

## CHEM 241: QUANTITATIVE CHEMICAL ANALYSIS

Spring 2014

Lecture - MWF 11:15 AM -12:05 PM, CON 467

Lab - W 1:00-4:00 PM CON 476

### Dr. Cielito "Tammy" DeRamos King

Conant 405

Office hours: MW 9-10 am and by appointment

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**Text:** D.C. Harris, *Quantitative Chemical Analysis*, Freeman and Co.: New York, 2011. (8<sup>th</sup> ed.)

Plus you will be **required** to purchase **Online Homework (1 Semester)** by Sapling Learning via BSU Bookstore.

### Grading system:

Your final grade for the course will be based on the following:

<i>Lecture</i>		70 %
Hour Exams (3) and Final	50 %	
Online homework and problem sets	20 %	
 <i>Laboratory</i>		30 %
Lab notebook and reports	20 %	
Lab technique	10 %	

Your course grade will be based on the following scale: A's (90+), B's (80-89), C's (70-79), D's (60-69), and F (<60).

### Course Description and Goals

This one semester course in quantitative chemical analysis covers techniques employed for the measurement of specific elements and compounds in complex mixtures. Topics include statistical analysis, sample preparation and analysis, acid-base chemistry, complex formation, electrochemistry, and spectroscopy. The course provides a foundation for advanced level courses in physical chemistry, instrumental analysis, and laboratory techniques. The specific goals of the course are as follows:

1. To provide a basic understanding of the two classical methods ("wet" chemistry) of chemical analysis: gravimetric and volumetric methods.
2. To provide a basic understanding of acid-base, solubility, redox, and complexation equilibria.
3. To learn to apply statistical methods in analyzing experimental data.
4. To provide an introduction to instrumental methods of chemical analysis, with emphasis on spectroscopy and chromatography.
5. To learn the different techniques involved in gravimetric (or precipitaton) and volumetric (or titrimetric) chemical analysis, including:
  - a.) analysis of ions (such as chloride, calcium, and magnesium) by precipitation and titration
  - b.) preparation and standardization of solutions for titrimetric analysis
  - c.) titrimetric analysis of an unknown mixture of acids or bases
6. To be introduced to basic instrumental techniques (spectroscopy and chromatography) used in chemical analysis.

**Attendance Policy:**

Class attendance is mandatory and will be taken every meeting. Points will be taken off of any requirement missed during an unexcused absence, as discussed in the next section.

**Class Policy**

**Seating arrangements during an exam:** You might be assigned specific seating during the exam, including the final. I reserve the right to decide on your seating arrangement during a given exam.

**Exam/lab makeup:** A makeup exam or lab will only be given if you have a valid excuse for your absence, provided that I have been notified within 24 hours of your absence and a written, supporting documentation (e.g. a doctor's note) of your absence has been provided soon after you come back to class. If you failed to provide me with valid documentation of your absence, a grade of zero will be assigned for the missed exam and/or lab. Unless I decided otherwise, *you have until the following meeting to makeup for a missed exam or lab*; otherwise a grade of zero will be assigned for that exam/lab.

**Late problem sets** will be accepted up to one meeting following the deadline, but with a corresponding 20 to 30 % deduction. Problems sets not turned in one meeting following the deadline will be assigned a grade of zero.

**Online homework due dates** must be followed. No credits will be given for online homework after the due date. While discussion of ideas related to an assigned problem is acceptable, copying one's work or copying each other either word for word or by rephrasing someone's statement, or blatant copying of someone's work/equations will be considered a form of cheating, thus will be treated as an academic misconduct. I expect you to write your own ideas and responses to assigned problems as an individual, not as a group. At this point, I also expect you to know how to use quotations if a response is quoted from the text or another source, and to list that text or any other sources used, including those taken from internet sites, towards the end of your problem set. Likewise, if you derived the ideas/responses from the text or another source, cite these references as well. In summary, **problem sets that I have deemed identical or close to being identical will receive a grade of zero!** Read the section below about academic integrity for more details.

**Academic Integrity:**

From the 2012-2013 Student Handbook: At Bridgewater State University, academic honesty is expected of all students; plagiarism and cheating are not condoned and are subject to academic penalty, which may result in a failure for the course in which the violation took place. A violation may result in a reduced grade, suspension, or dismissal from the university.

Academic misconduct includes, but is not limited to, plagiarism, cheating, and dishonest practices.

For more information please read the university's policy on academic integrity at:

<http://www.bridgew.edu/Handbook/PoliciesProcedures/academicintegrity.cfm>

**Course Requirements**

**Exams** will be based on topics covered in the lecture, assigned readings, and problem sets. Test questions will be a combination of two or more of the following: Problem solving, definitions, short answers and fill in the blanks.

**Problem sets** and **online homework** will be based on chapter readings and lecture topics. This requirement is designed to help you retain the materials covered in the lecture or discussed in the assigned chapters. Thus, it is imperative that you keep a good study habit and to try to get help before you even fall behind. Although I post my office hours, you may seek help through email or walk-in (if I'm available) outside of my office hours. *Those of you who have weak algebra skills may want to seek math tutoring from the beginning of, and throughout, the semester.*

**CHEM 241 COURSE OUTLINE AND TENTATIVE LECTURE SCHEDULE**  
**Spring 2014**

<b>Week #/Date</b>	<b>Topic</b>	<b>Readings or Exam Coverage</b>
<b>1</b> 1/20	Intro to Analytical Chemistry; Measurements	Chapters 0 and 1
<b>2</b> 1/27	Experimental Errors and Statistics	Ch. 3 & 4
<b>3</b> 2/03	Chemical Equilibrium and Systematic Treatment of Equilibrium	Ch. 6 & 7
<b>4</b> 2/10	Cont. Ch. 7 Monoprotic Acid-Base Equilibria	Ch. 8
<b>5</b> 2/17	Monoprotic Acid-Base Equilibria; <i>Exam 1 – Friday, Feb. 21</i>	Ch. 8 <i>Intro th/ Monoprotic...</i>
<b>6</b> 2/24	Polyprotic Acid-Base Equilibria	Ch. 9
<b>7</b> 3/03	Polyprotic Acid-Base Equilibria	Ch. 9
<b>Spring Break</b>	<b>Spring Break</b>	<b>Spring Break</b>
<b>8</b> 3/17	Polyprotic Acid-Base Equilibria; Acid-Base Titrations	Ch. 9
<b>9</b> 3/25	Acid-Base Titrations – <i>Cont.</i> <i>Exam 2 – Wednesday, March 26</i>	Ch. 10 <i>Polyprotic A/B Equil.</i>
<b>10</b> 3/28	Complexometric (EDTA) Titrations	Ch. 11
<b>11</b> 4/04	Fund. Electrochemistry	Ch. 13
<b>12</b> 4/13	Electrodes and Potentiometry	Ch. 14
<b>13</b> 4/18	Electrodes and Potentiometry – <i>Cont.</i> <i>Exam 3 – Wednesday, April 23</i>	Ch. 14 <i>Titration th/ electrochem.</i>
<b>14</b> 4/25	Fund. Spectroscopy	Ch. 17, parts of Ch. 18
<b>15 Final Exam</b>	<i>Friday, May 9, 11 AM-1 PM</i>	<i>Selected chapters TBA</i>

**Exam dates:** Please mark the following on your calendar.

- Exam 1 – Friday, February 21
- Exam 2 – Wednesday, March 26
- Exam 3 – Wednesday, April 23
- Final – Friday, May 9

Other important dates

Feb. 17 (M) - Presidents' day holiday  
 Feb. 19 (W) - Monday sched. of classes  
 Mar. 10-14- Spring Break  
 Apr. 21 (M) - Patriot's day holiday  
 May 5 - Spring day classes end  
 May 6 - Reading Day  
 May 7-13 - Final Exams  
 May 17 - Spring Commencement