



COURSE OUTLINE

BIOL 201

CELL BIOLOGY

**45 HOURS LECTURE, 39 HOURS LAB
3 CREDITS**

PREPARED BY: Tara Stehelin

DATE: May 16, 2018

APPROVED BY: Margaret Dumkee (Dean) DATE:

APPROVED BY ACADEMIC COUNCIL: May 2015

RENEWED BY ACADEMIC COUNCIL: (date)

YUKON COLLEGE
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Course Outline prepared by Tara Stehelin, May 16, 2018.

CELL BIOLOGY

INSTRUCTOR: Tara Stehelin B. Sc., M.Sc., PhD Candidate **OFFICE HOURS:** Fridays, 11am-12:30 pm or by appt.

OFFICE LOCATION: A2806

CLASSROOM: A2204, A2805

E-MAIL: tstehelin@yukoncollege.yk.ca

TIME: Lecture T/R 10:30 - 12:00,
Lab Wed 1:00 - 4:00

TELEPHONE: 456-6957

DATES: Sept. 6 - Dec. 20, 2018

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

Articulation in progress; transfers to most universities in BC as second-year Cell Biology; contact the School of Science 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
- understand the cell cycle, controls, molecular signalling and interactions between cells, as well as cancer

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

DELIVERY METHODS

Material will be presented in two lectures and one lab session per week. Attendance in the laboratory is mandatory. **Students must pass the lab and lecture portions independently.**

COURSE FORMAT (3-3-0)

Two 1.5 hour-lectures (3 hours) per week and one 3-hour lab per week-labs begin in the second week of classes, there are no tutorial hours.

ASSESSMENTS

Attendance

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.

Participation

Students are encouraged to engage in discussion relating to the course topics, especially during lab sessions. A portion of lab assignment marks will be related to a student's participation in classroom discussion and presentations.

Assignments

Lab Assignments: Assignments are given during lab sessions and graded on the basis of understanding and applying principles involved as well as the correctness of answers to solutions. For discussion and presentations, marks are awarded for appropriate involvement in classroom discussions or clearly presented results of lab exercises.

Tests

On lecture material: Two midterms on lecture material will be given during regularly scheduled class time. The final examination will be held at the end of the term and covers material from the entire course, although it will focus mostly on the last portion of material. The examination date will be announced as soon as confirmed by administration.

On lab material: Two exams on lab material will be given during assigned lab time and cover material from the lab exercises in the weeks before. There is no final lab exam.

EVALUATION

| | | |
|---|-------|-------------|
| Lecture | | |
| Two midterms worth 15% each x 2 = | 30% | |
| In class assignments (5) | 10% | |
| Final exam | 25% | |
| Total Lecture | | 65% |
| Lab | | |
| Laboratory Assignments | 17.5% | |
| Laboratory exams (2) & participation in lab exercises | 17.5% | |
| Total laboratory | | 35% |
| Total | | 100% |

A portion of lab assignment marks (the equivalent of one week's lab mark) will be assigned based on appropriate participation in classroom discussions and short presentations on results of lab exercises.

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 in the bookstore.

The 8th edition of the textbook is acceptable as well.

With supplemental information from (not a required text):

Essential Cell Biology, third edition. 2010. Alberts, B., D. Bray, K. Hopkin, A. Johnson, J. Lewis, M. Raff, K. Roberts, and P. Walter. Garland Science, Taylor and Francis Group, Abingdon, OX, UK.

Lab manual: lab materials will be handed 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 College.

YUKON FIRST NATIONS CORE COMPETENCY

Yukon College 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 College program, you will be required to achieve core competency in knowledge of Yukon First Nations. For details, please see www.yukoncollege.yk.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 College Academic Regulations (available on the Yukon College 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) at (867) 456-8629 or lac@yukoncollege.yk.ca.

TOPIC OUTLINE

| UNIT | TOPIC | WEEK | Chapter |
|--|---|------|-----------------|
| Introduction | Preview of the cell, cell theory, origins, history and modern Cell Biology techniques | 1 | 1 |
| Chemistry of the cell | Synthesis of polymers and macromolecules | 1 | CH. 2 |
| | Formation and function | 2 | CH. 3 |
| | Nucleic acids, amino acids, protein structure and formation, protein folding | | |
| | Lipid bilayers, membrane proteins | | |
| Cell and Organelles, review and overview | | 3 | 4 |
| Biological flow of information from DNA to protein | DNA replication, repair and recombination | | 17 |
| | Transcription, translation | | |
| | Genetic variation | 4 | 18 |
| | Protein Synthesis and Sorting | 5 | 19 |
| <i>Midterm I</i> **** OCT 11 th **** | | | |
| Bioenergetics: laws of thermodynamics | | | CH. 5 (briefly) |
| Energy Flow in the cell | Enzymes | 6 | CH. 6 |
| Membranes: structure, function, diversity, mosaic | | | 7 |
| | Transport across membranes (passive and active) | | 8 |
| | Homeostasis, membrane potential | | |
| The Endomembrane System | | 7 | 12 |
| | ER structure, vesicle formation, Golgi apparatus structure and function | | |
| | secretion, exo- and endocytosis | | |
| | lysosomes | | |
| Mitochondria and Chloroplasts | | 8 | |
| | Endosymbiosis | | |
| | Cellular Respiration, glycolysis | | 10 |
| | Electron transport | | |

*Midterm II ***NOV 15 ****

| | | | |
|--|----|----|------------|
| Cell Signalling | | | |
| Signal Transduction | | 9 | 22 |
| Electrical and synaptic signalling in neurons | | | |
| Chemical Signals and cellular receptors | | 10 | 23 |
| G-protein coupled receptors | | | |
| Enzyme coupled receptors | | | |
| Cytoskeleton | | | |
| Microfilaments, intermediate filaments, microtubules | | | 13 |
| Cell Motility | 11 | | 14 |
| The Cell Cycle | | | CH. 24 |
| Checkpoints, controls, growth factors | | | |
| Interphase, DNA replication | | | |
| Cancer cells | | 12 | 26 |
| Mitosis, cytokinesis | | | |
| Meiosis, sexual reproduction, genetic recombination | | 13 | 25 |
| Review | | | Last class |

Final exam

Lab Topic Outline

Lab 1 Introduction to the lab, safety, microscopes and measurements,
 Introduction to the cell

Lab 2 Cells and organelles -isolation and catalytic activity of chloroplasts

Lab 3 Cell Behavior

Lab 4 Measurement of protein content of cells, Part I

Lab 5 ***Lab Quiz #1***Oct. 17th, Measurement of protein content of cells, Part II

Lab 6 Cell cultures

Lab 7 Purification of mitochondria part I

Lab 8 Purification of mitochondria part II

Lab 9 Cytochemical methods, the cell cycle, mitosis and meiosis

Lab 10 ****Lab Quiz #2****Nov. 28th