# Chem 221 Syllabus

## Course objectives

This course is an introduction to instrumental methods of analysis - that is, the measurement of chemical systems using instruments.

This course has been developed to provide students with the background theory and principles of operation of modern instrumentation used for chemical analysis. Specifically, the objectives of this course are to initiate the students in the theory, operation and uses of

- Optical spectroscopy,
- Mass spectrometry,
- Chromatography
- Nuclear Magnetic Resonance spectroscopy
- Electrochemistry, and

The students will also develop an understanding of the types of samples amenable to each instrument and the kind of information attainable. Specifically, we will discuss

- the chemical and/or physical principles exploited during the measurement
- how the instrument actually makes the measurement, and
- some of the techniques used to improve the analytical figures of merit, such as accuracy, precision and sensitivity.

Throughout the course, the principles underlying common instrumental methods will be presented and discussed in detail. Each type of instrument has a unique set of strengths and weaknesses that makes it suitable for some measurements but not others. For example, some techniques are best for qualitative determinations while others are excellent for providing quantitative information regarding the analyte(s). During this course, you should develop an understanding of the analytical capabilities of a number of instrumental methods and ultimately be able to suggest suitable instrumental methods for particular analytical problems.

One thing you will <u>not</u> learn in this course is how to operate a particular instrument, but you don't need to! Each class of instrument is based on a similar measurement of a chemical or physical property. Therefore, if you understand the basic operation of each method, you should be able to operate any instrument based on similar principles. Specifically, in order to chose the best instrument for the task at hand, we will consider:

1. the property or quantity of the chemical system to be measured

2. the physical and chemical principles upon which the measurement is based
3. generation of a signal by a suitable detector (transducer) and the processing of the signal to convert it to a form appropriate for a readout device, and
4. the strengths and limitations of each particular instrumental method or approach.

## Instructor

Giuseppe Petrucci
A218 Cook - Office x6-0957
Giuseppe.Petrucci@ uvm.edu
http://www.uvm.edu/~gpetrucc/

## Textbook

"Principles of Instrumental Analysis," 7th Ed., by Skoog, Holler and Crouch. ISBN-13: 978-1305577213. Please do NOT try to purchase the text from the bookstore. In order to get the discounted price I mentioned in my last email, please use the ordering link given in that email.

## Office Hours

I will establish and announce office hours for the semester during the first week of classes. I will be available at other times as well (see me to make an appointment) and, of course, you are welcome to stop by my office at your convenience (but, if I am busy we will have to reschedule for another time). Also, I am *virtually* available via email for your questions; I check my email regularly every day (even on weekends), so you should be able to get an email reply to a question within 12 hours of your posting it to me (barring any unforeseen technical difficulties!).

## Grading

There will be 2-4 quizzes throughout the semester, one mid-term exam and one comprehensive Final Exam. The mid-term exam date will be announced once classes start. **The Final Exam time is scheduled (yes, already!) for May 12, 2017, 10:30am – 1:15pm.**

Your grade for the course will be determined as follows:

| | |
|---|---|
| Quizzes | 300 points |
| Mid-term exam | 300 points |

| | |
|---|---|
| Final Exam | 400 points |
| Total | 1000 points |