I. Logistics
Instructor
Professor Betsy Stone
Chemistry Building W313
(319) 384-1863
betsy-stone@uiowa.edu (preferred mode of contact)

Class Location and Time

Mondays and Wednesdays at 3:30-4:45 PM
Zoom Link for Class
Meeting ID: 946 8587 5106
Passcode: stone
https://uiowa.zoom.us/j/94685875106?pwd=aUlLSHBiSEVaT2ZQaXJjcStTeFkydz09

Office Hours

Tuesdays 2:00-3:00 PM
Wednesdays 10:30-11:30 AM
Thursdays 9:30-10:30 AM

Zoom Link for Office Hours
Meeting ID: 930 8383 2256
Passcode: stone
https://uiowa.zoom.us/j/93083832256?pwd=NmYwaW10RWthM3ZpNWdhMljIanNsUT09

Students are invited to join my virtual office hours to discuss questions about the course material or concerns. To schedule an appointment, please email me.

II. Course Description and Objectives
Description
Mass spectrometry (MS) will be examined in terms of basic theory, instrumentation, qualitative and quantitative analysis, and its application to the environmental and biological sciences. Topics will be explored through a combination of scientific readings, case studies, and independent projects. Emphasis will be placed on cyberlearning and instrumentation in the University of Iowa’s High Resolution Mass Spectrometry Facility.

Learning Goals and Objectives
• Develop an understanding of the physicochemical principles of mass spectrometry, methods of ionization, and the behavior of charged molecules.

• Gain practical knowledge of mass spectrometry instrumentation, including sample introduction, ionization sources, mass selectors, detectors, and vacuum systems.

• Develop a working knowledge of emerging trends in mass
spectrometry, including ultrahigh-resolution and tandem techniques.

- Interpret data from mass spectrometers for the purpose of qualitative and quantitative analysis, method development, and validation.
- Explain state-of-the-art applications of mass spectrometry in research areas of proteomics (and related fields), pharmacology, toxicology, environmental analysis, and organic chemistry
- Assess the advantages and limitations of various mass spectrometric techniques and their applicability.

### Media/System Requirements
Technical requirements for completing University of Iowa Distance and Online Education classes include:

- Student-provided personal computer
- Reliable Internet access. For specific requirements see [Distance and Online Education Technical Support](#)
- Microsoft 365
- Freeware or software available at no cost to UI students, as assigned

### III. Course Content

#### Modules

1. **Introduction to Mass Spectrometry**: terminology, the mass spectrometer, the mass spectrum
2. **Interpretation of mass spectrometer output**
3. **Mass Spectrometers**: principles of ionization, ionization sources; mass selectors; detectors, data acquisition, vacuum systems
4. **Case study: Toxicology**: electron impact (EI) gas chromatography mass spectrometry (GCMS) for identification and quantitation of hazardous substances
5. **Case Study: Metabolomics**: high-resolution and tandem mass spectrometry (Q-Exactive) coupled to ultra performance liquid chromatography
6. **Case Study: Environmental analysis**: triple quadrupole mass spectrometer for quantitative and semi-targeted qualitative analysis of atmospheric aerosols
7. **Advanced Applications**: ion mobility mass spectrometry, chemical ionization mass spectrometry, aerosol mass spectrometry, ambient mass spectrometry, desorption electrospray ionization, MALDI
Textbooks and other Readings


Additional readings will be assigned that are drawn from other textbooks, online resources, and scientific journals.

Course Website

The course website is posted on ICON (http://icon.uiowa.edu). Login with your username and password. Announcements, syllabus, assignments, and readings will be posted here. All assignments and written work must be submitted through the ICON drop box. Please visit the announcements section of this site for updates that may contain pertinent and/or clarifying information.

IV. Grading

Grading Scheme

<table>
<thead>
<tr>
<th>Assignments</th>
<th>30% or 150 points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam 1</td>
<td>20% or 100 points</td>
</tr>
<tr>
<td>Exam 2</td>
<td>20% or 100 points</td>
</tr>
<tr>
<td>Presentation 1</td>
<td>10% or 50 points</td>
</tr>
<tr>
<td>Presentation 2</td>
<td>10% or 50 points</td>
</tr>
<tr>
<td>Participation</td>
<td>10% or 50 points</td>
</tr>
</tbody>
</table>

Grading system

Final letter grades will be based upon points earned in the above categories. Letter grades and corresponding percentages of points earned are: A 90-100%; B 80-89%; C 70-79%; D 60-69%, F < 59%. The lower limits for letter grades may be adjusted, but will never be raised. For example, the A range for final grades may be 88-100%, but will not be 95-100%. Plus or minus grades will be appended to letter grades. The grade of A+ will be awarded only in extraordinary circumstances.

Brief Description of Course Deliverables

Periodic in-class and individual assignments will cover key concepts and calculations in mass spectrometry.

Exams 1 and 2 will be cumulative, take-home, require compliance with an honesty agreement, and shall be completed within the designated exam windows.

Presentation 1 is an individual research presentation on a scientific achievement enabled by mass spectrometry topic.

Presentation 2 is a small group presentation on an advanced application in mass spectrometry.

Course participation will be assessed through self- and faculty-assessment of student attendance, engagement in classroom activities, participation in online and in-class discussions, and
asking/answering questions.

Late assignment policy
Assignments will be accepted up to 48 hours past the original due date, with a 30% reduction in points per day.

Key Dates
- Exam 1: Window October 20 – 24
- Exam 2: TBD (due Final Exam Week)
- Presentation 1: October 11, 13, 18
- Presentation 2: November 15, 17

Tips for Success
- Stay on track with the assigned readings
- Use assignments to practice calculations and concepts
- Attend class prepared to take notes and ready to participate (download course materials in advance, have a calculator or spreadsheet handy)
- Ask questions during class or in office hours
- Complete assignments on time
- Understand course materials prior to exams
- Learn with each other
- If you miss a class, catch up on missed material (see ICON). Then, contact the instructor with questions.

V. Course Policies

Classroom Etiquette
- To ask a question during lecture, please raise your hand (via the Zoom function) or submit a question via chat box. When questions are invited, please unmute and ask or use any of the above options.
- Video is strongly encouraged, but not required.
- Do not distract from the learning environment. Stay on task. No "side conversations" or individual messaging.
- Mute your microphone when not presenting or speaking for best sound quality.
- Presenters and breakout room participants are responsible for shared content using the “share screen” feature in Zoom.
- Log in early - Connect up to 5 minutes early to check that your sound, video, and screen sharing are working properly.
- Please contact the instructor with any questions or suggestions.

Class Discussions
This course brings together people with various backgrounds, training, and experiences. To facilitate a productive discussion and to learn from this wide array of perspectives it is essential to
treat each other with respect and to value each other’s opinions. There will be times when people disagree, but debate should be kept to the facts and the merits of the topic and not personal or mean spirited.

**Re-grading**

Adjustments to grades will only be considered within one week after the graded assignment or exam is returned. The re-grade request must be accompanied by a written, detailed description of the grading concern. Re-grading will involve re-assessment of the entire assignment and may increase or decrease the grade.

**Attendance**

Attendance at class is mandatory for student presentations. If you have to miss class on one of these days, notify the instructor in advance by completing the Explanatory Statement for Absence form and submitting it to betsy-stone@uiowa.edu.

**Collaboration**

Collaboration among students is...

- Not allowed for exams, through which individual work is assessed.
- Allowed (and encouraged) in the form of verbal discussions for graded assignments. Written and computational work should not be shared. All submitted work for grading must reflect the effort of the individual.
- Expected to be of equivalent effort among group members for small group projects.
- Other types of collaboration should be discussed in advance with the instructor.

Students are responsible for understanding this collaboration policies. If you have questions, ask for clarification.

**VI. Additional Academic and Other Resources**

**Chemistry Center**

The Chemistry Center (for issues related to course registration) Chemistry Building E225
(319) 335-1341

**Departmental Executive Officer (DEO)**

Leonard MacGillivray
Chemistry Building E331
(319) 335-1350

**Distance Learning Resources**

For questions, with virtual classrooms (i.e. Zoom) or UICapture (Panopto), please contact Distance and Online Education Technical Support (319 335-3925).

Need help with ICON or your HawkID? Please contact the ITS Helpdesk (319 384-HELP).
The University of Iowa Libraries (to access e-books and journal holdings), https://www.lib.uiowa.edu/

The Writing Center (for written document review and individualized instruction), https://writingcenter.uiowa.edu/un

The Speaking Center (for individualized instruction in oral communication), https://speakingcenter.uiowa.edu/

The Graduate College (for financial assistance and funding opportunities, professional development, career planning, and one-on-one counseling through graduate success appointments)

Pomerantz Career Center (for leadership and career advancement at the undergraduate level)

Office of the Dean of Students Master Resource List (includes resources for emergency situations, mental health, sexual misconduct, illness/injury, academic issues, legal assistance, and other resources)

Office of Student Financial Aid (for information about financing your education)

Student Support Initiatives (Student Emergency Fund, Trans Student Support Fund, Safe Room Program).

VII. UI Indigenous Land Acknowledgement

The University of Iowa is located on the homelands of the Ojibwe/Anishinaabe (Chippewa), Báxoje (Iowa), Kiikapoi (Kickapoo), Omâæqnomenêwak (Menominee), Myaamiaki (Miami), Nutachi (Missouri), Umoⁿhoⁿ (Omaha), Wahzhazhe (Osage), Jiwere (Otoe), Odawaa (Ottawa), Póⁿka (Ponca), Bodéwaldmi/Neshnabé (Potawatomi), Meskwaki/Nemahahaki/Sakiwaki (Sac and Fox), Dakota/Lakota/Nakoda, Sahnish/Nuxbaaga/Nuweta (Three Affiliated Tribes) and Ho-Chunk (Winnebago) Nations. The following tribal nations, Umoⁿhoⁿ (Omaha Tribe of Nebraska and Iowa), Póⁿka (Ponca Tribe of Nebraska), Meskwaki (Sac and Fox of the Mississippi in Iowa), and Ho-Chunk (Winnebago Tribe of Nebraska) Nations continue to thrive in the State of Iowa and we continue to acknowledge them. As an academic institution, it is our responsibility to acknowledge the sovereignty and the traditional territories of these tribal nations, and the treaties that were used to remove these tribal nations, and the histories of dispossession that have allowed for the growth of this institution since 1847. Consistent with the University's commitment to Diversity, Equity and Inclusion, understanding the historical and current experiences of Native peoples will help inform the work we do; collectively as a university to engage in building relationships through academic scholarship, collaborative partnerships, community service, enrollment and retention efforts acknowledging our past, our present and future Native Nations. (Link to Learn More About the Land Acknowledgement and our Native Nations.)
ATTENDANCE AND CLASSROOM EXPECTATIONS
Students are responsible for attending class and for knowing an instructor’s attendance policies, which vary by course and content area. All students are expected to attend class and to contribute to its learning environment in part by complying with University policies and directives regarding appropriate classroom behavior or other matters.

ABSENCES
Students are responsible for communicating with instructors as soon they know that an absence might occur or as soon as possible in the case of an illness. Delays in communication could result in a forfeit of what otherwise might be an excused absence.

ABSENCES: ILLNESS, UNAVOIDABLE CIRCUMSTANCES, AND UNIVERSITY SPONSORED ACTIVITIES
Students who are ill, in an unavoidable circumstance affecting academic work, or who miss class because of a University sponsored activity are allowed by UI policy to make up a missed exam. Documentation is required by the 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
Reasonable accommodations are allowed for students whose religious holy days coincide with their classroom assignments, tests, and attendance if the student notifies the instructor in writing of any such religious Holy Day conflicts within the first days of the semester and no later than the third week. (See the University Operations Manual: https://opsmanual.uiowa.edu/students/absences-class#8.2).

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%A0-0).

ACADEMIC MISCONDUCT
Plagiarism and the process for addressing academic misconduct of graduate students are defined in Section IV, Article F “Plagiarism by Graduate Students” of the UI Graduate College Manual of Rules and Regulations. Please contact the CLAS Associate Dean for Graduate Education for any necessary assistance in navigating the process mandated by the Graduate College.

ACADEMIC ACCOMMODATIONS
UI is committed to providing 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) through the Student Disability Services (SDS) office. The student is responsible for discussing specific accommodations with the instructor. Note that accommodations are not granted retroactively but from the time of the student’s request to the instructor onward; additionally, accommodations must be requested at least two weeks in advance of the related assignment or exam (https://sds.studentlife.uiowa.edu/). Graduate students serving as Teaching Assistants, Research Assistants, or Fellows must contact Faculty and Staff Disability Services (https://hr.uiowa.edu/support/faculty-and-staff-disability-services) for assistance with accommodations.

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 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.

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/.

COMPLAINTS ABOUT ACADEMIC MATTERS
Students with a complaint about a grade or a related academic matter should first visit with the instructor and then with the course supervisor (if applicable), and finally with the director of the school, department, or program offering the course. If a graduate student has not been able to resolve the issue through the director of the school, department, or program, they should contact the associate dean for graduate education in the College of Liberal Arts and Sciences.

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 are allowed the week before finals, but with some exceptions made for labs, language courses, and off-cycle courses (https://registrar.uiowa.edu/final-examination-scheduling-policies).

HOME OF THE COURSE
The College of Liberal Arts and Sciences (CLAS) is the home of this course, and CLAS governs the policies and procedures for its courses. Graduate students, however, must adhere to the academic deadlines set by the Graduate College. See https://grad.uiowa.edu/academics/deadlines.

MENTAL HEALTH
Students are encouraged to seek help as a preventive measure or if feeling stressed or overwhelmed. Students should talk to their instructors for guidance with specific class-related concerns and are encouraged to contact University Counseling Service (UCS) at 319-335-7294 during regular business hours to schedule an appointment. UCS offers group and individual therapy as well as counseling for couples about relationships while making referrals to other resources (https://counseling.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.

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 based on race, class, gender, sexual orientation, national origin, and other identity categories indicated by the University’s Human Rights policy. For more information, contact the Office of Equal Opportunity and Diversity at https://diversity.uiowa.edu/division/office-equal-opportunity-and-diversity-eod.

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 are expected to conduct themselves in a manner that maintains an environment free from sexual harassment and sexual misconduct. Those experiencing Incidents of sexual harassment are strongly encouraged to report incidents and to seek help (https://osmrc.uiowa.edu/).