books (on reserve at Engineering Library)
  - Yariv & Yeh, Photonics: Optical Electronics in Modern Communications, Oxford University Press, 2006
  - L A Coldren; S W Corzine; Milan Mashanovitch, Diode Lasers and Photonic Integrated Circuits, John Wiley & Sons, 2012
  - D.A.B. Miller, Quantum Mechanics for Scientists and Engineers, Cambridge University Press, 2008.
  - Saleh & Teich, Fundamentals of Photonics, 2nd Ed. Wiley, 2007
  - [Reference for discussion session] Lukas Chrostowski and Michael Hochberg. Silicon Photonics Design: From Devices to Systems. Cambridge University Press, 2015.

Prerequisites

- EECS 130:
  - Simple p-n junction, semiconductor physics, concept of energy bands, Fermi levels.
- PHYS 137A:
  - recommended. Basic concept of quantum mechanics, perturbation theory
- EECS 117:
  - recommended. Concept of dielectric waveguide, electromagnetic waves.

Grading

- Grade calculation:
  - Participation 10%
  - Homework 20%
  - Midterm 20%
  - Final Exam 25%
  - Final Project 25%
- Two exams:
  - **Midterm** will be in class, ~ week 7
  - **Final exam** will take place on the last day of class (**Thursday, April 30th**).

Homework

- Homework will be assigned roughly every two weeks.
- It will be announced in class and posted on class website. Submission is through uploading in bCourses.
- Homework will be self-graded (spot check by GSI). Solution and rubric will be posted in bCourses.
- Discussion and collaboration are permitted, but you must write your own derivations and do your own calculations.

Discussion Session

- Semester-long tutorial on photonic simulation using Lumerical software (https://www.lumerical.com/)
  - Each student will be given license to install software on personal computer. License dictates that software should only be used for this course
  - Bring your laptop to discussion
- Learning goals
  - Become familiar with simulation best-practices
  - Visualize concepts learned in lecture
  - Learn new material that we do not have to cover in lecture (in particular, passive components)
  - Software is required for final project

Final Project

- Comprehensive exercise of what you learned in this course
  - You will analyze an optoelectronic device of your choice, using the techniques and tools covered in this course.
  - You do not need to invent a new device (though you are welcome to)
  - You can analyze structures published in the literature and extend, elaborate, or improve upon the published result
- Deliverable:
  - **3-4 page paper** (Due May 11th, Monday) in the format of a journal paper (Template for Optica). You will be the sole author of your paper. You can list others you have discussed with in the Acknowledgment section.
  - **Lightening talk** (in RRR week) with 3-minute presentation and 3-minute Q&A.