

Syllabus for ANALYTICAL CHEMISTRY II: CHEM:3120

Spring 2017

Lecture: Monday, Wednesday, Friday, 10:30-11:20 am in W128 CB

Discussion: CHEM:3120:0002 (Monday, 9:30-10:20 AM in C129 PC); CHEM:3120:0003 (Tuesday, 2:00-2:50 PM in C129 PC); or CHEM:3120:0004 (Wednesday, 11:30-12:20 PM in C139 PC)

INSTRUCTORS

Primary Instructor: Prof. Amanda J. Haes (amanda-haes@uiowa.edu; (319) 384 – 3695)

Office Hours Location: 204 IATL

Office Hours: Mondays from 8 – 9:30 AM; Wednesdays from 1:30 – 3 PM; by appointment

**Please note, I will be traveling periodically throughout the semester and will need to reschedule my office hours. I will post these updates on ICON (under news) at least 48 hours in advance of any planned absence. I have arranged for substitute instructors for lectures on dates when I need to miss class because of planned travel.*

Teaching Assistants: Sanjaya Dilantha Jayalath Mudiyansele (sanjaya-jayalath@uiowa.edu)

Office Hours Location: Student Resource Room (W208 CB)

Office Hours: Tuesdays and Wednesdays from 3:30-4:30 PM

Rachel Seurer (rachel-seurer@uiowa.edu)

Office Hours Location: Student Resource Room (W208 CB)

Office Hours: Mondays and Fridays from 12:30-1:30 PM

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

Guidance for communicating with course instructors: Please refrain from sending course instructors open ended questions that are better suited for a discussion. We are here to help you learn the course material but often, office hours are the best place to help you. Please come see us EARLY and OFTEN. A question that will upset us is “will this be on the exam?” If something is discussed in class, discussion, homework, and/or book; it has the potential of being on an exam.

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.

Prerequisite: CHEM:1120 (4:012) and MATH:1460 (22M:016, Calculus for Biological Sciences) or MATH:1860 (22M:026, Calculus II), and PHYS:1511 (029:011, College Physics I) or PHYS:1611 (029.081, 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 students devote ≥ 6 hrs/week (3 credits x 2 out of class hrs/credit) to out of class studying (reading book chapters, reviewing notes) and problem solving.

- (1) Lectures – Prof. Haes
- (2) Discussion Sections – Prof. Haes and a graduate student TA
- (3) Exams – Prof. Haes

The course has been designed and organized to help you learn chemistry, but no course or instructor can learn for you. Learning is something only you can do.

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.

OBJECTIVES AND GOALS OF THE COURSE

Learning objectives for this course will focus on developing a fundamental understanding of the following topics as they relate to separations and spectroscopy. Detailed learning objectives are listed on ICON.

- 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

Learning Catalytics (required). Learning Catalytics is a web-based tool used for interactive classroom activities and will be used in this course. 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 and create an account by January 20, 2017.

COURSE WEBSITE

<http://icon.uiowa.edu> (Access with your username and password) – lectures, homework, 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. News items will also be posted, so we encourage you to check ICON regularly.

GRADING SYSTEM AND THE USE OF +/-

Grades will be assigned and based on the distribution of point totals. The average score will likely lie at the B-/C+ border, and the overall grade distribution will approximately follow the College guidelines for advanced courses (22% A, 38% B, 36% C, 3% D, 1% F). The +/- grading scale will be used. Exceptional performances will receive an A+.

EXAMS, ASSIGNMENTS, AND PERCENTAGE OF FINAL GRADE

The course grade will be determined from the following elements:

- Discussion = 150 points (25 %)
- In-class exams – 2@100 points = 200 points (33.3 %)
- Comprehensive final exam = 150 points (25 %)
- Homework = 100 points (16.7 %)
- **Total = 600 points**

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.
- 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 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 during class.
- Refrain from using electronic devices for non-course related purposes during class.
- Homework assignments will be posted on ICON and announced in class. Follow instructions carefully.

DISCUSSION SECTION EXPECTATIONS

Discussion sections are limited to ~25 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.

Each week, 15 points are awarded for participation (3 pts) and performance in graded discussion activities including a quiz (12 pts). Your two lowest weekly scores will be ignored.

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

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

READING, SUGGESTED BOOK PROBLEMS, HOMEWORK, QUIZZES, 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 quizzes are designed to help you master the course material and to maximize your learning. These points can be earned each week except during the week of January 16 (first week of class), February 20 (week of Exam 1), and April 3 (week of Exam 2). During exam weeks, discussion sections may be used to review material so come prepared with your questions. There will be 12 discussion quizzes. 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. The final exam will consist of 100 points derived from **all** the course material and 50 points based on material covered after Exam #2. Sample exams are available on ICON.
- **Homework:** Homework assignments will be announced in class and posted on ICON. You can discuss these homework sets as a group; however, copying work is not discussion. The written work must be individually prepared. Work that is copied from another individual is not acceptable and will result in a "0" for individuals enrolled in the course. Please see the section in the Student Academic Handbook on Rights and Responsibilities for the University of Iowa's policy on academic misconduct: <http://www.clas.uiowa.edu/students/handbook/x/>. Homework will be due at the beginning of class.

A NOTE ON COLLABORATION

Homework is designed to help you master your knowledge related to the topics covered during lecture and in the textbook. Homework problems are turned in for credit and must represent your work and understanding (collaboration is not allowed on what you turn in for credit). Do not share your completed work with others or ask others to see their completed assignments because both are considered academic misconduct. You are responsible for understanding this policy. Ask questions if you need clarification.

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.

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 5..... Exam 2 (Material covered through April 3 and after Exam 1)

TBA..... Final Exam (Material covered throughout the course, Time and Place TBD)

Discussion quizzes and participation points can be earned each week except during the weeks of January 16 (first week of class), February 20 (week of Exam 1), and April 3 (week of Exam 2).

Homework is due on **February 3, February 17, March 10, March 31, April 21, May 5 (at 10:30 AM)**

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. A detailed course calendar representing what is covered in class will be maintained on ICON (under Contents). 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
 - Topics include class introduction, course overview, analytical method, importance of scientific terminology and how this relates to course goals
- **Lecture Pack 2: Separations – Introduction, Gas Chromatography, HPLC, and Electrophoresis**
 - Expected Reading: Chapters 26, 27, 28, 30A-B
 - Topics include
 - 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
- **Lecture Pack 3: Spectroscopy A – Introduction, Electromagnetic Spectrum, Signal/Noise, Quantification, and Instrumentation**
 - Expected Reading: Chapters 6, 5A-C (to page 119), 13C3-C4, 1D (should be a review), 7A-E
 - Topics include
 - What is 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**
 - Expected Reading: Chapters 8A, 9A-B, 10A-B, 13A-B, 13D, 14A-D, 15A-B, 16A1-A3, 18A1, 16A4-A5, 16B-C, 17A1-A3, 17B, 17D-G, 18A-D
 - Topics include
 - 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, quantitative analysis using Raman scattering, Raman scattering instrumentation

**University of Iowa and College of Liberal Arts and Sciences (CLAS)
Teaching Policies & Resources**

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 at <http://clas.uiowa.edu/students/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 correspondences (Operations Manual, III.15.2, k.11).

ACCOMMODATIONS FOR DISABILITIES

A student seeking academic accommodations should first register with Student Disability Services and then meet privately with the course instructor to make particular arrangements. See www.uiowa.edu/~sds/ for more information.

ACADEMIC HONESTY

All CLAS students or students taking classes offered by CLAS 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 final examination schedule for each class is announced by the Registrar generally by the tenth day of classes. Final exams are offered only during the official final examination period. **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. Once the Registrar has announced the date, time, and location of each final exam, the complete schedule will be published on the Registrar's web site and will be shared with instructors and students. It is the student's responsibility to know the date, time, and place of a final exam.

MAKING A SUGGESTION OR A COMPLAINT

Students with a suggestion or complaint should first visit with the instructor (and the course supervisor), 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 UI Comprehensive Guide on Sexual Harassment 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 Department of 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.