

## **ANALYTICAL CHEMISTRY (CHE213) SPRING 2016 SYLLABUS**

### **INSTRUCTORS:**

Dr. Sara Yu Choung

Office: Rohr Science 305A

Phone: 619-849-2627

Email: [sarachoung@pointloma.edu](mailto:sarachoung@pointloma.edu)

Office Hours: T 10:30 – 11:30 am, 1:30 – 2:30 pm

W 11:00 am – 12:00 pm

R 1:30 – 2:30 pm

F 10:30 am – 12:00 pm

and by appointment

Dr. Tracey Schalnat

Office: Rohr Science 302D

Phone: 619-849-2717

Email: [traceyschalnat@pointloma.edu](mailto:traceyschalnat@pointloma.edu)

**LECTURE (3 units):** MWF 1:30 – 2:25 pm Latter 102

**LABORATORY:** Section 1 Tuesday 8:00 – 11:30 am Sator Hall 221  
Section 2 Tuesday 1:30 – 5:00 pm Sator Hall 221

### **LEARNING MATERIALS:**

1. *Textbook\**: Daniel C. Harris, Quantitative Chemical Analysis, W.H. Freeman and Company, 9<sup>th</sup> edition 2016. ISBN-13: 9781319044053 (hard cover with Sapling code) or ISBN-13: 9781319044060 (loose leaf with Sapling code). Book companion site for 8<sup>th</sup> edition: [http://bcs.whfreeman.com/qca8e/default.asp#t\\_600368](http://bcs.whfreeman.com/qca8e/default.asp#t_600368)
2. *Laboratory Notebook*: Hayden-McNeil Scientific Lab Notebook for \$9 from Dr. Choung
3. *Online Homework*: Sapling Learning <http://www2.saplinglearning.com/> (bundled with hard cover or loose leaf textbook or purchased separately for \$45 or \$95 with eText)
4. *Course Website*: Canvas <https://canvas.pointloma.edu>
5. *Scientific Calculator*
6. *Computer with Excel*
7. *Laboratory Safety Glasses and Lab Coat*
8. *Optional Material*: Daniel C. Harris, Solution Manual for Quantitative Chemical Analysis, W.H. Freeman and Company, 9<sup>th</sup> edition 2016. ISBN-13: 9781464175633.

\* This textbook is also used for Instrumental Analysis (CHE370).

**COURSE DESCRIPTION:**

Examination of the theories and techniques of quantitative chemical analysis, with some emphasis on instrumental methods. Classical methods such as gravimetry, titrimetry, spectroscopy, electrochemistry, and chromatography will be discussed and used.

**LEARNING OUTCOMES:**

At the end of this course, students will be able to:

- Evaluate analytical data by determining error and uncertainty and using statistical methods such as the F test, t test, paired t test, and Q test.
- Solve equilibrium problems related to precipitation, acid-base, complexation, and oxidation-reduction reactions.
- Understand the concepts of various gravimetric methods such as precipitation, volatilization, and particulate gravimetry.
- Explain the principles of titrimetric methods including acid-base, complexometric, redox, and precipitation titrations.
- Understand the concepts of various spectroscopic and electrochemical methods.
- Perform analytical laboratory techniques related to the topics listed above.

Program Learning Outcomes: ENVS PLO 2 will be assessed directly using the ACS Analytical Chemistry Exam.

**PREREQUISITE:** One year of General Chemistry

**EVALUATION:**

The activities described above will contribute to your total course grade according to the following:

Lecture Examinations (4)	40%
Homework, Quizzes, Pre-Class Assignments, In-Class Activities	15%
Lecture Final Examination	10%
Laboratory Work	25%
Laboratory Final Examination	10%

Letter grades will be assigned at the end of the course according to the following approximate scale:

A	90 – 100%
B	80 – 89%
C	70 – 79%
D	60 – 69%
NC/F	< 60%

(+) and (–) grades will be assigned within each bracket except there is no A+ grade.

**ADMINISTRATION:**

1. Attendance and Participation: You are responsible for all the material and announcements covered during lecture and lab. Regular and punctual attendance at all classes is considered essential to optimum academic achievement. If the student is absent from more than 10 percent of class meetings, the faculty member can file a written report which may result in de-enrollment. If the absences exceed 20 percent, the student may be de-enrolled without notice until the university drop date or, after that date, receive the appropriate grade for their work and participation. See [Academic Policies](#) in the Undergraduate Academic Catalog.
2. Online Homework: Homework will be assigned regularly through Sapling Learning (<http://www2.saplinglearning.com/>). Successful completion of the homework is essential in mastering the course material. Late assignments will not be accepted.
3. Pre-Class Assignments, In-Class Activities and Quizzes: Pre-class assignments and in-class activities will be assigned and collected throughout the course. Quizzes will be given periodically throughout the course covering either the reading assignment or material already discussed in class. The lowest pre-class assignment, in-class activity or quiz score will be discarded when final grades are computed.
4. Exams: Four lecture exams, a lecture final exam, and a laboratory final exam will be given during the course. Make-up exams will be arranged only if the instructor is contacted prior to the scheduled exam time and then only if you present an institutionally valid excuse.
5. Laboratories: Attendance is mandatory at all laboratory sessions. If you must miss a lab for a valid reason, you should make prior arrangements with the instructor to see if you can attend the other lab section. A lab absence will result in a zero on that lab report and lab quiz. Experiments will be performed either individually, with a partner, or in a group. Each partner/group member must keep a record of their work in their own laboratory notebook to submit individually. Each partner must independently weigh samples, carry out titrations, etc. They cannot work together by participating in a joint titration, etc., with one partner functioning as a guide/consultant. Each partner must report at least one determination in the final value. Separate, individual lab notebook pages or a formal lab report will be submitted by each student. Each lab grade will be based on lab notebook entries, the accuracy and precision of the quantitative unknown determinations, or formal lab report. Lab quizzes will be given at the beginning of each new experiment, covering both the old and new experiments. Late labs will be penalized by deducting 10% for every day past the due date.

**OTHER MATTERS:**

Academic Honesty: Students should demonstrate academic honesty by doing original work and by giving appropriate credit to the ideas of others. Academic dishonesty is the act of presenting information, ideas, and/or concepts as one's own when in reality they are the results of another person's creativity and effort. A faculty member who believes a situation involving academic dishonesty has been detected may assign a failing grade for that assignment or examination, or, depending on the seriousness of the offense, for the course. Faculty should follow and students may appeal using the procedure in the university Catalog. See [Academic Policies](#) for definitions of kinds of academic dishonesty and for further policy information.

Academic Accommodations: If you have a diagnosed disability, please contact PLNU's Disability Resource Center (DRC) within the first two weeks of class to demonstrate need and to register for accommodation by phone at 619-849-2486 or by e-mail at [DRC@pointloma.edu](mailto:DRC@pointloma.edu). See [Disability Resource Center](#) for additional information.

FERPA Policy: In compliance with federal law, neither PLNU student ID nor social security number should be used in publicly posted grades or returned sets of assignments without student written permission. This class will meet the federal requirements by distributing all grades and papers individually. Also in compliance with FERPA, you will be the only person given information about your progress in this class unless you have designated others to receive it in the "Information Release" section of the student portal. See [Policy Statements](#) in the (undergrad/graduate as appropriate) academic catalog.

Final Examination Policy: Successful completion of this class requires taking the final examination **on its scheduled day**. The final examination schedule is posted on the [Class Schedules](#) site. No requests for early examinations or alternative days will be approved.

PLNU Mission: To Teach, To Shape, To Send. Point Loma Nazarene University exists to provide higher education in a vital Christian community where minds are engaged and challenged, character is modeled and formed, and service becomes an expression of faith. Being of Wesleyan heritage, we aspire to be a learning community where grace is foundational, truth is pursued, and holiness is a way of life.

**CHEMISTRY 213 CLASS SCHEDULE**

DATE	LECTURE TOPICS	CHAPTERS	LABORATORY*
1/12 (T)	Overview of Course and Syllabus The Analytical Process	0	<b>No Lab</b>
1/13 (W)	Chemical Measurements	1	
1/15 (F)	Chemical Measurements	1	
1/18 (M)	<b>No Class – Martin Luther King Jr. Day</b>		Introduction and Check-in Preparing Solutions
1/20 (W)	Tools of the Trade	2	
1/22 (F)	Experimental Error	3	
1/25 (M)	Statistics	4	Statistical Evaluation of Acid-Base Indicators  <i>(Preparing Solutions Due)</i>
1/27 (W)	Statistics	4	
1/29 (F)	Statistics	4	
2/1 (M)	Statistics	4	Statistical Evaluation of Acid-Base Indicators
2/3 (W)	Forensic Chemistry Dean Kirby (Drug Enforcement Administration)		
2/5 (F)	<b>EXAM #1</b>	0 – 4	
2/8 (M)	Quality Assurance and Calibration Methods	5	Bulk Drug Analysis Using IR and HPLC  <i>(Statistical Evaluation Due)</i>
2/10 (W)	Quality Assurance and Calibration Methods	5	
2/12 (F)	Quality Assurance and Calibration Methods	5	
2/15 (M)	Sample Preparation	28	Photometric Detection of Manganese in Steel  <i>(Bulk Drug Analysis Due)</i>
2/17 (W)	Sample Preparation	28	
2/19 (F)	Chemical Equilibrium	6	
2/22 (M)	Chemical Equilibrium	6	Re-Design of Photometric Detection of Manganese in Steel  <i>(Photometric Detection Due)</i>
2/24 (W)	Chemical Equilibrium	6	
2/26 (F)	Chemical Equilibrium	6	
2/29 (M)	Drug Purification/Processing/Manufacturing Elyse Engle (Isis Pharmaceuticals, Inc.)		Tour of Isis Pharmaceuticals, Inc. in Carlsbad
3/2 (W)	<b>EXAM #2</b>	5, 6, 28	
3/4 (F)	Let the Titrations Begin	7	
3/7 (M) – 3/11 (F)	<b>No Class – Spring Break</b>		

DATE	LECTURE TOPICS	CHAPTERS	
3/14 (M)	Activity and the Systematic Treatment of Equilibrium	8	Spectrophotometric Determination of the pKa of Bromothymol Blue <i>(Photometric Re-Design Due)</i>
3/16 (W)	Activity and the Systematic Treatment of Equilibrium Monoprotic Acid-Base Equilibria	8 9	
3/18 (F)	Monoprotic Acid-Base Equilibria	9	
3/21 (M)	Monoprotic Acid-Base Equilibria Polyprotic Acid-Base Equilibria	9 10	Complexometric Titration of Calcium with EDTA <i>(Detemination of pKa Due)</i>
3/23 (W)	Polyprotic Acid-Base Equilibria	10	
3/25 (F)	<b>No Class – Easter Recess</b>		
3/28 (M)	<b>No Class – Easter Recess</b>		Unknown Series Identification Redox/ICP/Electrochemistry** <i>(EDTA Due)</i>
3/30 (W)	Acid-Base Titrations	11	
4/1 (F)	Acid-Base Titrations	11	
4/4 (M)	<b>EXAM #3</b>	7 – 11	Unknown Series Identification Redox/ICP/Electrochemistry** <i>(Unknown Part 1 Data Analysis Due)</i>
4/6 (W)	Acid-Base Titrations	11	
4/8 (F)	Acid-Base Titrations EDTA Titrations	11 12	
4/11 (M)	EDTA Titrations	12	Unknown Series Identification Redox/ICP/Electrochemistry** <i>(Unknown Part 2 Data Analysis Due)</i>
4/13 (W)	EDTA Titrations	12	
4/15 (F)	EDTA Titrations Redox Titrations	12 16	
4/18 (M)	Redox Titrations	16	Check Out <i>(Unknown Part 3 Data Analysis Due)</i>
4/20 (W)	<b>EXAM #4</b>	11, 12, 16	
4/22 (F)	Fundamentals of Electrochemistry	14	
4/25 (M)	Review for Lab Final		Laboratory Final Examination <i>(Unknown Formal Lab Report Due)</i>
4/27 (W)	Electrodes and Potentiometry	15	
4/29 (F)	Review for Final Exam	0 – 12, 14 – 16, 28	
5/4 (W)	<b>FINAL EXAM (1:30 – 4:00 pm)</b>	0 – 12, 14 – 16, 28	<b>No Lab</b>

\* Labs meet and are due on Tuesdays.

\*\* Formal lab report