
Dr. Navdeep B. Malkar, PS 301G

nmalkar@fau.edu

Catalog Description:

3 credits

Prerequisites: 8 credits of general chemistry, CHM 3120, CHM 3120L, and 8 credits each of physics and calculus

An introduction to theories of the states of matter, thermodynamics, phase and chemical equilibria, electrochemistry, kinetics and factors affecting reactivity, and chemical statistics.

Time and Location:

M W F 11:00 am - 11:50 am, PS 112

Course Objective:

This is a part one of two-part Physical Chemistry course. Objective of course is to develop an understanding of the macroscopic as well as molecular-level phenomena with emphasis studies of molecular-level phenomena. During this course, we will introduce and develop different topics such as kinetics, thermodynamics, quantum mechanics and spectroscopy and will be continued in Physical Chemistry II.

Office Hours:

M 2:00 – 4:00 pm. Other time by appointments only.

Text Book:

Gordon M. Barrow, **Physical Chemistry**, 6th Edition, WCB/McGraw-Hill, 1996.

<http://www.mhhe.com/catalogs/0070051119.mhtml>

Grading Policy:

Exam 1 and 2	=	50 %
Final		40 %
Homework		10 %
<hr/>		
Total		100 %

Exam Dates:

Exam I: Friday, 14th September 2001

Exam II: Friday, 26th October 2001

Final; Friday, 7th December 2001

No makeup exams.

No late submission of homework is accepted.

Missed homework and exams will receive zero grade.

Course Outline:**1. Physical Properties of Gases**

The chapter basically deals with the experimental studies of the pressure-volume-temperature behavior of gases. A molecular model describing the empirical relations is developed.

- Ideal Gases
- Nonideal gases

2. The Molecular Theory of Gases

In this chapter, we take a detail look into the molecular world of gases. We will learn the classical kinetic-molecular theory which gives an explanation of ideal-gas pressure-volume-temperature behavior. This is based on two assumptions 1. Speed of molecules can vary in a continuous way. 2. Molecules are assumed to follow laws of motion.

In order to get the molecular information, we will learn about the motions of the molecules of a gas by using a simple quantum mechanics. Finally, we will study the properties of collections of large number of molecules, the molecules of a gas sample.

- Classical Kinetic-Molecular Theory
- Introduction to Quantum Theory
- Distribution Over Quantum States

3. Elements of Quantum Mechanics and Atomic Structure

Here, we begin our specific studies of the mechanics of atoms and molecules with a development of some essential methods of the mechanics known as quantum mechanics. We will start with Schrödinger equation and its application to particle-on-a-line and particle-in-a-box examples.

- Wave Mechanics
- Angular Features

4. Electronic Structure of Atoms and Diatomic Molecules

In this chapter, we will use methods of quantum mechanics to deduces properties of the electrons of atoms and diatomic molecules.

- Atoms
- Diatomic Molecules

5. Spectroscopy

In this chapter, we study the experimental methods that give information on the size, shape, rigidity and electron structure of molecules.

Spectroscopy is the measurement and interpretation of electromagnetic radiation which is absorbed or emitted when the radiation produces changes in the energy of the molecules, atoms, or ions of a sample.

We will also study the energy differences that arise when a sample is placed in a magnetic or electric field.

- Molecular Spectra
- Nuclear and Electron Magnetic Spectroscopy

6. Energy of Chemical Systems: The First Law of Thermodynamics

The name thermodynamics has its origin in studies of the conversion of thermal energy to mechanical energy in the engines that drove the industrial revolution. In this chapter, we will see how the conservation-of-energy principle i.e. first law of thermodynamics will be helpful for detailed studies of chemical processes.

- First Law of Thermodynamics
- Enthalpy
- Temperature Dependence
- Molecular Basis of Heat Capacities
- Molecular Basis of Energies