

ECE304 Introduction to Photonics Fall 2026

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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 4
Quiz #1	Friday Sept 11
Homework#2	Monday Sept 21
Homework#3	Monday Sept 28
Quiz #2	Wed. Sept. 30
Homework#4	Monday Oct. 12
Quiz #3	Wed. Oct. 14
Homework#5	Friday Oct. 23
Homework#6	Friday Oct. 30
Quiz #4	Monday Nov. 2
Homework#7	Friday Nov 13
Quiz #5	Friday Nov 20
Homework#8	Friday Dec. 4
Quiz #6	Monday Dec. 7
Final Exam	Thurs Dec 17 @ 1:30-4:30pm