

# FAIRLEIGH DICKINSON UNIVERSITY

SONS -CHEMISTRY (TEANECK CAMPUS)

**Course:** Instrumental Methods of Analysis Lecture (CHEM-4233)

**3 credits**

**Level:** Undergraduate

**Instructor:** Dr. Arthur R. Murphy

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**Office Hours:** M 10:00 AM – 11:50 AM

F: 10:00 AM – 11:00 AM

and by appointment.

**Semester:** Spring 2009

**Required Text:** Principles of Instrumental Analysis 6th Edition

by Skoog/Holler/Crouch

**Classroom, Day and time:** EWC 202, Monday 5:25 PM – 8:00 PM

## **2008 – 2010 Catalog Description:**

Theory and applications of absorption, emission and interpretative spectroscopy, electrochemistry and chromatography to problems of chemical analysis. Introduction to interfacing, data acquisition and data manipulations.

## **Intended Audience:**

This course is designed for students majoring in chemistry. Students majoring in other Natural Sciences may also find the course of interest.

## **Teaching Methodologies:**

The course employs both traditional lectures involving board work and overheads as well as microcomputers. WEB resources will also be utilized where appropriate.

## **Course Objectives and Outcomes:**

**Objective 1:** Students should understand the principles and applications of atomic and molecular spectroscopy.

**Outcome 1.1:** Students should know the various regions of the electromagnetic spectrum and the instruments, techniques, and major applications used in these areas. They should have a firm foundation in visible, UV, and IR spectroscopy

**Outcome 1.2** Students should understand the instrumentation, techniques, and applications of fluorescence spectroscopy.

**Outcome 1.3** Students should understand the instrumentation, techniques, and applications of Atomic Absorption spectroscopy.

**Objective 2:** Using computer software and WEB resources, the principles of Interpretive Spectroscopy will be reviewed and broadened.

**Outcome 2.1** Students should know how to interpret elementary IR, NMR, and Mass Spectral data.

**Objective 3:** The principles of Instrumental Measurements will be presented.

**Outcome 3.1** Students should have an appreciation of electronic components and basic circuits.

**Outcome 3.2** Students should understand digital and analogue signals, and they should have an introductory knowledge of digital electronic, operational amplifiers, as well as signals and noise.

**Objective 4:** If students already have good backgrounds in Electrochemistry from their Analytical Chemistry course, this section will be skipped in favor of Miscellaneous Instrumental Analysis Techniques. (see objective 6 below). Otherwise, aspects of Electroanalytical Chemistry will be reviewed and broadened.

**Outcome 4.1** Students should understand the basic principles of potentiometry.

**Outcome 4.2** Students should understand the basic principles of Coulometry and Voltammetry

**Objective 5:** If students already have good backgrounds in Separation methods from their Analytical Chemistry course, that material will be omitted in favor of miscellaneous Instrumental Analysis Techniques (see objective 6 below). Otherwise, aspects of Chromatography will be reviewed and broadened.

**Outcome 5.1** Students should understand the basic principles of Chromatographic separations.

**Outcome 5.2** Students should be familiar with the instrumentation used for Chromatographic methods.

**Objective 6:** Various miscellaneous topics in Instrumental Analysis will be presented. Possible topics may include Higher Derivative Spectroscopy, Simplex Methods, radiochemical methods, thermal methods, Scanning Tunneling Microscopy, or

**Outcome 6.1** Students should become familiar with the instrumentation, and applications of the chosen method(s).

#### Tentative Lecture Schedule (Spring 2009)

Week #	Date	Topic
1	Jan. 26	Chapters 6,7 Electromagnetic Radiation and Introduction to Optical Spectroscopy (Components of Optical Instruments)
2	Feb. 2	Chapters 13 and 14 UV/Vis and Applications
3	Feb. 9	Chapter 15 Fluorescence and Applications Chapters 8, 9, and 12 Intro to Optical Atomic Spectroscopy and Atomic Absorption and Applications, Atomic X- Ray Spectroscopy.
4	Feb. 16	Chapter 16 Interpretive IR
5	Feb. 23	Exam #1
6	Mar. 2	Chapters 17 and 19 Interpretive NMR
7	Mar. 9	Interpretive NMR (continued) Chap. 20 Mass Spectroscopy. Student presentation topics must be selected.
8	Mar. 16	Spring Recess
9	Mar. 23	Miscellaneous Methods Perhaps Higher Derivative Spectroscopy, Simplex Methods, etc.
10	Mar. 30	Exam #2
11	Apr. 6	Highlights of Chapters 2,3,4,5 Basic Measurements – Some analogue and digital electronics
12	Apr. 13	Highlights of Chapters 22,23,24,25 Electroanalytical Chemistry, (perhaps radiochemical methods – Chap 32)
13	Apr. 20	Highlights of Chapters 22,23,24,25 Electroanalytical Chemistry (continued)

14	Apr. 27	Highlights of Chapters 26,27,28 Separation Methods
15	May 4	TBA
16	May 11	Final Exam

**Procedures, Policies, and Expectations**

- 1) The last day for withdrawing from the course with a grade of "W" is April 3, 2009
- 2) All homework assignments must be submitted on time. Late assignments will not be accepted.
- 3) During lecture all cell phones and pagers must be turned off.

**Grading Policy**

Exams - 50%  
Homework - 50%