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.
<table>
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<th>Course Outline</th>
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<td>I) Optical materials</td>
<td>Characteristics optical physics of the solid state</td>
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| 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                  |