

COURSE SYLLABUS



COURSE TITLE: CHEM-213: Molecular Spectroscopy

CLASS SECTION: 001

TERM: 2025W

COURSE CREDITS: 3

DELIVERY METHOD(S): Face-to-face

Camosun College campuses are located on the traditional territories of the Lək̓ʷəŋən and W̱SÁNEĆ peoples. We acknowledge their welcome and graciousness to the students who seek knowledge here.

Learn more about Camosun's [Territorial Acknowledgement](#).

INSTRUCTOR DETAILS

NAME: Steve McKinnon

EMAIL: mckinnons@camosun.ca

OFFICE: F350B

HOURS: Tues, Thurs, 2:30-3:20 or by appointment

As your course instructor, I endeavour to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with me. Camosun College is committed to identifying and removing institutional and social barriers that prevent access and impede success.

CALENDAR DESCRIPTION

The elementary theories and applications of IR, UV/visible, mass and NMR spectroscopy are presented in one unified course. The problems of identification, bonding and structure encountered in chemistry, biochemistry and environmental science are used as illustrations and case studies throughout.

PREREQUISITE(S):

All of:

- C in CHEM 121

CO-REQUISITE(S):

One of:

- C in CHEM 221
- C in CHEM 230

COURSE LEARNING OUTCOMES / OBJECTIVES

Upon completion of this course a student will be able to:

1. Describe and explain the production of the various types of electromagnetic radiation and derive and use the laws of absorption spectroscopy.
2. Associate a nuclear, atomic or molecular process with the absorption of radiation of a particular frequency.
3. Describe the Boltzmann distribution of energy and explain its importance in spectroscopic experiments.
4. Explain the results of the photoelectronic experiments and interpret the spectrum in terms of bonding and non-bonding molecular orbitals.
5. Describe and explain the processes of absorption and emission in organic and inorganic compounds and comment on the link between the features of a spectrum and the presence of particular structural features in the compound.
6. Describe and explain the behaviour of diatomic molecules in terms of the simple harmonic oscillator model and derive the number of modes of vibration for linear and non-linear polyatomic molecules.
7. Comment on the features of an IR spectrum in terms of the presence or absence of a particular functional group and analyze the pure rotational spectra to determine the bond length of the molecules using the rigid rotor model.
8. Describe the different ways in which the molecular mass is determined and calculate isotope splitting patterns based on the known isotopic ratios in nature.
9. Describe the absorption of radiation by the hydrogen-1, carbon-13, fluorine-19, and phosphorous-31 nuclei and deduce the chemical structures of compounds containing these nuclei using tables of chemical shifts, known reference materials and coupled and decoupled spectra.

REQUIRED MATERIALS & RECOMMENDED PREPARATION / INFORMATION

“Chemistry 213 Laboratory Manual and Study Guide” by C.G.C. Shorthill and N. Khalifa

Recommended: “Organic Structures from Spectra”, by Field, Sternhell, and Kalman
“Introduction to Spectroscopy”, by Pavia, Lampman, Kriz, and Vyvyan

EVALUATION OF LEARNING

DESCRIPTION	WEIGHTING
Laboratory Work	25%
Term Test 1 - (Sections 1-3)	10%
Term Test 2 - (Sections 4-5)	10%
Term Test 3 - (Sections 6-8)	10%
Online D2L Quizzes	10%
FINAL EXAM	35%
	TOTAL 100%

If you have a concern about a grade you have received for an evaluation, please come and see me as soon as possible. Refer to the [Grade Review and Appeals](http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf) policy for more information.
<http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf>

Students registered with the Centre for Accessible Learning (CAL) who complete quizzes, tests, and exams with academic accommodations have booking procedures and deadlines with CAL where advanced notice is required. Review deadlines on the [CAL exams page](http://camosun.ca/services/accessible-learning/exams.html). <http://camosun.ca/services/accessible-learning/exams.html>

COURSE SCHEDULE, TOPICS, AND ASSOCIATED PREPARATION / ACTIVITY / EVALUATION

The following schedule and course components are subject to change with reasonable advance notice.

WEEK	ACTIVITY or TOPIC	Tuesday	
1	Introduction to Spectroscopy		Exp 1 – General Spec
2	Electronic Spectroscopy		Exp 2 – Absorption Spectra
3	IR Spectroscopy of Organic Compounds		Exp 3 – Sampling Techniques in IR
4	IR Problems		Exp 4 – IR Spec 1 - Organic
5	Vibrational and Rotational Theory	Test 1	Exp 5 – IR Spec 2 – Vibration/Rotation
6	NMR Spectroscopy		
7	Reading Break – College closed		
8	HNMR of Organic Compounds		Exp 6a – HNMR of Organic Compounds
9	HNMR Problems	Test 2	
10	CNMR of Organic Compounds		Exp 6b – HNMR with Complex Coupling
11	Heteronuclear NMR		Exp 7a – CNMR Spectroscopy
12	2D NMR		Exp 7b – Organic Multinuclear NMR
13	Mass Spectrometry	Test 3	Exp 8 – Inorganic NMR and Mass Spec
14	Review		

COURSE GUIDELINES & EXPECTATIONS

Class Attendance

To get the most out of this course, students are expected to attend all classes and be on time. It is your responsibility to acquire all information given during a class missed, including notes, handouts, changed exam dates etc.

Laboratory Attendance

Laboratory participation is essential to the course learning outcomes, and largely involves practical exploration of the core topics. It is also an opportunity for students to practice key skills that will be required for further chemistry courses. Punctual attendance of all laboratory classes is mandatory; however, it is recognized that circumstances such as illness may prevent this from being possible. In these cases, you should provide an email prior to the lab as a courtesy to your instructor if you know you are going to be unable to attend a laboratory class, (or meet a laboratory assignment deadline). Without this, the instructor reserves the right to assign you a mark of zero for a missed lab or deduct marks for a late submission. A passing grade of 50 % is required on

the laboratory section of the course to pass the course. This requires attending at least 6 of the 9 practical laboratory experiments.

Exam Procedures

All exams must be written at the scheduled times except for students requiring accommodation by CAL. It is understood that emergency circumstances do occur (e.g. illness or family emergency), in which case the weight of the missed test will be carried over to the final, unless you are able to arrange an alternate time with your instructor, or the Assessment Centre. <https://camosun.ca/apply/how-apply/assessment-and-testing/rescheduled-camosun-course-exams>

SCHOOL OR DEPARTMENTAL INFORMATION

- The School of Arts and Science offers a Science Help Centre. Tutors are available in Fisher 264 everyday to assist you in chemistry, biology, and physics. The service begins in week three, and the schedule will be posted on D2L for you at this time.
- Students may only use recording devices in the classroom with the prior permission of the instructor or the Centre for Accessible Learning. The instructor's permission is not required when the use of a recording device is sanctioned by the College's Centre for Accessible Learning to accommodate a student's disability, and when the instructor has been provided with an instructor notification letter specifying the use of a recording device.

STUDENT RESPONSIBILITY

Enrolment at Camosun assumes that the student will become a responsible member of the College community. As such, each student will display a positive work ethic, assist in the preservation of College property, and assume responsibility for their education by researching academic requirements and policies; demonstrating courtesy and respect toward others; and respecting expectations concerning attendance, assignments, deadlines, and appointments.

SUPPORTS AND SERVICES FOR STUDENTS

Camosun College offers a number of services to help you succeed in and out of the classroom. For a detailed overview of the supports and services visit camosun.ca/services.

Support Service	Website
Academic Advising	camosun.ca/services/academic-supports/academic-advising
Accessible Learning	camosun.ca/services/academic-supports/accessible-learning
Counselling	camosun.ca/services/health-and-wellness/counselling-centre
Career Services	camosun.ca/services/co-operative-education-and-career-services
Financial Aid and Awards	camosun.ca/registration-records/financial-aid-awards
Help Centres (Math/English/Science)	camosun.ca/services/academic-supports/help-centres
Indigenous Student Support	camosun.ca/programs-courses/iecc/indigenous-student-services
International Student Support	camosun.ca/international
Learning Skills	camosun.ca/services/academic-supports/help-centres/writing-centre-learning-skills

Support Service	Website
Library	camosun.ca/services/library
Office of Student Support	camosun.ca/services/office-student-support
Ombudsperson	camosun.ca/services/ombudsperson
Registration	camosun.ca/registration-records/registration
Technology Support	camosun.ca/services/its
Writing Centre	camosun.ca/services/academic-supports/help-centres/writing-centre-learning-skills

If you have a mental health concern, please contact Counselling to arrange an appointment as soon as possible. Counselling sessions are available at both campuses during business hours. If you need urgent support after-hours, please contact the Vancouver Island Crisis Line at 1-888-494-3888 or call 911.

COLLEGE-WIDE POLICIES, PROCEDURES, REQUIREMENTS, AND STANDARDS

Academic Integrity

Students are expected to comply with all College policy regarding academic integrity; which is about honest and ethical behaviour in your education journey. The following guide is designed to help you understand your responsibilities:

<https://camosun.libguides.com/academicintegrity/welcome>

Please visit <https://camosun.ca/sites/default/files/2021-05/e-1.13.pdf> for Camosun's Academic Integrity policy and details for addressing and resolving matters of academic misconduct.

Academic Accommodations for Students with Disabilities

Camosun College is committed to achieving full accessibility for persons with disabilities. Part of this commitment includes arranging appropriate academic accommodations for students with disabilities to ensure they have an equitable opportunity to participate in all of their academic activities. If you are a student with a documented disability and think you may need accommodations, you are strongly encouraged to contact the Centre for Accessible Learning (CAL) and register as early as possible. Please visit the CAL website for more information about the process of registering with CAL, including important deadlines: <https://camosun.ca/cal>

Academic Progress

Please visit <https://camosun.ca/sites/default/files/2023-02/e-1.1.pdf> for further details on how Camosun College monitors students' academic progress and what steps can be taken if a student is at risk of not meeting the College's academic progress standards.

Course Withdrawals Policy

Please visit <https://camosun.ca/sites/default/files/2021-05/e-2.2.pdf> for further details about course withdrawals. For deadline for fees, course drop dates, and tuition refund, please visit <https://camosun.ca/registration-records/tuition-fees#deadlines>.

Grading Policy

Please visit <https://camosun.ca/sites/default/files/2021-05/e-1.5.pdf> for further details about grading.

Grade Review and Appeals

Please visit <https://camosun.ca/sites/default/files/2021-05/e-1.14.pdf> for policy relating to requests for review and appeal of grades.

Medical / Compassionate Withdrawals

Students who are incapacitated and unable to complete or succeed in their studies by virtue of serious and demonstrated exceptional circumstances may be eligible for a medical/compassionate withdrawal (see [Medical/Compassionate Withdrawals policy](#)). Please visit <https://camosun.ca/services/forms#medical> to learn more about the process involved in a medical/compassionate withdrawal.

Sexual Violence

Camosun is committed to creating a campus culture of safety, respect, and consent. Camosun's Office of Student Support is responsible for offering support to students impacted by sexual violence. Regardless of when or where the sexual violence occurred, students can access support at Camosun. The Office of Student Support will make sure students have a safe and private place to talk and will help them understand what supports are available and their options for next steps. The Office of Student Support respects a student's right to choose what is right for them. For more information see Camosun's Sexualized Violence Policy: <https://camosun.ca/sites/default/files/2021-05/e-2.9.pdf> and camosun.ca/services/sexual-violence-support-and-education.

To contact the Office of Student Support: oss@camosun.ca or by phone: 250-370-3046 or 250-370-3841

Student Misconduct (Non-Academic)

Camosun College is committed to building the academic competency of all students, seeks to empower students to become agents of their own learning, and promotes academic belonging for everyone. Camosun also expects that all students to conduct themselves in a manner that contributes to a positive, supportive, and safe learning environment. Please review Camosun College's Student Misconduct Policy at <https://camosun.ca/sites/default/files/2021-05/e-2.5.pdf> to understand the College's expectations of academic integrity and student behavioural conduct.

Looking for other policies?

The full suite of College policies and directives can be found here: <https://camosun.ca/about/camosun-college-policies-and-directives>

Changes to this Syllabus: Every effort has been made to ensure that information in this syllabus is accurate at the time of publication. The College reserves the right to change courses if it becomes necessary so that course content remains relevant. In such cases, the instructor will give the students clear and timely notice of the changes.