**ENEE 486/ ENEE 648D Optoelectronics Lab, Fall 2021**

**Course description**

This course will introduce you to basic concepts in physical optics (refraction, reflection, image formation and diffraction) and will steer you to modern concepts in photonics such as detectors, photovoltaic cells, LED’s, semiconductor lasers, displays, modulators, spectrometers and fiber optics communication. Each experiment will be introduced by a 1 hour lecture followed by an afternoon laboratory.

This course is accessible to both senior undergraduates and 1st year graduate students who want to sharpen their skills in experimental optics. Graduate students will be offered advanced topics for half of the 10 proposed experimental labs.

Prerequisites: ENEE 380 and 381 or similar E&M classes.

The goal of this course is to provide students with hands on experience in performing measurements in physical optics and electro-optics.

**Time:** W 10:00 am -10.50 am Tutorials EGR0108

 W 2:00 pm - 5:00 pm Labs A.V. Williams Building

**Instructor:** Mario Dagenais

**Office:** Kim Building, Rm 2128, x5-3684; dage@umd.edu

**Office Hours:** W 5:30 pm-6:30 pm or by appointment

**Class TA:** ; email:

**Homepage:**

<http://www.elms.umd.edu/>

**Method of Grading:**

The class will be divided in 4 groups of 3 people. Each group will complete 10 experiments during the semester. Laboratory report will be submitted within one week after each experiment. Pre-labs exercises are mandatory and the students will hand out their pre-labs at the start of each laboratory class. They will count for 20 % of the lab report grade. The overall grade for the class will be based on laboratory reports (60 %), two tests (30 %) and class participation (10%).

**Lab Reports:**

1. Neatness and organization count
2. computer generated reports are expected

**2**.      Each section should follow the lab description order and should have:

**a**. A brief introduction (one or two sentences about what is the goal

of this part of the experiment)

**b**. Brief description of measurements performed.

Data should be in the form of neat tables, graphs and sketches.

**DO NOT HAND IN YOUR ORIGINAL DATA SCRAP SHEETS!!!**

Whenever you have data that can be plotted, make a graph. Make sure that you

label the axes.

Plot all graphs using a computer.

Make an estimate of experimental errors, if possible.

**c.** Compare the experimental results with theory (using two plots on a graph)

whenever it is appropriate, or doing a separate calculation.

Discuss the results –is there agreement with theory?

How good is it? If there is disagreement with theory provide a

plausible explanation. Remember that each experiment has previously been done by many previous generations of students and TAs and that good results can be obtained with the supplied equipment.

**3.** OverallConclusion: Summarize your results, succinctly describe what you have learned,

describe how the experiment can be improved.

**Exams:**

Mid-term Exam: October ??, 2021

Final Exam: Dec ??, 2021

**Textbook:**

No textbook are required. Detailed class notes are supplied.

**Reference texts:**

1. “Optics”, E. Hecht, (Addison Wesley, 680 pp., (2001, 4th edition), ISBN 0805385665.
2. “Fundamentals of Photonics”, B.E.A. Saleh and M.C. Teich (Wiley, 2007, ISBN 978-0-471-35832-9) 1177 pages.
3. “Lasers and Electro-Optics”, C. Davis (Cambidge University Press, Second Edition, 2014, ISBN-13: 978-0521860291) 882 pages.

**List of Experiments:**

1. Refraction
2. Reflection
3. Diffraction
4. Image formation
5. Transmission gratings and acousto-optic modulators
6. Reflection gratings and spectroscopy
7. Light detectors and photovoltaic cells
8. Optical Sources
9. Fiber Optics
10. Polarization and liquid crystal modulators