CHEM:3120 Analytical Chemistry II
Syllabus – Spring 2021

I. General Information:

Instructor: Prof. David McCurdy
W239 CB
Office Phone: 319-335-4867
E-Mail: david-mccurdy@uiowa.edu

Teaching Assistants: Christian Haas
E-mail: christian-haas@uiowa.edu
Office Hours: M at 11:30 AM-12:30 PM; T at 1:00 -2:00 PM

Rasheda Samiha
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Office Hours: TBD

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

Course WebSite: Class Information, lecture slides and pictures, alternate reading information, problems/solutions and grade points are available on the class ICON site. The web address is http://icon.uiowa.edu . Announcements will also be posted on this site, so it is encouraged that you check the site regularly.

Office Hours: Professor McCurdy’s office hour times are posted on the ICON web site. They will be held using Zoom and can be accessed at the following zoom link.

https://uiowa.zoom.us/j/91588700924

Tuesday: 2:30 – 3:30 PM
Thursday: 2:30 – 3:30 PM
Other times by appointment.

Course Schedule:

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Section 000A</th>
<th>10:30-11:20 AM</th>
<th>MWF</th>
<th>W290 CB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discussion</td>
<td>Section 0002</td>
<td>09:30-10:20 AM</td>
<td>M</td>
<td>W268 CB</td>
</tr>
<tr>
<td></td>
<td>Section 0003</td>
<td>02:00-02:50 PM</td>
<td>T</td>
<td>W268 CB</td>
</tr>
<tr>
<td></td>
<td>Section 0004</td>
<td>11:30 AM -12:20PM</td>
<td>W</td>
<td>W268 CB</td>
</tr>
</tbody>
</table>

Course Description: This course will survey modern chemical instrumental techniques with focus on spectroscopy, chemical separations, and, if time allows, some mass spectrometry. Specific topics will include important introductory ideas that are overarching to all instrumental techniques as well as atomic spectroscopy, molecular spectroscopy, gas chromatography, liquid chromatography, capillary electrophoresis, and mass spectrometry.

Course Pre-requisites: CHEM 1120 and MATH:1460 (Calculus for Biological Sciences) or MATH 1860 (Calculus II); PHYS:1511 (College Physics I) or PHYS:1611 (Introductory Physics I).

Required Materials:

Text: “Principles of Instrumental Analysis”, Seventh Edition, D.A. Skoog, F. J. Holler, S.R. Crouch, Brooks-Cole, 2007, ISBN:978-1-305-57721-3. Edition 6 can be used if desired, as it has quite similar content. Older editions and international versions are discouraged as they contain errors and often have different material. Your instructors and class TA will be providing references to the 7th edition.
and may not always remember to compare to older editions. If using an older edition, it is your responsibility to determine the corresponding reading and problems in that book. The detailed table of contents for the 7th edition will be posted on the ICON class site under general course information.

**Additional reading assignments:** Assignments will be made from other sources than the text. They may constitute handouts, posted pdf files, web links, or perhaps obtained through the chemical literature.

**Calculator:** A hand-held, non-programmable, scientific calculator will be necessary for exams and quizzes. The instructor will not be responsible for bringing “loaners” for your use.

**Photocopy Costs:** Occasional literature assignments may be made in which you may be responsible for the costs of photocopying a research or review article.

**Course Structure:**

The class consists of three components. Attendance is considered necessary as the material presented in class will be derived from a variety of sources and the text will not always contain everything covered nor will every portion of the text material be covered in lecture. Not all lectures will be presented solely on Powerpoint; many will emphasize some interactive discussion in reviewing the ideas of the class presented. It is recommended you devote about 6 hours per week (3 credits x 2 study hours per credit) for your out of class activities. This should include reading recommended materials, working on homework assignments, reviewing class notes, and spending time on problem-solving activities.

1. **Lectures:** Professor McCurdy – Class notes will be presented on Powerpoint and through written information on the class board. Questions will be asked and answers (right or wrong) are expected. Be prepared to discuss ideas.

2. **Discussion Sessions:** Prof. McCurdy and graduate TA -- Exercises in which you will participate, discuss and critically think will be done in these sessions.

3. **Homework:** Homework will be assigned to correlate with lecture topics. These assignments will be posted on the class ICON site. Announcements in lecture will also refer to the assignments (can be both text problems or worksheet postings on ICON) as well as due dates correlating with them.

4. **Examinations:** Professor McCurdy with assistance from TAs -- The exams will certainly not have only multiple choice questions. There will be short answer, problems and discussion topics included. An example will be provided on the ICON site prior to the first exam. Practice exams will not be posted.

**II. Course Objectives:**

The objectives of this class include the development of a fundamental understanding of separations, spectroscopy, and mass spectrometry. More details on specific objectives related to the diverse instrumental topics covered will be posted on the course ICON site. The overarching objectives of the class are:

- Understand the background theory, fundamental principles and relevant terminology associated with separations, spectroscopy, and mass spectrometry.
- To understand and critically evaluate the utility, strengths, weaknesses and limitations of common, modern separation, spectroscopic and mass spectrometric instrumentation.
- To integrate the theory of modern instrumentation with the practical ways that modern instruments are used.
- To understand and be able to solve qualitative and quantitative problems with familiar and unfamiliar concepts, as applicable with modern instrumentation.
• To understand how mathematics, statistics, and the basic concepts of chemistry, physics and electronics are fundamentally important to intelligent use of modern instrumentation, as well as to practice the application of these ideas.

III. Lecture Information:

Lectures will be face-to-face this semester. Recordings using Panopto will be made and shared by the instructor if a reasonable excuse for missing lecture is made. If circumstances for us to go to virtual delivery methods, lectures will be recorded and posted on ICON. In lieu of the lectures, the instructor will be present on the zoom link during normal lecture time to discuss lecture material.

Course Coverage: Topics will be covered in the approximate sequence below, as time permits. You instructor reserves the right to modify content and coverage based on student needs and timing. Most certainly every topic in the book cannot be covered in a class such as this, so please pay close attention to the recommended reading assignments associated with each topic presented.

• Reading assignments will be made from the text. It will be expected you read these sections.
• The lecture will explore and expand upon topics from the text reading assignments. Additional information will be presented that may not always be in the text, making class attendance important.
• Powerpoint slides shown in lecture will be posted on the ICON site. As many notes will not be presented through Powerpoint and often driven by class discussion, these will not necessarily be provided through the ICON site. Students will be responsible for this information.
• A more detailed calendar of specific reading assignments, goals, homework, discussion activities, exams and exam coverage will be maintained on the ICON site and announced in lecture. The general areas covered in this course will include the major sections as listed below. An approximation of the number of lectures spent is also included.

<table>
<thead>
<tr>
<th>Unit #</th>
<th>Topic</th>
<th>Approx. # of Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introductory Ideas (Chapters 1-5) Overview of Instrumentation Electronics and Chemical Instrumentation Signals, Noise and Calibration</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>Separations (Chapters 26-28, 30) Introductory Theory of Chromatographic Separations Gas Chromatography Liquid Chromatography Electrophoresis (capillary)</td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td>Spectroscopy (Chapters 6-11; 13-18) Interaction of Light and Matter Optical Components and spectrometers Atomic Spectroscopy Molecular Spectroscopy UV-VIS Spectrophotometry Luminescent Spectroscopy Infrared and Raman Spectroscopy</td>
<td>14</td>
</tr>
<tr>
<td>4</td>
<td>Mass Spectrometry (Chapter 20/additional reading) Molecular Mass Spectrometry Biochemical Mass Spectrometry</td>
<td>4</td>
</tr>
</tbody>
</table>
**Lecture Exams:** There will be 3 lecture examinations given as in-class exams. Each exam will be worth 100 points. The exams will be written for 50 minutes. Exams will be closed book and note. The following is a tentative schedule of the days set aside for examinations. If circumstances require virtual instructions, exams will be given on ICON or as take-home exams.

Exam 1: February 17, 2021 (Wednesday)
Exam 2: March 24, 2021 (Monday)
Exam 3: April 30, 2021 (Friday)

- Re-grade requests must be submitted within 1 week after grading evaluations have been made available through the Chemistry Center. Make sure they are time stamped when turning them in.

**Final Exam:** A comprehensive final exam worth 150 points will be given at a time and place to be determined during Finals week (May 9 – 14, 2021).

- If you have any exam conflicts, please let them be known to your instructor more than 1 week in advance.

**Class Assignments:** Assignments involving reading, homework, and literature work will be given regularly. You will be expected to complete them on time to allow more active and meaningful participation in the class.

- Homework is important! It contributes up to 150 points to your grade and is also important in terms of preparation for quizzes and exams.
- Not all assignments may be awarded point contributions to your grades.
- Complete all assignments in ink or as a printed version of electronic answers (MS word, …)
- **No late assignments will be accepted.** Due dates will be announced in advance and enforced.
- Assignments and announcements will be announced at the beginning of the class period and on the class ICON site. The instructor assumes no responsibility for communicating information presented in lecture for tardy individuals or absences.
- Failure to turn in homework that is collected will have a bearing on borderline grades.
- It is particularly important to prepare the pre-class reading **IN ADVANCE** of the classroom discussion. In many cases, advance reading will mean the difference between clear comprehension and utter confusion.
- If circumstances require virtual instruction, assignments will be collected by the submission of pdf files directly to the ICON class site or to Gradescope. Instructions will be given if necessary.

**Quizzes:** Routine quizzes are not planned but will be given if I deem that class preparation is inadequate, or poor course citizenship is exhibited.

**Attendance and Participation:** You are expected to attend lecture and arrive on time. [An old adage suggests that being on time is 10 minutes early – Being late is arriving on time]. Attendance and participation in lecture and discussion periods will be noted and will be considered in grade determinations (both through points earned in discussion and in grade borderline considerations). Habitually late arrival will be noted and will be considered an absence.

**Absences Due to Illnesses:** If you are ill, you should stay home and contact your class instructors. Please make this contact before the missed class components wherever possible, as it makes planning the makeup work easier. If you are absent or quarantined due to COVID, in order to grant accommodations, you must fill out the student self-report form found on your MyUI page. If these forms are not completed, assistance for the missed work may not be given.
Make-Up Exams: Makeup 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. No credit will be given for missed exams or quizzes without prior instructor notification and approval.

IV. Discussion Section:

Discussion sessions will meet face-to-face this semester, unless circumstances force us to virtual. If this happens, they will be conducted on Zoom. The discussion sections are limited to about 15 students and add a more personal component to the lectures. These sessions are designed to provide students to ask questions, gain problem solving experience and strategies, and to reinforce/add additional important ideas to complement the lecture coverage. They will contribute 150 points to your overall grade. Graduate student TAs will facilitate learning teams and lead problem-solving strategies.

- **Attendance and Participation are required** throughout the semester.
- During exam weeks the discussion sections will review material to allow an additional opportunity to ask questions. Use this opportunity to your advantage.
- You should attend the discussion to which you are registered. You must receive permission in advance to attend an alternate section. Requests to attend an alternate session must be considered university-approved reasons.
- Points will be awarded for participation and performance on graded discussion activities. Some problems done in the discussion session will be collected and graded.
- You should bring notes and a text to the sessions, though some exercises will be done with closed text and notes.
- A maximum of 150 discussion points can be earned through the semester.
- Your lowest 2 review activity scores will not be counted for the discussion contribution to your grade.

V. Course Grade Summary:

The overall breakdown of grade points will be as follows.

<table>
<thead>
<tr>
<th>Component</th>
<th>Points Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examinations</td>
<td>300</td>
</tr>
<tr>
<td>Homework and Projects</td>
<td>150</td>
</tr>
<tr>
<td>Discussion Activities</td>
<td>150</td>
</tr>
<tr>
<td>Final Examination</td>
<td>150</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>750</strong></td>
</tr>
</tbody>
</table>

Letter grades will be assigned by calculating the percentage of points earned during the semester. The scale used to assign letter grades is shown below. The +/- grading scale will be used and exceptional performances will earn an A+. The instructor reserves the right to lower the grading scale, but this should not be expected. The grading scale will never be raised.

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>88.0 - 100</td>
<td>A</td>
</tr>
<tr>
<td>76.0 - 87.9</td>
<td>B</td>
</tr>
<tr>
<td>64.0 - 75.9</td>
<td>C</td>
</tr>
<tr>
<td>52.0 - 63.9</td>
<td>D</td>
</tr>
<tr>
<td>0 – 51.9</td>
<td>F</td>
</tr>
</tbody>
</table>

VI. Course Policies and Reminders:

*** Course materials are not to be shared to the world wide web. Similarly, the use of internet “cheat” sites on exams or homework will be considered academic misconduct.

***Your instructors reserve the right to deduct a point for using the term “machine” to refer to an instrument.
*** No unauthorized photography or recording! You should be taking notes in class and discussion. Point deductions may be assessed for violation of this policy.

*** No late homework assignments will be accepted. Make-ups will be granted only at the instructor’s discretion and only for reasonable excuses.

** No makeup opportunities for unexcused absences. If you must miss discussion or an exam, please fill out the “Excused Absence Form” and submit it via email.

*** All mathematical work and assumptions used when solving a problem must be shown to receive credit. Mark all answers clearly.

*** Solutions keys for homework and exams will be posted on the class ICON site.

*** Please stow and silence cell phones during class.

*** Refrain from working with electronic devices during class for non-related class purposes. It disturbs those around you. If you do, sit in the rear of the room. If these activities disturb another student, you will be asked to leave.

*** Cramming class material will not develop necessary proficiency to allow completion of the exams.

***A NOTE ON CLASS COLLABORATION: Assignments turned in for credit must represent your work and understanding, as well as being written in your own words. Do not share your completed work with others or as others to see their completed assignments. These are all considered academic misconduct and will be reported to the Dean of Students.

*** DATE and TIME of the Final Exam: The final exam date and time will be announced by the registrar roughly 4 weeks into the semester. This information will be shared through ICON when known. Do not plan your end of semester travel plans until the schedule is made public. It is your responsibility to know the date, time and place of the final exam and to be sure there are no conflicts.

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

Absences and Attendance
Students are responsible for attending class and for contributing to the learning environment of a course. Students are also responsible for knowing course absence policies, which vary by instructor. All absence policies, however, must uphold the UI policy related to student illness, mandatory religious obligations, including Holy Day obligations, unavoidable circumstances, and University authorized activities (https://clas.uiowa.edu/students/handbook/attendance-absences). Students may use the CLAS absence form to aid communication with the instructor who will decide if the absence is excused or unexcused; the form is located on ICON within the top banner under “Student Tools.”

Academic Integrity
All undergraduates enrolled in courses offered by CLAS have in essence agreed to the College's Code of Academic Honesty. Academic misconduct affects a student’s related grade and is reported to the College
which applies an additional sanction including suspension. Outcomes about misconduct are communicated through UI email (https://clas.uiowa.edu/students/handbook/academic-fraud-honor-code).

Accommodations for Disabilities
UI is committed to an educational experience that is accessible to all students. A student may request academic accommodations for a disability (such as a mental health, attention, learning, vision, and a physical or health-related condition) by registering with Student Disability Services (SDS). The student is then responsible for discussing specific accommodations with the instructor. More information is at https://sds.studentlife.uiowa.edu/.

Administrative Home of the Course
The College of Liberal Arts and Sciences (CLAS) is the administrative home of this course and governs its add/drop deadlines, the second-grade-only option, and related policies. Other UI colleges may have different policies for courses offered by that college. CLAS policies may be found here: https://clas.uiowa.edu/students/handbook.

Classroom Expectations
Students are expected to comply with University policies regarding appropriate classroom behavior as outlined in the Code of Student Life (https://dos.uiowa.edu/policies/code-of-student-life/). This includes related UI policies and procedures that all students have agreed to regarding the COVID-19 pandemic. Particularly, each student must wear a face mask when in a UI building, including a classroom. The density of seats in classrooms has been reduced, and in some instances, this will allow 6 feet or more of distance while other cases, it may be less. Regardless, wearing a face mask and maintaining as much distance as is possible are vital to slowing the spread of COVID-19. In the event that a student disrupts the classroom environment through the failure to comply with a reasonable directive of an instructor or of the University, the instructor has the authority to ask that the student to leave the space immediately for the remainder of the class period. Additionally, the instructor is asked to report the incident to the UI Office of Student Accountability, with the possibility of additional follow-up with the student. Students who need temporary alternative learning arrangements (TALA) for a future semester related to COVID-19 should visit this website for more information: https://coronavirus.uiowa.edu/temporary-alternative-learning-arrangements-tala.

Class Recordings: Privacy and Sharing
Some sessions of a course could be recorded or live-streamed. Such a recording or streaming will only be available to students registered for the course. These recordings are the intellectual property of the faculty, and they may not be shared or reproduced without the explicit written consent of the faculty member. Students may not share these sessions with those who are not enrolled in the course; likewise, students may not upload recordings to any other online environment. Doing so is a breach of the Code of Student Conduct and in some cases is a violation of the Federal Education Rights and Privacy Act (FERPA).
Communication and the Required Use of UI Email
Students are responsible for official correspondences sent to the UI email address (uiowa.edu) and must use this address for all communication within or with UI (Operations Manual, III.15.2).

Complaints
Students with a complaint about an academic issue should first visit with the instructor or course supervisor and then with the Chair of the department or program offering the course; students may next bring the issue to the College of Liberal Arts and Sciences. See this page for more information: https://clas.uiowa.edu/students/handbook/student-rights-responsibilities.

Final Examination Policies
The final exam schedule is announced around the fifth week of classes; students are responsible for knowing the date, time, and place of a final exam. Students should not make travel plans until knowing this information. No exams of any kind are allowed the week before finals with a few exceptions made for particular types of courses such as labs or off-cycle courses: https://registrar.uiowa.edu/final-examination-scheduling-policies.

Nondiscrimination in the Classroom
The University of Iowa is committed to making the classroom a respectful and inclusive space for people of all gender, sexual, racial, religious, and other identities. Toward this goal, students are invited in MyUI to optionally share the names and pronouns they would like their instructors and advisors to use to address them. 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 (https://diversity.uiowa.edu/eod; +1 319 335-0705 or (diversity.uiowa.edu)

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 must uphold the UI mission and contribute to a safe environment that enhances learning. Incidents of sexual harassment must be reported immediately. For assistance, please see https://osmrc.uiowa.edu/.

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.

Diligence is the mother of good luck.

-------- Benjamin Franklin