



## SYLLABUS

### A. Course Description

Course Code	Course Num.	Course Name	Credit Hours	Lec.	Lab.	Tut.	Private study	Pre-requisites	Course Level	Language
CHM	346	Quantum Chemistry	2	2	0	0	4	CHM 242	6	English

This course deals with classical and quantum mechanics, black body radiation, atomic models and spectra, Schrodinger equation, operators, postulates of quantum mechanics, wave functions, particle in 1-D box, rigid rotor and harmonic oscillator.

At the end of this course the student will be able to:

- Describe the failure of classical mechanics in contrast to quantum mechanical phenomena.
- Define concepts relevant to quantum mechanics such as photoelectric effect, wave-particle duality.
- Recognize the principles of the translational motion, particle in a box.
- Write the Schrodinger equation in its correct form.
- Calculate the energies of atomic orbital for hydrogen and hydrogen-like atoms.

### B. References: Required Textbook & Internal Website

I shall use

**Physical Chemistry**, Atkins, P. W., and J. de Paula, (8<sup>th</sup> Ed.), Freeman and Company, New York, NY: W.H, 2001, ISBN: 9780716735397

**Students are required to purchase the textbook/materials (it is an obligation).** The book contains the lecture notes as well as activities for the students to take part in; the book serves as a workbook. Other references:

- **Physical Chemistry**, Sanctuary, K. J. Laidler, J. H. Meiser, B. C., (4<sup>th</sup> Ed.), Houghton Mifflin Company, 2003, ISBN: 81-239-0645-5.
- **Physical Chemistry**, Silbey, R., R. Alberty, and M. Bawendi. (4<sup>th</sup> Ed.), John Wiley & Sons, New York, NY, 2004, ISBN: 9780471215042

Google Classroom Webpage: <http://www.imamm.org/>

### C. Topics Outline

**Disclaimer: Disclaimer:** this is a very fast-paced course. There will be little time—if any—for review. What follows is an approximate outline of the pace of the course. We may go faster or slower, contingent on the class response. The tentative list of topics to cover:

1. **Classical Mechanics:** dawn of quantum mechanics, Black-Body radiation, Photo electric effect, dual nature of light, the uncertainty principle, Bohr model of the atom, spectral series, Rydberg formula for hydrogen spectrum.
2. **Derivation of Schrodinger equation:** Operators and their properties, eigenfunctions and eigenvalues, postulates of quantum mechanics, Particle in 1-D box and Harmonic oscillator.
3. **Rigid-rotor model:** hydrogen atoms and hydrogen like atoms wave function, Normalized and orthogonal wave functions, translational motion. Classical and quantum mechanical treatment.



## D. Exams & Grading System

The semi-official dates of the exams for this course, with all the caveats, that the word “semi-official” entails, can be found here:

- **Midterm 1:** 6<sup>th</sup> or 7<sup>th</sup> week      & **Midterm 2:** 11<sup>th</sup> or 12<sup>th</sup> week
- **Quizzes:** 2 Quizzes
- **Homework:** 4 Homework
- **Final Exam:** 16<sup>th</sup> week

	Teaching/learning activities	Contact Hours	Frequency	Total Contact hours	Self-study hours (hrs)	Total self-study hours	Student Learning Time
1	Lecture	2	15	30	2	30	60
2	Tutorial	0	0	0	0	0	0
3	Lab\Practical	0	0	0	0	0	0
4	Lab report	0	0	0	0	0	0
5	Lab Exam	0	0	0	0	0	0
6	Homework	0	4	0	2	8	8
7	Quiz	0.25	2	0.5	1	2	2.5
8	Test (Midterm)	1.5	2	3	8	8	11
9	Final Exam	2	1	2	9	9	11
Total				35.5		57	92.5

- **Independent self-study = 57 / 15  $\cong$  4 hrs per week (as average)**

Your course grade will be based on Final Exam, Midterms, Homework, Quizzes, Participation, Attendance and Project.

<b>Midterm 1: 20 %</b>	<b>Midterm 2: 20 %</b>	<b>Final Exam: 40 %</b>
<b>Quizzes; Homework &amp; Attendance &amp; Participation: 20 %</b>		

## Grading distribution:

A+: [95, 100], A: [90, 95), B+: [85, 90), B: [80, 85), C+: [75, 80), C: [70, 75), D+: [65, 70), D: [60, 65), F: [0, 60).

## E. Student Attendance/Absence

Only three situations will be considered as possible excused absences:



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- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
  - Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

**[Executive Rules for Study Regulations and Examsgoo.gl/ykm7t3](https://Examsgoo.gl/ykm7t3)**

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