Syllabus for Chemistry 43400

Physical Chemistry Laboratory II
Fall Semester, 2016

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Teaching Assistants: Abed Haddad and Julien Lombardi

Lecture: Friday 12:00 – 12:50 am, MR1026
Lab: Friday 1:00 – 5:50 pm, MR1023

Office hours by appointment.

Course: CHEM 43400
Course title: Physical Chemistry and Chemical Instrumentation Laboratory II
Designation: Required course

Catalog Description:
This course will introduce students to experimental methods in physical chemistry, instrumental analysis and the principles and applications of chemical instrumentation. The course will acquaint the student the behavior of real chemical systems, the theory of the chemical phenomenon under observation and the design and methodology of measurement systems to detect the chemical phenomenon.

Prerequisites: CHEM 33000, 33100, 33200 or departmental approval
Special Consideration: Fall semester only

Hours/Credits: 1 hour lecture per week, 5 hours lab per week, 3 cr.
Lecture and lab is given once per week.
This course is counted as a writing course (W) to partially fulfill the elective-level course requirement.

Textbook: None. Extensive original literature searching and retrieval is necessary for the laboratory reports.

Course objectives:
This course follows in a sequence of Physical Chemistry I and II and Physical Chemistry Laboratory I. Chemistry 43400 is a requirement for the chemistry major-standard option. Students will be introduced to advanced instrumentation, such as infrared absorption spectroscopy, ultraviolet-visible spectroscopy, surface enhanced Raman spectroscopy, and X-ray diffraction. The laboratory experiments will be focused on the interpretation of spectra, and diffraction patterns in order to understand electronic and vibrational energy levels within molecules, and symmetry and structures in solid state crystalline materials, respectively. Students will be able to present their experiments including results and discussion in formal laboratory reports written in the style of professional scientific journals.

After completing this course, students should be able to:	Dept outcome letters
1. Collect and interpret an infrared absorption spectrum on a co-polymer.	a, b, c, d, e, f, i
2. Describe the transitions between vibrational energy levels in two electronic states of molecular iodine.	a, c, d, e, f, i
3. Evaluate cyclic voltammetry and polarography of metal ions in aqueous solutions.	a, b, c, d, e, f, i
4. Collect Raman spectra on tetrahedral molecules and ions and compare the frequencies of the vibrational modes to theoretical models.	a, c, d, e, f, i
5. Interpret powder X-ray diffraction patterns of crystalline solids and compare to known diffraction patterns from the literature.	a, b, c, d, e, f, i
6. Collect time-resolved fluorescence spectra and calculate lifetimes.	a, c, d, e, f, i
7. Design an experiment related to physical chemistry with attention to experimental techniques and instruments and interpretation of data	a, e, f, i, j
8. Write complete laboratory reports including abstract, introduction, experimental methods, results, discussion, and references	f, g, i, k
9. Orally defend the results and discussion from a laboratory experiment	h, k

Relationship of course to program outcomes:

The outcome of this course contribute to the following departmental educational outcomes:

		Course Objective Numbers
a.	demonstrate an understanding of the fundamental principles of chemistry, including atomic and molecular structure, quantum chemistry, chemical bonding, stoichiometry, kinetics and mechanism, equilibrium, thermochemistry and thermodynamics, molecular structure and function, electrochemistry, and the periodic chemical properties of the elements.	**1, 2, 3, 4, 5, 6, 7**
b.	apply the fundamental principles of chemistry to life sciences, the environment, materials, engineering, and emerging technological fields of chemistry, as well as to everyday situations.	**1, 3, 5**
c.	conduct experiments and learn fundamental laboratory skills	**1, 2, 3, 4, 5, 6**
d.	analyze and interpret data	**1, 2, 3, 4, 5, 6**
e.	apply mathematical concepts to chemical problems	**1, 2, 3, 4, 5, 6, 7**
f.	work as part of a problem-solving team	**1, 2, 3, 4, 5, 6, 7, 8**
g.	convey facts, theories and results about chemistry in written form	**8**
h.	use oral presentation to convey facts, theories and results about chemistry	**9**
i.	access and utilize chemical information technology	**1, 2, 3, 4, 5, 6, 7, 8**
j.	design and execute scientific research	**7**
k.	apply ethical responsibilities and professional conduct	**8, 9**

Grading Scheme

5 lab reports: 15% of final course grade for each report (total 75%)
The grading rubric for laboratory reports is based on each individual section.
No late lab reports will be accepted.
For every lab report (or individual section) not submitted, a full letter grade will be deduced from the final grade in the course.

Laboratory reports must be in scientific journal article format (abstract, introduction, experimental, results, discussion, conclusion, references, appendix for all data and calculations). Each person will be asked to focus on a different section.

Presentation with an oral exam (during last 2 weeks of the semester): 25% of final course grade. Each student will give a PowerPoint presentation on one randomly chosen laboratory experiment. The presentation must be 15 minutes in duration followed by student questions and an oral exam by the professor. The grading rubric is in the laboratory manual.

There is no final written exam. The class will be divided into groups of 4-5 students.

List of Experiments and Oral Presentations

1. FTIR analysis of copolymer films, development of an analytical method for thin polymer films (3 weeks)
2. UV-VIS absorption spectrum of molecular I_2, vibrational-rotational fine structure (2 weeks)
3. Raman spectroscopy and calculations of tetrahedral compounds (2 weeks)
4. X-ray diffraction (XRD) of solid state compounds (2 weeks).
5. Surface Enhanced Raman Spectroscopy (2 weeks)
6. Presentations and Oral Examinations (2 weeks)

Schedule

Date	FTIR (Julian)	FTIR computation (Ed)	UV-VIS (Glen)	UV-VIS computation (Ed)	Raman (Abed)	XRD (Julian)	SERS (Abed)	PowerPoint prep
Aug. 26	Group 1		Group 2		Group 3	Group 4		
Sept. 2	Group 1			Group 2	Group 3	Group 4		
Sept. 9	Group 2	Group 1	Group 3		Group 4			
Sept. 16	Group 2			Group 3	Group 4		Group 1	
Sept. 23	Group 3	Group 2	Group 4		Group 1			
Sept. 30	Group 3			Group 4	Group 1		Group 2	
Oct. 7	Group 4	Group 3	Group 1		Group 2			
Oct. 21	Group 4			Group 1	Group 2	Group 3		
Oct. 28		Group 4				Group 3	Groups 1 & 2	
Nov. 4						Group 1	Group 3	Groups 2 & 4
Nov. 11						Groups 1 & 2	Group 4	Group 3
Nov. 18						Group 2	Groups 3 & 4	Group 1
Dec. 2	Presentations on FTIR, UV-VIS and Raman Labs							
Dec. 9	Presentations of XRD and SERS Labs							

Statement on Academic Integrity from the CCNY Website:
Academic integrity is an essential part of the pursuit of truth, and of your education. We are all are all responsible for maintaining academic integrity at City College – it is the rock on which the value of your degree is built.

If you cheat on a test or plagiarize by using someone else's work or ideas, you defeat the purpose of your education. In addition, academic dishonesty is prohibited in the City University of New York, and is punishable by failing grades, suspension and expulsion.

Details of the CCNY Policy on Academic Integrity can be found here:
www.ccny.cuny.edu/about/integrity

Attendance (specific to CHEM 43400):
All portions of the course (lecture, lab and presentation) are required. You are permitted one unexcused absence. If you are absent for more than one session, you will be automatically dropped from the course at the end of the semester. You will be given a WU grade that converts to an F if not officially withdrawn. If you do not give a presentation, but you have completed all of the reports, then you will receive a grade of INC.

Attendance (general CCNY policy):
Students are expected to attend every class session of each course in which they are enrolled and to be on time. An instructor has the right to drop a student from a course for excessive absence. Students are advised to determine the instructor's policy at the first class session. They should note that an instructor may treat lateness as equivalent to absence. (No distinction is made between excused and unexcused absences.) Each instructor retains the right to establish his or her own policy, but students should be guided by the following general College policy: In courses designated as clinical, performance, laboratory or field work courses, the limit on absences is established by the individual instructor (see above). For all other courses, the number of hours absent may not exceed twice the number of contact hours the course meets per week. When a student is dropped for excessive absence, the Registrar will enter the grade of WU.

Courtesy:
Noise and excessive chatter, eating, drinking, or use of unauthorized electronic equipment is not allowed in the classroom.

Disability:
In compliance with CCNY policy and equal access laws, appropriate academic accommodations are offered for students with disabilities. Students must first register with The AccessAbility Center for reasonable academic accommodations. The AccessAbility Center is located in the North Academic Center, Rm. 1/218. Tel: (212) 650-5913. Under The Americans with Disability Act, an individual with a disability is a person who has a physical or mental impairment that substantially limits one or more major life activities. If you have any such issues, I encourage you to visit the AccessAbility Center to determine which services may be appropriate for you.

Academic Appeals:
The faculty of each of the schools defines the degree requirements, academic standards, and rules, and in general has jurisdiction over all of the courses offered by that school. Each of the schools has a Committee on Course and Standing charged with overseeing enforcement of these matters and dealing with special cases and appeals. Students have the right to appeal to the

appropriate Committee on Course and Standing any decision made by individual faculty members or administrators about these academic matters. Students must consult with their academic advisor for the appropriate appeals procedure. The Committees on Course and Standing are the final authority on enforcement of curriculum, degree requirements, academic standards, grades and academic rules. It should be noted that most academic rules are enforced without exception.

Grievances:
Students with grievances concerning classroom matters other than grades should first attempt to resolve the grievance at the department level through discussion with the faculty member(s) or department chair. If the matter is not resolved, the student or department may refer the problem to the appropriate academic dean, the Ombudsman, or the Vice President for Student Affairs, who shall, if necessary, refer it to the Office of the Provost for further consideration and possible action.

Late Reports for INC grades:
INC may be assigned to students who have a passing grade (average on **all** the reports) in the course but who are unable to complete all reports due to conflict with another scheduled examination, death of spouse, injury sustained in a catastrophic incident, etc. (proof is also required). An Incomplete Grade Agreement form must be signed by the Instructor before the student is allowed to makeup the report(s). Payment of a fee at the Bursar's office is required in order to makeup the work.

Wellness:
If you find yourself suffering during this or any other semester from anxiety, stress, or issues related to mental health, this is nothing to be ashamed of, and it is recommended you seek help. The Wellness and Counseling Center (WCC) at City College provides counseling and psychological services to all registered CCNY students. There is no charge for these services, and sessions are confidential.
http://www1.ccny.cuny.edu/current/student/services/wellness/index.cfm

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