ECE304 Introduction to Photonics Fall 2025

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Description: Introduction to active and passive photonic devices and applications: optical processes in semiconductor and dielectric materials including electrical junctions, light emission and absorption, and waveguide confinement; photonic components such as light emitting diodes, lasers, photodetectors, solar cells, liquid crystals, and optical fiber; optical information distribution networks and display applications. The cellular phone and the associated information distribution systems introduce and motivate the study of photonic devices.

Box: See "Lectures and Notes" for slides, reading assignments, and homework.

Supplementary texts: R. Quimby, *Photonics and Lasers* (Wiley 2006)
R. Pierret, *Semiconductor Device Fundamentals* (Addison Wesley 1996)

Grading:			
	Homework	10%	Due one week after assigned
	Six in-class quizzes	60% total, 10% each	
	Final Exam	30%	

Syllabus:

1) Introduction
   - Photonics in smart phones
   - Information networks
2) Electrons in solids
   - Energy bands
   - Charge carriers
3) Interaction between light & semicond.
   - Absorption
   - Emission
4) Semiconductor P/N junctions
   - Built-in potential
   - Forward & reverse bias
5) Diode photonics: detectors
   - Photodetectors
   - Solar cells
6) Diode photonics: emitters
   - LEDs
   - White lighting & display
7) Semiconductor laser diodes
   - Lasing threshold
   - Light confinement
8) Optical fiber
   - Optical modes and V-parameter
   - Fiber loss & dispersion
9) Optical networks:
   - Modulation & multiplexing
   - Photonic integrated circuits

Assignments & due dates:

Homework#1	Friday Sept 5
Quiz #1	Friday Sept 12
Homework#2	Monday Sept 22
Homework#3	Monday Sept 29
Quiz #2	Wed. Oct. 1
Homework#4	Monday Oct. 13
Quiz #3	Wed. Oct. 15
Homework#5	Friday Oct. 24
Homework#6	Friday Oct. 31
Quiz #4	Monday Nov. 3
Homework#7	Friday Nov 14
Quiz #5	Friday Nov 21
Homework#8	Friday Dec. 5
Quiz #6	Monday Dec. 8
Final Exam	Thurs Dec 18 @ 1:30-4:30pm