

CHEMISTRY 360- Physical Chemistry II
Theme of Course: Optical Spectroscopy and Materials Science

Spring 2018

Location: BSC 308, Time: M/W: 11:30 am – 12:45 pm, Credits: 4 hours

Instructor: Professor Sarah A. Winget

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Office: BSC 301E; 404.471.5379

Office Hrs: Tue 12.15-1.15pm, Wed 2-3pm

Course description: An advanced course that builds on concepts learned in the foundational physical chemistry courses (CHE-220 and CHE-260). Topics covered will include quantum mechanics, spectroscopy and materials science.

Prerequisites: CHE 260 (physics majors who have taken Modern Physics can waive the pre-requisite with a signature from the instructor).

Course objectives: By the end of the course, students will be able to....

1. Explain various quantum mechanical models, including the limitations of the models and how the models can be applied/used.
2. Apply quantum mechanical models in order to (i) obtain molecular parameters, and (ii) predict and/or explain the appearance of optical spectra
3. Explain how a variety of lasers function
4. Discuss fundamental topics and recent advances in the fields of optical spectroscopy and materials science
5. Decipher physical chemistry research papers
6. Analyze and communicate complex data to others
7. Communicate physical chemistry research findings to others
8. Complete a literature research project in the field of physical chemistry
9. Prepare a professional website in order to showcase research to a wide audience
10. Formulate questions for seminar speakers at the end of physical chemistry research seminars

Relevance to the departmental and college curriculum: This course can count as one of the two in-depth courses that are required for the Chemistry major, or one of the four in-depth courses that required for the American Chemical Society (A.C.S.) approved Chemistry major, or one of the four chemistry courses beyond CHE150 that are required for the Chemistry minor, or for the additional biology/chemistry course required for the biochemistry major, or for one of the five additional courses required for the physics major.

Course materials: No textbook is required for this course, however readings will be assigned from various handouts and current research articles. These will be distributed via *moodle*.

Moodle (courses.agnesscott.com): is a web-based course management system that will be used in this course. The syllabus, grades, in-class materials, assignments, study guides, etc. will be posted for your access.

Workload statement: This is a 4-credit course that meets 3 hours per week. To succeed in a 4-credit course you should also expect to spend an average of 7-9 hours per week outside of class on this course, on reading, weekly homework problems, and on the literature project.

Appointments: Appointments may be made with Professor Winget via e-mail (swinget@agnesscott.edu)

Attendance Policy: You are allowed two absences in this class without penalty and where no excuse is required. Each absence beyond three will result in a 2 percentage point reduction of your final grade. The only exceptions that will be made are for absences that are sanctioned by Agnes Scott College or approved absences (e.g. absences resulting from participation at some ASC sanctioned event as an official representative of ASC), or for classes missed in observance of a religious holiday. Please notify the professor of all planned absences (sports events,

religious holidays) in advance. You will also lose points for chronic tardiness. Three (3) tardies will be counted as one absence. Six (6) tardies will count as two absences and so forth

Reading and preparation for each class: There will be some preparation required for each class (reading, watching a video, finding papers, other assignments), and details will be posted on Moodle no later than the end of the previous class.

Exams: There will be two take-home exams during the semester, and students will have one week to complete and return them. All exams will be of the closed-note, closed-book variety. Only the contents of the exam envelope, your calculator and your pencil may be used during an exam. Late exams will be reduced by 5% points per day up to a maximum of 7 days. There is no final exam.

Group presentations of specific research articles to the class: Students will work in pairs. On specific weeks, a specific pair of students will present a research article, assigned by the instructor, to the rest of the class. A schedule will be available on Moodle after pairs have been decided.

Literature project: Students will work individually on a literature research project, writing up their findings in a paper and presenting this to the rest of the class. More details and rubrics available on Moodle.

Public showcase of literature project: Students will showcase their literature research project via a website, in the manner of the professional websites of research scientists. More details and rubrics available on Moodle.

Course Requirements:

<i>Assignment/Activity</i>	<i>% of course score</i>	<i>Learning Objective (1-10)</i>
Two Exams	30	1-4
Participation in the assignments that are given as preparation for each class (readings, video-watching, other assignments)	20	1-4
Preparation of a tip sheet on how to decipher research papers	5	5
Group presentations of specific research articles (articles provided by the instructor) in class. 20 mins per article.	15	5-7
Individual literature research paper (and associated work)	10	5- 8
Individual literature research oral presentation. 12-15 mins	7.5	5-7
Individual literature research website	7.5	9
Preparation of questions to be asked of seminar speaker(s), after viewing online seminar(s)	5	10

Absolute grading scale:

A	93-100	B-	80-82	D+	67-69
A-	90-92	C+	77-79	D	63-66
B+	87-89	C	73-76	D-	60-62
B	83-86	C-	70-72	F	0-59

Academic honesty: The Agnes Scott College honor code embodies an ideal of character, conduct, and citizenship, and is an important part of the College's mission and core identity. This applies especially to academic honesty and integrity. Passing off someone else's work as your own represents intellectual fraud and theft, and violates the core values of our academic community. To be honorable, you should understand not only what counts as academic dishonesty, but also how to avoid engaging in these practices. Please note that in this course you are sometimes encouraged to work with others, but the work completed is your own. In particular, the copying of another student's homework assignment answers (or copying from any other source, for that matter) is an Honor Code violation. The examinations and quizzes are not proctored, although the faculty member will often be close by during an exam to answer any questions. You are expected not to seek aid from anyone (or anything) during these examinations and should not give aid to anyone else taking a quiz or examination. Please pledge ALL your quizzes and exams with "I pledge that I have neither given nor received any unauthorized aid on this assignment. (signed)_____"

Course evaluations: Near the end of the semester you will be notified by email, and provided with a link to follow, to complete course evaluations online outside of class. You are expected to complete the them as your feedback is extremely valuable to Dr. Winget, the department, and the administration. Of particular importance are constructive comments that help Dr. Winget improve the course.

Accommodations: Agnes Scott College seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in this class, please contact Rashad Morgan in the Office of Academic Advising (X6174 or rmorgan@agnesscott.edu) to complete the registration process. Once registered, please contact Dr. Winget by email in order to make an appointment to discuss the specific accommodations needed for this course.

Inclusion: This course adheres to the principles of diversity and inclusion integral to the Agnes Scott community. We respect people from all backgrounds and recognize the differences among our students, including racial and ethnic identities, religious practices, and gender expressions. We strive for our campus to be a safe space in which all students feel acknowledged and supported. We request and invite your thoughtful and constructive feedback on ways that we can, as a community of learners, respectfully assist and challenge one another in our individual and collective work.

Title IX: For the safety of the entire community, any incidence of, or information about, sexual misconduct must be reported immediately to Title IX Coordinator Marti Fessenden (mfessenden@agnesscott.edu, 404-471-6547), Deputy Title IX Coordinator Karen Gilbert (kgilbert@agnesscott.edu, 404-471-6435), or Vice President for Student Life and Dean of Students Karen Goff (kgoff@agnesscott.edu, 404-471-6449).

This course adheres to the principles of diversity and inclusion integral to the Agnes Scott community. We respect people from all backgrounds and affirm people's decisions about gender expression and identity. Please feel free to correct Dr. Winget if your preferred name or gender pronoun are different from that listed on the class roster.

Tentative Course Schedule – CHE360 – Spring 2018

class numbers are given for those classes with content that will appear on exams

	DATE	In-Class	Due (in addition to posted prep for each class)
1	W-Jan 10	Welcome and introduction. Historical context of Quantum Mech. Heisenberg Uncertainty Principle. Quick recap of CHE260 topics.	
--	M-Jan 15	MLK HOLIDAY – NO CLASSES	
2	W-Jan 17	Symmetry and point groups. Introduction to the rigid rotor model.	
3	M-Jan 22	Article 1 given to group 1. Also: Discussion of how to read articles. Rigid rotor model continued.	
4	W-Jan 24	Rigid Rotor model contd. Harmonic Oscillator model	
5	M-Jan 29	Discussion of article 1. Also: Term symbols	Article 1 presented by group 1.
6	W-Jan 31	Term symbols contd. Selection rules	
7	M-Feb 5	Article 2 given to group 2. Also: Rotational spectroscopy	Select a research topic from list
8	W-Feb 7	Vibrational and ro-vibrational spectroscopy	
9	M-Feb 12	Discussion of article 2. Also: Ro-vibrational spectroscopy contd	Article 2 presented by group 2
10	W-Feb 14	Raman spectroscopy	
11	M-Feb 19	Exam 1 handed out (on material from classes 1-10). Also: Discussion of tip sheets. Introduction to Electronic spectroscopy.	Tip sheets
12	W-Feb 21	Electronic spectroscopy contd	
13	M-Feb 26	Class meets in the library. Discussion of the literature research project with the librarian	Completed exam 1
--	W-Feb 28	Lasers	
--	M-Mar 5	PEAK WEEK	
--	W-Mar 7	PEAK WEEK	
--	M-Mar 12	SPRING BREAK	
--	W-Mar 14	SPRING BREAK	
14	M-Mar 19	Article 3 given to group 1. Also: Lasers contd. Short online seminar (s) in class.	Annotated bibliography for research project
15	W-Mar 21	Discussion of questions for seminar speakers. Also: Introduction to materials Science	Questions for seminar speakers
16	M-Mar 26	Discussion of article 3. Also: Crystalline solid materials and unit cells	Article 3 presented by group 1.
17	W-Mar 28	Article 4 given to group 2. Also: Unit cells contd. Advanced materials	Draft/Outline of research paper
--	M-April 2	Class meets in D-center – learning about website design	
--	W-April 4	No formal class meeting today - students work on literature research paper	
18	M-April 9	Discussion of article 4. Discussion of websites so far. Also: Materials science topics contd	Draft/Outline of website. Article 4 presented by group 2
19	W-April 11	Materials science topics contd.	
--	M-April 16	Exam 2 handed out (on material from classes 11-19). Also: The future of physical chemistry/optical spectroscopy/materials science.	Final draft of research paper
--	W-April 18	The future of physical chemistry/optical spectroscopy/materials science	
--	M-April 23	Class meets in BSC304W - students work on websites in class	Completed exam 2
--	W-April 25	Class meets in BSC304W - Students work on oral presentations in class	A draft/outline of presentation
--	M-April 30	Individual oral presentations of literature research project (12-15 mins each)	Oral presentations
--	W-May 2	Wrap up, informally present websites to others	website