



School of Science  
**BIOL 201**  
**Cell Biology**  
Term: Fall 2021  
Number of Credits: 3

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## Course Outline

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**OFFICE:** A2806

**PHONE:** (867) 456-6957

**TIME/DATES:** M/W 1:00 pm – 2:30 (lectures) T 2:30 – 5:30 (labs)

**OFFICE HOURS:** *anytime*, email me, but scheduled office hours are Wednesdays 2:30 – 4:00.

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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.

### COURSE REQUIREMENTS

Prerequisite(s): Successful completion of BIOL 101 and BIOL 102 or equivalent, with a final minimum grade of C in both. Successful completion of a university-level first-year chemistry course (e.g., CHEM 110).

### EQUIVALENCY OR TRANSFERABILITY

This course transfers to most universities in BC as second-year Cell Biology. However, please be aware that receiving institutions determine final course transferability. Find further information at:

<https://www.yukonu.ca/admissions/transfer-credit>

### LEARNING OUTCOMES

Upon successful completion of the 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 using 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: students will be able to 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

This course will be delivered with the following breakdown per week: three hours of lecture (in two 1.5-hour blocks), one three-hour lab, and zero hours of tutorial. Although it will vary from individual to individual, students should expect to spend 6 hours on course material outside of the classroom time (per week) on studying or completing assignments.

### Delivery format

This course will be delivered in a face-to-face (in person) format. However, lectures may be attended remotely and recorded to be watched later (upon request). Students will be expected to access the YU online learning platform for additional material (Moodle). Labs can only be conducted in person.

## EVALUATION

|                                 |             |
|---------------------------------|-------------|
| Assignments on lecture material | 10 %        |
| Midterm exams (2)               | 30 %        |
| Lab Exams (2)                   | 15 %        |
| Lab Assignments                 | 20 %        |
| Final Exam                      | 25 %        |
| <b>Total</b>                    | <b>100%</b> |

*Please note that there is no midterm for this course. The midterm mark is based on lecture quizzes.*

*Students are expected to read lab material before coming into the lab. There is no final exam for the laboratory portion of the course, instead there will be two lab exams during the semester.*

Lab assignments are handed out at the beginning of lab sessions and are to be completed once lab exercises are completed. They are due within one week unless otherwise announced. Late assignments may be deducted -5% of marks per day.

*Students must pass the lab and lecture portions of the course independently.*

## **COURSE WITHDRAWAL INFORMATION**

The last date to withdraw without academic penalty is November 5<sup>th</sup>, 2021. Refer to the YukonU website for other important dates.

## **TEXTBOOKS & LEARNING MATERIALS**

Students are required to purchase a textbook; either as a hard copy from the YU bookstore, or an online eText access through the publisher (Pearson).

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

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

Lab materials (e.g., lab manuals) are provided in the form of three-hole punched pages at least one week prior to the scheduled lab.

Students are required to wear a lab coat during lab sessions. These can be purchased from YU for \$20. Students are also required to use disposable gloves and safety glasses on occasion. These are provided. Unless otherwise noted students will be required to wear masks for COVID-19 precaution during labs. Students should bring a mask that is comfortable enough to wear for a 3-hour lab session.

## **ACADEMIC INTEGRITY**

Students are expected to contribute toward a positive and supportive environment and are required to conduct themselves in a responsible manner. Academic misconduct includes all forms of academic dishonesty such as cheating, plagiarism, fabrication, fraud, deceit, using the work of others without their permission, aiding other students in committing academic offences, misrepresenting academic assignments prepared by others as one's own, or any other forms of academic dishonesty including falsification of any information on any Yukon University document.

Please refer to Academic Regulations & Procedures for further details about academic standing and student rights and responsibilities. <https://www.yukonu.ca/policies/academic-regulations>

## **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 by contacting the Learning Assistance Centre (LAC): [LearningAssistanceCentre@yukonu.ca](mailto:LearningAssistanceCentre@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                        |  | 2    | CH 2                       |
|   | Nucleic acids, amino acids, protein structure  |      | CH 3                       |
|   | Lipid bilayers, membrane proteins  |      |                            |
| Cellular organelles, review and overview                        |  | 3    | CH 4                       |
| Biological flow of information from DNA to protein              |  | 4    | CH 17                      |
|   | DNA replication, repair and recombination  |      |                            |
|   |  |      | <b>Midterm I Oct. 6th</b>  |
| Gene Expression   |  | 5    | CH 18                      |
|   | The Genetic Code, Transcription, translation   |      |                            |
|   | Protein Synthesis and Sorting  | 6    | CH 19                      |
| Enzymes   |  | 7    | CH 6                       |
|   | Enzyme Kinetics  | 8    |                            |
|   |  |      | <b>Midterm II Nov. 3rd</b> |
| Membranes: structure, function, diversity                       |  | 9    | CH 7                       |
|   | Transport across membranes   | 10   | CH 8                       |
|   | The Energetics of Transport  |      |                            |
| The Endomembrane System   |  | 11   | CH 12                      |
| The Cytoskeletal system   |  | 12   | CH 13                      |
| Cell Motility   |  |      | CH 14                      |
| Cell Adhesions, cellular junctions and extracellular structures |  | 13   | CH 15                      |
| The Cell Cycle and Cancer Cells (if time allows)                |  |      | CH 24                      |
|   |  |      | CH 25                      |
| Review  |  |      |                            |

*Final exam – date set by administration and available on the website  
<https://www.yukonu.ca/programs/courses/biol-201>*

**Lab Schedule and List of Topics – *Labs start in the second week of classes.***

**Labs take place in Room A2805**

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 behaviour 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 OR PCR depending on availability of reagents.

Lab 10 Lab Quiz #2 and student presentations