

SDSU Syllabus Template

CHEM752 Mass Spectrometry Spring 2024

COURSE INFORMATION

Class Days / Times: Monday and
Wednesday 5:00PM to 6:15PM

Instructor: Dr. McCall

Class Location: PSFA 325, except for
listed hands-on instrumental activities
that will take place in CSL403 and
MZmine data processing that will take
place in GMCS245

Preferred pronouns: she/her

Email: please use the Canvas email
function to contact Dr. McCall

Office location: GMCS213B

Mode: face-to-face, including lectures,
discussions and hands-on activities

Office hours: Wednesdays 12-1 pm

Platform: Canvas

ESSENTIAL STUDENT INFORMATION

For essential information about student academic success, please see the [SDSU Student Academic Success Handbook](#).

- This course requires the use and handling of hazardous materials. You must complete the Environmental Health and Safety module and survey in our Canvas course by January 31st 2024.
- SDSU provides disability-related accommodations via the Student Ability Success Center (sascinfo@sdsu.edu | sdsu.edu/sasc). Please allow 10-14 business days for this process.
- Class rosters are provided to the instructor with the student's legal name. Please let me know if you would prefer an alternate name and/or gender pronoun.

COURSE MATERIALS

All material will be provided through canvas.

COURSE DESIGN: MAJOR ASSIGNMENTS AND ASSESSMENTS

In this course, we will design and pursue a project using mass spectrometry-based metabolomics to gain insights into health and disease. Students will write up the resulting data into the format of a scientific manuscript. Assignments will focus on

reading examples of relevant literature, and on sequential crafting each part of the manuscript, leading to a manuscript-quality collaborative product by semester end.

COURSE SCHEDULE

- All assignments are due before class start time (5 pm), on the date listed, via canvas, unless otherwise specified in the assignment instructions.

TABLE 1 COURSE SCHEDULE

Date	Activity	Location	Assignment	Points
January 17th	Intro + fundamentals of mass spectrometry part 1	PSFA 325		
January 22nd	Fundamentals of mass spectrometry part 2	PSFA 325		
January 24th	“Where will mass spectrometry take you?” Flash talks	PSFA 325	Flash talk	5
January 29th	1st manuscript discussion	PSFA 325	Manuscript peer review #1	5
January 31st	Manuscript introduction: background, experimental design and writing start	PSFA 325	Hazardous Materials and Hazardous Equipment in Instructional Courses	0
Feb 5th	Sample preparation: considerations for metabolomics	PSFA 325	Bullet point manuscript introduction outline covering project goals	5
Feb 7th	LC-MS run start	CSL403	Pre-reading	0
Feb 12th	LC-MS run monitoring and QC check	CSL403	Pre-reading	0
Feb 14th	Practical LC-MS: troubleshooting instrument issues	PSFA 325	Instrumental methods paragraph	5

Date	Activity	Location	Assignment	Points
Feb 19th	Principles of open science: dataset creation and submission	PSFA 325	Pre-reading	0
Feb 21st	A new(ish) approach: ion mobility-mass spectrometry	PSFA 325	Ion mobility video assignment	10 (note that this one is due right after the lecture time)
Feb 26th	Feature finding with MZmine software, part 1	GMCS 245	Pre-reading	0
Feb 28th	Feature finding with MZmine software, part 2	GMCS 245		
March 4th	Feature finding with MZmine software, part 3	GMCS 245		
March 6th	Data clean-up: metadata clean-up, blank removal, normalizations	PSFA 325	MZmine methods paragraph	10
March 11th	2nd manuscript discussion	PSFA 325	Manuscript peer review #2	10
March 13th	Higher-level visualizations: Principal Coordinate Analysis	PSFA 325		
March 18th	Identifying differential features and their visualization	PSFA 325	Annotated PCoA	10
March 20th	ROC plots	PSFA 325	Annotated boxplots	10
March 25th	3rd manuscript discussion	PSFA 325	Manuscript peer review #3	10

Date	Activity	Location	Assignment	Points
March 27th	Metabolite feature annotation by molecular networking, part 1	PSFA 325	Annotated ROC analysis	10
SPRING BREAK!!!				
April 8th	Metabolite feature annotation by molecular networking, part 2	PSFA 325		
April 10th	Single-spectrum search and database-scale networking tools	PSFA 325		
April 15th	4th manuscript discussion	PSFA 325	Manuscript peer review #4	10
April 17th	Steps to writing a manuscript; begin writing manuscript methods and results sections	PSFA 325	Annotated molecular network	10
April 22nd	Student presentations	PSFA 325	Presentation	20
April 24th	In-class manuscript writing – finish results section and introduction section	PSFA 325		
April 29th	In-class manuscript writing – discussion section	PSFA 325		

Date	Activity	Location	Assignment	Points
May 1st	In-class manuscript writing – final polishing	PSFA 325	Final manuscript writing tasks: Individual tasks assigned based on course findings and manuscript needs	10
No final exam				

GRADING POLICIES

- Any late submission received within one week of assignment due date will receive only half of the listed point value. Submissions more than one week late will receive no point credit.
- Total assignment points value is 140 points. This will be graded out of 130, so you get a 10-point “bonus” opportunity. That 10 point bonus is intended to cover circumstances like being unable to submit an assignment, for any reason. It also helps you make up your grade, if one of your assignments doesn’t score as well as you would like. Because of this, grades will not be rounded up.
- Requests for regrading and correcting recorded scores will be considered for up to one week (7-calendar days) following the posting of grades. The request for regrading must be submitted in writing via Canvas email to the instructor and thoroughly explain why the submitted answer is correct. Meeting with the instructor to discuss your request will likely be required. After 7 days, the assigned grade will stand as recorded. It is your responsibility to check grades and monitor records.
- Science, and especially mass spectrometry, are collaborative endeavors. Collaborative science can be one of the most exciting and joyful processes in research. Coming to class is important so that you can interact with your classmates, brainstorm together, and learn hands-on handling of the mass spectrometer. By coming to class, you will also get direct feedback and practice on using the different data analysis tools that you will need to complete your assignments.

STUDENT LEARNING OUTCOMES

By the end of this class, you should be able to:

- Describe basic instrumental principles for mass spectrometry alone and in combination with chromatography approaches.
- Describe the limitations/challenges of modern mass spectrometry techniques.
- Summarize the key findings of a mass spectrometry paper and critically evaluate it.
- Write a formal manuscript peer review.
- Propose mass spectrometry-based experiments to address a given research question.
- Perform basic metabolomics data analysis, including spectral annotation.
- Understand and describe the limitations of current metabolomics data analysis workflows.
- Draft a scientific manuscript.

DIVERSITY, INCLUSION AND TEACHING PHILOSOPHY

I will strive to provide an environment that is equitable and conducive to achievement and learning for all students. We all bring unique perspectives to science that enrich us all, and the field as a whole. My goal is to create a class in which everyone is welcome, included, and able to learn and succeed. I believe strongly in everyone's capacity to learn mass spectrometry. Mass spectrometry is a complex tool with considerable power to understand our world. It's ok to feel challenged by the course material. Ask me questions before or after class, come to office hours, and I will help you!

LAND ACKNOWLEDGMENT

For millennia, the Kumeyaay people have been a part of this land. This land has nourished, healed, protected and embraced them for many generations in a relationship of balance and harmony. As members of the San Diego State University community, we acknowledge this legacy. We promote this balance and harmony. We find inspiration from this land, the land of the Kumeyaay.