

# Course Syllabus

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Chem 341: Instrumental Analysis

Fall 2009

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## Class Meetings

TR: 8:10a – 9:30a

Tomsich 206

## Instructor

Simon Garcia

Tomsich 108

garcias@kenyon.edu

427-5077

## Textbook

D.C. Harris, *Quantitative Chemical Analysis*, 7<sup>th</sup> edition

## Office Hours

TBA, please check the course website (below).

## Course Website

<https://moodle.kenyon.edu/course/view.php?id=3783>

## Important Dates

Final Project due: December 21, Monday, 1:30p

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## Course Description

It's not important to know how every instrument works. During your lifetime, new instruments will be invented, and old ones will be adapted for new analytes. It is more important to understand the principles of measurement that apply to all instrumental methods. We will explore these principles by focusing on a selection of methods. Through this focused approach, you should be prepared to understand and analyze other methods that you encounter as a chemist. We will also use numerical analysis to extract information from data and to simulate the results of physical processes.

Throughout this course, think about the following questions. Your goal is to be comfortable asking and answering these questions about various methods of chemical analysis.

- How do I know whether an analytical method is working?
- What part of a measurement process introduces the most uncertainty?
- How do I tweak a method to make it better, and what does "better" mean for a method?

## Objectives

At the end of this course, you should be able to do the following:

- Select and adapt instrumental methods appropriate to an analytical problem.
- Develop protocols for applying a method to an analytical problem.
- Evaluate instrumental methods empirically.
- Identify instrumental parameters and predict their effects on a method.

## Laboratory Experiments

I will assign four experiments throughout the semester. In each case, we will preview and begin the experiment during class, and you may complete it outside of class on your own schedule.

You may use general-purpose equipment in the Advanced Laboratory. Please be a good citizen! If you break anything, or use the last vial or pipette in a drawer, let Carolyn Waggoner or me know so that we can replace it; otherwise, your classmates will come into lab and have no equipment to use. You can also use the spectrophotometers in the Advanced Laboratory, but please check and respect the schedule in each instrument's handbook, since we share the instruments with other classes and research groups.

Before you use any *research instruments*, make an appointment with the instrument's manager, and arrange to have that person with you when you perform the experiment. **You are not to use an instrument on your own without the express permission — in writing — of the instrument manager.** You may perform sample preparation in the lab at any time, as long as you have someone else (your lab partner or a friend) in the lab at the same time.

As always, safe practices and behavior are required in the laboratory. No eating or drinking; wear eye protection at all times; wear gloves if necessary; do not work alone. Any negligent or dangerous behavior in the laboratory will result in expulsion from the course.

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## Problem Sets

Along with each reading, I will post problem sets drawn from the text or of my own design. We will discuss some — but not all — of the problems in class, so please read them as soon as they are posted.

## Examination

The examination is cumulative: it may test on any topic since the *beginning* of the course (not since the previous exam). The two-part exam takes place over two, 80-minute periods on the last two days of the semester. Because of limited time, it is impossible to include every question encountered in class. For this reason, actual exam questions will be a *sample* of topics. Obviously, I cannot tell you which topics will be chosen, so please do not ask.

## Final Project

Through the course, you will work on a final project. In this project, you will “adopt” an instrument and use it to develop the protocol for an analytical method. Your goal is to test your protocol, validate it, evaluate it, and then apply it to a practical question. Start thinking about possible projects as early as Week 6. You will first need to write a proposal, and I will need to approve it before you start. At the end of the project, you will turn in a written report and give a 15-minute presentation in class. A rough draft is due before Thanksgiving. The final draft is due on the day assigned by the Registrar for the final examination.

## Grading

- 20% Experiments
- 40% Problem Sets
- 20% Examination
- 20% Final Project

## Late Work

I do not accept late work without an official, excused absence. In special circumstances, I may grant an extension if you agree to a 10 % grade-point penalty for each 24 hours that the assignment is late.

## Academic Honesty

Please read the College's statement on Academic Honesty in the *Course of Study*. Pay special attention to the definition of plagiarism and to the list of activities that violate the standards of academic honesty. I expect you to avoid plagiarism and to avoid even the mere appearance of possible plagiarism.

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## Excused Absences

**Planned Absence.** If you cannot attend a class or exam or finish an assignment because of an athletic, religious, or other event, you can make it up *before* the scheduled date, not afterward. I need at *least 2 weeks advanced notice* (let me know as early as possible, though).

You are allowed a **maximum of two** planned, excused absences. Check all of your commitments for this semester and find any possible conflicts. If you find conflicts and aren't sure what to do about them, *consult with me as soon as possible*.

**Unplanned Absence.** If you miss class, quiz, exam or assignment because of an *unexpected* event, such as illness, depression, bereavement, or the Imperius Curse, notify a Student Support specialist. In most cases, the appropriate people may include: the Dean of Academic Advising, the Dean of Students, and the staff of the Health and Counseling Center.

Tell me which person above you talked to, and I will verify your situation with this person. The people above maintain confidentiality: They will not discuss the reason for your absence with me. **Without verification, I will not accept late work and I will not schedule a make-up for the work.**

**Influenza.** If you experience flu-like symptoms, call the Health Center immediately. Depending on your symptoms, they may advise you to **self-isolate** (stay confined to your room) to minimize the chances of spreading the flu. In this case, please do not come to class. Ask the Health Center to send me a message confirming your situation. Send me a message to inform me, and ask a friend to photocopy their notes for you. You must call or email the Health Center each day to keep them updated.

## Disability Services

**Accommodations.** If you have a learning disability or physical disability, or think that you might, please schedule an appointment with Disability Services *as soon as possible*. Only the Coordinator of Disability Services is authorized to review your documentation and to recommend an accommodation. I will work with you and with them to arrange an accommodation tailored to your situation.

If your accommodation grants extra time on an exam, you must inform me *two weeks before the exam*.

**Coordinator of Disability Services.** Erin Salva is the Coordinator of Disability Services. You can reach her by phone at 427-5453 or by email at [salvae@kenyon.edu](mailto:salvae@kenyon.edu).

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## Tentative Schedule

Week	Dates	Topics	Experiment
1	08/30 – 09/05	Introduction and Check-In	
2	09/06 – 09/12	Uncertainty and Statistics	<i>Determining p-nitrophenol by uv-vis spectrophotometry</i>
3	09/13 – 09/19	Calibration and Validation	
4	09/20 – 09/26	Spectrophotometry I	<i>Determining quinine content of tonic water by fluorimetry</i>
5	09/27 – 10/03*	Spectrophotometry II	
6	10/05 – 10/10	Atomic Spectroscopy I	<i>Determining Zn content by atomic absorption spectroscopy</i>
7	10/11 – 10/17*	Atomic Spectroscopy II	
8	10/18 – 10/24	Potentiometry I	<i>Determining the pK<sub>a</sub> of an acid by potentiometry</i>
9	10/25 – 10/31	Potentiometry II	
10	11/01 – 11/07	Chromatography I	
11	11/08 – 11/14	Chromatography II	
12	11/17 – 11/21	Presentations I	
	11/22 – 11/28	Thanksgiving	
13	11/29 – 12/05	Presentations II	
14	12/06 – 12/12	Exam, Part 1	
15	12/13 – 12/15*	Exam, Part 2	
	12/21	<b>Final Project due on Monday, 1:30p</b>	

\* During Week 5, there is no class on Monday

\* During Week 7, there is no class on Monday (Reading Period)

\* During Week 15, Monday is the last day of class