CAMOSUN COLLEGE
School of Arts & Science
Department of Biology

BIOL-231-001
Principles of Cell Biology
Fall 2019

COURSE OUTLINE

The course description is online @ http://camosun.ca/learn/calendar/current/web/biol.html
Ω Please note: This outline will not be kept indefinitely. It is recommended students keep this outline for their records, especially to assist in transfer credit to post-secondary institutions.

1. Instructor Information

(a) Instructor	Dr. Larry Anthony		
(b) Office hours	Monday 4:00–4:50; Wednesday 10:30–12:20		
(c) Location	F314A		
(d) Phone	250-370-3459	**Alternative:**	
(e) E-mail	anthonyl@camosun.bc.ca		
(f) Website	http://online.camosun.ca/ (D2L)		

IMPORTANT NOTE: I understand that my scheduled drop-in office hour times will not necessarily align with everyone's class schedules. This should not deter you from trying to visit me in my office! My schedule will be posted on my office door and on the course D2L website: I can be available at almost any time that I'm not already in class or lab. Simply arrange an appointment by e-mail and I'll be very pleased to meet with you at a mutually convenient time.

2. Intended Learning Outcomes

Upon completion of this course the student will be able to:

1. Describe the properties of the four groups of macromolecules, including how polymers are synthesized from monomeric units.
2. Describe the structure and functions of the subcellular compartments, organelles and structural molecules.
3. Describe the molecular structure of cellular membranes and explain how membrane structure facilitates membrane function.
4. Explain the molecular mechanisms underlying diffusion, facilitated diffusion and active transport across cytoplasmic membranes.
5. Describe how cells interact with their environment through the extracellular matrix and with other cells through intercellular junctions.
6. Describe the structure and functions of the intracellular membrane systems. Explain the cellular and molecular mechanisms underlying the flow of molecules through the endomembrane system.
7. Explain how secretion, endocytosis and exocytosis facilitate the bulk movement of molecules into and out of the cell.

8. Explain the cellular and molecular mechanisms underlying communication between neurons.
9. Explain the cellular and molecular mechanisms through which cells communicate with one another by chemical messengers.
10. Describe the structures of the cytoskeleton. Explain how the cytoskeletal components are used in movement of intracellular components and in cell motility in the environment.
11. Describe the cellular and molecular mechanisms underlying control of the cell cycle and programmed cell death. Apply these principles in the dysregulated environment of cancer cells.
12. Conduct complex experiments and use a variety of current molecular and analytical techniques to assess various aspects of cellular biology. Critically evaluate data and present written laboratory reports.

3. Required Materials

Text: Hardin & Bertoni (2016) *Becker's World of the Cell*, 9th Edition (Pearson)

Lab Manual: Biology 231 lab outlines will be posted on the Biology 231 D2L website several days prior to the lab times. You will be responsible for printing the outline (and any associated worksheet materials) and reading it before the lab session. You will also be responsible for following any pre-lab instructions that may be indicated in the lab. Knowledge of lab procedures and principles prior to the lab may be evaluated through pre-lab quizzes.

Lab Coat: Lab coats are required for laboratory work. See below.

Lecture Outlines: Lectures will be delivered in a PowerPoint format. PowerPoint slides will be made available on the Biology 231 D2L website. These may be used at the student's discretion

4. Course Content and Schedule

Lectures:	Mon	2:30–3:50	Y201
	Wed	2:30–3:50	Y201
Lab Section A:	Fri	8:30–11:20	F222
Lab Section B:	Fri	13:30–16:20	F222

NOTE: See last page for a weekly breakdown of scheduled lecture and topics.

5. Basis of Student Assessment (Weighting)

(Should be directly linked to learning outcomes.)

ONE of the following grading options will apply:

Lecture Midterm 1	14	Lecture Midterm 1	15
Lecture Midterm 2	19	Lecture Midterm 2	20
Lecture Quizzes	5%	Lecture Quizzes	0%
Lab Exam 1	12%	Lab Exam 1	12%
Lab Exam 2	12%	Lab Exam 2	12%
Lecture Final Exam	24%	Lecture Final Exam	27%
Assignments / Labs	14%	Assignments / Labs	14%
TOTAL	**100%**	**TOTAL**	**100%**

NOTE: There will as many weekly lecture quizzes as possible to facilitate you establishing patterns of regularly studying, rather than cramming in the days or hours before a midterm exam.

6. Grading System

[X] Standard Grading System (GPA)

[ ] Competency Based Grading System

7. Recommended Materials to Assist Students to Succeed Throughout the Course

Larry Anthony has prepared a document intended to provide insight into effective (and ineffective) ways of studying. This document will be posted on the course D2L website.

8. College Supports, Services and Policies

Immediate, Urgent, or Emergency Support
If you or someone you know requires immediate, urgent, or emergency support (e.g. illness, injury, thoughts of suicide, sexual assault, etc.), **SEEK HELP**. Resource contacts @ http://camosun.ca/about/mental-health/emergency.html or http://camosun.ca/services/sexual-violence/get-support.html#urgent

College Services
Camosun offers a variety of health and academic support services, including counselling, dental, disability resource centre, help centre, learning skills, sexual violence support & education, library, and writing centre. For more information on each of these services, visit the **STUDENT SERVICES** link on the College website at http://camosun.ca/

College Policies
Camosun strives to provide clear, transparent, and easily accessible policies that exemplify the college's commitment to life-changing learning. It is the student's responsibility to become familiar with the content of College policies. Policies are available on the College website at http://camosun.ca/about/policies/. Education and academic policies include, but are not limited to, Academic Progress, Admission, Course Withdrawals, Standards for Awarding Credentials, Involuntary Health and Safety Leave of Absence, Prior Learning Assessment, Medical/Compassionate Withdrawal, Sexual Violence and Misconduct, Student Ancillary Fees, Student Appeals, Student Conduct, and Student Penalties and Fines.

See below for how some of these policies are applied in the lecture and lab of BIOL-231.

A. Grading Systems *http://camosun.ca/about/policies/index.html*

The following two grading systems are used at Camosun College:

1. Standard Grading System (GPA)

Percentage	Grade	Description	Grade Point Equivalency
90-100	A+		9
85-89	A		8
80-84	A-		7
77-79	B+		6
73-76	B		5
70-72	B-		4
65-69	C+		3
60-64	C		2
50-59	D		1
0-49	F	Minimum level has not been achieved.	0

2. Competency Based Grading System (Non GPA)

This grading system is based on satisfactory acquisition of defined skills or successful completion of the course learning outcomes

Grade	Description
COM	The student has met the goals, criteria, or competencies established for this course, practicum or field placement.
DST	The student has met and exceeded, above and beyond expectation, the goals, criteria, or competencies established for this course, practicum or field placement.
NC	The student has not met the goals, criteria or competencies established for this course, practicum or field placement.

B. Temporary Grades

Temporary grades are assigned for specific circumstances and will convert to a final grade according to the grading scheme being used in the course. See Grading Policy at http://camosun.ca/about/policies/index.html for information on conversion to final grades, and for additional information on student record and transcript notations.

Temporary Grade	Description
I	***Incomplete***: A temporary grade assigned when the requirements of a course have not yet been completed due to hardship or extenuating circumstances, such as illness or death in the family.
IP	***In progress***: A temporary grade assigned for courses that are designed to have an anticipated enrollment that extends beyond one term. No more than two IP grades will be assigned for the same course.
CW	***Compulsory Withdrawal***: A temporary grade assigned by a Dean when an instructor, after documenting the prescriptive strategies applied and consulting with peers, deems that a student is unsafe to self or others and must be removed from the lab, practicum, worksite, or field placement.

ACADEMIC HONESTY AND ACADEMIC MISCONDUCT

In addition to the College Student Conduct Policy (see http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.5.pdf), the School of Arts and Science has guidelines to interpret and apply this policy (see http://camosun.ca/learn/school/arts-science/images/Arts%20and%20Science%20Academic%20Honesty%20Guidelines.pdf). The guidelines require the instructor to report all instances of academic dishonesty to the School. The guidelines also prescribe penalties for infractions. All learners in BIOL-231 are bound by **BOTH** the College policy **AND** the School guidelines, so be sure to familiarize yourself with them. **WITHOUT EXCEPTION**, violations of the School academic honesty guidelines will be reported to the School, regardless of the level of infraction. The School will make a notation of the infraction.

The Arts & Science Academic Honesty Guidelines outline the types of behaviour that constitute academic dishonesty. Although **ALL** types of dishonesty described will apply without exception, two of them are worth highlighting for BIOL-231.

CHEATING

A student caught using "any unauthorized material or information in order to complete an assignment, exam or project" will forfeit all credit for that assignment or exam, and perhaps for the course. **ALL** examples in the Guidelines apply to BIOL-231, but the following are worth noting:
(a) using **ANY** unauthorized materials or resources in a quiz/exam;
(b) allowing others to copy or otherwise use your work;
(c) providing information to another person regarding exam content.

To be clear, during quizzes and exams, there will be **NO** materials or resources permitted.

PLAGIARISM

Plagiarizing is appropriating the work or parts or passages of another's writing, ***including the ideas or language***, and passing them off as the product of one's own mind or manual skill. **ALL** examples in the Guidelines apply to BIOL-231, but the following is worth noting:
(a) except where work is assigned to a group, all written work, **including lab data processing** and graphs, must be done individually, with no input from anyone, including group members.

IMPORTANT NOTE:
In the Arts & Science Academic Honesty Guidelines, reference is made to "intentional or knowing use". Since the Policy, the Guidelines and this course outline have stated clearly that cheating and plagiarism is not permitted, there is no circumstance in which an infraction in BIOL-231 will be considered unintentional or unknowing. All infractions will be assigned 0 marks and the infraction reported to the Arts & Science office.

STUDENT SAFETY

NOTHING is more important to the instructor than students enjoying a safe class and lab environment. In Principles of Cell Biology we will ***NOT*** be working with organisms capable of causing infection. However, the cell biology labs take place within the Camosun Biological Safety Containment Zone (CZ), where other classes will be using potentially infectious organisms. Therefore, our work in the CZ is mandated by federal and provincial legislation and regulations to conform to strict safety standards. These will be outlined fully in the lab, but consider the following issues:

Lab footwear	• For safety reasons, **WorkSafeBC** mandates, and federal regulations require, that students are **required** to wear closed shoes in all lab times. Flip flops, sandals or shoes with holes are not acceptable. Other footwear posing an instability risk (e.g. high heels or bicycle shoes) are prohibited.
Lab coats	• For regulatory, safety and professional reasons, it is **mandatory to wear a lab coat** during all lab sessions. Because the 231 lab is within the CZ lab coats must remain in the lab for the duration of the semester. Personal lab coats are not permitted; lab coats must be rented for the semester from the Biology Department by purchasing a lab coat rental chit from the Lansdowne Bookstore. Presenting this chit to the instructor will ensure you access to a clean lab coat for your use throughout the semester. If it needs to be cleaned during the semester, then we will do so at no additional cost to you. • Failure to wear proper lab attire will result in the **inability to enter** the lab and the subsequent **loss of credit** for that lab, including any lab assessment credit. • While in the lab the lab coat must be completely buttoned. • The lab coat must **NEVER** be worn outside of the lab. If you must leave the lab for any reason you must remove your lab coat.
Eating & drinking	• Eating or drinking anything in the lab is a violation of federal regulations, so absolutely **NOTHING** may be ingested while in the lab. Chewing gum and applying makeup or lip balm are similarly prohibited. **NO EXCEPTIONS** will be made, even for medications. • If something must be consumed, then it may be taken out of the lab.
Hair	• It is recommended that long hair be tied securely to prevent it from being exposed to lab equipment.
Handwashing	• Hands should be thoroughly washed **AFTER** removing lab coats and **BEFORE** leaving the lab. Proper procedure will be demonstrated and practised.

LABORATORY ATTENDANCE

Lab work is critical to the course objectives and much effort has been expended to ensure the lab experience is interesting and educational, both from academic and practical points of view. Therefore, attendance throughout the entire laboratory session is mandatory and will be noted each lab period. Labs will start promptly (after a five-minute grace period) because information necessary for performing the laboratory correctly and safely is given at the beginning of the lab. Late attendance may result in inability to attend the lab and subsequent loss of credit for any assignments. Lateness in arriving, unexcused failure to attend the lab or unexcused departure from the lab before its scheduled finish time will result in forfeiting credit for any written assignments for that lab. If a lab session is missed, another student's data **may not** be used to complete a lab assignment for credit. **At the instructor's discretion**, in legitimate cases of emergency (e.g. illness) the instructor may grant accommodation, **provided** he receives **advance notification** and **documented evidence** of the situation (e.g. medical certificate). In cases when a lab is done over two weeks, missing one of the weeks will result in a 50% reduction in the grade for any assignment associated with that lab.

MISSED EXAMS AND QUIZZES

LECTURE MIDTERM EXAMS AND QUIZZES

WITHOUT EXCEPTION, all lecture midterm exams or quizzes must be written at the scheduled times. However, it is understood that emergency circumstances occur (e.g. illness or emergency in the immediate family). Any accommodation is subject to **strict conditions**:
(a) The student must notify the instructor **in advance** of the exam (not after), **AND**
(b) The student must provide **original, paper-copy evidence** of the situation requiring accommodation.

The two options for accommodation are:

Option 1: ***Deferring*** the exam, opting to write on a different day.
Option 2: **Re-weighting** the final exam, by transferring the weight of the midterm to the final. This is feasible because the final exam is cumulative, covering content from the entire course.

A deferred exam **MUST** be written **within five school days** after the scheduled exam to prevent the student from falling behind in the regular lecture schedule. If writing the deferred exam is not possible within five school days, then Option 2 will be automatically be applied. When Option 2 is applied, then the final exam will include extra questions to thoroughly examine knowledge of previously untested subject matter. Sufficient time for the extra questions will be provided. The final exam mark will be based upon the total mark for the main exam and the supplemental questions.

LECTURE FINAL EXAM

In a situation in which a learner is unable to write the lecture final exam, then the instructor will permit deferring he final exam to another time **within the final exam period**. In very extraordinary cases, a deferred final exam cannot be written in the final exam period. In such cases an 'I' grade (incomplete) will be recorded until the final exam can be completed.

NOTE: Once any quiz or exam is written:
- **there will be no opportunity to defer;**
- **there will be no opportunity to write a makeup exam; and**
- **there will be opportunity re-weight the final exam.**

NOTE: Lecture midterm or final exam emergency accommodation is NOT automatic, the decision to accommodate either will be at the discretion of the instructor.

******* HOLIDAYS OR SCHEDULED FLIGHTS ARE NOT CONSIDERED TO BE EMERGENCIES, AND WILL NOT BE ACCEPTED AS REASONS TO DEFER OR RE-SCHEDULE EXAMS. *******

Be sure not to make travel plans for the middle or the end of the semester until the lecture and lab exam schedules are posted. **Important**: please ask any friends or family members who might make travel plans on your behalf to consult you before booking non-refundable tickets.

LAB EXAMS

Lab exams differ from lecture exams in their formatting and the fact that they cover lab content in a non-cumulative manner. Administering a deferred lab exam will be at the discretion of the instructor and requires advance notice of the reason for deferral and supporting documentation. **Under no circumstances will any make-up lab exam be administered to re-write an exam that has already been written**.

WRITTEN WORK

Lecture and lab assignments will be assigned at the instructor's discretion. It is the student's responsibility to be informed of any work expected and the dates the work is due. Assignments may be intended to be completed as individuals or as groups. The instructor will make clear which is which. Work intended to be submitted by an individual must be completed independently, keeping in mind the academic honesty discussion above. Work intended for completion by a group **MUST NOT** be completed by an individual. Each person in a group will receive the same mark on any group work. If a group member does not contribute in an equal manner to a group assignment, then that person's name **MUST NOT** be included on the assignment; this is academic dishonesty.

To be clear, if individual assignments ***fail in any way*** to reflect an entirely individual effort, this will be regarded as an infraction under the guidelines that will be penalized and reported to the School.

Unless otherwise indicated, ***ALL written material*** to be submitted to the instructor (including numerical entries in data tables) must be prepared using word processing (typically MS Word) or graphing software (e.g. Excel). **Any exceptions to this rule will be clearly indicated.** Work submitted inappropriately formatted will not be marked and a late penalty will be applied (see below).

MS Word templates will be posted on the course D2L website for assignment purposes; these templates must not be altered except to complete the blank areas. All written work must be submitted in **hard copy**, not e-mailed or posted to the D2L website. Exceptions to this policy are rare and made only at the discretion of the instructor. This is for purely practical reasons: printing out many assignments is problematic because instructors use shared-access printers, which are not private, and documents or parts of documents can easily go missing. **Always be on the lookout for special instructions**.

LATE PENALTIES

All assignments must be handed in on the ***correct dat***e, and by the ***time indicated***, on the assignment. If the instructor is not in the office, then slide your work under the office door. Late assignments that are correctly formatted will be graded, but marks equivalent to 15% of the total value of the assignment will be deducted for each day past the deadline (weekends count as one day). If the format is inappropriate, then an additional late penalty of ***at least*** one day will be applied (see above).

SUMMARY OF STUDENT RESPONSIBILITIES

1. Attending classes and actively engaging in lecture times are optimal for learning and therefore are in the best interests of student success. Should it be necessary to miss a lecture, however, it is the student's responsibility to catch up on anything that may have been missed (e.g. important announcement or assignments).
2. Students must hand in required assignments on time or be subject to penalty.
3. Electronic submissions of assignments (e.g. as e-mail attachments) will **NOT** be accepted.
4. Evaluation of written or oral work will not be given if a student is not present.
5. Students must work independently, except when a group effort is required.
6. Students must know and follow all Safety Rules and Procedures. Students must sign the Safety Contract before participating in any laboratory activity.
7. All safety measures must be followed, with **NO EXCEPTIONS**.
8. The use of cell phones is prohibited in the lab.
9. All laboratories start punctually.

Biology 231 – 2019W – Course Schedule (Note: Scheduled dates and specific topics are subject to change)
Topics may be added or deleted or adjusted in length depending upon time constraints or availability.

Wk	Day	Date	Unit	Lecture Topic	Lab	Lab Activity
1	Mon	2-Sep		**LABOUR DAY - NO CLASSES**		
1	Wed	4-Sep		Course Introduction		
1	Fri	6-Sep	1, 2			Safety, Inflammation & Cell Structure
2	Mon	9-Sep	3	Biological Molecules		
2	Wed	11-Sep	3	Biological Molecules		
2	Fri	13-Sep			1	Microscopy
3	Mon	16-Sep	4	Membrane Functional Anatomy		
3	Wed	18-Sep	4	Membrane Functional Anatomy		
3	Fri	20-Sep			2	Histology
4	Mon	23-Sep	5	Membrane Transport Mechanisms		
4	Wed	25-Sep	5	Membrane Transport Mechanisms		
4	Fri	27-Sep			3	Quantifying Diffusion
5	Mon	30-Sep	5	Membrane Transport Mechanisms		
5	Wed	2-Oct		**LECTURE MIDTERM 1**		
5	Fri	4-Oct			4A	Cell Culture (Wk1)
6	Mon	7-Oct	6	Cytoskeleton Structure & Function		
6	Wed	9-Oct	6	Cytoskeleton Structure & Function		
6	Fri	11-Oct			5	Leukocyte Isolation
7	Mon	14-Oct		**THANKSGIVING DAY - NO CLASSES**		
7	Wed	16-Oct	7	Cell Motility		
7	Fri	18-Oct				**LAB EXAM 1**
8	Mon	21-Oct	7	Cell Motility		
8	Wed	23-Oct	8	Cell Adhesion, Junctions & ECM		
8	Fri	25-Oct			4B	Cell Culture (Wk 2)
9	Mon	28-Oct	8	Cell Adhesion, Junctions & ECM		
9	Wed	30-Oct	8	Cell Adhesion, Junctions & ECM		
9	Fri	1-Nov			6	RBC Protein Isolation & Assay
10	Mon	4-Nov	9	Chemical Signal Transduction		
10	Wed	6-Nov		**LECTURE MIDTERM 2**		
10	Fri	8-Nov			7A	RBC Protein SDS-PAGE (Wk 1)
11	Mon	11-Nov		REMEMBRANCE DAY - NO CLASSES		
11	Wed	13-Nov	9	Chemical Signal Transduction	*7B*	*Protein SDS-PAGE Analysis (Wk 2)*
11	Fri	15-Nov			8	RTK Signaling
12	Mon	18-Nov	10	Cell Cycle, Cell Death & Cancer		
12	Wed	20-Nov	10	Cell Cycle, Cell Death & Cancer		
12	Fri	22-Nov			9	Phagocytosis
13	Mon	25-Nov	11	Electrical Signaling in Neurons		
13	Wed	27-Nov	11	Electrical Signaling in Neurons		
13	Fri	29-Nov				**TUTORIAL**
14	Mon	2-Dec	12	Endomembrane System		
14	Wed	4-Dec	12	Endomembrane System		
14	Fri	6-Dec				**LAB EXAM 2**
	Mon	9-Dec		**FINAL EXAM PERIOD BEGINS**		

TEXTBOOK READINGS

Unit	Topic	Chapter	Pages
1	Inflammation: Cell Biology in a Nutshell	N/A	PPT on D2L
2	Cellular & Sub-Cellular Structure	N/A	Chapter provided on D2L
3	Biological Molecules	2 / 3	24–25; 32–38; 42–67; 70-71
4	Membrane Functional Anatomy	3 / 7	67–70; 152–154; 157–171; 175–180
5	Membrane Transport Mechanisms	8	185–211
6	Cytoskeleton Structure & Function	13	351–375
7	Cell Motility	14	377–387; 388–397; 399–402
8	Cell Adhesion, Junctions & Extracellular Matrix	15	405–424
9	Chemical Signal Transduction	23	684–686; 689–701
10	Cell Cycle, Cell Death & Cancer	24 / 26	714–718; 730–743 (+ PPT); 791–799
11	Electrical Signaling in Neurons	22 / 12	658–681; 338–340
12	Endomembrane System	12	314–323 (+PPT)

NOTES:

1. The pages listed are from the 9th edition of Hardin & Bertoni "*Becker's World of the Cell*". Other editions may describe similar concepts, but the page numbers will be different.

2. Unit 1 (Inflammation) is not covered in the text book. Refer to PowerPoint (PPT) slides posted on the D2L website.

3. Unit 2 (Cellular Structure) is covered in textbook Chapter 4. However, the information required for the course is written in "Unit 02 Cellular & Sub-Cellular Structure", a chapter written by Larry Anthony, based upon Chapter 4 in *Becker's World of the Cell*. This chapter will be posted on the course D2L website.