

CHEM 810

Liquid Chromatography

Sample Syllabus

Description

CHEM 810 is the first in a sequence of liquid chromatography-mass spectrometry (LC-MS) courses designed to fill an industry need to provide high-quality instruction in LC theory and application. The course topics include the background and history of chromatography; fundamental concepts in chromatographic separations; basic instrumentation; column, particle and phase chemistry; and basic method development. The course material is designed to increase student understanding of both the analytical instrument used in the laboratory and the principles underlying the measurements. The course specifically caters to the needs of the analytical chemical industry and individuals newly hired into introductory sample management/preparation and quality assurance/quality control positions within companies using liquid chromatographic techniques.

There is no required textbook. The bulk of the course uses algebra to solve sets of equations. You should feel comfortable doing this and capable of doing this in a timely manner. You will also use Microsoft Excel for a number of assignments. You should feel comfortable preparing spreadsheets, preparing plots, and adding trendlines. If you do not feel confident in these areas talk with the instructor early in the semester so you can acquire some proficiency. Don't fall behind. Later material in this course depends strongly on earlier material and procrastination can quickly lead to a difficult situation. You should set aside regular times during the week for focused study.

Objectives

After successfully completing this course, the student will be able to:

- Identify the factors (and associated equations) which influence the efficiency and resolution of a chromatographic separation and be able to quantify these contributions.

- Identify which factors influence column performance.
- Identify the chemical interactions (intermolecular forces) which give rise to analyte separation and use this knowledge to develop isocratic or gradient-based elution methods.
- Evaluate the instrumental contributions (extra-column) to the resolution and efficiency of chromatographic separations.
- Identify and describe the function of each component of an HPLC system.
- Design an SPE sample pretreatment method appropriate for the analyte(s) of interest.

Course Schedule

Week	Topic(s)
1	Background & History of Chromatography
2	Basics & Terminology
3	Introduction to Instrumentation
4	Column Basics
5	Silica Particles
6	Bonding and Packing
7	Intermolecular Forces
8	Stationary Phase Chemistry
9	Mobile Phase Chemistry
10	Basic Method Development
11	Sample Preparation

Discussions

The first activity is to engage in a class discussion related to that week's assigned problems – questions concerning clarification, problem-solving strategies, and placing the questions into a broader context

(when/how/why might such a problem be useful in the practical application of LC). You must post an initial response to any one or all assigned problems by 11:59 PM Wednesday of each week. You will then respond to at least two of your colleagues during the week. You must post your initial response before you are able to respond to others. Even though it is due on Wednesday at the latest, the earlier you can post your initial response during the week offers everyone a greater opportunity to respond to others. As with any academic work, procrastination makes the process more difficult in the long run. Responses to your peers, along with your answers to the assigned problems, are due no later than 11:59 PM Sunday each week.

Grading

The course website provides numerous example problems with detailed instructor-guided solutions and practice problems for which answer keys are provided once an initial answer attempt is submitted. No grade is assigned to the instructor-guided example problems or the practice problems.

Each week, a set of 5-10 proficiency- and mastery-level questions associated with each module will be assigned. Students are encouraged to discuss the questions with each other and the instructor (see Course Schedule above) prior to submitting their answers. Answer keys are not provided.

There are a total of 4 exams, one at the end of each module. Each exam is comprehensive in scope. A minimum score of 70% is required on an end-of-module exam before a student is eligible to access the subsequent module (e.g., a score of 70% is required on Exam 1 – the exam at the end of Module 1 – before a student is permitted access to the material in Module 2).

In fairness to the instructor who must grade the required course work, and to the other students, late work will not be accepted. Think about this. A substantial number of late or missing work will affect your grade. Stay caught up.

Assignment	% of Course Points
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Discussion Participation	200
Problem Assignments	400
Lecture Exams	400
Total	1000

Grade Scale

Letter Grade	Points Earned
A	930-1000
A-	900-929
B+	870-899
B	820-869
B-	780-819
C+	750-779
C	700-749
D	600-699
F	< 600

Academic Integrity

Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. Academic integrity is a basic guiding principle for all academic activity at The Pennsylvania State University, and all members of the University community are expected to act in accordance with this principle. Consistent with this expectation, the University's Code of Conduct states that all students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts.

Academic integrity includes a commitment by all members of the University community not to engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty violate the fundamental ethical principles of the University community and compromise the worth of work completed by others.

Accommodating Disabilities

Penn State welcomes students with disabilities into the University's educational programs. Every Penn State campus has an office for students with disabilities. The [Student Disability Resources \(SDR\) website](#) provides contact information for every Penn State campus . For further information, please visit [Student Disability Resources website](#).

In order to receive consideration for reasonable accommodations, you must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: [See documentation guidelines](#) . If the documentation supports your request for reasonable accommodations, your campus disability services office will provide you with an accommodation letter. Please share this letter with your instructors and discuss the accommodations with them as early as possible. You must follow this process for every semester that you request accommodations.

Counseling and Psychological Services

Many students at Penn State face personal challenges or have psychological needs that may interfere with their academic progress, social development, or emotional wellbeing. The university offers a variety of confidential services to help you through difficult times, including individual and group counseling, crisis intervention, consultations, online chats, and mental health screenings. These services are provided by staff who welcome all students and embrace a philosophy respectful of clients' cultural and religious backgrounds, and sensitive to differences in race, ability, gender identity and sexual orientation.

- [Counseling and Psychological Services at University Park \(CAPS\)](#): 814-863-0395

- [Counseling and Psychological Services at Commonwealth Campuses](#)
- Penn State Crisis Line (Available 24 hrs, 7 days a week): 877-229-6400
- Crisis Text Line (Available 24 hrs, 7 days a week): Text LIONS to 741741

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