

COURSE OUTLINE		
TERM: Fall 2020	COURSE NO: CHEM 311	
INSTRUCTOR: TBA	COURSE TITLE: Applications of Spectroscopy	
OFFICE: LOCAL: E-MAIL: @capilanou.ca	SECTION NO(S):	CREDITS: 4.0
OFFICE HOURS:		
COURSE WEBSITE:		

Capilano University acknowledges with respect the Lil'wat, Musqueam, Squamish, Sechelt, and Tsleil-Waututh people on whose territories our campuses are located.

COURSE FORMAT

Three hours of class time, three lab hours plus an additional hour of supplemental activity delivered through on-line or other activities for a 15-week semester, which includes two weeks for final exams.

COURSE PREREQUISITES

CHEM 201 (C-); or CHEM 211 (C-) and CHEM 204 (C-)

CALENDAR DESCRIPTION

This course focuses on the application of spectroscopic techniques to the identification of organic and inorganic compounds. Topics include ultraviolet-visible spectroscopy, infrared spectroscopy, mass spectrometry and nuclear magnetic resonance. The application of these important techniques to environmental chemistry and biomedical science will be discussed. In the laboratory, students will have the opportunity to synthesize, purify and characterize compounds using the methods listed above.

COURSE NOTE

CHEM 311 is an approved Quantitative/Analytical course for baccalaureate degrees.

CHEM 311 is an approved Science course.

CHEM 311 is an approved Laboratory Science course.

CHEM 311 is an approved Science and Technology course for Cap Core requirements.

REQUIRED TEXTS AND/OR RESOURCES

Pavia et al., *Introduction to Spectroscopy*, 5th Ed., 2014.

Capilano University, [Chemistry 311 Laboratory Manual and Student Laboratory Guide](#).

COURSE STUDENT LEARNING OUTCOMES

On successful completion of this course, students will be able to do the following:

- Identify organic and inorganic compounds through the analysis and interpretation of UV, IR, NMR and MS spectroscopic data;
- Explain the effect of molecular structure on spectroscopic data;
- Analyze and interpret 1D and 2D NMR spectra;
- Design a spectroscopic analysis by selecting and applying the appropriate spectroscopic techniques for the determination of the structure of an unknown chemical compound;
- Synthesize, isolate and characterize chemical compounds using modern laboratory techniques and clearly communicate the experimental results in writing.

Students who complete this Science and Technology course will be able to do the following:

- Apply numerical and computational strategies to solve problems.
- Demonstrate how a problem, concept, or process can be modelled numerically, graphically, or algorithmically.
- Explain how scientific inquiry is based on investigation of evidence and evolves based on new findings.
- Participate in scientific inquiry and communicate the elements of the process, including making careful and systematic observations, developing and testing a hypothesis, analysing evidence, and interpreting results.

COURSE CONTENT

Topic	Weeks (Approx.)
Review of Chemistry and Light Fundamentals Electromagnetic radiation, electronegativity and bond polarity, bond strength, resonance, symmetry and stereochemistry	1-2
Infrared and UV-Visible Spectroscopy (Applications to Coordination Chemistry) An introduction to coordination compounds (i.e., oxidation state and coordination number of metal; types of ligands); The structures of coordination compounds with an emphasis on octahedral, square planar and tetrahedral coordination spheres. Applications of IR and UV spectroscopy to the identification of coordination compounds.	3-5
Mass Spectrometry Molecular fragments, isotope effect on molecular ion, assessment of sample purity using GC-MS	6
^1H and ^{13}C NMR Spectroscopy The key elements of an NMR spectrum (chemical shift, integration, nuclei coupling) and the influence of molecular structure: electron shielding effects, anisotropy, symmetry, spin-splitting and J-values, DEPT and partially decoupled spectra.	7-11
2D – NMR Spectroscopy Interpretation of COSY and HETCOR spectra	12

Applications in Environmental Chemistry and Medicine	13
Final Exam Period	14-15

EVALUATION PROFILE

Final grades for the course will be computed based on the following schedule:

Term Work	30%
Laboratory Work	30%
Performance Evaluation	5%
Final Examination	35%
TOTAL	100%

Term work will consist of tests, quizzes and/or assignments. Laboratory work will consist of quizzes, laboratory reports and/or in-lab assessments. The weight of individual tests, quizzes and assignments, lab reports etc. are assigned by the instructor.

A pass grade of 50% or above is required on each of the laboratory and term work portions of the course for the student to pass the course.

PERFORMANCE EVALUATION

In the absence of exceptional circumstances, which are evaluated at the instructor's discretion, the performance evaluation component of the final grade will be pro-rated to the rest of the grade. For example, a 10% performance evaluation component would be determined by dividing the remaining mark out of 90 by 9. The most common circumstance justifying an increased performance evaluation mark is a student's improved performance in the final examination relative to the term work, which the instructor feels justifies an elevated letter grade.

GRADING PROFILE

A+	90 - 100	B+	77 - 79	C+	67 - 69	D	50 - 59
A	85 - 89	B	73 - 76	C	63 - 66	F	0 - 49
A-	80 - 84	B-	70 - 72	C-	60 - 62		

Incomplete Grades

Grades of Incomplete "I" are assigned only in exceptional circumstances when a student requests extra time to complete their coursework. Such agreements are made only at the request of the student, who is responsible to determine from the instructor the outstanding requirements of the course.

Late Assignments

Assignments are due at the beginning of the class on the due date listed. If you anticipate handing in an assignment late, please consult with your instructor beforehand.

Missed Exams/Quizzes/Labs etc.

The situations in which a score of zero may be avoided are those for which the student meets all of the following conditions:

1. Circumstances clearly beyond the control of the student caused the exam, test, quiz, lab or assignment deadline to be missed. Such circumstances include serious illness or injury, or death of close family member. They do not include forgetting about the test, lack of preparation for the test, work-related or social obligations.
2. The student has notified the instructor (or the School of STEM office staff, if the instructor is not available) about the missed exam, test, quiz, lab, etc. Such notification must occur in advance, if possible, or at the latest, on the day of the exam, test, quiz, lab, etc.
3. Proof of the circumstances may be required.
4. The student has been fully participating in the course up until the circumstances that prevented the writing of the exam, test, quiz, lab, etc. Fully participating means attending almost all of the classes and turning in almost all assignments in the course.

The options offered to the student who meets the four conditions are decided by the instructor. They will not necessarily meet the convenience of the student. Make-up exams, tests and/or labs or extensions on assignment due dates are given at the discretion of the instructor. They are generally given only in medical emergencies or severe personal crises. Some missed labs or other activities may not be able to be accommodated. Please consult with your instructor.

Attendance

Students are expected to attend all classes and associated activities. If classes are missed, it is the student's responsibility to become aware of all information given out in the classes or tutorials, including times of examinations and assignment deadlines.

English Usage

Students are expected to use correct standard English in their written and oral assignments, exams, presentations and discussions. Failure to do so may result in reduced grades in any part of the Evaluation Profile. Please refer to the guidelines provided in the Capilano Guide to Writing Assignments (available from the University Bookstore).

Electronic Devices

Students may use electronic devices during class; however an instructor may ask for devices to be put away if they become a distraction to other students or interfere with classroom learning.

On-line Communication

Outside of the classroom, instructors will (if necessary) communicate with students using either their official Capilano University email or Moodle; please check both regularly. Official communication between Capilano University and students is delivered to students' Capilano University email addresses only.

UNIVERSITY OPERATIONAL DETAILS

Tools for Success

Many services are available to support student success for Capilano University students. A central navigation point for all services can be found at: <https://www.capilanou.ca/student-life/>

Capilano University Security: download the [CapU Mobile Safety App](#)

Policy Statement (S2009-06)

Capilano University has policies on Academic Appeals (including appeal of final grade), Student Conduct, Academic Integrity, Academic Probation and other educational issues. These and other policies are available on the University website.

Academic Integrity (S2017-05)

Any instance of academic dishonesty or breach of the standards of academic integrity is serious and students will be held accountable for their actions, whether acting alone or in a group. See policy and procedures S2017-05 Academic Integrity for more information: <https://www.capilanou.ca/about-capu/governance/policies/>

Violations of academic integrity, including dishonesty in assignments, examinations, or other academic performances, are prohibited and will be handled in accordance with the Student Academic Integrity Procedures.

Academic dishonesty is any act that breaches one or more of the principles of academic integrity. Acts of academic dishonesty may include but are not limited to the following types:

Cheating: Using or providing unauthorized aids, assistance or materials while preparing or completing assessments, or when completing practical work (in clinical, practicum, or lab settings), including but not limited to the following:

- Copying or attempting to copy the work of another during an assessment;
- Communicating work to another student during an examination;
- Using unauthorized aids, notes, or electronic devices or means during an examination;
- Unauthorized possession of an assessment or answer key; and/or,
- Submitting of a substantially similar assessment by two or more students, except in the case where such submission is specifically authorized by the instructor.

Fraud: Creation or use of falsified documents.

Misuse or misrepresentation of sources: Presenting source material in such a way as to distort its original purpose or implication(s); misattributing words, ideas, etc. to someone other than the original source; misrepresenting or manipulating research findings or data; and/or suppressing aspects of findings or data in order to present conclusions in a light other than the research, taken as a whole, would support.

Plagiarism: Presenting or submitting, as one's own work, the research, words, ideas, artistic imagery, arguments, calculations, illustrations, or diagrams of another person or persons without explicit or accurate citation or credit.

Self-Plagiarism: Submitting one's own work for credit in more than one course without the permission of the instructors, or re-submitting work, in whole or in part, for which credit has already been granted without permission of the instructors.

Prohibited Conduct: The following are examples of other conduct specifically prohibited:

- Taking unauthorized possession of the work of another student (for example, intercepting and removing such work from a photocopier or printer, or collecting the graded work of another student from a stack of papers);
- Falsifying one's own and/or other students' attendance in a course;
- Impersonating or allowing the impersonation of an individual;
- Modifying a graded assessment then submitting it for re-grading; or,
- Assisting or attempting to assist another person to commit any breach of academic integrity.

Sexual Violence and Misconduct

All Members of the University Community have the right to work, teach and study in an environment that is free from all forms of sexual violence and misconduct. Policy B401 defines sexual assault as follows:

Sexual assault is any form of sexual contact that occurs without ongoing and freely given consent, including the threat of sexual contact without consent. Sexual assault can be committed by a stranger, someone known to the survivor or an intimate partner.

Safety and security at the University are a priority and any form of sexual violence and misconduct will not be tolerated or condoned. The University expects all Students and Members of the University Community to abide by all laws and University policies, including B.401 Sexual Violence and Misconduct Policy and B.401.1 Sexual Violence and Misconduct Procedure (found on Policy page <https://www.capilanou.ca/about-capu/governance/policies/>)

Emergencies: Students are expected to familiarise themselves with the emergency policies where appropriate and the emergency procedures posted on the wall of the classroom.

DEPARTMENT OR PROGRAM OPERATIONAL DETAILS

Professionalism

Students are expected to demonstrate a professional attitude and behaviour: reliability, respect for and cooperation with colleagues, willingness to work calmly and courteously, respect for equipment and systems, and constructive response to criticism.