Douglas College

# EFFECTIVE: SEPTEMBER 2004
# CURRICULUM GUIDELINES

| | | | | | |
|---|---|---|---|---|---|
| **A.** | Division: | Science and Technology | Effective Date: | | September 2004 |
| **B.** | Department / Program Area: | Biology | Revision | X | New Course ☐ |
| | | | If Revision, Section(s) Revised: | | C, H, J, R |
| | | | Date of Previous Revision: | | May 2002 |
| | | | Date of Current Revision: | | September 2004 |

**C:** BIOL 2321 **D**: Cell Biology **E:** 5

| Subject & Course No. | Descriptive Title | Semester Credits |
|---|---|---|

**F:** Calendar Description:

A survey of cell ultrastructure and cellular function. Topics discussed include nuclear, organelle, membrane and cytoskeletal structures and associated functions including DNA replication, transcription, translation, cell signalling, photosynthesis and respiration.

**G:** Allocation of Contact Hours to Type of Instruction / Learning Settings

Primary Methods of Instructional Delivery and/or Learning Settings:

**Lecture, Tutorial, Laboratory**

Number of Contact Hours: (per week / semester for each descriptor)

**Lecture/Tutorial 4hrs/week**
**Laboratory 3 hrs/week**

Number of Weeks per Semester:

15 weeks

**H:** Course Prerequisites:

BIOL 1210 with C- or better and CHEM 1110, or permission of instructor
CHEM 1210 recommended

**I:** Course Corequisites:

None

**J:** Course for which this Course is a Prerequisite

BIOL 2421

**K:** Maximum Class Size:

27

**L:** PLEASE INDICATE:

- ☐ Non-Credit
- ☐ College Credit Non-Transfer
- ☒ College Credit Transfer:

SEE BC TRANSFER GUIDE FOR TRANSFER DETAILS (www.bctransferguide.ca)

**M:** Course Objectives / Learning Outcomes

Upon completion of this course, students will:

1. Understand the origin of cells and the evolution of metabolism.

2. Be able to explain the composition and function of carbohydrates, lipids, proteins and nucleic acids in the cell.

3. Be able to explain how DNA provides a mechanism for heredity and to understand the flow of genetic information from DNA to RNA to protein.

4. Be able to describe the structure of the nuclear envelope and explain the mechanisms which allow for traffic of molecules between nucleus and cytoplasm.

5. Understand the structure and function of the plasma membrane and to be able to explain its role in active and passive transport and cell signalling and apply these concepts to explain cancer.

6. Be able to explain the processes by which proteins destined for peroxisomes, mitochondria and chloroplasts are synthesized and imported into these organelles and explain how this differs from translocation of protein into endoplasmic reticulum, Golgi apparatus, lysosomes and plasma membrane.

7. Understand the structure and organization of the different components of the cytoskeleton and relate them to cell movement.

8. Be able to describe the phases of the cell cycle and explain the experimental data that has identified the regulators of cell cycle progression.

9. Be able to use general principles of cell biology to discuss current issues.

10. Be familiar with and able to perform experiments using the common tools of cell and molecular biology, including light microscopy, fluorescence microscopy, sub-cellular fractioning, culture of animal and plant cells, immunoassays, electrophoresis, restriction enzyme mapping.

**N:** Course Content:

The major topics in the course include the following:

1. INTRODUCTION
   - -origin and evolution of cells
   - -characteristics of prokaryotic and eukaryotic cells
   - -development of multicellular organisms
   - -cells as experimental models
   - -tools of cell biology
2. CHEMICAL COMPONENTS OF CELLS
   - -water
   - -carbohydrates
   - -lipids
   - -nucleic acids
   - -proteins
3. FUNDAMENTALS OF MOLECULAR BIOLOGY
   - -heredity, genes and DNA
   - -structure of DNA
   - -organization of eukaryotic and prokaryotic genomes
4. FLOW OF GENETIC INFORMATION
   - -DNA replication
   - -DNA repair
   - -transcription in prokaryotes
   - -eukaryotic RNA polymerases and basal transcription factors

-regulation of transcription in eukaryotes
-RNA processing and turnover
-translation of mRNA
-protein folding and processing
-regulation of protein function
-protein degradation

5. INTERPHASE NUCLEUS
-structure of nuclear envelope
-traffic between nucleus and cytoplasm
-internal organization of the nucleus
-the nucleolus

6. MEMBRANE STRUCTURE AND FUNCTION
-phospholipid bilayer
-membrane proteins
-mobility of membrane proteins
-glycocalyx
-passive diffusion
-facilitated diffusion and carrier proteins
-ion channels
-active transport driven by ATP hydrolysis
-active transport driven by ion gradients
-endocytosis
-tight junctions
-gap junctions

7. PROTEIN SORTING AND TRANSPORT
-endoplasmic reticulum and protein secretion
-targeting proteins to the endoplasmic reticulum
-insertion of proteins into ER membrane
-protein folding and processing in the ER
-organization of the Golgi apparatus
-protein glycosylation within Golgi
-mechanisms of vascular transport

8. INTRACELLULAR COMPARTMENTS
-organization and function of mitochondria
-mechanism of oxidative phosphorylation
-structure and function of chloroplasts
-photosynthesis
-structure and function of peroxisomes

9. CYTOSKELETON
-structure and organization of actin filaments
-actin, myosin and cell movement
-intermediate filaments
-microtubules
-microtubule motors and movements

10. CELL SIGNALLING
-modes of cell-cell signalling
-G protein-coupled receptors
-receptor protein-tyrosine kinases
-cytokine receptors and nonreceptor protein
-pathways of intracellular signal transduction

11. THE CELL CYCLE
-phases of the cell cycle
-regulation of the cell cycle by cell growth and extracellular signals
-cell cycle checkpoints
-regulators of cell cycle progression
-stages of mitosis
-cell differentiation
-programmed cell death
-development and causes of cancer

**O:** Methods of Instruction

This course involves four hours of lecture and/or tutorial/week and three hours of laboratory work. The information content is integrated with laboratory experiments, and textbook and scientific journal readings.

**P:** Textbooks and Materials to be Purchased by Students

Cooper, G. M. The Cell, A Molecular Approach. 2nd Ed. ASM Press, Sinauer Associates Inc. Massachusetts. 2000.

**Q:** Means of Assessment

| TYPE OF EVALUATION | POINTS |
|---|---|
| Class Tests | 5-15 |
| Laboratory | 15 |
| Term paper | 5-15 |
| Examinations | |
| -Term exam/s | 15-30 |
| -Final exam | 35 |
| TOTAL | 100 |

| **GRADES:** | **A+ 95-100** | **A 90-94** | **A- 85-89** | **B+ 80-84** | **B 75-79** |
|---|---|---|---|---|---|
| **B- 70-74** | **C+ 65-69** | **C 60-64** | **C- 55-59** | **P 50-54** | **F 0 - 49** |

Notes:
Laboratory:
Students will be evaluated based on their performance in the laboratory, short lab evaluations and lab reports.
Examinations:
Term exams will evaluate knowledge on subjects covered during the immediate past period. The final comprehensive examination will cover the entire course.

**R:** Prior Learning Assessment and Recognition: specify whether course is open for PLAR

At the moment, there is no provision for PLAR, other than by examining transcripts of biology courses taken within the last 5 years and comparing them to the course content of Biology 2321

Course Designer(s)

Education Council / Curriculum Committee Representative

Dean / Director

Registrar