



MASS SPECTROMETRY CHEM 752

Spring 2021
Schedule # 34033

COURSE INFORMATION

Class Days: Monday, Wednesday

Class Times: 5:00 – 6:15 PM

Zoom Meeting ID:

<https://SDSU.zoom.us/j/82547163676>

Instructor: Dr. Erica Forsberg

Email: eforsberg@sdsu.edu

Phone: 858-353-2925

Office Hours Meeting ID:

<https://SDSU.zoom.us/j/84041469326>

Office Hours: Mon & Wed 12:00PM – 1:30PM

COURSE OVERVIEW

Official Course Catalog listing: Theory and practice in analysis of volatile and nonvolatile organic and inorganic compounds, basic design principles, theory of ionization processes; interpretation of mass spectra.

Scope and Purpose: Students will be able to describe component parts of mass spectrometers and how they function, as well as be able to select which instrument is best suited for performing specific applications including environmental analysis, pharmacokinetics, proteomics and metabolomics. Students will also obtain preliminary skills in performing data analysis on these applications.

Student Learning Outcomes:

- Differentiate between soft and hard ionization sources and the benefits/drawbacks to each.
- Recognize the physical properties and equations that govern the function of mass analyzers.
- Utilize different methods of ion selection and fragmentation for compound characterization and biological applications.
- Predict isotope patterns and ratios based on chemical formula and charge state.
- Identify and quantify specific analytes using targeted methods (applications in environmental chemistry and pharmacokinetics).
- Apply mass spectrometry to untargeted proteomic and metabolomic studies.

ENROLLMENT INFORMATION

- Prerequisites: CHEM 410b, CHEM 550
- ADD/DROP Deadline: February 2, 2020

COURSE MATERIALS

Lectures will be recorded in Zoom and posted on Canvas after class

Hoffmann & Stroobant, Mass Spectrometry: Principles and Applications, third edition, 2007

SDSU Library Journal Databases – Web of Science – Pub Med

COURSE STRUCTURE AND CONDUCT

- The course will be a mixture of synchronous and asynchronous modalities.
- Lectures will be held by Zoom and consist of both traditional lecture format and lecture-discussion, particularly when discussing journal articles and fundamental concepts that are difficult to visualize.
- There will be regular formative (non-graded) and evaluative (graded) assessments so both you and I know where the class understanding level is.
- There will be both individual and group activities within the break-out rooms during class time.
- Canvas will be used to access course materials, lecture recordings and slides.
- Students are expected to come to class. Absences will be noted in participation marks and I will be less likely to schedule meetings outside of class time.

COURSE ASSESSMENT AND GRADING

- 3 Multiple Choice Quizzes (3 x 5%)
- 2 Assignments (2 x 10%)
- 2 Midterms (2 x 20%)
- 1 Final (20%)
- Participation in class discussion (5%)
- All quizzes, assignments and exams will be completed asynchronously
- Quizzes and exams will only be available for the day they are assigned on the syllabus
- Late assignments will be penalized 10% each day past due for up to five days, then a zero grade will be given
- A doctor's note is necessary for any late assignments to be considered for full grading. After five days late, a zero grade will be assigned.
- Make-up policy will be negotiated between Professor Forsberg and the student on an individual basis.

The final letter grade will be determined based upon the total number of points you have earned throughout the course. A tentative grade distribution (in percentages) is tabulated below. Note that particularly high or low class averages may shift the grade distribution.

Letter	A	A-	B+	B	B-	C+	C	C-	D	F
Cutoff	92	88	84	80	76	72	68	64	60	<60

ACADEMIC HONESTY

The University adheres to a strict [policy regarding cheating and plagiarism](#). These activities will not be tolerated in this class. Become familiar with the policy and what constitutes plagiarism. Any cheating or plagiarism will result in failing this class and a disciplinary review by the University. These actions may lead to probation, suspension, or expulsion.

Examples of Plagiarism include but are not limited to:

- Using sources verbatim or paraphrasing without giving proper attribution (this can include phrases, sentences, paragraphs and/or pages of work)
- Copying and pasting work from an online or offline source directly and calling it your own
- Using information you find from an online or offline source without giving the author credit
- Replacing words or phrases from another source and inserting your own words or phrases
- Submitting a piece of work you did for one class to another class

TURNITIN

Students agree that by taking this course all required papers may be subject to submission for textual similarity review to Turnitin.com for the detection of plagiarism. All submitted papers will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. You may submit your papers in such a way that no identifying information about you is included. Another option is that you may request, in writing, that your papers not be submitted to www.turnitin.com. However, if you choose this option you will be required to provide documentation to substantiate that the papers are your original work and do not include any plagiarized material.

COURSE SCHEDULE

TABLE 1 - COURSE SCHEDULE WITH DATES, APPROXIMATE ACTIVITIES, AND ASSESSMENTS

	MONDAY	WEDNESDAY	TOPIC
Jan 18 / 20	NO CLASS		A Brief History of Mass Spectrometry
Jan 25 / 27			Ionization mechanisms and hard vs. soft ionization sources
Feb 1 / 3	QUIZ 1		Mass Analyzers, quadrupole, magnetic sector, ion trap, time of flight, orbitrap
Feb 8 / 10		ASSIGNMENT 1	Mass calibration, accuracy, practical aspects such as cleanliness and contamination, detectors and saturation
Feb 15 / 17		MIDTERM 1	Average mass vs monoisotopic mass and nominal mass; Parameters: mass range, duty cycle, resolution, mass accuracy (ppm),
Feb 22 / 24			Mass accuracy and predicting chemical formula, stable isotope natural abundances, isotope ratios in structure characterization
Mar 1 / 3	QUIZ 2		Collision cells (CID, ETD, etc), Fragmentation and structure characterization
Mar 8 / 10	REST & RECOVERY		Fragmentation and structure characterization continued
Mar 15 / 17		QUIZ 3	Fragmentation modes: MS2, MRM, precursor ion scan, neutral loss scan, DDA and DIA
Mar 22 / 24			Quantitation - MRM calibration curve with internal standard, standard addition, stable isotopes
Mar 29 / 31		CESAR CHAVEZ DAY	pharmacokinetics, intact protein analysis
Apr 5 / 7	ASSIGNMENT 2		proteomics
Apr 12 / 14			oligonucleotides and oligosaccharides
Apr 19 / 21	MIDTERM 2		lipids: fatty acids, acylglycerols, bile acids
Apr 26 / 28			metabolomics and stable isotope tracing
May 3 / 5		FINAL EXAM & LAST DAY OF CLASS	MS Imaging

STUDENTS WITH DISABILITIES

If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact the Student Ability Success Center at (619) 594-6473. You can also learn more about the services provided by visiting the [Student Ability Success Center](#) website.

To avoid any delay in the receipt of your accommodations, you should contact the Student Ability Success Center as soon as possible. Please note that accommodations are not retroactive, and that accommodations based upon disability cannot be provided until you have presented your instructor with an accommodation letter from the Student Ability Success Center. Your cooperation is appreciated.

STUDENT SERVICES:

A complete list of all academic support services is available on the [Academic Success](#) section of the [SDSU Student Affairs](#) website.

For help with improving your writing ability, the staff at the SDSU [Writing Center](#) is available in person and online.

[Counseling and Psychological Services](#) offers confidential counseling services by licensed psychologists, counselors, and social workers. More info can be found at their website or by contacting (619) 594-5220. You can also Live Chat with a counselor http://go.sdsu.edu/student_affairs/cps/therapist-consultation.aspx between 4:00pm and 10:00pm, or call San Diego Access and Crisis 24-hour Hotline at (888) 724-7240.

TECHNICAL SUPPORT FOR BLACKBOARD

Student support for Blackboard is provided by the Library Computing Hub, located on the 2nd floor of Love Library. They can be reached at 619-594-3189 or hub@mail.sdsu.edu

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