Course Syllabus  
Chemistry 338  
Physical Chemistry II  
Spring 2020  

Course Description: Continuation of CHE 337.

Number of Credit Hours: 4 semester hours - 3 hours lecture

Course Prerequisites and Corequisites: Prerequisite: CHE 337. Required lab fee.

Program Learning Outcomes:
1. The student will demonstrate knowledge of fundamental content in the basic areas of chemistry: Analytical, Biochemistry, Inorganic, Organic, and Physical.
2. The student will integrate knowledge with critical thinking to solve problems.

General Education Core Curriculum Objectives: There are no specific general education core curriculum objectives in this course. This course is not a general education core curriculum course.

Course Objective: The basic techniques and tools used in the area of Quantum Mechanics will be explained. This includes the prediction of behavior of atomic and molecular systems.

Student Learning Outcomes: Upon completion of this course students will:
- Recognize the need for the field of quantum mechanics.
- Derive and understand the three basic models in quantum mechanics. (PLO 1, 2)
- Recognize and apply basic symmetry to molecular systems. (PLO 1, 2)
- Recognize the role of quantum mechanics and symmetry in spectroscopy. (PLO 1)
- Interpret basic spectra utilizing concepts from quantum mechanics and spectroscopy. (PLO 1, 2)

Outline of Topics (approximate course time):
Quantum Theory (5-15%)
Atomic Structure (5-15%)
Molecular Electronic Structure (5-15%)
Symmetry (5-15%)
Rotational and Vibrational Spectroscopy (5-15%)
Electronic Spectroscopy of Molecules (5-15%)
Magnetic Resonance Spectroscopy (5-15%)
Statistical Mechanics (5-15%)
Course Syllabus
Chemistry 338L
Physical Chemistry II Lab

Course Description: Continuation of CHE 337.

Number of Credit Hours: 0 semester hours - 3 hours lab per week

Course Prerequisites and Corequisites: Prerequisite: CHE 337. Required lab fee.

Program Learning Outcomes:
2. The student will integrate knowledge with critical thinking to solve problems.
3. The student will perform qualitative/quantitative chemical analyses/syntheses using modern instrumentation.
4. The student will articulate scientific information through oral communication.
5. The student will articulate scientific information through written communication.
6. The student will demonstrate ability to integrate knowledge content, laboratory skill, critical thinking and problem solving, and communication skills via participation in research projects.

General Education Core Curriculum Objectives: There are no specific general education core curriculum objectives in this course. This course is not a general education core curriculum course.

Course Objective: The basic techniques and tools used in the area of Quantum Mechanics will be explained. This includes the prediction of behavior of atomic and molecular systems.

Student Learning Outcomes: Upon completion of this course students will:
- Recognize the need for the field of quantum mechanics.
- Derive and understand the three basic models in quantum mechanics.
- Recognize and apply basic symmetry to molecular systems.
- Recognize the role of quantum mechanics and symmetry in spectroscopy.
- Interpret basic spectra utilizing concepts from quantum mechanics and spectroscopy.

Outline of Topics (approximate course time):
Absorption Spectrum of a Conjugated Dye
Dipole Moments
XRD
Napthol
Research Project
Chemistry CHE 338/338L
Physical Chemistry II
Spring, 2020

Instructor:  Dr. Alyx S. Frantzen  
Office:  MN 119
Phone:  468-2338  
e-mail:  afrantzen@sfasu.edu

Student Hours:  T 3:00-4:00pm; T 5:00-6:00; W 12:00-1:00 pm;  W 9:00-11:00 am; F 10:00-11:00 am;  other times by appointment; if my door is open, I am generally available.

Class Hours:  TR 9:30-10:50 pm; TR 11:00-12:15 pm; T 3:00-4:00pm; T 5:00-6:00pm; W 12:00-1:00 pm; W 2:00-5:00; F 1:00-3:50 pm

CATALOG DESCRIPTION:  Continuation of CHE 337

PREREQUISITES:  CHE 337 or permission of instructor, MTH 234

CO-REQUISITES:  CHE 338L

REQUIRED TEXTS AND OTHER MATERIALS:
Lide, D.R. editor CRC Handbook of Chemistry and Physics  
(The CRC can be any edition, but try to get an edition from the 2000’s-present)

SUPPLEMENTARY MATERIALS:

COURSE GOALS:  Students should learn the basic techniques and tools used in the area of Quantum Mechanics. This includes the prediction of behavior of atomic and molecular systems.

STUDENT OUTCOME OBJECTIVES:
Upon completion of this course students will:
  • Understand the need for the field of quantum mechanics.
  • Derive and understand the three basic models in quantum mechanics.
  • Apply basic symmetry to molecular systems.
  • Interpret the role of quantum mechanics and symmetry in spectroscopy.

COURSE CONTENT:  Chapters from the text will be covered in the following order.
  9  QUANTUM THEORY
  10  ATOMIC STRUCTURE MOLECULAR ELECTRONIC STRUCTURE
  11  SYMMETRY ROTATIONAL AND VIBRATIONAL SPECTROSCOPY
  12  ELECTRONIC SPECTROSCOPY OF MOLECULES
  13  MAGNETIC RESONANCE SPECTROSCOPY
  14  STATISTICAL MECHANICS (IF TIME PERMITS)

COURSE REQUIREMENTS:  Exams will be given on Thursday evenings, starting at 5pm (ish).  There will be a two hour time limit.  The exams will be given on February 6th, 20th, March 19th, April 4th, 23rd.  The final exam will be at the scheduled time, May 7th, 8:00-10:30 am (We will start at 7:00am).
Grades for this course will be assigned in the following manner:
  Laborator 30%
  5 Exams 40%
  Final Exam 20%
  Homework/Quizzes 10%
  100%

CHE 338/338L
Spring, 2020
Dr. A. S. Frantzen
METHOD OF EVALUATION:
Grading scale -  
A= 90 - 100%; B= 80 - 89%; C= 70 - 79%; D= 60 - 69%; F= below 60%

MAKE-UP POLICY: There will be no make-ups in this class.

ATTENDANCE POLICY: Attendance is probably the single most important study aid in physical chemistry. As such, there is an attendance policy. Excused absences must be documented. The first two unexcused absences will not count against you. Upon the third unexcused absence, each absence will result in the removal of three percentage points from your final average. Attendance is also required at the recitation on Wednesdays at 12 pm.

ACADEMIC HONESTY POLICY: Any student found cheating will be subject to the penalties as stated in the Student Code of Conduct handbook; including but not limited to a score of zero on exam, expulsion from the class or expulsion from the University. Use of a programmable calculator is considered cheating.

SEMESTER WITHDRAWALS: Last day to withdraw from the course without obtaining WP or WF grade is March 18th.

ACADEMIC DISABILITIES POLICY: Students with Disabilities – To obtain disability – related accommodations and/or auxiliary aids, students with disabilities must contact the Office of Disability Services, Wisely Hall, Room 104, 468-3004/468-1004 (TDD) as early as possible in the semester. Once verified, DS will notify the course instructor and outline the accommodation and/or auxiliary aids to be provided.

CLASSROOM BEHAVIOR POLICY: To ensure a classroom environment conducive to learning, any forms of classroom disruptions will not be tolerated (examples but not limited to – talking, use of cell phones/beepers, sleeping, reading other material, eating/drinking). Students who violate these rules will be asked to leave. Repeat offenders will be subject to disciplinary action in accordance with University policies as described in the Code of Student Conduct.

Instructor reserves the right to change the syllabus at any time.

LAB SCHEDULE:
There are four required laboratory exercises this semester. You must work with a partner for these experiments.

- Experiment #39 Absorption Spectrum of a Conjugated Dye
- Experiment #38 Excited State Properties of 2-Napthol Part 1: Excited State Acidity Constant
- Handout Dipole Moments
- Handout XRD

The reports for all experiments will be full, formal lab reports.

EXAMS:
The first five exams you have will be written by me. The final exam will consist of two parts. The first will be the ACS Quantum Mechanics exam. The second part of the final exam will be the ACS Comprehensive exam. It will cover thermodynamics, kinetics, and quantum mechanics. We will take the Quantum part starting at 7 am on May 7th and take the Comprehensive after that.

HOMEWORK:
I will give you random exercises for homework.

PCHEM PROJECT:
You are required to design, carry out, and present the results of a research project during PChem II. The project must be agreed upon by both student and instructor. You must decide on a topic by the end of January so that we can order what you need. The project must be complete by the 15th of April. Presentations will start the following week (on Wednesday starting during recitation and continuing through the lab time, 12-5pm).