



REVISED COURSE OUTLINE FOR REMOTE LEARNING

To account for the necessary transition to remote learning from March 13 onward, adjustments have been made to assessment deadlines and requirements so that all coursework tasks are in line with the necessary and evolving health precautions for all involved (students and staff). If you are unable to meet the deadlines or requirements specified, please connect with your course instructor to work out alternative dates/assessments.

1. **Course:** BCEM 393, Introduction to Biochemistry - Winter 2020

Lecture 01: MWF 11:00 - 11:50 - Remote Learning (check with your instructor or coordinator for details)

Instructor	Email	Phone	Office	Hours
Dr. Brianne Burkinshaw	brianne.burkinsha1@ucalgary.ca	403 220-5350		Zoom meetings by appointment
Dr. Marie Fraser	frasm@ucalgary.ca	403 220-6145	BI 413	TBA

Course Coordinator: Dr. Brianne Burkinshaw

Laboratories:

The labs run on a two-week cycle. You will attend one BCEM 393 lab every two weeks. Please ensure you attend the correct lab section in the correct week. Labs will begin during the week of January 13, 2020, with the first lab section beginning on Tuesday January 14, 2020. All labs are in room **BI 136**. Labs 5 and 6 will be completed with data provided by your TA with no in-person laboratory component.

Week 1 of the two-week cycle:

Section	Day and Time
1	T 09:00 - 11:50
2	T 12:30 - 15:20
3	T 16:00 - 18:50
4	W 13:00 - 15:50
5	W 16:30 - 19:20
6	R 09:00 - 11:50
7	R 12:30 - 15:20
8	R 16:00 - 18:50
9	F 13:00 - 15:50
10	F 16:30 - 19:20

Week 2 of the two-week cycle:

Section	Day and Time
11	M 13:00 - 15:50
12	M 16:30 - 19:20
13	T 09:00 - 11:50
14	T 12:30 - 15:20
15	T 16:00 - 18:50
16	W 13:00 - 15:50
17	W 16:30 - 19:20
18	R 09:00 - 11:50
19	R 12:30 - 15:20
20	R 16:00 - 18:50

Lab technician: Ms. Jennifer Kearley BI 136

Course Site:

D2L: BCEM 393 L01-(Winter 2020)-Introduction to 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):

Chemistry 351; and Biology 311 or admission to the BHSc Honours program and Medical Sciences 341.

Antirequisite(s):

Credit for Biochemistry 393 and 341 will not be allowed.

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
In Class Quiz	10	Wednesday, Feb. 5, 2020
On-Line Midterm Exam (3 hours)	23	Saturday, Mar. 21, 2020
Laboratory Reports (6 x 3% each)	18	Submitted via D2L Dropbox
Laboratory Quizzes (2 x 2% each)	4	
On-Line Final Exam (please see below for duration limits)	45	Tuesday April 21, 2020

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	92 %	86 %	82 %	78%	74%	70 %	66 %	62%	58%	54 %	50 %

In order to pass the course, students will be required to pass the laboratory component of the course by achieving 50% or more on the laboratory component. Lab reports 5 and 6 will be written with provided data and will be due 168 hours after the start of your scheduled lab section. They should be submitted as PDF files via Dropbox. No further lab quizzes will be conducted after March 16, 2020.

Students may decide to use their in-class quiz grade to replace their midterm and/or final exam grade. In these cases:

- 1) the weighting of in-class quiz is 78%, the weighting of Midterm Exam is 0%, and the weighting of the Final Exam is 0%;
- 2) the weighting of in-class quiz is 33%, the weighting of Midterm Exam is 0%, and the weighting of the Final Exam is 45%; or
- 3) the weighting of in-class quiz is 55%, the weighting of Midterm Exam is 23%, and the weighting of the Final Exam is 0%.

Students must notify the course coordinator by email of their decision to replace their midterm and/or final exam grade with the in-class quiz grade before the final exam.

4. Missed Components Of Term Work:

The University has suspended requirements for students to provide evidence for reasons for absences so please do not attend medical clinics for medical notes or Commissioners for Oaths for statutory declarations. Please let your instructor know immediately if you are ill and cannot meet the deadlines specified.

5. Scheduled Out-of-Class Activities:

The following out of class activities are scheduled for this course.

Activity	Location	Date and Time	Duration
MidTerm Exam	On-Line	Saturday, March 21, 2020 at 9:00 am	3 Hours

REGULARLY SCHEDULED CLASSES HAVE PRECEDENCE OVER ANY OUT-OF-CLASS-TIME-ACTIVITY. If you have a conflict with the out-of-class-time-activity, please contact your course coordinator/instructor no later than **14 days prior** to the date of the out-of-class activity so that alternative arrangements may be made.

The midterm exam will be online on Saturday March 21, 2020. Students will write the exam between 9:00 am and 12:00 pm MDT; the duration of the midterm will be 3 hours.

The final exam will available online starting at 11:30 am MDT on Monday April 20, 2020. The completed exam must be submitted on D2L by 11:30 am MDT on Tuesday April 21, 2020. The final exam will be available for 24 h to ensure sufficient time in case of technological issues; however, the exam is planned so that it can be completed within the original 3-hour duration with time built in for any technological issues.

6. **Course Materials:**

Recommended Textbook(s):

John L. Tymoczko; Jeremy M. Berg; Lubert Stryer, *Biochemistry: A Short Course Fourth Edition*: MacMillan.

Laboratory manual:

The laboratory manual will be available from the D2L course site for download.

7. **Examination Policy:**

Statement about the use of electronic devices or examination aids: The in-class quiz is a closed-book examination. Calculators are allowed, but not programmable ones.

The online midterm and final exam will be open-book examinations.

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.

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.

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 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) 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 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 (FOIPP). 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](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.
- 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.

Tentative Lecture Schedule

Month	Day	Topic	Instructor
Jan.	13	Introduction to the Course and the First Lab	BB1
		Lab 1 Jan. 14 - 23 Introduction and Proteins in Milk	
	15	Water/Acids/Bases/Buffers	MEF1
	17	Amino Acids - Structures and Properties	MEF2
	20	Peptides and Proteins - Peptide Bond and Primary Structure	MEF3
	22	Peptides and Proteins - Secondary Structure	MEF4
	24	Peptides and Proteins - Tertiary and Quaternary Structure	MEF5
	27	Protein Purification	MEF6
		Lab 2 Jan. 28 - Feb. 6 Protein Purification (Quiz 1 on Amino Acids)	
	29	Carbohydrates - Monosaccharides	MEF7
31	Carbohydrates - Linking Monosaccharides	MEF8	
Feb.	3	Carbohydrates Attached to Proteins and Proteins that Bind Carbohydrates	BB2
	5	In Class Quiz (Material from Jan. 15 - Jan. 31)	MEF
	7	Basic Concepts about Enzymes	BB3
	10	Enzyme Kinetics	BB4
		Lab 3 Feb. 11 - 27 Carbohydrates (Quiz 2 on Carbohydrates)	
	12	Enzyme Kinetics - Allosteric Enzymes	BB5
	14	Enzyme Mechanisms and Inhibitors	BB6
	15-21	Winter Break *** No Lectures***	
	24	Classes of Enzymes. Example of a Hydrolase: Chymotrypsin	BB7
	26	Example of an Allosteric Protein: Hemoglobin	BB8
	28	Digestion: Turning a Meal into Cellular Biochemicals	MEF9
Mar.	2	Basic Concepts of Metabolism	MEF10
		Lab 4 Mar. 3 - 12 Enzyme Kinetics	
	4	Glycolysis	MEF11
	6	Fermentation and Regulation of Glycolysis	MEF12
	9	Gluconeogenesis	MEF13
	11	Preparation for Citric Acid Cycle & Citric Acid Cycle	MEF14
	13	Citric Acid Cycle (cont'd)	MEF15
	16	Classes Cancelled	
		Lab 5 Mar. 17 - 26 Nucleic Acids (no in-person experiments)	
18	Classes Cancelled		

	20	Oxidative Phosphorylation	MEF 16
	21	3-h Online Midterm on Saturday, March 21 (Material from Feb. 3 - Mar. 13)	BB, MEF
	23	Lipids	BB9
	25	Membrane Structure and Function	BB10
	27	Nucleic Acids: Base Pairing, the Double Helix and DNA packaging	BB11
	30	DNA Replication, Repair and Recombination-Part 1	BB12
		Lab 6 Mar. 31 - Apr. 9 Lipids (no in-person experiments)	
Apr.	1	DNA Replication, Repair and Recombination- Part 2	BB13
	3	Recombinant DNA Techniques	BB14
	6	Gene Expression and RNA Processing in Eukaryotes	BB15
	8	Translation and Posttranslational Modifications of Proteins	BB16
	10-13	Easter Weekend *** No Lectures***	
	15	Review	BB, MEF

Overview of the Course

We will explore the structure and function of amino acids, carbohydrates, proteins, lipids, enzymes and nucleic acids. We will use this knowledge to create a framework to gain a deep understanding of biological processes such as carbohydrate metabolism, energy transduction, enzymatic reactions, and the biosynthesis of nucleic acid and proteins.

Course Learning Outcomes

By the end of this course, successful students will be able to:

- Compare and contrast the roles of van der Waals interactions, charge-charge interactions, hydrogen bonds, covalent bonds and the hydrophobic effect in the structures of biological molecules
- Describe the structures and physicochemical properties of amino acid, carbohydrates, lipids and nucleic acids
- Distinguish the four levels of protein structure and describe the folding and forces leading to these structures
- List, discuss, use and evaluate the major techniques used in separating proteins, including ammonium sulfate precipitation, column chromatography and sodium dodecylsulfate polyacrylamide gel electrophoresis (SDS-PAGE)
- Describe and experimentally examine how enzymes catalyze reactions, and how pH, temperature, inhibitors and allosteric regulators can affect their function using the principles of protein structure, Michaelis-Menten kinetics and allostery
- Distinguish between aerobic and anaerobic carbohydrate metabolism, and describe for each reaction the flow of energy and matter, the purpose(s), the mechanism of catalysis and regulation, and the conditions under which the reaction occurs
- Explain how the chemical structures of DNA and RNA are utilized by the enzymes of replication, repair, transcription, and translation to regulate and express genetic information
- Demonstrate skills frequently used in biochemistry laboratories:
 - Dispense small volumes accurately using mechanical pipettes
 - Perform serial dilutions
 - Measure absorbance by visible spectroscopy
 - Use standard curves for quantification
 - Use chromatography and electrophoresis to separate biochemical molecules
 - Work as a team
 - Communicate biochemical experiments in written reports

Classroom Performance System

Students may be asked to use the classroom performance system, Top Hat, in lecture. We will use Top Hat as a learning tool, but not in the calculation of a student's course grade.

Course Policies

Attendance of all laboratory sessions is mandatory. If you are unable to attend your assigned lab section for valid reasons, please provide the course coordinator with appropriate documentation (ex. Statutory Declaration) and we will arrange for a make-up lab, or if this is not possible, shift the weight of the missed lab to the other labs. If

you miss a lab without providing valid documentation, then you will receive a zero for that lab and will not be allowed to submit a report.

All lab reports are due 7 days (168 hours) after the beginning of your assigned lab section. Failure to submit your report on time without valid documented reasons will result in a 20% deduction for the first day late, and a score of zero after that. Information about lab report format, rubrics, and marking policies will be provided in the "Lab Report Guidelines" posted on D2L.

Lab quizzes will test drawing and naming of molecules listed on the Chemical Structure Syllabus and are graded according to accompanied rubric (both posted in D2L).

The in-class quiz will be multiple choice and cover lecture material from January 15 - January 31. **The online midterm exam will be multiple choice and written and cover material from February 3 - March 20. The online final exam will be cumulative, with an emphasis on material covered from March 23 - April 8. Both the online midterm and final exam will be open-book.** Material covered in the labs and textbook readings may also be examined during the midterm and final. If you miss the in-class quiz or midterm for valid reasons, the weight of the missed component will be shifted to the final exam.

Students may decide to use their in-class quiz grade to replace their midterm and/or final exam grade. Students must notify the course coordinator of their decision to replace their midterm and/or final exam grade with the in-class quiz grade before the final exam.

When corresponding by email, please include BCEM 393 in your subject line. We will respond within 24 hours on a weekday, and within 48 hours over the weekend. Please contact the course coordinator (Dr. Burkinshaw) for any lab-related or administrative issues.

Electronically Approved - Mar 20 2020 17:52

Department Approval

Electronically Approved - Mar 22 2020 19:34

Associate Dean's Approval for alternate final examination arrangements or remote learning and out of regular class-time activity