EE 574 OPTICAL PROPERTIES IN SOLIDS
Spring 2016
Instructor: Prof. Carmen S. Menoni (Carmen.menoni@colostate.edu)
Class Schedule: Tue and Thurs 12:30-1:45 PM – ENGR B4
Office: Engineering EC101E and ERC B325, tel: 491.8659
Office Hours: TBA or by appointment
Text: Optical Properties of Solids, Mark Fox, Oxford University Press
Class Webpage: www.engr.colostate.edu/ECE574/
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)
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
Plasma resonance
Dispersion
Optical anisotropy
Experimental techniques to determine optical constants
III) Linear optical properties of bulk semiconductor materials
Linear optical properties of low dimension semiconductor materials
Excitons
IV) Luminescence
Photoluminescence
Electroluminescence
V) Polarization and electric/magnetic-field effects
Frank-Keldish effect; DC-Stark effect
Kerr Effect
Faraday Effect
Magneto-optics effects
VI) Nonlinear responses and multiphoton processes
Two-photon spectroscopy
Light scattering
Inner-shell interactions: electrons and synchrotron radiation
Photoelectron spectroscopy
Photo-induced structural changes
VII) Processes involving coherent radiation
Photon-Photon interaction: Amplification, Harmonic Generation, Multi-photon absorption, Frequency Mixing
Photon-phonon interactions: Raman and Brillouin scattering, stimulated Raman effect
VIII) Matter-light interaction in soft and biological materials
IX) Laser crystal materials
X) Current topics
Grading: In class midterm 30%
Comprehensive Final 30%
*Discussion of papers in class 10%
*In-class problem solving 10%
Research Paper 20% (written report and oral presentation)

*Papers will be assigned to you during the course, which you then will present in class in a 10 minute presentation.
*In-class problem solving: Regularly after a chapter is covered, there will be problem session in-class. This is mainly individual work, although group discussions are encouraged.
As part of her professional obligations, Prof. Menoni has travel scheduled during the semester. A schedule will be provided every month. When needed Prof. Menoni will use Go-To-Meeting to deliver the class via the web.
Emails to Prof. Menoni: please use as heading ECE 574
All electronic devices must be turned off during the class period.