

Molecular Spectroscopy (CHEM513)

General Information:

Instructor: Sunmin Ryu (Chem. Bldg. #128, Tel: 279-2124, E-mail: sunryu@postech.ac.kr)
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Text: **(H)** J. Michael Hollas, *Modern Spectroscopy*, 4th ed., Wiley, 2004.
(L) Joseph Lakowicz, *Principles of Fluorescence spectroscopy*, 3rd ed., Springer, 2006.
*Ebooks of both are available online @ library.postech.ac.kr
References: Peter F. Bernath, *Spectra of Atoms and Molecules*, 2nd ed., Oxford University Press, 2003; Daniel C. Harris & Michael D. Bertolucci, *Symmetry and Spectroscopy*, Oxford University Press, 1978; Wolfgang Demtroder, *Laser Spectroscopy: Basic Concepts and Instrumentation*, 3rd ed., Springer, 2003; John Wilson & J.F.B. Hawkes, *Lasers Principles and Applications*, Prentice Hall, 1987.
Course website: <http://sunryu.postech.ac.kr> (Go to "Lecture")
Class meetings: Tue & Thu 09:30~10:45, Chem. Bldg. #201
Office hours*: by appointment

Overview of the Course:

The objective of this course is to provide a solid background in molecular spectroscopy for graduate students majoring in physical chemistry or related areas so that they can utilize such knowledge in their research. The course will center on rotational, vibrational and electronic spectroscopy of small molecules during the first half and cover fluorescence spectroscopy for its use in biological and chemical sciences during the second half.

Prerequisites: Chem211 with preferably Chem510 or solid background in quantum chemistry

Grading:

Mid-term and final exams will contribute 35% each to the course grade (70% in total). Problem sets, quizzes and classroom attitude will account for 15, 10 and 5%, respectively.

Problem sets (20%): will be given as homework at the end of each chapter. (Go to the course website.) *Completing the homework assignments is essential for success in this course.* Delayed submission leads to penalties: 80% off within 1 week; not accepted afterward.

Quizzes (5%): Quizzes may be given at the beginning of or in the mid of class, in order to test understanding of previous and current class materials.

Classroom attitude (5%): will be closely monitored to maintain learning atmosphere. You are expected to respect other students and the instructor in classroom. If necessary for academic purpose, the instructor may enforce *seating* or order misbehaving students to leave the classroom early. An unjustified absence will lead to 1% off and more than 5 absences to a fail.

Collaboration on assignments:

Students are encouraged to discuss in groups to finish their assignments. However, the work students present must be their own. In order to develop problem solving skills, students are *strongly* advised to tackle problem sets on their own before getting help from others. Also, do not simply copy answers from classmates nor be copied by others, both of which are considered as academic misconduct or "cheating". Such misconduct on homework will lead to a penalty on grade.

Lecture Schedule

Week	Date	Topics*
1	9/5 & 7	H1. Review of quantum mechanics H2. Light and its interaction with atoms and molecules
2	9/12 & 14	H3. General features of spectroscopy experiments H4. Molecular symmetry
3	9/19 & 21	No lecture (International Conference); *makeup: 30' x 2 + 15' + 75'
4	9/26* & 28*	H5. Rotational spectroscopy *[09:00~10:45] H6. Vibrational spectroscopy *[09:00~10:45]
5	10/3 & 5	[No lecture, holiday]
6	10/10* & 12	H6. Vibrational spectroscopy *[09:15~10:45]
7	10/17 & 19	H7. Electronic spectroscopy [No lecture on 10/19, KCS Meeting]
8	10/24 & 26	Makeup class + Mid Term Exam (10/26, 9:00 AM)
9	10/31 & 11/2	H7. Electronic spectroscopy H8. Photoelectron and related spectroscopies
10	11/7 & 9	H8. Photoelectron and related spectroscopies H9. Lasers
11	11/14 & 16	L1&2. Fluorescence and instrumentation for its detection
12	11/21 & 23	L3. Fluorophores
13	11/28 & 30	L4. Time-domain lifetime measurements
14	12/5 & 7	L6&7. Solvent effects and dynamics
15	12/12 & 14	L8. Quenching: mechanism and dynamics
16	12/19 & 21	Makeup class when necessary + Final Exam (12/21, 9:00 AM)

(*Tentative and subject to change)