Extended Syllabus

(2016 2ST Semester)

Course Title	Energy Engineering	Course Number	CBE4020
Credit		Enrollment Eligibility	
Class Time	Mon: 13:30, Fri: 12:00	Classroom	

Professor's Picture	Name: Choongik Kim	
	Office hour/place: TBA	

Ⅰ. Course Overview

1. Description

As the field of chemical engineering is being expanded to diverse area such as materials science, biological science, and environmental/energy engineering, technology and chemical instrumentation understanding continue to progress. In this lecture, various types of classical and instrumental analytical methods will be introduced and be related to up-to-date techniques in chemical engineering research.

2. Prerequisites

Helpful class: General Chemistry, Physical Chemistry

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.

3. Course Format (%)

Lecture	Discussion	Experiment/Practicum	Field study	Presentations	Other
%	%	%	%	%	%

4. Evaluation (%)

mid-term Exam	Final exam	Quizzes	Presentations	Projects	Assignments	Participation	Other
%	%	%	%	%	%	%	%

Ⅱ. Course Objectives

Today's chemical engineer can be classified as a problem solver that uses cutting edge scientific technology pulled from a variety of fields to qualitatively and quantitatively analyze complex systems in an attempt to better understand a given sample's chemical composition and structural characteristics that give rise to unique functionality. The purpose of this course is to introduce chemical engineers to the ever-changing world of chemical instrumentation. This class is a survey of the theory and practice of modern analytical instrumentation. Some topics covered will include: ultraviolet-visible spectroscopy, infrared and Raman spectroscopy, nuclear magnetic resonance spectroscopy, mass spectrometry, gas and liquid chromatographic techniques, atomic absorption spectroscopy, atomic force microscopy, scanning electron microscopy, and electrochemical methods of analysis.

Ⅲ. Course Format

(* In detail)

This courses is intended for students in chemical and biomolecular engineering department with contents of general introduction to chemical instrumentation. The course begins with the review of previous class, followed by the lecture. 3/4 of the class will be lecture and 1/4 of the class will be presentation by teams of students.

Ⅳ. Course Requirements and Grading Criteria

Grades

(1) Midterm exam: 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: The final exam is scheduled in class on TBA. The type of questions will be multiple choices, short answers, and detailed derivation.

(3) Quiz: The quiz is scheduled in class on TBA. The type of questions will be multiple choices, short answers, and detailed derivation.

(4) Team presentation: The team presentation on instrumental techniques of students' choosing to the class, scheduled in class at the end of the semester.

Ⅴ. Course Policies

Any student who uses cell phone in class gets "F" grade.

Any student who misses an exam gets "F" grade.

If a student cheat during the exam, s/he gets and "F" for the course. If the professor believes a more severe penalty (i.e., probation, suspension or report to the school) is warranted, it can refer the case to the dean for further action.

VI. Materials and References

Textbook : Principles of Instrumental Analysis, sixth Edition, Skoog, Holler, Nieman.(required) Supplemental handouts as necessary

Ⅶ. Course Schedule

(* Subject to change)

Week 1	**Learning Objectives**	Introduction to Instrumental Analysis
	Topics	Measurement Basics, analysis concept
	Class Work (Methods)	Lecture
	Materials (Required Readings)	Textbook
	Assignments	Preparation (reading) for the lecture
Week 2	**Learning Objectives**	Learn the basics of Atomic Spectroscopy
	Topics	Introduction to spectroscopic methods, components of optical instruments, Atomic spectrometry
	Class Work (Methods)	Lecture
	Materials (Required Readings)	Textbook
	Assignments	Preparation (reading) for the lecture
Week 3	**Learning Objectives**	Learn the basics of Molecular Spectroscopy
	Topics	UV-Vis absorption spectrometry

	Class Work (Methods)	Lecture
	Materials (Required Readings)	Textbook
	Assignments	Preparation (reading) for the lecture
Week 4	**Learning Objectives**	Learn the basics of IR Spectroscopy
	Topics	IR spectroscopy
	Class Work (Methods)	Lecture
	Materials (Required Readings)	Textbook
	Assignments	Preparation (reading) for the lecture
Week 5	**Learning Objectives**	Learn the basics of Electroanalytical Chemistry
	Topics	Potentiometry, Coulometry, Voltammetry
	Class Work (Methods)	Lecture
	Materials (Required Readings)	Textbook
	Assignments	Preparation (reading) for the lecture
Week 6	**Learning Objectives**	Learn the basics of chromatographic separation
	Topics	Gas chromatography, liquid chromatography, CE
	Class Work (Methods)	Lecture
	Materials (Required Readings)	Textbook
	Assignments	Preparation (reading) for the lecture

Week 7	**Learning Objectives**	Learn the basics of mass spectrometry
	Topics	Mass spectrometry
	Class Work (Methods)	Lecture
	Materials (Required Readings)	Textbook
	Assignments	Preparation (reading) for the lecture
Week 8	**Learning Objectives**	Mid-term exam
	Topics	
	Class Work (Methods)	
	Materials (Required Readings)	
	Assignments	
Week 9	**Learning Objectives**	Basics of biosensors
	Topics	Biosensors
	Class Work (Methods)	Lecture
	Materials (Required Readings)	Textbook
	Assignments	Preparation (reading) for the lecture
Week 10	**Learning Objectives**	Basics of calorimetry
	Topics	Thermal methods (DSC, TGA)
	Class Work (Methods)	Lecture

	Materials (Required Readings)	Textbook
	Assignments	Preparation (reading) for the lecture
Week 11	**Learning Objectives**	Learn the basics of X-ray diffraction
	Topics	X-ray diffraction basics
	Class Work (Methods)	Lecture
	Materials (Required Readings)	Supplementary readings
	Assignments	Preparation (reading) for the lecture
Week 12	**Learning Objectives**	Learn the basics of electron microscopy
	Topics	AFM, SEM, TEM
	Class Work (Methods)	Lecture
	Materials (Required Readings)	Supplementary readings
	Assignments	Preparation (reading) for the lecture
Week 13	**Learning Objectives**	Team presentation #1
	Topics	Up-to-date instrumental techniques
	Class Work (Methods)	Presentation
	Materials (Required Readings)	Multiple scientific publications
	Assignments	
Week 14	**Learning Objectives**	Team presentation #2

	Topics	Up-to-date instrumental techniques
	Class Work (Methods)	Presentation
	Materials (Required Readings)	Multiple scientific publications
	Assignments	
Week 15	**Learning Objectives**	Team presentation #3
	Topics	Up-to-date instrumental techniques
	Class Work (Methods)	Presentation
	Materials (Required Readings)	Multiple scientific publications
	Assignments	
Week 16	**Learning Objectives**	Final exam
	Topics	
	Class Work (Methods)	
	Materials (Required Readings)	
	Assignments	

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.

IX. Aid for the Challenged Students

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