



## COURSE OUTLINE

### 1. **Course:** BCEM 471, Physical Biochemistry - Fall 2019

Lecture 01: MWF 12:00 - 12:50 in ES 054

Instructor	Email	Phone	Office	Hours
Dr Elmar Prenner	eprenner@ucalgary.ca	220-7632	BI 145	TBA
Dr Sergei Noskov	snoskov@ucalgary.ca	403 210-7971	BI 411	MWF, 13:00-14:30

**Course:** BIOCHEMISTRY 471 - PHYSICAL BIOCHEMISTRY

TUTORIAL: T01 T 15:30-17:20 ST 129

#### **Course Site:**

D2L: BCEM 471 L01-(Fall 2019)-Physical Biochemistry

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

### 2. **Requisites:**

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

#### **Prerequisite(s):**

Biochemistry 341 or 393; Chemistry 353 or 355; one of Mathematics 249, 251, 265, 275, 281, or Applied Mathematics 217 and one of 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
Assignments	14 %	TBD
Midterm 1	26 %	Oct 15, 2019 (during tutorial)
Midterm 2	26 %	Nov 5, 2019 (during tutorial)
Final Exam	34 %	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
<b>Minimum % Required</b>	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:**

In the event that a student misses the midterm or any course work due to illness, supporting documentation, such as a medical note or a statutory declaration will be required (see [Section M.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 themselves with these regulations. See also [Section E.3](#) of the University Calendar.

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

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

## 6. **Course Materials:**

Assignments and Recommended Readings will be posted on D2L.

## 7. **Examination Policy:**

The use of camera devices, MP3 Players and headphones, wireless earbuds or wireless access devices such as smart phones, smart watches, iOS and/or Android, etc., during the examination will not be allowed. All exams are closed book exams. Cue cards will be allowed for Midterms and Final exams. Students should also read the Calendar, Section G, on Examinations.

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## 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.

**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 **10 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 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 [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:** 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](http://www.ucalgary.ca/wellnesscentre) or call [403-210-9355](tel: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](mailto: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](#). 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 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](mailto: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.

- g. **Safewalk:** Campus Security will escort individuals day or night (See the [Campus Safewalk](#) website). Call [403-220-5333](tel: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 (FOIP). 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.

- i. **Student Union Information:** [VP Academic](#), Phone: [403-220-3911](#) Email: [suvpaca@ucalgary.ca](mailto:suvpaca@ucalgary.ca). SU Faculty Rep., Phone: [403-220-3913](#) Email: [sciencerep@su.ucalgary.ca](mailto:sciencerep@su.ucalgary.ca). [Student Ombudsman](#), Email: [ombuds@ucalgary.ca](mailto:ombuds@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:** 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.

### 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 H<sub>2</sub>O & biomolecules, how the properties of water influence the actions and interaction of biomolecules

### BCEM 471 - Physical Biochemistry - Tentative Schedule (F2019)

Month	Day	Instructor	Lectures	Tutorial , Exams, and Assignments
Sept	06	SN-EJP	Introduction to the Course	
Sept	09	SN	QM for biochemists	
Sept	10	SN	→	Tutorial #1 Calculus
Sept	11	SN	FEM models of conjugated systems	Begin Assignment #1
Sept	13	SN	QM models of aromatic systems	
Sept	16	SN	Harmonic oscillator & vibrating molecules	
Sept	17	SN	→	Tutorial #2; Practice Prob.
Sept	18	SN	Atomic & molecular wavefunctions	Submit Assignment #1
Sept	20	SN	The Huckel model applied to UV-Vis Spectra	Begin Assignment #2
Sept	23	EJP - 1	Intro to Spectroscopy	
Sept	24	SN	→	Tutorial #3 Problem solving;
Sept	25	EJP - 2	Principles of Spectroscopy	
Sept	27	EJP	IR Spectroscopy	
Sept	30	EJP	Applications of IR Spectroscopy	Submit Assign #2 & Begin Assign #3
Oct	1	EJP	→	Tutorial #4 Problem solving, Practice problems
Oct	2	EIP	Intro-to Fluorescence	

<b>Oct</b>	7	EJP	Principles of Fluorescence	
<b>Oct</b>	8	EJP	→	Tutorial #5 Problem solving, Practice problems Submit Assign #3
<b>Oct</b>	9	EJP	Applications of Fluorescence	
<b>Oct</b>	11	SN/EJP	Synopsis and Review	
<b>Oct</b>	14	EJP	<b>Thanksgiving: No Classes</b>	
<b>Oct</b>	15	SN /EJP	** Midterm Exam **	Midterm Exam-1 during Tutorial #6
<b>Oct</b>	16	EJP	Dynamic Light Scattering	Begin Assign #4
<b>Oct</b>	18	SN	Solids, Liquids, and Gases	
<b>Oct</b>	21	SN	1 <sup>st</sup> Law of Thermo	
<b>Oct</b>	22	EJP	→	Tutorial #7 - Practice Problems
<b>Oct</b>	23	SN	2 <sup>nd</sup> Law of Thermo	Submit Assign #4
<b>Oct</b>	25	SN	Free Energy & spontaneity	
<b>Oct</b>	28	SN	Calorimetry and Its Applications (ITC & DSC)	
<b>Oct</b>	29	SN	→	Tutorial #8- Practice Problems
<b>Oct</b>	30	SN	3 <sup>rd</sup> Law of Thermo	
<b>Nov</b>	1	SN/EJP	Synopsis and Review	
<b>Nov</b>	4	SN	Ideal gases & solutions (Henry's & Raoult's Laws)	
<b>Nov</b>	5	SN /EJP	** Midterm Exam **	Midterm Exam-2 during Tutorial 9
<b>Nov</b>	6	SN	Standard States of solids, liquids, and gases	Begin Assign #5
<b>Nov</b>	8	SN	Dependence of Free Energy on Temp. & Conc.	
<b>Nov</b>	11/17		No Lectures or Tutorials (Reading week)	
<b>Nov</b>	18	SN	Electrolyte Solutions & Debye-Huckel Theory	
<b>Nov</b>	19	SN	→	Tutorial #10 Practice Prob. Submit Assign #5
<b>Nov</b>	20	SN	Multiple Equilibrium & Buffers	Begin Assign #6
<b>Nov</b>	22	SN	Water and Hydrogen Bonding	
<b>Nov</b>	25	SN	The Hydrophobic Effect	
<b>Nov</b>	26	SN	→	Tutorial #11 - Practice Prob;
<b>Nov</b>	27	SN	Thermodynamics applied to proteins	Submit Assign #6, Begin Assign #7
<b>Nov</b>	29	SN	Thermo applied to Lipids & Detergents	
<b>Dec</b>	2	SN	Thermodynamics applied to Nucleic Acids	
<b>Dec</b>	3		→	Tutorial #12;
<b>Dec</b>	5	SN	Synopsis and Review	
<b>Dec</b>	6		No lecture, office visits as needed	Submit Assign #7

Department Approval:

Electronically Approved

Date: 2019-08-29 10:29