Spring 2023

The Pennsylvania State University

EE 497

APPLIED OPTICS AND SPECTROSCOPY

Course Overview: This class will broadly cover the topic of applied spectroscopy from the perspective of electrical engineering and optical engineering. The topics in this course will be presented in several ways including traditional lectures, in class labs, instruction via students, and guest lectures presented by other faculty. The goal of this course is to prepare students to undertake spectroscopic experiments on their own or under the observation of a senior researcher. Student understanding of material will be assessed via class participation, homework, a final project, and a midterm exam.

Class Time and location: Tu Th 12:05PM - 1:20PM in Elec Eng West 304

Instructor: Laurel O'Neill (they/them), ajo5182@psu.edu

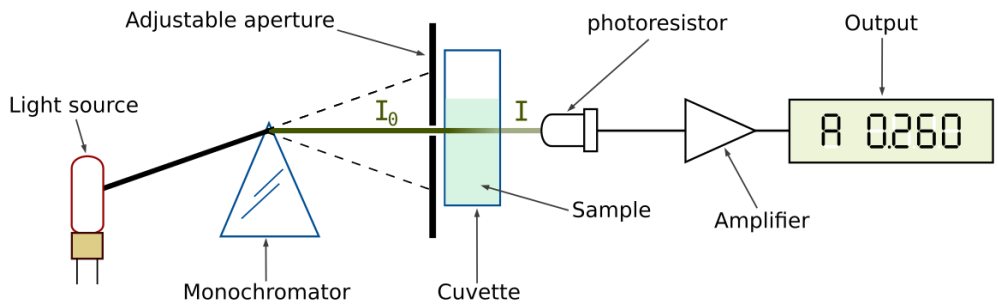
Helpers: Tim Kane (he/him), 3-8727, tjk7@psu.edu

Resources*: *"Modern Spectroscopy"* by Hollas

SPIE "Field Guide to Spectroscopy" by David W. Ball

- *Download from a Penn State computer (Physical Copy: https://spie.org/Publications/Book/682726)*

Office Hours: Laurel ONeill: W 1:00-2:30 and by appointment in 213 EE East
Tim Kane: M,F 1:30-3:00 213 EE East



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* Additional Reading: Optics Experiments and Demonstrations for Student Laboratories: Principles, methods and applications

Course Requirements and Grading Policy:

Homework and Labs (25%):

Labs: Labs will be conducted in the classroom. Labs will be completed using a packet that explains the lab and has associated questions. Labs will be able to be completed during the class period. Any material not completed during class will be treated as homework and must be turned in before the start of the next lab.

Problem Sets: There will be five "problem sets" assigned throughout the semester. The emphasis on the assignments is the application of class materials, not mindless calculations.

Biweekly Class Presentations: Every other week you will be required to give a 5-10 minute presentation to the class on a scientific paper of your choice. The paper must be broadly on the topic of spectroscopy. This can include applications, development of spectrometers, sources, or any other semi-relevant topic. The paper you are presenting on, and the presentation must be uploaded to canvas the Wednesday before the presentation.

Paper/Presentation 1	01/18	01/19
Paper/Presentation 2	02/01	02/02
Paper/Presentation 3	02/15	02/16
Paper/Presentation 4	03/01	03/02
Exam 03/16 no presentation		
Paper/Presentation 5	03/29	03/30
Paper/Presentation 6	04/12	04/13

Midterm (25%):

The midterm will take place in two parts during a planned lab day. You will perform and explain a simple experiment and then answer three questions about it. The goal of this assessment is to gauge your comfort with the techniques we have discussed as well as to assess your understanding of the physics of the technique.

Final Project and Presentation (25%):

The final project is in place of an exam. This is an opportunity to really show that you have learned something in this course. Examples of acceptable projects include a literature review on a topic of interest to you, conducting an experiment you designed and developed and then writing about it. The written portion is expected to be no less than ten pages, but less than fifteen pages. This includes figures and tables. The bibliography does not count towards the page length. A final project proposal will be submitted five weeks before the presentation. This is to ensure that you have begun to think about your final project before the week that it is due.

Participation (25%):

Class participation includes bringing up questions, answering questions posed by instructors or students, actively participating in discussions, and attending office hours. If in the case one has a disability of any kind that makes this unnecessarily challenging, accommodations will be made.

Topics:

- Geometric Optics
- Light Matter Interactions
- Lasers and other Light sources
- Common Spectrometer Designs and Topologies
- Inversion Techniques in Spectroscopy
- Absorbance Spectroscopy
- Transmission Spectroscopy
- Fourier Transform Infrared Spectroscopy
- Fluorescence Spectroscopy
- Raman Spectroscopy
- Atomic Emission Spectroscopy
- Cavity Ringdown Spectroscopy

Engineering
https://www.engr.psu.edu/explore-engineering-majors/index.aspx

Engineering Peer Advising Leaders (EPALs)
EPALS are a cohort of upper-class College of Engineering students who offer technical and advising support to first and second year students who are exploring majors within the College of Engineering. EPALs provide a peer to peer exchange of accurate information to first and second year students, which allows for both parties to engage with the college in meaningful ways. They have gone through training and are ready to assist you.

Writing
Writing Reports: https://sites.psu.edu/scientificwriting/tutorial-reports/
Writing Job Emails: https://sites.psu.edu/scientificwriting/tutorial-emails/

Academic Integrity
Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. Academic integrity is a basic guiding principle for all academic activity at The Pennsylvania State University, and all members of the University community are expected to act in accordance with this principle. Consistent with this expectation, the University's Code of Conduct states that all students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts. Academic integrity includes a commitment by all members of the University community not to engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty violate the fundamental ethical principles of the University community and compromise the worth of work completed by others.

Accommodating Students with Disabilities
Penn State welcomes students with disabilities into the University's educational programs. Every Penn State campus has an office for students with disabilities. Student Disability Resources (SDR) website provides contact information for every Penn State campus. For further information, please visit Student Disability Resources website. In order to receive consideration for reasonable accommodations, you must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: See documentation guidelines. If the documentation supports your request for reasonable accommodations, your campus disability services office will provide you with an accommodation letter. Please share this letter with instructors and discuss the accommodations with them as early as possible. You do this every semester you request accommodations.

Counseling and Psychological Services
Many students at Penn State face personal challenges or have psychological needs that may interfere with their academic progress, social development, or emotional wellbeing. The university offers a variety of confidential services to help you through difficult times, including individual and group counseling, crisis intervention, consultations, online chats, and mental health screenings. These services embrace a philosophy respectful of clients' cultural and religious backgrounds, and sensitive to differences in race, ability, gender identity and sexual orientation.
Counseling and Psychological Services at University Park (CAPS): 814-863-0395
Counseling and Psychological Services at Commonwealth Campuses
Penn State Crisis Line (24 hours/7 days/week): 877-229-6400
Crisis Text Line (24 hours/7 days/week): Text LIONS to 741741

Educational Equity/Reporting Bias
Penn State takes great pride to foster a diverse and inclusive environment for students, faculty, and staff. Acts of intolerance, discrimination, or harassment due to age, ancestry, color, disability, gender, gender identity, national origin, race, religious belief, sexual orientation, or veteran status are not tolerated and can be reported through Educational Equity via the Report Bias webpage.

Safer People Safer Places Network: Members
We are members of the Penn State Safer People Safer Places Network and are available to listen and support you in a safe and private manner. As network members, we can help you connect with resources on campus to address problems you may face that interfere with your academic and social success on campus as it relates to issues surrounding sexual and gender diversity. Our goal is to help you be successful and to maintain a safe and equitable campus. For more information visit the Penn State Center for Sexual and Gender Diversity in LL011 HUB-Robeson Center or at: https://studentaffairs.psu.edu/csgd