Syllabus for ANALYTICAL CHEMISTRY II: CHEM:3120  
Spring 2019

Lecture: Monday, Wednesday, Friday, 10:30-11:20 am in W55 CB
Discussion: CHEM:3120:0002 (Monday, 9:30-10:20 AM in E203 CB); CHEM:3120:0003 (Tuesday, 2-2:50 PM in E203 CB); CHEM:3120:004 (Wednesday, 11:30 AM-12:20 PM in E203 CB)

INSTRUCTORS
Primary Instructor: Prof. Amanda J. Haes (amanda-haes@uiowa.edu; (319) 384 – 3695)
Office Hours: Mondays (11:20-12:20 PM), Wednesdays (9:15-10:15 AM), Fridays (9:15-10:15 AM), or by appointment in 204 IATL
Teaching Assistant: Katrina Pagel (katrina-pagel@uiowa.edu)
Office Hours: Mondays (1:30-2:30 PM) and Tuesdays (12:30-1:30 PM) in E208 CB
Teaching Assistant: Md Robiul Islam (md-islam@uiowa.edu)
Office Hours: Wednesdays (5:30-6:30 PM) and Thursdays (5:30-6:30 PM) in E208 CB
*Please note, I may need to reschedule my office hours at times. When I do, I will post these updates on ICON (as announcements) at least 48 hours in advance of any planned absence and will announce these changes in class. I have arranged for alternative activities and/or substitute instructors for lectures on dates when I need to miss class.
**Guidance for communicating with instructors: Ask questions! We are here to help you learn the course material but learning is something you will need to do via studying and thinking. Use office hours to help us help you. Please come see us EARLY and OFTEN. Please know that if something is discussed in class, discussion, and/or book; it has the potential of being on an exam. Dr. Haes and your TAs will help you gauge importance throughout the semester.

DEO: Prof. Jim Gloer, Department of Chemistry; Office: E331 CB; Phone: 335-1361/335-1350

COURSE DESCRIPTION AND PREREQUISITES
This course surveys and provides a theoretical description of modern spectroscopy and separation techniques. Specific topics in spectroscopy are atomic spectroscopy, molecular UV visible absorption and luminescence spectroscopy, and vibrational spectroscopy.

Prerequisites: CHEM:1120 and MATH:1460 (Calculus for Biological Sciences) or MATH:1860 (Calculus II), and PHYS:1511 (College Physics I) or PHYS:1611 (Introductory Physics I)

COURSE STRUCTURE AND INSTRUCTORS
This course has three components. Attendance is necessary in order to maximize your educational experience. We recommend that you devote ~6 hrs/week (3 credits x 2 out of class hrs/credit) for your out of class activities including reading book chapters, reviewing notes, and problem solving.

1. Lectures – Prof. Haes – Come prepared to write, listen, and ask questions!
2. Discussion Sections – Prof. Haes and a graduate student TA – Come prepared to participate, critically think, and discuss!
3. Exams – Prof. Haes

The course has been organized to help you learn, but no instructor can learn for you. Learning is something only you can do. Please see detailed learning objectives and practice book problems to help you master the course material. Taking notes will help, so no unauthorized photos or recordings!

HEALTH NOTE REGARDING FRAGRANCE, ODOR, SCENTS, AND FOOD ALLERGIES
Due to one or more individuals in this course having significant allergies to both mint and cinnamon, any food, gum, lotions, fragrances, or the like are prohibited from the classroom, discussion, and office hours. Failure to comply with the instructor’s request regarding this issue may be subject to discipline with the Dean of Students Office.

COURSE WEBSITE
http://icon.uiowa.edu – lectures, problems, and up-to-date point totals will be available here. A link to Learning Catalytics will also be found here. You may also be required to submit documents on this site. Announcements will also be posted, so we encourage you to check ICON regularly.
OBJECTIVES AND GOALS OF THE COURSE
Learning objectives for this course include the development of fundamental understanding in separations and spectroscopy. Detailed learning objectives and practice problems can be found on the course website and are organized by lecture packet number. Broad learning objectives include:

- Understand the fundamental principles of, procedures used, and relevant terminology associated with separations and spectroscopy
- Relate knowledge and understanding to critically evaluate the function, use, and limitations of modern separations and spectroscopy
- Develop the intellectual skills to integrate theory and practice related to separations and spectroscopy to solve qualitative and quantitative problems with familiar and unfamiliar contexts
- Apply knowledge regarding the principles discussed to problems in separations and spectroscopy using mathematics (including statistics) and basic chemistry and physics concepts

REQUIRED TEXTBOOK AND ELECTRONIC RESOURCES
Principles of Instrumental Analysis, 6th Edition, by D. A. Skoog, F. J. Holler, S. R. Crouch, Brooks/Cole, 2007. ISBN: 978-0-495-01201-6. Editions 5-7 can be used if desired. Older versions and international versions are discouraged as they contain many errors and at times, different material. Instructors will only reference material (reading and suggested book problems) from the 6th edition textbook. If you choose to use the 5th or 7th editions, it is your responsibility to determine what the corresponding reading and practice problems from textbook are. Detailed Table of Contents for the 6th edition textbook can be found on the course website.

Learning Catalytics (required) is a web-based tool that will be used for interactive classroom activities. Students are required to purchase accounts individually using a credit card ($12). This provides 6 months of access to Learning Catalytics. Please enter your student ID number and use your uiowa email address when registering. See additional instructions for the registration procedure and setting up your account (Under General Course Information). You must register by your discussion section time during the week of January 14th.

GRADING SYSTEM AND THE USE OF +/-.
Grades will be assigned based on the distribution of point totals. The average score will likely lie at the B-/C+ border, and the overall grade distribution will follow the included grading scale. The +/- grading scale will be used. Exceptional performances will receive an A+. Students will not receive a grade lower than the indicated range. The instructors reserve the right to lower the scale, but this should not be expected.

EXAMS, ASSIGNMENTS, AND PERCENTAGE OF FINAL GRADE
The course grade will be determined from the following elements:

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discussion Review Activities</td>
<td>150</td>
<td>25%</td>
</tr>
<tr>
<td>In-class exams – 2@100 points</td>
<td>200</td>
<td>33.3%</td>
</tr>
<tr>
<td>Comprehensive Final Exam</td>
<td>150</td>
<td>25%</td>
</tr>
<tr>
<td>Select Problems from Discussion</td>
<td>100</td>
<td>16.7%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>600</strong></td>
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A’s  88-100%
B's  76-87.9%
C's  64-75.9%
D's  52-63.9%
F's  0-51.9%

CALENDAR OF COURSE DEADLINES AND EXAMS
Important Course Deadlines (These will take place during lecture. Your attendance is mandatory.)

February 22..... Exam 1 (Material covered through ~February 20)
April 12.......... Exam 2 (Material covered through ~April 10 that was not covered on Exam 1)
TBA.............. Final Exam (Material covered throughout the course, Time and Place TBD)
Each Week..... Discussion review activities and problems introduced and worked through during discussion can be earned each week except during exam weeks. Discussion will be held each week except during the first week of class.

A complete schedule will be maintained on ICON.
COURSE POLICIES REGARDING EXPECTATIONS, ATTENDANCE, ABSENCES

- A 3 hour class typically entails at least 2 hours of outside preparation for the average student per each hour spent in class.
- No unauthorized photography or recording! You are expected to take notes during class/discussion. Your final point total will be reduced by 5 points for every instance you violate this course policy.
- Attendance at Discussion and exams is required. Lecture attendance on other days (except day 1) is neither taken nor required but encouraged. If you will miss Discussion or an exam, please notify the instructors in advance by filling out the form “Excused Absence Form” and submitting it via email.
- There will be no make up opportunities for unexcused absences.
- Exams 1 and 2 are 50 minute exams that will be taken during regularly scheduled class time. An equation sheet will be given to you. The exams are closed book and closed note.
- Make up exams must be scheduled BEFORE the original exam starts and taken within 48 hours of the originally scheduled exam time. Additional accommodations will be provided if warranted.
- Re-grade requests must be submitted within 1 week after these are available in the Chemistry Center. Only electronic or assignments completed in pen will be considered.
- Please silence all cell phones/electronic devices during class.
- Refrain from using electronic devices including smart watches for non-course related purposes during class. If you chose to use these for non-course related purposes, you should sit in the back of the room so that no one else is distracted during lecture and discussion. Otherwise, you will be asked to leave.

DISCUSSION SECTION EXPECTATIONS

Discussion sections are limited to ~20 students and are a very helpful, more personal complement to lectures. These sessions provide students with the opportunity to ask questions and gain problem-solving experience. Graduate teaching assistants will facilitate learning teams and efficient problem-solving strategies. Attendance and participation are required throughout the semester. YOU MUST RECEIVE PERMISSION IN ADVANCE TO ATTEND AN ALTERNATIVE DISCUSSION SECTION. ONLY REQUESTS THAT SATISFY VALID ABSENCES WILL BE CONSIDERED.

Points are awarded for participation and performance in graded discussion activities including a weekly review exercise and practice problems. Some practice problems will be collected and graded. Part 1 (review) is closed book, closed note but requires the use of Learning Catalytics (see page for opt out policy). Part 2 (practice problems) is electronics free but notes and books are allowed.

You will need a web-enabled device to connect to Learning Catalytics for the weekly review exercise. If you do not have one, please let the instructors know in advance. Your grade is based on your earned score, active participation, and contributions to your group. A maximum of 150 discussion points can be earned from review activities throughout the semester. Your two lowest review activity scores will not count toward your grade. You cannot participate in guided inquiry activities and discussion if you are not present.

ATTENDANCE IS REQUIRED. Consult the Courses tab at https://myui.uio.edu for time/location.

READING, SUGGESTED BOOK PROBLEMS, DISCUSSION REVIEW EXERCISES, EXAMS

- Reading: You are expected to read the assigned textbook sections. Working through problems at the end of the book and in the chapters are also excellent methods for you to learn this material and demonstrate your expertise. Some of these problems could be selected as homework problems.
- Discussion: Weekly discussion activities and practice problems are designed to help you master the course material and to maximize your learning. During exam weeks, discussion sections will be used to review material so come prepared with your questions. Discussions will be held during exam weeks. There will be 12 discussion review activities. You can miss two of these and still earn full discussion credit for the course. Success in this course requires that you attend your weekly discussion.
- Exams: There will be two in-class hour exams given during the course along with a comprehensive final exam. Sample exams are available on ICON.
- Practice Problems: Practice problems are included on ICON and will be delivered during discussion sections.
A NOTE ON COLLABORATION
Assignments turned in for credit must represent your work and understanding. Do not share your completed work with others or ask others to see their completed assignments as both are considered academic misconduct. You are responsible for understanding this policy and asking clarifying questions.

A WORD ABOUT THE DATE AND TIME OF THE FINAL EXAM
The final examination date and time will be announced by the Registrar generally by the tenth day of classes. I will announce the final examination date and time for this course at the course ICON site once it is known. Do not plan your end of semester travel plans until the final exam schedule is made public. It is your responsibility to know the date, time, and place of the final exam.

COURSE TOPICS, RELEVANT READING, AND SUGGESTED HOMEWORK
Topics will be selected from and presented in the following order as time permits. Slides shown during class will be posted on ICON. Handwritten notes from lecture will not be provided. A detailed course calendar representing what is covered in class will be maintained on ICON. I reserve the right to modify the following content based on student needs.

Lecture Pack 1: Course Overview and Brief Review
- Expected Reading: Chapters 1A-B, 1E and topics including
- Class introduction and course overview
- Overview of analytical method, importance of scientific terminology, and how your pre-requisite knowledge relates to course goals

Lecture Pack 2: Separations – Introduction, Gas Chromatography, HPLC, and Electrophoresis
- Expected Reading: Chapters 26, 27, 28, 30A-B and topics including
- Extractions, why do molecules separate and what does this have to do with kinetics and thermodynamics?, define retention parameters and use these to compare/contrast the effectiveness of a separation, real world limitations of separations, plate theory, column efficiency, mechanisms of band broadening, resolution
- Introduction to gas chromatography, gas chromatography components (block diagram), stationary and mobile phases in gas chromatography
- Introduction to liquid chromatography; why use liquid chromatography and high performance liquid chromatography; liquid chromatography separation efficiency, elution strength, block diagrams, columns, stationary and mobile phase selection, retention order, and detectors
- Introduction to electrophoresis, mechanisms of separation in electrophoresis, compare and contrast separation mechanisms of gas chromatography, liquid chromatography, and electrophoresis

- Expected Reading: Chapters 6, 5A-C (to page 119), 13C3-C4, 1D (should be a review), 7A-E and topics including
- Electromagnetic radiation, light interactions of matter, quantifying light-matter interactions, energy, principle of superposition, methods of quantification (quick review), noise
- Spectrometer components (overview, excitation sources, blackbody radiation sources, lasers filters, monochromators, gratings, cells, detectors)

Lecture Pack 4: Spectroscopy B – Atomic and Molecular Spectroscopy
- Introduction to atomic spectroscopy, atomizers
- Introduction to molecular spectroscopy, molecular spectroscopy theory, Beer’s law, instrumental components, theory of fluorescence and phosphorescence
- Introduction to vibrational spectroscopy, classical vs. quantum treatment of vibrational spectroscopy, vibrational spectroscopy selection rules, introduction to infrared spectroscopy, qualitative and quantitative analysis using infrared spectroscopy, infrared spectroscopy instrumentation, introduction to Rayleigh and Raman scattering, qualitative and quantitative analysis using Raman scattering, Raman scattering instrumentation
Administrative Home
The College of Liberal Arts and Sciences is the administrative home of this course and governs matters such as the add/drop deadlines, the second-grade-only option, and other related issues. Different colleges may have different policies. Questions may be addressed to 120 Schaeffer Hall, or see the CLAS Academic Policies Handbook.

Electronic Communication
University policy specifies that students are responsible for all official correspondences sent to their University of Iowa e-mail address (@uiowa.edu). Faculty and students should use this account for correspondence (Operations Manual, III.15.2. Scroll down to k.11).

Accommodations for Disabilities
A student seeking academic accommodations should first register with Student Disability Services and then meet with the course instructor privately in the instructor's office to make particular arrangements. See https://sds.studentlife.uiowa.edu/ for more information.

Nondiscrimination in the Classroom
The University of Iowa is committed to making the classroom a respectful and inclusive space for all people irrespective of their gender, sexual, racial, religious, or other identities. Toward this goal, students are invited to optionally share their preferred names and pronouns with their instructors and classmates. The University of Iowa prohibits discrimination and harassment against individuals on the basis of race, class, gender, sexual orientation, national origin, and other identity categories set forth in the University’s Human Rights policy. For more information, contact the Office of Equal Opportunity and Diversity, diversity@uiowa.edu, or visit diversity.uiowa.edu.

Academic Honesty
All students taking CLAS courses have, in essence, agreed to the College's Code of Academic Honesty: "I pledge to do my own academic work and to excel to the best of my abilities, upholding the IOWA Challenge. I promise not to lie about my academic work, to cheat, or to steal the words or ideas of others; nor will I help fellow students to violate the Code of Academic Honesty." Any student committing academic misconduct is reported to the College and placed on disciplinary probation or may be suspended or expelled (CLAS Academic Policies Handbook).

CLAS Final Examination Policies
The date and time of every final examination is announced by the Registrar generally by the fifth week of classes. No exams of any kind are allowed during the last week of classes. All students should plan on being at the UI through the final examination period. It is the student's responsibility to know the date, time, and place of the final exam.

Making a Suggestion or a Complaint
Students with a suggestion or complaint should first visit with the instructor and then with the departmental DEO. Complaints must be made within six months of the incident (CLAS Academic Policies Handbook).

Understanding Sexual Harassment
Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community have a responsibility to uphold this mission and to contribute to a safe environment that enhances learning. Incidents of sexual harassment should be reported immediately. See the Office of the Sexual Misconduct Response Coordinator for assistance, definitions, and the full University policy.

Reacting Safely to Severe Weather
In severe weather, class members should seek appropriate shelter immediately, leaving the classroom if necessary. The class will continue if possible when the event is over. For more information on Hawk Alert and the siren warning system, visit the Public Safety website.

These CLAS policy and procedural statements have been summarized from the web pages of the College of Liberal Arts and Sciences and The University of Iowa Operations Manual.