I. General Information:

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

**Teaching Assistants:**
Andres Mora-Mata  
E-mail: andres-moramata@uiowa.edu  
Office Hours: M and F 5:30-6:30 PM in E208CB

**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](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 in person.

Tuesday: 2:30 – 3:30 PM  
Thursday: 10:30-11:30 AM  
Other times by appointment.

**Course Schedule:**
Lecture: Section 000A 10:30-11:20 AM  MWF  W107 PBB  
Discussion:  
Section 0002 09:30-10:20 AM  M  C129 PC  
Section 0003 02:00-02:50 PM  T  C129 PC  
Section 0004 11:30 AM -12:20PM  W  C139 PC

**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. As such, it will be difficult to record lectures and capture the blackboard discussion. Questions will be asked and answers (being right or wrong is not as critical as involving yourself in the discussion) 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 -- The exams will certainly not have only multiple choice questions. There will be short answer, problems and discussion topics included. Be prepared to explain things on the exam. 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, if time allows, a little 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 ~1200 page textbook 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, preferably before coming to lecture.
- 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>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>3</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>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 11, 2022 (Friday)
Exam 2: March 25, 2022 (Friday)
Exam 3: April 29, 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 – 13, 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 200 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, nor will every question be graded. Keys will be posted for the assignments so you can self-check and review them.
- 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. 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 on Gradescope, which is now integrated into ICON. Instructions will be given if necessary.

**Quizzes:** Routine quizzes are not planned but will be given if your instructors deem that class preparation is inadequate, or poor course citizenship is exhibited. The instructor reserves the right to award points in the form of attendance quizzes.

**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/lecture 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 quickly. Please make this contact before the missed class components wherever possible, as it makes planning a route to get the missed work completed much easier. If no contact is made, it is assumed a non-university approved absence.

**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. The discussion sections are limited to about 20 students maximum 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 must attend the discussion to which you are registered. You must receive permission in advance to attend an alternate section from your TA. Requests to attend an alternate session must be considered university-approved reasons.
- Points will be awarded for attendance, 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</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examinations</td>
<td>300</td>
</tr>
<tr>
<td>Homework and Projects</td>
<td>200 max</td>
</tr>
<tr>
<td>Discussion Activities</td>
<td>150</td>
</tr>
<tr>
<td>Final Examination</td>
<td>150 max</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>800 max</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>
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<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. If there are difficulties, advance notice of the issues will be needed.

** 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.
instructor except in the case of a brief illness. Students are responsible for communicating with instructors as soon as the absence is known (https://opsmanual.uiowa.edu/students/absences-class#8.1).

**ABSENCES: HOLY DAYS**
The University is prepared to make reasonable accommodations for students whose religious holy days coincide with their classroom assignments, test schedules, and classroom attendance expectations. Students must notify their instructors in writing of any such Religious Holy Day conflicts or absences within the first few days of the semester or session, and no later than the third week of the semester. If the conflict or absence will occur within the first three weeks of the semester, the student should notify the instructor as soon as possible. See Operations Manual 8.2 Absences for Religious Holy Days for additional information.

**ABSENCES: MILITARY SERVICE OBLIGATIONS**
Students absent from class due to U.S. veteran or U.S. military service obligations (including military service-related medical appointments, military orders, and National Guard Service obligations) must be excused without penalty. Instructors must make reasonable accommodations to allow students to make-up exams or other work. Students must communicate with their instructors about the expected possibility of missing class as soon as possible. (For more information, see https://opsmanual.uiowa.edu/iv-8-absences-class%C2%A00).

**ACADEMIC MISCONDUCT**
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 grade and is reported to the College which applies an additional sanction, such as suspension. Outcomes about misconduct are communicated through UI email (https://clas.uiowa.edu/students/handbook/academic-fraud-honor-code).

**ACADEMIC ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES**
The University is committed to providing an educational experience that is accessible to all students. If a student has a diagnosed disability or other disabling condition that may impact the student’s ability to complete the course requirements as stated in the syllabus, the student may seek accommodations through Student Disability Services (SDS). SDS is responsible for making Letters of Accommodation (LOA) available to the student. The student must provide a LOA to the instructor as early in the semester as possible, but requests not made at least two weeks prior to the scheduled activity for which an accommodation is sought may not be accommodated. The LOA will specify what reasonable course accommodations the student is eligible for and those the instructor should provide. Note that accommodations are not granted retroactively but from the time of the student’s request to the instructor onward. Additional information can be found on the SDS website.

**CLASS RECORDINGS: PRIVACY AND SHARING**
Course lectures and discussions are sometimes recorded or live-streamed. These are only available to students registered for the course and are the intellectual property of the faculty member. These materials may not be shared or reproduced without the explicit written consent of the instructors. Students may not share these recordings 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 could be a violation of the Federal Education Rights and Privacy Act (FERPA); also see https://dos.uiowa.edu/policies/code-of-student-life/.

**COMMUNICATION: UI EMAIL**
Students are responsible for all official correspondences sent to their UI email address (uiowa.edu) and must use this address for any communication with instructors or staff in the UI community (Operations Manual, III.15.2). Emails should be respectful and brief, with complex matters addressed during the instructor’s drop-in hours, for example. Faculty are not expected to answer email after business hours or during the weekends.

**COMPLAINTS ABOUT ACADEMIC MATTERS**
Students with a complaint about a grade or a related academic issue should first visit with the instructor and then with the course supervisor (if one is assigned), and next with the Chair of the department or program offering the
course. If not resolved, students may bring their concerns to the College of Liberal Arts and Sciences: https://clas.uiowa.edu/students/handbook/student-rights-responsibilities. **FINAL EXAMINATION POLICIES**

The final exam schedule is published during the fifth week of the fall and spring semesters or on the first day of summer classes; *students are responsible for knowing the date, time, and place of their final exams*. Students should not make travel plans until knowing this information. A student with exams scheduled on the same day and time or who have more than two final exams on the same day should visit this page for how to resolve these problems by the given deadline: https://registrar.uiowa.edu/makeup-final-examination-policies. No exams may be scheduled the week before finals; some exception, however, have been made for labs, language courses, and off-cycle courses (https://registrar.uiowa.edu/final-examination-scheduling-policies). **FREE SPEECH AND EXPRESSION** The University of Iowa supports and upholds the First Amendment protection of freedom of speech and the principles of academic and artistic freedom. We are committed to open inquiry, vigorous debate, and creative expression inside and outside of the classroom. Visit Free Speech at Iowa for more information on the University's policies on free speech and academic freedom (https://freespeech.uiowa.edu/).

**HOME OF THE COURSE** The College of Liberal Arts and Sciences (CLAS) is the home of this course, and CLAS governs the course’s add and drop deadlines, the “second-grade only” option (SGO), and other undergraduate policies and procedures. Different UI colleges may have other policies or deadlines. See https://clas.uiowa.edu/students/handbook. Questions? Contact CLAS at clasps@uiowa.edu or 319-335-2633.

**MENTAL HEALTH**

Students are encouraged to be mindful of their mental health and seek help as a preventive measure or if feeling overwhelmed and/or struggling to meet course expectations. Students are encouraged to talk to their instructor for assistance with specific class-related concerns. For additional support and counseling, students are encouraged to contact University Counseling Service (UCS). Information about UCS, including resources and how to schedule an appointment, can be found at counseling.uiowa.edu. Find out more about UI mental health services at: mentalhealth.uiowa.edu. Student Health can also address related concerns (https://studenthealth.uiowa.edu/).

These visits are free to students. After hours, students are encouraged to call the Johnson County Community Crisis Line at (319) 351-0140 or dial 911 in an emergency.

**NON-DISCRIMINATION STATEMENT**

The University of Iowa prohibits discrimination in employment, educational programs, and activities on the basis of race, creed, color, religion, national origin, age, sex, pregnancy, disability, genetic information, status as a U.S. veteran, service in the U.S. military, sexual orientation, gender identity, associational preferences, or any other classification that deprives the person of consideration as an individual. The university also affirms its commitment to providing equal opportunities and equal access to university facilities. For additional information on nondiscrimination policies, contact the Director, Office of Institutional Equity, the University of Iowa, 202 Jessup Hall, Iowa City, IA 52242-1316, 319-335-0705, oie-ui@uiowa.edu. Students may share their pronouns and chosen/preferred names in MyUI, which is accessible to instructors and advisors.

**SEXUAL HARASSMENT** The University of Iowa prohibits all forms of sexual harassment, sexual misconduct, and related retaliation. The Policy on Sexual Harassment and Sexual Misconduct governs actions by students, faculty, staff and visitors. Incidents of sexual harassment or sexual misconduct can be reported to the Title IX and Gender Equity Office or to the Department of Public Safety. Students impacted by sexual harassment or sexual misconduct may be eligible for academic supportive measures and can learn more by contacting the Title IX and Gender Equity Office. Information about confidential resources can be found here. Watch the video for an explanation of these resources.

*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