

CHM 6159
MASS SPECTROMETRIC METHODS
Fall Semester 2020, 3 Credits

Instructor: Boone Prentice, CLB C210C, 352-392-0556,
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Lectures: M W F, 12:50PM-1:40PM (Period 6), ONLINE (Zoom)

Office hours: See me (virtually) after lecture or e-mail me to set up a Zoom appointment.

Course objectives: To provide students with a solid understanding of modern mass spectrometry, including fundamentals, instrumentation and applications.

Textbook: "Mass Spectrometry: Principles and Applications," 3rd Edition, Edmond de Hoffman and Vincent Stroobant; \$79.00 (list), \$51.51 (Amazon, new), \$31.98 (Amazon, used). The book is not required, but may serve as a useful reference.

Grading: Grades will be based on problem sets (10%), an in-class critical review (30%), a mid-term exam (20%), and a final exam (40%).

Problem sets: Homework problem sets will be made available throughout the semester.

Critical review: Each student is expected to give a short oral presentation (10 min) on an area of mass spectrometry not covered in class. This "critical review" should focus on 1-3 research papers. The exercise will be graded based on the **ability of communicating and critiquing** the material. A choice on the topic of the presentation should be made by **November 16th** in consultation with Dr. Prentice.

Mid-term: The mid-term exam takes place **outside of our normal lecture period on Tuesday, October 13th at 8:20PM (Periods E2 & E3) via Zoom.**

Final exam: The cumulative final exam takes place on **Wednesday, December 16th at 7:30AM via Zoom.**

Information on current UF grading policies is online: (<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>).

Course policies:

Attendance will not be recorded, but class participation is important for assimilating course material. Any request for make-up exams should be made to Dr. Prentice as far in advance as possible. Late assignments will be deducted 25% per calendar day past due.

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, www.dso.ufl.edu/drc/) by providing appropriate documentation. Once registered, students will receive an accommodation letter that must be presented to the instructor when requesting accommodation. Students with disabilities should do this as early as possible.

UF students are bound by The Honor Pledge which states: "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (<http://www.dso.ufl.edu/sccr/process/student-conduct-honorcode/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class."

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

For counseling the following resources are available to students: **U Matter, We Care:** If you or a friend is in distress, please contact umatter@ufl.edu or 352-392- 1575. **Counseling and Wellness Center:** <http://www.counseling.ufl.edu/cwc/Default.aspx>, 352-392-1575; the University Police Department: 352-392-1111 or 911 for emergencies. **Sexual Assault Recovery Services (SARS):** Student Health Care Center, 352-392-1161.

COVID-19 Changes: CHM 6159 is typically an in-person course. Due to the COVID-19 pandemic, we will instead meet online via Zoom. Lectures will occur synchronously to encourage student participation (the small class size of a graduate course is amenable to in-class discussion). However, our class sessions may also be audio-visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. These recordings will be uploaded to Canvas for asynchronous learning. If you experience technical issues with connecting, you should contact the UF Help Desk (<https://helpdesk.ufl.edu>, 352-392-4357).

Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate verbally are agreeing to have their voices recorded.

If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

In order to ensure student privacy, communication concerning grades will only be conducted through Canvas or online via a Zoom meeting.

TENTATIVE LECTURE SCHEDULE

| <u>Date</u> | <u>Lecture</u> | <u>Topic</u> | <u>Textbook</u> |
|-------------|----------------|---|--------------------------------------|
| M 8/31 | 1 | Overview and brief history of MS | Introduction |
| W 9/2 | 2 | Measurements and figures of merit in MS | Introduction |
| F 9/4 | 3 | Ionization: EI | Ch. 1.1 |
| M 9/7 | | <i>No class- Labor Day</i> | |
| W 9/9 | 4 | Ionization: CI | Ch. 1.2 |
| F 9/11 | 5 | Ionization: API | Ch. 1.10, 1.12-1.13, 1.16-1.17 |
| M 9/14 | 6 | Ionization: ESI | Ch. 1.9,1.11 |
| W 9/16 | 7 | Ionization: DI | Ch. 1.3-1.10 |

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| F | 9/18 | 8 | Ion optics | Ch. 2.4 |
| M | 9/21 | 9 | Mass analyzers: TOF | Ch. 2.4 |
| W | 9/23 | 10 | Mass analyzers: Sectors | Ch. 2.5 |
| F | 9/25 | 11 | Guest Lecture: Alex Jacobs (Ion mobility) | |
| M | 9/28 | 12 | Mass analyzers: Quadrupoles/ion traps | Ch. 2.1-2.2 |
| W | 9/30 | 13 | Mass analyzers: Quadrupoles/ion traps | Ch. 2.1-2.2 |
| F | 10/2 | | <i>No class - Homecoming</i> | |
| M | 10/5 | 14 | Mass analyzers: Quadrupoles/ion traps | Ch. 2.1-2.2 |
| W | 10/7 | 15 | Mass analyzers: FT-ICR | Ch. 2.6 |
| F | 10/9 | 16 | Mass analyzers: Electrostatic traps | Ch. 2.6 |
| M | 10/12 | | Exam Preparation | |
| T | 10/13 | | Mid-term Exam (up to lecture 16)- 8:20PM (Virtual via Zoom) | |
| W | 10/14 | 17 | Hybrid instruments & Ion detection | Ch. 2.7 |
| F | 10/16 | 18 | Vacuum technology & Instrumentation | Ch. 3 |
| M | 10/19 | 19 | Tandem mass spectrometry | Ch. 4.1-4.3 |
| W | 10/21 | 20 | Collisional activation | Ch. 4.1-4.3 |
| F | 10/23 | 21 | RRKM Theory | Ch. 7.1-7.3 |
| M | 10/26 | 22 | Ion/electron and ion/photon reactions | Ch. 4.4-4.6 |
| W | 10/28 | 23 | Ion/molecule and ion/ion reactions | Ch. 4.4-4.6 |
| F | 10/30 | 24 | High resolution accurate mass | Ch. 6.1-6.3 |
| M | 11/2 | 25 | Structural elucidation & ion chemistry | Ch. 7.4-7.7 |
| W | 11/4 | 26 | Chromatography | Ch. 5 |
| F | 11/6 | 27 | Imaging mass spectrometry | |
| M | 11/9 | 28 | Native mass spectrometry | Ch. 8.5 |
| W | 11/11 | | <i>No class - Veterans Day</i> | |
| F | 11/13 | 29 | Guest Lecture: Tim Garret (Metabolomics) | Ch. 8.6 |
| M | 11/16 | 30 | Guest Lecture: Rick Yost (History of QqQ) | |
| W | 11/18 | 31 | Guest Lecture: Kari Basso (Proteomics) | Ch. 8.2 |
| F | 11/20 | 32 | Guest Lecture: John Bowden (Exposomics) | |
| M | 11/23 | 33 | In class article review | |
| W | 11/25 | | <i>No class - Thanksgiving</i> | |
| F | 11/27 | | <i>No class - Thanksgiving</i> | |
| M | 11/30 | | Student presentations | |
| W | 12/2 | | Student presentations | |
| F | 12/4 | | Student presentations | |
| M | 12/7 | | <i>Virtual Lab Tours</i> | |
| W | 12/9 | | <i>Exam Preparation</i> | |
| F | 12/11 | | <i>No class - Reading Day</i> | |
| T | 12/16 | | Final Exam - 7:30AM (Virtual via Zoom) | |