



COURSE OUTLINE

1. **Course:** BCEM 471, Physical Biochemistry - Fall 2020

Lecture 01: MWF 12:00 - 12:50 - Online

Instructor	Email	Phone	Office	Hours
Dr Elmar Prenner	eprenner@ucalgary.ca	220-7632	BI 145	TBA MWF, 13:00-14:30 via Zoom and preferably by prior appointment via course-related Slack channel. I will respond to your email inquiries about the course within 24 hours except on weekends and holidays.
Dr Sergei Noskov	snoskov@ucalgary.ca	403 210-7971	BI 411	

Online Delivery Details:

This course is being offered online in real-time via scheduled meeting times, you are required to be online at the same time.

The class is 100 % online synchronous delivery aimed at introducing students to fundamental physical chemistry concepts with applications to biological spectroscopy and thermodynamics. The class will be taught using online platform approved by the University of Calgary (Zoom) for lecture and tutorials. The synchronous lectures be recorded and the recordings will be made available to students through D2L site.

ASSIGNMENTS: There will be a number of graded assignments (written assignments, short reviews and timed online quizzes) held during the class. They will be done either individually or in designated groups and submitted online with a timeline indicated in the course outline. All lecture-related materials (slides, notes and lecture-reading materials) will be posted online to D2L. The course-specific Slack channel will be created for student consulting, TA assistance and collaborative/team projects. All grading will be done via D2L. The course will be taught interactively with periods of short exercises where students are asked to apply the course material and Q&A periods both during lecture and tutorial periods.

ONLINE MIDTERM: There will be synchronous midterm during tutorial on October 28th, 2020. The midterm will be online synchronous 80 minutes-long exam with a two hour time window to complete accounting for the possible technical issues. Midterm exam will be mostly problem solving with occasional multiple-choice questions and may include some short answer questions. Time will be adjusted for SAS students if needed and accommodations for students will be done on a case-by-case basis. The final exam will be administered online through the course D2L website.

ONLINE FINAL EXAM: The final written exam will be online synchronous a two-hour examination with 3 hours time window to complete as per the University of Calgary instruction. The synchronous online final examination will be scheduled by the Registrar office. Exam will be comprised of mostly problem-solving questions and may include some short answer questions. Time will be adjusted for SAS students if needed and accommodations for students will be done on a case-by-case basis. The final exam will be administered online through the course D2L website.

IMPORTANT NOTE ON THE ONLINE EXAMS: It is the student's responsibility to ensure that they have adequate computer and internet access to write the exams. Students will be required to begin their exams promptly at the start of their scheduled class on the day of the exam. If a student encounters any technical issues starting an exam, they **MUST** document the issue by taking a photo, screenshot, or video, and they must contact the instructor immediately so that either additional time can be provided to access the exam or alternative arrangements made. **Students claiming to experience such difficulties who do not contact their instructor providing evidence of technical difficulties within 15 minutes of the scheduled start of the exam will not be allowed to write the exam and will receive a grade of zero (0) on the exam.** If a student's exam is suspended during the exam (lost internet connection, internet browser crashes etc.), they **MUST** provide evidence (photo/ screenshot/video) and contact the instructor immediately. Students will then be granted reentry to suspended exams if they began the exam on time, provided evidence of the suspension, and still have time remaining to complete their exam.

Course Site:

F2020 BCEM471L01

Web-link: <https://d2l.ucalgary.ca/d2l/home/328261>

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

Course Outcomes:

- Select appropriate quantum mechanical models (QM), formulate parameters from molecular chemical structures, and calculate the shape and energy of wavefunctions
- Use energy and intensity principles to extract & predict structural and functional information from UV/Vis and IR spectra and engage in the reverse process of predicting spectra from structure
- Evaluate the correlation between predictions and known spectra and formulate new applications of spectral methods to diverse biomolecules
- Select appropriate thermodynamic equations and models to calculate, analyze, and predict the properties and interactions of diverse biomolecules
- Develop conceptual understanding of key models used to describe energy flow in biological systems
- Evaluate the applicability of these theoretical results by comparing and contrasting the calculated/predicted results to experimental results and explain how they correspond (or not) to qualitative and quantitative values and trends
- Describe, based on the structures & thermodynamic properties of H₂O & biomolecules, how the properties of water influence the actions and interaction of biomolecules

2. Requisites:

See section [3.5.C](#) in the Faculty of Science section of the online Calendar.

Prerequisite(s):

Biochemistry 341 or 393; and Chemistry 353 or 355; and 3 units from Mathematics 249, 251, 265, 275, 281, or Applied Mathematics 217; and 3 units from Mathematics 253, 267, 277, 283, 211, 213, or Applied Mathematics 219; and Physics 211 or 221, and 223.

3. Grading:

The University policy on grading and related matters is described in [F.1](#) and [F.2](#) of the online University Calendar.

In determining the overall grade in the course the following weights will be used:

Component(s)	Weighting %	Date/Form
Assignments (8 assignments)	32 %	As per course schedule (assignments, online quizzes). Online
Midterm 1	34 %	October 28, 2020 (80 minutes exam during tutorial). Online synchronous, conducted at the UofC approved platform. The link to the exam will be active for 2 hours e.g. 80 minutes + 50 % time allocation as per FoS recommendation (e.g. additional 40 minutes to account for technical issues/difficulties).
Final Exam	34 %	2 hours-long final exam. Will be scheduled by the Registrar's Office

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.

	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
Minimum % Required	95 %	90 %	85 %	80%	75%	70 %	65 %	60%	55%	53 %	50 %

This course has a registrar scheduled final exam.

4. Missed Components Of Term Work:

The university has suspended the requirement for students to provide evidence for absences. Please do not attend medical clinics for medical notes or Commissioners for Oaths for statutory declarations.

In the event that a student legitimately fails to submit any online assessment on time (e.g. due to illness etc...), please contact the course coordinator, or the course instructor if this course does not have a coordinator to arrange for a re-adjustment of a submission date. Absences not reported within 48 hours will not be

accommodated. If an excused absence is approved, then the percentage weight of the legitimately missed assignment could also be pro-rated among the components of the course.

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.6](#) of the University Calendar

5. **Scheduled Out-of-Class Activities:**

There are no scheduled out of class activities for this course.

6. **Course Materials:**

Lectures, Lecture-reading, Assignments and Recommended Readings will be posted on D2L.

In order to successfully engage in their learning experiences at the University of Calgary, students taking online, remote and blended courses are required to have reliable access to the following technology:

- A computer with a supported operating system, as well as the latest security, and malware updates;
- A current and updated web browser;
- Webcam/Camera (built-in or external);
- Microphone and speaker (built-in or external), or headset with microphone;
- Current antivirus and/or firewall software enabled;
- Stable internet connection.

For more information please refer to the UofC [ELearning](#) online website.

7. **Examination Policy:**

The midterm and final exams are closed book examination. You may not access your lecture notes or any other resources during exams. Each student is allowed to have one 4" x 6" card with equations and notes for midterm and final examination. The copy of the cue card to be submitted online via D2L. No other aids are allowed on tests or examinations, including accessing internet resources such as search engines (Google, etc.), other websites, shared documents (Google docs etc.) or chat servers (Discord, WhatsApp, etc.), etc., and you are specifically prohibited from working with or contacting any other individuals while you complete the exam. Violation of these rules is considered academic misconduct with penalties as described in the University Calendar section K.

Students should also read the Calendar, [Section G](#), on Examinations.

8. **Approved Mandatory And Optional Course Supplemental Fees:**

There are no mandatory or optional course supplemental fees for this course.

9. **Writing Across The Curriculum Statement:**

For all components of the course, in any written work, the quality of the student's writing (language, spelling, grammar, presentation etc.) can be a factor in the evaluation of the work. See also Section [E.2](#) of the University Calendar.

In this course, the quality of the student's writing in assignments and examinations will be a factor in the evaluation of those reports. See also Section E.2 of the University Calendar.

10. Human & Living Organism Studies Statements:

Students will not participate as subjects or researchers in human studies.

See also [Section E.5](#) of the University Calendar.

STUDIES IN THE BIOLOGICAL SCIENCES INVOLVE THE USE OF LIVING AND DEAD ORGANISMS. Students taking laboratory and field-based courses in these disciplines can expect involvement with and experimentation on such materials. Students perform dissections on dead or preserved organisms in some courses. In particular courses, students experiment on living organisms, their tissues, cells, or molecules. Sometimes field work requires students to collect a variety of living materials by many methods, including humane trapping.

All work on humans and other animals conforms to the Helsinki Declaration and to the regulations of the Canadian Council on Animal Care. The Department strives for the highest ethical standards consistent with stewardship of the environment for organisms whose use is not governed by statutory authority. Individuals contemplating taking courses or majoring in one of the fields of study offered by the Department of Biological Sciences should ensure that they have fully considered these issues before enrolling. Students are advised to discuss any concern they might have with the Undergraduate Program Director of the Department.

Students are expected to be familiar with [Section SC.4.1](#) of the University Calendar.

11. 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.

- a. **Term Work:** The student should present their rationale as effectively and as fully as possible to the Course coordinator/instructor within **ten business 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 submit the Reappraisal of Graded Term work form to the department in which the course is offered within 2 business days of receiving the decision from the instructor. The Department will arrange for a reappraisal of the work within the next ten business days. The reappraisal will only be considered if the student provides a detailed rationale that outlines where and for what reason an error is suspected. See sections [I.1](#) and [I.2](#) of the University Calendar
- b. **Final Exam:** The student shall submit the request to Enrolment Services. See [Section I.3](#) of the University Calendar.

As per the University of Calgary policies.

12. 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 Center:** For more information, see www.ucalgary.ca/wellnesscentre or call [403-210-9355](tel:403-210-9355).
- c. **Sexual Violence:** 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 (syva@ucalgary.ca) or phone at [403-220-2208](tel:403-220-2208). The complete University of Calgary policy on sexual violence can be viewed at (<https://www.ucalgary.ca/policies/files/policies/sexual-violence-policy.pdf>)
- 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](#). 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. **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 with disabilities available at [procedure-for-accommodations-for-students-with-disabilities.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, Undergraduate of the Department of Biological Sciences, Heather Addy by email addy@ucalgary.ca or phone 403 220-6979. 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. See [Section E.4](#) of the University Calendar.

- f. **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPPA). 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 [Legal Services](#) website.
- g. **Student Union Information:** [VP Academic](#), Phone: [403-220-3911](tel:403-220-3911) Email: suvpaca@ucalgary.ca. SU Faculty Rep., Phone: [403-220-3913](tel:403-220-3913) Email: sciencerep@su.ucalgary.ca. [Student Ombudsman](#), Email: ombuds@ucalgary.ca.
- h. **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.
- i. **Copyright of Course Materials:** All course materials (including those posted on the course D2L site, a course website, or used in any teaching activity such as (but not limited to) examinations, quizzes, assignments, laboratory manuals, lecture slides or lecture materials 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.

BCEM 471 – Physical Biochemistry – **Tentative** Schedule (F2020)

Tutorial sessions (W 15:50-17:50 are marked in red). The schedule is tentative and subject to change.

Month	Day	Instructor	Lectures	Tutorial , Exams, and Assignments
Sept	09	SN-EJP	Introduction to the Course	No tutorial
Sept	11	SN	QM for biochemists	
Sept	16	SN	FEM models of conjugated systems	Begin Assignment #1
Sept	16	SN	→	Tutorial #1 Problem Solving/ Calculus bootcamp
Sept	18	SN	QM models of aromatic systems	
Sept	21	SN	Harmonic oscillator & vibrating molecules	
Sept	23	SN	Atomic & molecular wavefunctions	Submit Assignment #1
Sept	23	SN	→	Tutorial #2; Practice Prob.
Sept	25	SN	The Huckel model applied to UV-Vis Spectra	Begin Assignment #2
Sept	28	EJP	Intro to Spectroscopy	
Sept	30	EJP	Principles of Spectroscopy	
Sept	30	SN	→	Tutorial #3 Problem solving;
Oct	02	EJP	IR Spectroscopy	
Oct	05	EJP	Applications of IR Spectroscopy	Submit Assign #2 & Begin Assign #3

Oct	07	EJP	Intro to Fluorescence	
Oct	07	EJP	→	Tutorial #4 Problem solving, Practice problems
Oct	09	EJP	Principles of Fluorescence	Submit Assign #3,
Oct	12	EJP	Thanksgiving, No Classes, J	
Oct	13	EJP	Thanksgiving, No Classes, J	
Oct	14	EJP	Fluorescence Applications	
Oct	14	EJP	→	Fluorescence Tutorial #5 Begin Assignment 4
Oct	16	EJP	Applications of Fluorescence	
Oct	19	EJP	Dynamic Light Scattering	
Oct	21	SN	Solids, Liquids, and Gases	Submit Assign #4,
Oct	21		→	Tutorial #6 Problem solving, Practice problems
Oct	23	SN	1 st Law of Thermodynamics	
Oct	26	SN/EJP	Review and Synopsis for Midterm	
Oct	28	SN	2 nd Law of Thermodynamics	
Oct	28	SN	MIDTERM	
Oct	30	SN	Free Energy & spontaneity	Begin Assign #5
Nov	02	SN	Calorimetry and Its Applications (ITC & DSC	
Nov	04	SN	3 rd Law of Thermo	
Nov	04	SN	→	Tutorial #7 - Practice Problems
Nov	06	SN	Ideal gases & solutions (Henry's & Raoult's Laws)	
Nov	9-13	SN/EJP	Reading week, No lectures, J J	Submit Assign #5 (Nov 9 th)
Nov	16	SN	Standard States of solids, liquids, and gases	
Nov	18	SN	Dependence of Free Energy on Temp. & Conc.	
Nov	18	SN	→	Tutorial #8- Practice Problems Begin Assign #6
Nov	20	SN	Electrolyte Solutions & Debye-Huckel Theory	
Nov	23	SN	Multiple Equilibrium & Buffers	
Nov	25	SN	Water and Hydrogen Bonding	Begin Assign #7
Nov	25	SN	→	Tutorial #9 Practice Prob. Submit Assign #6
Nov	27	SN	The Hydrophobic Effect	
Nov	30	SN	Thermodynamics applied to proteins	
Dec	02	SN	Thermodynamics of Lipids & Detergents	Begin Assign #8
Dec	02	SN	→	Tutorial #10 - Practice Problems;
Dec	04	SN	Thermodynamics applied to Nucleic Acids	Submit Assign #7
Dec	07	SN	Synopsis and Review	
Dec	09	SN	No lecture, office visits as needed	Submit Assign #8
Dec	09	SN	→	Tutorial #11;

Two Hour Final Exam to be scheduled by the Registrar.

Department Approval