



**COURSE OUTLINE**

1. **Course:** BCEM 341, Biochemistry of Life Processes - Winter 2019

Lecture 01: MWF 13:00 - 13:50 in ENE 241

<b>Instructor</b>	<b>Email</b>	<b>Phone</b>	<b>Office</b>	<b>Hours</b>
Marie Fraser	frasm@ucalgary.ca	403 220-6145	BI 413	TBA
Peter Tieleman	tieleman@ucalgary.ca	403 220-2966	BI 489	TBA
Robert Edwards	redwards@ucalgary.ca	403 220-5350	BI 443	TBA

Lab Sections:

B01 M 14:00-16:50 BI 117

B02 T 09:30-12:20 BI 117

B03 T 14:00-16.50 BI 117

B04 T 17:30-20:20 BI 117

B05 M 17:30-20:20 BI 117

Course Coordinator: Dr. M.E. Fraser

**Course Site:**

D2L: BCEM 341 L01-(Winter 2019)-Biochemistry of Life Processes

**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.

**Antirequisite(s):**

Not open to majors in the Department of Biological Sciences or Natural Sciences concentrators in Biological Sciences. Credit for Biochemistry 341 and 393 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:

Midterm Exam I	17%	In-Class Feb 13, 2019
Midterm Exam II	34%	Sat. March 23 1-3PM ICT 102
Laboratory Work (5 x 4% each)	20%	
Quizzes (4 x 1% each)	4%	
Final Exam	25%	

A mark of 50% is the minimal passing grade for the lab component of this course. Attendance at labs is mandatory. There are six labs, but labs five and six are written up in one lab report. Please bear in mind that a failing grade will result if the student does not pass the laboratory work.

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>	92 %	86 %	82 %	78%	74%	70 %	66 %	62%	58%	54 %	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 N.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:

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

Activity	Location	Date and Time	Duration
Midterm Exam II	ICT 102	Saturday, March 23, 2019 at 1:00 pm	2 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.

#### 6. Course Materials:

Recommended Textbook(s):

Tymoczko, Berg, and Stryer, *Biochemistry: A Short course*: MacMillan.

#### 7. Examination Policy:

Non-programmable calculators will be allowed for exams. The use of camera devices, MP3 Players and headphone, wireless earbuds or wireless devices such as smart phone, smart watches, iOS and/or Android, etc., during the examinations will not be allowed.

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

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

There are no mandatory not optional supplemental fees.

#### 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 **15 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.

## 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](#) 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 (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.
- 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: [suvpaca@ucalgary.ca](mailto:suvpaca@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.

### BCEM341 Winter 2019: Tentative Lecture Schedule

Jan.	11	Introduction to the Course and Lipids	MEF1
	14	Lipids in Membranes	MEF2

	16	Carbohydrates - Monosaccharides	MEF3
	18	Carbohydrates - Linking Monosaccharides	MEF4
	<b>21+22</b>	<b>Lab 1: Lipids (Quiz on Lipids)</b>	MEF
	21	Amino Acids - Structures and Properties	MEF5
	23	Peptides and Proteins - Peptide Bond and Primary Structure	MEF6
	25	Peptides and Proteins - Secondary Structure	MEF7
	28	Peptides and Proteins - Tertiary and Quaternary Structure	MEF8
	30	Carbohydrates Attached to Proteins and Proteins that Bind Carbohydrates	MEF9
Feb.	1	Membranes, including Membrane Proteins; Transport across Membranes	MEF10
	<b>4+5</b>	<b>Lab 2: Food Chemistry (Proteins and Carbs in Beer) (Quiz on Amino Acids)</b>	MEF
	<b>4</b>	Basic Concepts about Enzymes	MEF11
	6	Enzyme Kinetics	MEF12
	8	Enzyme Kinetics - Allosteric Enzymes	MEF13
	11	Enzyme Mechanisms and Inhibitors	MEF14
	13	In Class: First Midterm - 12 lectures, 2 labs (Jan. 11 - Feb. 6) MEF1-MEF12	
	15	Classes of Enzymes. Example of a Hydrolase: Chymotrypsin	MEF15
	<b>17-23</b>	<b>Reading Week *** No Lectures***</b>	
	<b>25+26</b>	<b>Lab 3: Enzymatic Activity of beta-Galactosidase (Quiz on Carbohydrates)</b>	MEF
	25	Example of an Allosteric Protein: Hemoglobin	MEF16
	27	Digestion: Turning a Meal into Cellular Biochemicals	MEF17
Mar.	1	Basic Concepts of Metabolism	MEF18
	4	Glycolysis	MEF19
	6	Fermentation and Regulation of Glycolysis	MEF20
	8	Gluconeogenesis	MEF21
	<b>11+12</b>	<b>Lab 4: A Metabolically Reversible Reaction (Quiz on Metabolically Important Molecules)</b>	MEF
	11	Preparation for Citric Acid Cycle & Citric Acid Cycle	MEF22
	13	Citric Acid Cycle (cont'd)	MEF23
	15	Ox Phos: The Electron Transport Chain	MEF24
	18	Ox Phos: ATP Synthesis	MEF25
	20	Review	MEF
	22	Nucleic Acids: Base Pairing, the Double Helix and DNA packaging	DPT1
	23	Saturday: Second Midterm -MEF	
	<b>25+26</b>	<b>Lab 5: Plasmid Purification</b>	RAE
	25	DNA Replication	DPT2
	27	DNA Repair and Recombination	DPT3
	29	Transcription of DNA = Synthesis of RNA	DPT4
Apr.	1	Recombinant DNA Techniques	DPT5
	3	Gene Expression in Eukaryotes	DPT6
	5	RNA Processing in Eukaryotes	DPT7
	<b>8+9</b>	<b>Lab 6: DNA Cleavage and Electrophoresis</b>	RAE

	8	The Genetic Code and tRNA	DPT8
	10	Translation of RNA	DPT9
	12	Synopsis and Review	DPT

### Final Exam Scheduled by the Registrar

## Learning outcomes

General - BCEM 341 is a course for chemistry and kinesiology majors wishing to familiarize themselves with all aspects of biochemistry in one term. There is a laboratory component that integrates with the lecture material.

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

1. Compare the structures of the major classes of biological molecules, i.e. lipids, carbohydrates, proteins and nucleic acids, and relate these to their cellular roles.
2. Explain how individual enzymes catalyze biochemical reactions so that the reactions take place at the rate needed for life; and analyze an enzyme kinetically in a laboratory setting.
3. Classify the enzyme reactions in the metabolic pathway "glycolysis" into one of six classes and calculate overall energy yields for anaerobic metabolism of glucose.
4. Compare the anaerobic energy yields with those obtained when glucose is completely combusted to CO<sub>2</sub> and H<sub>2</sub>O in mitochondria during oxidative phosphorylation.
5. Explain how hydrogen bonding and stacking interactions of nucleic acid bases, as well as ribo and deoxyribo sugars enable polymers of nucleic acids to have different structures and functions within the cell.
6. Explain the process of DNA replication, RNA transcription and translation of RNA into proteins that can be post-translationally modified.
7. Explain how errors in the DNA code can give rise to mutations that are either lethal or non-lethal.
8. Demonstrate skills frequently used in biochemistry laboratories:
  - Dispense small volumes accurately using mechanical pipettors.
  - Perform serial dilutions.
  - Measure absorbance by visible spectroscopy.
  - Use standard curves for quantification.
  - Use chromatography and electrophoresis to separate biochemical molecules.
  - Distinguish qualitative from quantitative experiments.
  - Work as a team.
  - Communicate biochemical experiments in written reports.

Department Approval:

Electronically Approved

Date: 2019-01-09 13:08

Associate Dean's Approval for out of regular class-time activity:

Electronically Approved

Date: 2019-01-09 17:02