



COURSE OUTLINE

BIOL 201 Cell Biology

3 CREDITS

PREPARED BY: Tara Stehelin, Biology Instructor
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APPROVED BY: Ernest Prokopchuk, Dean, ASM
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Cell Biology

INSTRUCTOR: Tara Stehelin, MSc, PhD **OFFICE HOURS:** F 11:00 – 1:00 PM
OFFICE LOCATION: A2806 **CLASSROOM:** A2805
E-MAIL: tstehelin@yukonu.ca **TIME:** M 1:00 – 2:30 **Labs** T 2:30 – 5:30
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COURSE DESCRIPTION

This core second-year biology course examines the structure and function of cells and cell membranes in detail. Students gain an understanding of processes such as cell mobility, the cell cycle and cellular reproduction, vesicular transport, endo- and exocytosis, and membrane transport. Cellular genetics (cytogenetics), homeostasis of the cell, and the evolution of cell organelles will also be examined. Students will gain understanding of cellular flow of information from genetic code to protein and the importance of this flow in cellular processes. Students will gain hands-on experience in basic cellular biology lab techniques, such as various microscope, specimen staining, assay, and separation techniques.

PREREQUISITES

Successful completion of both Biology 101 and 102 or equivalent with a final grade of “C” or higher in both. Successful completion of a university-level first-year chemistry course.

EQUIVALENCY OR TRANSFERABILITY

Transfers to most universities in BC as second-year Cell Biology. Contact the course instructor for specific examples.

LEARNING OUTCOMES

Upon successful completion of this course students will be able to

- explain the unifying and separating features of prokaryotic and eukaryotic cells and the implications of these features in evolution and diseases that impact humans,
- identify and explain the structure and function of all organelles in eukaryotic cells with an evolutionary approach,
- explain molecular structure and diversity of the four types of molecules important to life: carbohydrate, lipid, protein, and nucleic acids and how these molecules facilitate cellular function,

- describe how organelles and membranes work individually and together to achieve homeostasis of the cell,
- outline and compare theories of evolution of organelles and metabolism, including the function of electron transport chains and energy flow, and
- understand the cell cycle, controls, molecular signalling and interactions between cells, as well as the identifying features and metabolism of cancer cells.

Lab learning outcome: demonstrate lab techniques relating to cellular biology such as microscope and staining techniques of both live and preserved specimens, isolation and separation techniques as well as identification of organelles and features of cells.

COURSE FORMAT

3 hours of lecture and 3 hours of laboratory per week.

ASSESSMENTS

Attendance & Participation

Attendance is mandatory in laboratory sessions and strongly recommended in lectures. Students who do not attend a lab session will receive a zero for that day's activities unless the instructor is informed of the absence before the start of that lab.

Assignments

Assignments are given during lab sessions and occasionally during lecture and graded on the basis of understanding and applying principles involved. For discussion and presentations, marks are awarded for appropriate involvement in classroom discussions or clearly presented results of lab exercises.

Tests

Two midterms will be given during lecture and two lab exams will be given during the semester. There is no final lab exam.

Because of unusual circumstances of the 2020 **SARS Cov-2 pandemic**, lectures will be delivered online. Students are greatly encouraged to attend lectures when they are delivered synchronously (during the lecture time) although lectures will be recorded and can be watched later. Some lab activities will be conducted online, although most labs will be face to face, with some added precautionary measures in place in the lab. Please follow all directions carefully. *Students are expected to have access to a computer with internet capability for best viewing of online lectures and activities. If this is not possible, please contact the university to make other arrangements.*

EVALUATION

Assignments	10%
Midterm Exams (2)	30%
Lab assignments and quizzes	35%
Final Exam	25%
Total	100%

REQUIRED TEXTBOOKS AND MATERIALS

Becker's World of the Cell, 9th edition". 2016. J. Hardin and G. Bertoni. Pearson Benjamin Cummings. San Francisco, CA, USA.

Available for purchase as an eText (or hard copy) from the publisher.

With supplemental information from (*not a required text*):

Essential Cell Biology, 5th edition. 2019. Alberts, B., K. Hopkin, A. Johnson, D. Morgan, M. Raff, K. Roberts, and P. Walter. W. W. Norton and Company, Inc. New York.

Lab manual: *lab materials will be handed out during the first lab in the form of 3-hole punched pages.*

Students will be expected to read and understand scientific articles relating to course material.

ACADEMIC AND STUDENT CONDUCT

Information on academic standing and student rights and responsibilities can be found in the current Academic Regulations that are posted on the Student Services/ Admissions & Registration web page.

PLAGIARISM

Plagiarism is a serious academic offence. Plagiarism occurs when a student submits work for credit that includes the words, ideas, or data of others, without citing the source from which the material is taken. Plagiarism can be the deliberate use of a whole piece of work, but more frequently it occurs when students fail to acknowledge and document sources from which they have taken material according to an accepted manuscript style (e.g., APA, CSE, MLA, etc.). Students may use sources which are public domain or licensed under Creative Commons; however, academic documentation standards must still be followed. Except with explicit permission of the instructor, resubmitting work which has previously received credit is also considered plagiarism. Students who plagiarize material for assignments will receive

a mark of zero (F) on the assignment and may fail the course. Plagiarism may also result in dismissal from a program of study or the University.

YUKON FIRST NATIONS CORE COMPETENCY

Yukon University recognizes that a greater understanding and awareness of Yukon First Nations history, culture and journey towards self-determination will help to build positive relationships among all Yukon citizens. As a result, to graduate from ANY Yukon University program, you will be required to achieve core competency in knowledge of Yukon First Nations. For details, please see www.yukonu.ca/yfnccr.

ACADEMIC ACCOMMODATION

Reasonable accommodations are available for students requiring an academic accommodation to fully participate in this class. These accommodations are available for students with a documented disability, chronic condition or any other grounds specified in section 8.0 of the Yukon University Academic Regulations (available on the Yukon University website). It is the student's responsibility to seek these accommodations. If a student requires an academic accommodation, he/she should contact the Learning Assistance Centre (LAC): lac@yukonu.ca.

TOPIC OUTLINE

UNIT	TOPIC	WEEK	Chapter
Introduction			
	Overview of the cell, cell theory, origins, history and modern Cell Biology techniques	1	CH 1
Chemistry of the cell			
	Synthesis of polymers and macromolecules	1	CH 2
	Nucleic acids, amino acids, protein structure	2	CH 3
	Lipid bilayers, membrane proteins		
Cellular organelles, review and overview		3	CH 4
Biological flow of information from DNA to protein			
	DNA replication, repair and recombination	4	CH 17
Transcription , translation		5	CH 18
Genetic variation			
Protein Synthesis and Sorting (mostly review)			

Midterm I

Enzymes	6	CH 6
Membranes: structure, function, diversity, mosaic	7	CH 7
Transport across membranes	8	CH 8
Homeostasis, membrane potential		
The Endomembrane System	9	CH 12
The Cytoskeletal system	10	CH 13
Cellular Movement; motility	11	CH 14

Midterm II

Cell Adhesions, cellular junctions and extracellular structures	12	CH 15
Cell Signalling and cellular receptors		CH. 23
The Cell Cycle	13	CH. 24
Cancer cells (as time allows)		CH. 25

Review

Final exam

Lab Topic Outline

Please note that because of the COVID-19 Pandemic, some of these lab activities for the 2020 delivery will be augmented with online learning activities. Labs may also be conducted in a compressed format; such as combing several face to face activities into one lab session to limit contact between people.

- Lab 1 Introduction to the lab, safety, microscopes, and cell counting
- Lab 2 Cells and organelles –isolation and catalytic activity of chloroplasts
- Lab 3 Cell Behavior and cell counting review
- Lab 4 Measurement of protein content of cells, Part I
- Lab 5 Measurement of protein content of cells, Part II
- Lab 6 Lab Quiz #1
- Lab 7 Purification of mitochondria part I, introduction to cell cultures
- Lab 8 Purification of mitochondria part II, isolating plasmid DNA and electrophoresis
- Lab 9 Cytochemical methods, the cell cycle, mitosis and meiosis
- Lab 10 Lab Quiz #2 and student presentations