

**UNIVERSITY OF CALGARY
FACULTY OF SCIENCE
DEPARTMENT OF CHEMISTRY
COURSE OUTLINE
WINTER 2019**

1. **Course:** Chemistry 619.16, Advanced Mass Spectrometry

LEC	DAYS	TIME	ROOM	INSTRUCTOR	OFFICE	EMAIL	OFFICE HOURS
L01	TuTh	16:00-17:15	TBD	David C. Schriemer	2aa22 HRIC	dschriem@ucalgary.ca	By appointment

Department of Chemistry: Room SA 229, Tel: (403) 220-5341, e-mail: chem.info@ucalgary.ca

Students must use their U of C account for all course correspondence.

2. **Prerequisites:** Registration in a chemistry graduate program

3. **Grading:** The University policy on grading and related matters is described sections F.1 and F.2 of the online University Calendar. In determining the overall grade in the course the following weights will be used:

Assignments (3)	50%
Paper	30%
Journal discussions	20%

Each piece of work (reports, assignments, quizzes, midterm exam(s) or final examination) submitted by the student will be assigned a grade. The student's grade for each component listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade.

The conversion between a percentage grade and letter grade is as follows: **(Example)**

A+	A	A-	B+	B	B-
95% - 100%	87% - 94%	82% - 86%	77% - 81%	72% - 76%	66% - 71%
C+	C	C-	D+	D	F
62% - 65%	58% - 61%	54% - 57%	50% - 53%	45% - 49%	< 44%

4. **Missed Components of Term Work:** **There are no deferred Midterm/term test examinations.** In the event that a student misses any course work due to illness, supporting documentation, such as a medical note or a statutory declaration will be required (see [Section N.1](#); for more information regarding the use of statutory declaration/ medical notes, see [FAQ](#)). Absences must be reported **within 48 hrs**. The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in [Section 3.6](#). It is the student's responsibility to familiarize himself/herself with these regulations. See also [Section E.3](#) of the University Calendar.

5. **Course Materials:** "Mass Spectrometry – a Textbook" (vol 3), and assigned primary literature

Course Description: This course is focused on modern mass spectrometry in bioanalysis. Mass spectrometry is a universal detector with a long history of use in all branches of science. Mass spectrometers are capable of interrogating any form of natural or synthetic matter, returning not only a measurement of mass, but also deep insights into structure. In addition, mass spectrometers can measure the abundance of a compound at sensitivities approaching the single-molecule limit. It has become the definitive technology in both proteomic and metabolomics, in addition to its established role in environmental analysis, forensics, food analysis, clinical diagnostics and pharmaceutical product development. This course will teach students a set of fundamental physical concepts that

explain how and why modern instruments are designed the way they are, and how these concepts influence the data and its interpretation in select application areas. Interactions will involve a series of taught lectures, assigned readings and discussions. Testing will involve assignments and a final paper.

Course Objectives: The course is focused on deconstructing the mass spectrometer and its modern applications in the life sciences. It will provide a theoretical treatment of several topics, including:

1. fundamentals of mass and the mass spectrum
2. ionization methods and ion fragmentation
3. instrumentation
 - a. ion optics and gas dynamics
 - b. quadrupoles and “higher-order poles”
 - c. time of flight
 - d. ion traps
 - e. Fourier-transform based analyzers
 - f. Analyzer-specific detectors

Where relevant, these topics will be combined with principles of data processing and analysis.

All content will be taught by Dr. Schriemer using a combination of lecture notes, examples and lab-based activities. Content will be delivered according to the following schedule in sessions of 90 min:

Dates:

Jan 10	Introduction, isotopic composition and accurate mass	
Jan 15	Ionization methods	
Jan 17	Tandem mass spectrometry and ion fragmentation - 1	
Jan 22	Tandem mass spectrometry and ion fragmentation - 2	
Jan 29	Journal article discussion - 1	
Jan 31	Journal article discussion - 2	
Feb 5	Ion optics	ASSIGNMENT #1 DUE (10%)
Feb 7	The mass spectrometer – time of flight	
Feb 12	The mass spectrometer – quadrupole ion filter	
Feb 14	The mass spectrometer – quadrupolar ion trap	
Feb 26	The mass spectrometer – FT-based analyzers (ICR)	
Mar 7	The mass spectrometer – FT-based analyzers (Orbitraps)	
Mar 12	Journal article discussion – 3	ASSIGNMENT #2 DUE (20%)
Mar 14	Journal article discussion – 4	
Mar 19	Mass spectrometry methods – Proteomics 1	
Mar 21	Mass spectrometry methods – Proteomics 2	
Mar 26	Journal article discussion – Student 1	
Mar 28	Journal article discussion – Student 2	
Apr 2	Mass spectrometry methods – Metabolomics 1	
Apr 4	Mass spectrometry methods – Metabolomics 2	
Apr 9	Journal article discussion – Student 3	
Apr 11	Journal article discussion – Student 4	ASSIGNMENT #3 DUE (20%)
Apr 16	Mass spectrometry methods – Pharmaceutical R&D 1	
Apr 18	Mass spectrometry methods – Pharmaceutical R&D 2	
Apr 25	FINAL PAPER DUE.	

6. **Reappraisal of Grades:** A student wishing a reappraisal, should first attempt to review the graded work with the Course coordinator/instructor or department offering the course. Students with sufficient academic grounds may request a reappraisal. Non-academic grounds are not relevant for grade reappraisals. Students should be aware that the grade being reappraised may be raised, lowered or remain the same. See [Section I.3](#) of the University Calendar.

- (1) **Term work:** The student should present their rationale as effectively and as fully as possible to the Course coordinator/instructor within **15 days** of either being notified about the mark, or of the item's return to the class. If the student is not satisfied with the outcome, the student shall immediately submit the *Reappraisal of Graded Term work* form to the department in which the course is offered. The department will arrange for a re-assessment of the work if, and only if, the student has sufficient academic grounds. See sections [1.1](#) and [1.2](#) of the University Calendar.

7. OTHER IMPORTANT INFORMATION FOR STUDENTS:

- (a) **Mental Health:** The University of Calgary recognizes the pivotal role that student mental health plays in physical health, social connectedness and academic success, and aspires to create a caring and supportive campus community where individuals can freely talk about mental health and receive supports when needed. We encourage you to explore the mental health resources available throughout the university community, such as counselling, self-help resources, peer support or skills-building available through the SU Wellness Centre (Room 370, MacEwan Student Centre, [Mental Health Services Website](#)) and the Campus Mental Health Strategy website ([Mental Health](#)).
- (b) **SU Wellness Centre:** The students Union Wellness Centre provides health and wellness support for students including information and counselling on physical health, mental health and nutrition. For more information, see www.ucalgary.ca/wellnesscentre or call 403-210-9355.
- (c) **Sexual Violence:** The University of Calgary is committed to fostering a safe, productive learning environment. The Sexual Violence Policy (<https://www.ucalgary.ca/policies/files/policies/sexual-violence-policy.pdf>) is a fundamental element in creating and sustaining a safer campus environment for all community members. We understand that sexual violence can undermine students' academic success and we encourage students who have experienced some form of sexual misconduct to talk to someone about their experience, so they can get the support they need. The Sexual Violence Support Advocate, Carla Bertsch, can provide confidential support and information regarding sexual violence to all members of the university community. Carla can be reached by email (svsa@ucalgary.ca) or phone at [403-220-2208](tel:403-220-2208).
- (d) **Misconduct:** Academic misconduct (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under [Section K](#) on Student Misconduct to inform yourself of definitions, processes and penalties. Examples of academic misconduct may include: submitting or presenting work as if it were the student's own work when it is not; submitting or presenting work in one course which has also been submitted in another course without the instructor's permission; collaborating in whole or in part without prior agreement of the instructor; borrowing experimental values from others without the instructor's approval; falsification/fabrication of experimental values in a report. **These are only examples.**
- (e) **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on [assembly points](#).
- (f) **Academic Accommodation Policy:** Students needing an accommodation because of a disability or medical condition should contact Student Accessibility Services in accordance with the Procedure for Accommodations for Students Accessibility Services in accordance with the procedure for accommodations for students with disabilities available at http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities_0.pdf.
- Students needing an accommodation in relation to their coursework or to fulfill requirements for a graduate degree, based on a protected ground other than disability, should communicate this need, preferably in writing, to the Associate Head of the Department of Chemistry, Dr. Farideh Jalilehvand, by e-mail ahugchem@ucalgary.ca or phone (403) 220-5353. Religious accommodation requests relating to class, test or exam scheduling or absences must be submitted no later than **14 days** prior to the date in question: <http://www.ucalgary.ca/pubs/calendar/current/e-4.html>
- (g) **Safewalk:** Campus Security will escort individuals day or night (<http://www.ucalgary.ca/security/safewalk/>). Call (403) 220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- (h) **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information see also <http://www.ucalgary.ca/legalservices/foip>.

- (i) **Student Union Information:** VP Academic Phone: (403) 220-3911 E-mail: suypaca@ucalgary.ca
SU Faculty Rep. Phone: (403) 220-3913 E-mail: sciencerep@su.ucalgary.ca; Student Ombudsman, E-mail suypaca@ucalgary.ca
- (j) **Internet and Electronic Device Information:** Unless instructed otherwise, cell phones should be turned off during class. All communication with other individuals via laptop, tablet, smart phone or other device is prohibited during class unless specifically permitted by the instructor. Students that violate this policy may be asked to leave the classroom. Repeated violations may result in a charge of misconduct.
- (k) **Surveys:** At the University of Calgary, feedback through the Universal Student Ratings of Instruction ([USRI](#)) survey and the Faculty of Science Teaching Feedback form provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses. Your responses make a difference - please participate in these surveys.
- (l) **Copyright of Course Materials:** The materials posted on the course D2L site, including (but not limited to) exams, lab manual, lecture slides and other course notes, are protected by law. These materials are for the sole use of students registered in this course and must not be redistributed. Sharing these materials with anyone else would be a breach of the terms and conditions governing student access to D2L, as well as a violation of the copyright in these materials, and may be pursued as a case of student academic or [non-academic misconduct](#), in addition to any other remedies available at law.

The following signature lines should be added to the course outline as appropriate

Department Approval _____ Date _____

Where applicable – one of the following.

Associate Dean's Approval for
out of regular class-time activity: _____ Date: _____

Associate Dean's Approval for
Alternate final examination arrangements: _____ Date: _____

Associate Dean's Approval for
out of regular class-time activity and
alternate final examination arrangements: _____ Date: _____

<https://library.usask.ca/copyright/students/your-course-materials.php#CourseMaterials>