ECE 574 OPTICAL PROPERTIES IN SOLIDS
Spring 2022

Electrical & Computer ENGINEERING

Colorado State University

Instructor:	Prof. Carmen S. Menoni
Class Schedule:	Monday and Wednesday, 5-6.15 PM – ENGR B105
Office:	Engineering EC101E and ERC B325, tel: 491.8659
Office Hours:	By appointment – send a message to Prof. Menoni to arrange to meet
Text:	Optical Properties of Solids, Mark Fox, Oxford University Press
	Notes from the instructor. All class material is on CANVAS
Course description:	Basic optical phenomena in solids, linear and nonlinear optical properties
Course credits:	3
Prerequisites:	PH441 with a C-or better, or equivalent – (only applies to undergraduates)

Grading:	*In class midterm	40%
	*Journal paper reading and discussion	15%
	*In-class problem solving & Labs	15%
	*Research Paper/Project	30% (written report and oral presentation)

- **Papers** will be assigned during the course and students will present them in class. The presentation will be 10 minutes long.
- **In-class problem solving**: Regularly after a chapter is covered, there will be a problem solving session in-class. Students will be asked to discuss a particular problem within the set. Submission of the solutions in canvas is required. The grading is mainly based on the presentation in class. There are some weeks in which a lab will be conducted instead of problem solving.
- Research paper/project: Each student will pick a paper of interest to critique. To earn the full grade students submit a written paper and deliver a 10 min oral presentation in class.
- **Snow days**: Classes which are canceled due to snow, will need to be recovered.
- Emails to Prof. Menoni: please use as heading ECE 574 – carmen.menoni@colostate.edu

All electronic devices must be turned off during the class period.

Course Outline	
I) Optical materials	Characteristics optical physics of the solid state
II) Basic Concepts of the Optical response	The oscillator model Kramer-Kronig relations Dispersion Optical anisotropy Experimental techniques to determine optical constants
III) Linear optical properties of materials	Semiconductors, 3D and low dimension Dielectrics and metals Excitons
IV) Emission	Luminescence, Photoluminescence, Electro-luminescence
V) Polarization and electric/magnetic field effects	Frank-Keldish effect – DC Stark effect – Kerr effect – Faraday effect – Magneto-optics effect
VI) Nonlinear response and multiphoton processes	Two photon spectroscopy Light scattering Photoelectron spectroscopy
VII) Optical processes of impurity atoms in solids	Laser crystals NV centers
VIII) Light-matter interactions	Ultrashort pulse laser-matter interactions
IX) Current topics	Laser Fusion: intense light/matter interactions