



COURSE OUTLINE

1. **Course:** BCEM 443, Metabolism - Fall 2020

Lecture 01: MWF 11:00 - 11:50 - Online

Instructor	Email	Phone	Office	Hours
Dr Ian Lewis	ian.lewis2@ucalgary.ca	403 220-4366	BI 472	TBD
Dr Vanina Zarembeg	vzarembeg@ucalgary.ca	403 220-4298	BI 390	TBA

COURSE DESCRIPTION:

In this course, we will learn about primary metabolism. This includes carbohydrate, lipid, amino acid, and nucleotide metabolism. We will also learn about how these pathways are regulated and how these pathways inform us about health, evolution and the molecular underpinnings of life.

Online Delivery Details:

This course does not follow a scheduled meeting pattern.

ONLINE COURSE INFORMATION:

This course will run 100% online for the Fall 2020 semester via D2L and Zoom. All lecture and learning materials will be available to the student asynchronously within the D2L classroom to allow students the greatest flexibility in scheduling their work. Additionally, synchronous online class sessions will be run through Zoom on Monday, Wednesday and Fridays from 11-11:50 AM and once a week for each tutorial. These sessions are *optional* to attend and will provide an opportunity to work through problem sets. Synchronous online sessions will be recorded and shared within the D2L classroom. Synchronous lecture and tutorial dates and times are listed in the course schedule.

TUTORIAL INFORMATION:

Tutorials will be held synchronously via Zoom. Attendance at the tutorials is *optional*, but highly recommended. Sessions will be recorded and housed in D2L for students unable to attend. Please attend the tutorial section to which you have been assigned on the ucalgary course schedule. Read and watch tutorial material and prepare questions to ask your TA before coming to the live tutorial. TA office hours will be held on weeks without tutorials. Please refer to the *Teaching Assistants* tab in D2L for specific meeting times. If you have any questions regarding course-related material, please post your questions on the D2L *Q/A Discussion forum*.

NAME & EMAIL CONTACT OF TEACHING ASSISTANTS:

- Carly Chan (Lead TA) carly.chan@ucalgary.ca
- Colin MacKenzie colin.mackenzie1@ucalgary.ca
- Spencer Wildman spencer.wildman@ucalgary.ca
- Xufan Huang xufan.huang@ucalgary.ca
- Sam Carr sccarr@ucalgary.ca

Course Site:

D2L: BCEM 443 L01-(Fall 2020)-Metabolism

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 353 or 355; and Biochemistry 341 or 393.

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:

Part 1, taught by Dr. Lewis:

- (16%) Quizzes - 8 quizzes worth 2% each
- (18%) Homework Assignments - 3 assignments worth 6% each
- (20%) Midterm Project
- (16%) Tutorial Reports - 4 reports worth 4% each

Part 2, taught by Dr. Zaremborg

- (15%) Presentations
- (15%) Final Project

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 %

ASSESSMENT COMPONENTS: Course assessments will be divided into the two parts of the course, as noted in the course schedule.

In Part 1, Dr. Lewis will assess your learning using:

- **Quizzes (16%):** Quizzes are designed to give you opportunities to practice and assess your understanding of the course material. Quizzes will be posted during the scheduled weeks in D2L. Quizzes are automatically generated from a large test bank of questions. You may complete the quizzes as many times as you like to practice and review the course material. The highest score from all attempts will be used as your course grade. Quizzes are due by 11:59 PM on Mondays.
- **Tutorial Reports (16%):** Tutorials are designed to give you an opportunity to apply the course content to real world problems. There are six scheduled tutorials to be completed in Part 1 of the course. You will create a tutorial report for each of the six tutorials. Tutorials will be submitted as a single PDF file within D2L in the weeks they are scheduled. Complete details for the tutorial reports are listed in D2L. Tutorial reports are due by 11:59 PM every other Friday.
- **Homework Assignments (18%):** Homework assignments are designed to test your problem solving abilities and encourage team problem solving to work towards understanding more challenging concepts in biochemistry. While homework assignments can be discussed with other students or in groups, all written work **must** be prepared and submitted individually. Work will be checked for plagiarism. Homework will be submitted as a single PDF file within D2L in the weeks they are scheduled. Complete details for the homework assignments are listed in D2L. Homework assignments are due by 11:59 PM every other Friday.
- **Midterm Research Project (20%):** Your midterm research project will allow you to apply the concepts you've learned throughout the lectures and tutorials to gain a deeper understanding of a human disease or biological process. Students will be given a range of topics to research and prepare a written and oral report that explains the underlying biochemistry behind these important biological phenomenon. Detailed instruction and evaluation criteria will be provided in the D2L classroom. Final project and presentation are due at 11:59 PM on November 6, 2020.

In Part 2, Dr. Zaremborg will assess your learning using:

- **Presentations (15%)**
- **Final Research Project (15%)**

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.

Missed work must be reported within 48 hours of the missed due date. Absences must be reported within 48 hours.

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

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

6. **Course Materials:**

Recommended Textbook(s):

JOH L. TYMOCZKO JEREMY M BERG, LUBERT STRYER, *Biochemistry A short Course*: W H FREEMAN & COMPANY A MACMILLAN EDUCATION.

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:**

No examinations will be given this term. Midterm and Final Projects will replace exams. Details for the projects will be included in the D2L classroom.

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:**

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:** 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](tel: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 (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.
- 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.

TENTATIVE CLASS SCHEDULE:

Week	Date	Lecture Description (MWF11-11:50am)	Assignment Due	Tutorials
Part 1: Central Carbon Metabolism taught by Dr. Lewis				
1	9-Sep	Course and metabolism introduction		No tutorials
	11-Sep	Organic chemistry review		
2	14-Sep	Glycolysis review	Quiz 1	Malaria drug screening
	16-Sep	Glycolysis mechanisms		
	18-Sep	PPP and Malaria	Tutorial report 1	
3	21-Sep	Glycogenesis/glycogenolysis	Quiz 2	No tutorials TA Office hours
	23-Sep	TCA review and glyoxylate shunt		
	25-Sep	Ketogenic diet	Homework 1	
4	28-Sep	Metabolic regulation 1	Quiz 3	Metabolomics
	30-Sep	Metabolic regulation 2		
	1-Oct	Diabetes	Tutorial report 2	
5	5-Oct	Flux introduction	Quiz 4	No tutorials TA Office hours
	7-Oct	Flux balance analysis		
	9-Oct	Microbial metabolism	Homework 2	
6	12-Oct	<i>Thanksgiving (no lecture)</i>		Isotope Tracing
	14-Oct	Amino acid catabolism	Quiz 5	
	16-Oct	Amino acid anabolism Inborn errors of metabolism	Tutorial Report 3	
7	19-Oct	Urea cycle	Quiz 6	No tutorials TA Office hours
	21-Oct	Growth laws		
	23-Oct	Nutritional supplements	Homework 3	
8	26-Oct	Purine biosynthesis	Quiz 7	CSI-Calgary
	28-Oct	Pyrimidine biosynthesis		
	30-Oct	Cancer metabolism	Tutorial report 4	
9	2-Nov	Plant metabolism	Quiz 8	No tutorials TA Office hours
	4-Nov	Nitrogen cycle		
	6-Nov	Metabolism and evolution	Midterm Project	
10	9-Nov	<i>Reading week (no lecture)</i>		No tutorials

Part 2: Fatty Acid Metabolism taught by Dr. Zaremborg				
11	16-Nov	Lipids introduction		Lipids (TBD)
	18-Nov	Biophysical properties of lipids		
	20-Nov	FA synthesis		
12	23-Nov	FA oxidation		<i>No tutorials</i> TA Office hours
	25-Nov	Glycerolipids		
	27-Nov	Neutral lipid		
13	30-Nov	Lipid signalling		Presentations
	2-Dec	Sphingolipids		
	4-Dec	Sterols		
14	7-Dec	Review		<i>No tutorials</i> TA Office hours
	9-Dec	Final Project	Final Project	

Course Outcomes:

- Analyze and rationalize cellular strategies for maintenance of carbon, nitrogen and lipid homeostasis
- Understand the common reaction mechanisms used in central carbon metabolism.
- Diagram the flow of carbon through glycolysis, pentose phosphate pathway, glycogen, tricarboxylic acid cycle, and related pathways.
- Understand metabolic flux and be able to use flux balance analysis to describe metabolic steady state.
- Identify critical metabolic steps where crosstalk between different metabolic pathways occurs
- Understand basic regulatory mechanisms that maintain homeostasis
- Recognize that alterations of cellular homeostasis lead to metabolic diseases and appreciate how this is studied using modern approaches.
- Know how to interpret data, how to label scientific figures and tables, and how to write a lab report.

Electronically Approved - Sep 04 2020 14:34

Department Approval

Electronically Approved - Sep 05 2020 11:58

Associate Dean's Approval