

Extended syllabus

Course Title	Physical Chemistry	Course Number	CBE2004-02
Credit	Theory (3.0) Experiment (0.0) Design (0.0)	Eligible Student	Sophomore
Class time		Venue	

Professor's Picture	Name: Choongik Kim	Homepage:
	E-mail:	Telephone:
	Office hour/place: TBA	

I. Course Description

1. Description							
<p>This course is intended for sophomores in chemical and biomolecular engineering department with contents of general introduction to physical chemistry (thermodynamics). The goal of this course is to make basic thermodynamics as clear and applied as possible and to familiarize students with the major aspects of thermodynamics.</p> <p>'Flipped classroom' will be applied for this class. Lecture videos will be provided to students before each class. Each student is expected to watch and study lectures before class.</p>							
2. Prior learning contents							
<p>Helpful class: Applied Mathematics</p> <p>Although there is no prerequisite in this course, in case students have taken above-mentioned class, it would be helpful to understand the course purpose.</p>							
3. Course Format(%)							
Lecture	Discussion	Experiment/Practice	Field study	individual/T	Others/ Extra		
100 %	%	%	%	%			
4. Evaluation(%)							
mid-term Exam	final exam	Quiz	Presentation	Project	Assignments	Participation	Others/ Extra
50 %	25 %	5 %	%	%	15%	5 %	%

II. Course Purpose

<p># This course serves as an introduction to chemical thermodynamics, giving you an understanding of basic principles, laws and theories of physical chemistry that are necessary for chemical engineering students.</p> <p># You will develop the ability to solve quantitative problems, and learn to use original thought and logic in the solution of problems and derivation of equations.</p> <p># You will learn to apply mathematics in chemistry in such a way that the equations paint a clear picture of the physical phenomena.</p>
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III. Course Format

This course is intended for sophomores in chemical and biomolecular engineering department with contents of general introduction to thermodynamics. The course begins with the review of previous class, followed by the lecture. Most of the portions of the class will be lecture.

IV. Course Requirements

Grades

- (1) Midterm exams (30% x 2 times): The midterm exams are scheduled in class on TBA. The type of questions will be multiple choices, short answers, and detailed derivation.
- (2) Final exam (40%): The final exam is scheduled in class on TBA. The type of questions will be multiple choices, short answers, and detailed derivation.
- (3) Attendance (+3%): Additional points will be provided to students who don't miss any classes.

V. Materials and References

Materials

Textbook: Atkins, P.W. and De Paula, J. Physical Chemistry, 9th edition.

VI. Course schedule

1 week	Learning objective	Introduction to Physical Chemistry
	Main learning contents	Atoms Molecules Bulk Matter Energy The relation between molecular and bulk properties The electromagnetic field Units
	Teaching method and materials	Lecture
	preparation must be done by student	Preparation (reading) for the lecture on chapter 0
	References	Chapter 0 of the textbook
2 week	Learning objective	The properties of gases
	Main learning contents	The states of gases The gas laws

		Molecular interaction The van der Waals equation
	Teaching method and materials	Lecture
	preparation must be done by student	Preparation (reading and watching video) for the lecture on chapter 1
	References	Chapter 1 of the textbook
3 week	Learning objective	The First law of thermodynamics
	Main learning contents	Work, heat, and energy The internal energy Expansion work Heat transaction Enthalpy Adiabatic changes
	Teaching method and materials	Lecture
	preparation must be done by student	Preparation (reading and watching video) for the lecture on chapter 2
	References	Chapter 2 of the textbook
4 week	Learning objective	The First law of thermodynamics
	Main learning contents	Standard enthalpy change Standard enthalpies of formation The temperature dependence of reaction enthalpies Exact and inexact differentials Changes in internal energy The Joule-Thomson effect
	Teaching method and materials	Lecture
	preparation must be done by student	Preparation (reading and watching video) for the lecture on chapter 2
	References	Chapter 2 of the textbook
5 week		Supplementary class and Mid-term exam #1
6 week	Learning objective	The Second Law of Thermodynamics
	Main learning contents	The dispersion of energy Entropy Entropy changes accompanying specific processes

		The Third Law of thermodynamics
	Teaching method and materials	Lecture
	preparation must be done by student	Preparation (reading and watching video) for the lecture on chapter 3
	References	Chapter 3 of the textbook
7 week	Learning objective	The Second Law of Thermodynamics
	Main learning contents	The Helmholtz and Gibbs energies Standard molar Gibbs energies The fundamental equation Properties of the internal energy Properties of the Gibbs energy
	Teaching method and materials	Lecture
	preparation must be done by student	Preparation (reading and watching video) for the lecture on chapter 3
	References	Chapter 3 of the textbook
8 week	Learning objective	Physical Transformation of Pure Substances
	Main learning contents	The stabilities of phases Phase boundaries Three representative phase diagrams
	Teaching method and materials	Lecture
	preparation must be done by student	Preparation (reading and watching video) for the lecture on chapter 4
	References	Chapter 4 of the textbook
9 week	Learning objective	Physical Transformation of Pure Substances
	Main learning contents	The dependence of stability on the conditions The location of phase boundaries The Ehrenfest classification of phase transitions
	Teaching method and materials	Lecture
	preparation must be done by student	Preparation (reading and watching video) for the lecture on chapter 4
	References	Chapter 4 of the textbook
10 week	Supplementary class and Mid-term exam #2	

11 week	Learning objective	Simple Mixtures
	Main learning contents	Partial molar quantities The thermodynamics of mixing The chemical potentials of liquids Liquid mixtures
	Teaching method and materials	Lecture
	preparation must be done by student	Preparation (reading and watching video) for the lecture on chapter 5
	References	Chapter 5 of the textbook
12 week	Learning objective	Simple Mixtures
	Main learning contents	Colligative properties Vapor pressure diagrams Temperature-composition diagrams Liquid-liquid phase diagrams Liquid-solid phase diagrams
	Teaching method and materials	Lecture
	preparation must be done by student	Preparation (reading and watching video) for the lecture on chapter 5
	References	Chapter 5 of the textbook
13 week	Learning objective	Simple Mixtures
	Main learning contents	The solvent activity The solute activity The activities of regular solutions The activities of ions in solution
	Teaching method and materials	Lecture
	preparation must be done by student	Preparation (reading and watching video) for the lecture on chapter 5
	References	Chapter 5 of the textbook
14 week	Learning objective	Chemical Equilibrium
	Main learning contents	The Gibbs energy minimum The description of equilibrium How equilibria respond to changes of pressure and temperature
	Teaching method and materials	Lecture
	preparation must be done by student	Preparation (reading and watching video) for the lecture on chapter 6
	References	Chapter 6 of the textbook

15 week	Learning objective	Chemical Equilibrium
	Main learning contents	Half-reaction and electrodes Varieties of cells The cell potential Standard electrode potentials Applications of standard potentials
	Teaching method and materials	Lecture
	preparation must be done by student	Preparation (reading and watching video) for the lecture on chapter 6
	References	Chapter 6 of the textbook
16 week	Supplementary Class and Final exam	

VII. Course Policy

Any student who cheats gets “F” grade.
If a student cheat during the exam, s/he gets and “F” for the course. If the law school believes a more severe penalty (i.e., probation, suspension or report to the Bar Association) is warranted, it can refer the case to the dean for further action such as reporting the bar association.

VIII. Special Accommodations

In cases you want to request special accommodations to take courses and exams due to a temporary or permanent physical, sensory, psychological/emotional or learning disability, contact the school office at 02-705-7964. The Instructor will take necessary measure to accommodate any needs that can be acknowledged by the school policy.