

*This syllabus is provided as a general informational guide. Some of the information may vary depending on the specific course section and instructor. Different sections of the same course may require different textbooks. Verify the section specific textbook information in the CUNY's Academic Course Schedule Web Page. Modifications of the grading system presented here will be communicated by the instructors of the sections when they meet the class.*

**BOROUGH OF MANHATTAN COMMUNITY COLLEGE**  
 The City University of New York  
 Department of Science

**CELL BIOLOGY – Bio 260**

**Class Hours: 6**

**Lecture Hours per Week: 3**

**Laboratory Hours per Week: 3**

**Semester:** Spring 2019

**Instructor Information (Phone#, Office#, email)**

**Credits:** 4

**BIO260 is not yet an elective science course**

**Course Description:** The goal of this course is to provide students with a basic understanding of the molecular mechanisms underlying cellular processes – the structure, function and specializations of the cell. This will be accomplished through a combination of lecture and laboratory sessions providing both theory and application. The course will include study of subcellular structure and function such as protein structure and activity, nucleotide structure, gene expression, regulation of gene expression, cellular organelles, cell respiration and photosynthesis, cellular trafficking, cell-to-cell communication, cell division and cancer.

**Basic Skills:** ENG 095 or ESL 095, ACR 095, MAT 056

**Prerequisites:** BIO 220 and CHE 201

**Corequisites:** CHE 230 (optional)

<b>Course Student Learning Outcomes. Students will be able to</b>	<b>Measurements</b>
1. Understand the cell as the basic unit of life by being able to describe the structure and function of the cellular organelles. Students will be able to explain the molecular mechanisms of cellular function	Quizzes, examinations, case studies and homework assignments.
2. Demonstrate understanding of DNA as the genetic material of cell and will be able to explain DNA replication, cell division, protein synthesis, mutation and inheritance.	Quizzes, examinations, case studies and homework assignments
3. Explain cell signaling pathways and intracellular trafficking.	Quizzes, examinations, case studies and homework assignments
4. Understand the process of cell division and relate it to cancer.	
5. Explain biological energy related processes like Cell respiration, photosynthesis and the role of enzymes in	

these processes.	
4. Perform common laboratory techniques used in the study of cells, such as (but not limited to) microscopy, immunohistochemistry, cell culture and cell transfection.	Laboratory research project. Students will search literature to identify a question they can investigate and conduct research. A written report on their work will be submitted and students will also present their work to their class

Below are the college's general education learning outcomes, the outcomes that are checked in the left-hand column indicate goals that will be covered and assessed in this course. (Check at least one.)

	General Education Learning Outcomes	Measurements
X	Scientific Reasoning- Students will be able to apply the concepts and methods of the natural sciences.	Lab experiments, written reports, reading peer reviewed papers
X	Communication Skills- Students will be able to write, read, listen and speak critically and effectively.	Working on projects, submitting written reports and presenting their work orally
X	Quantitative Reasoning- Students will be able to use quantitative skills and the concepts and methods of mathematics to solve problems.	Homework assignments and case studies

### Required Text & Readings

Essential Cell Biology (4<sup>th</sup> Ed)–

An Introduction to the Molecular Biology of the Cell.

By Alberts, B; Bray, D; Hopkins, K; Johnson, S; Lewis, J;

Raff, M; Roberts, K; Walter, P. Garland Science, 2014

ISBN 978-0-8153-4454-4(hard cover)

978-0-8153-4455-1 (soft cover)

978-0-8153-4525-1 (Loose leaf)

### Required Laboratory Manual

Handouts

### Other Resources:

- iBioseminars from Howard Hughes Medical Institute
- Coursesource.org
- CBI website

### Use of Technology (If Applicable)-Blackboard

### Evaluation and Requirements of Students

Lecture Examinations: 30%

In class assignments 30%

Laboratory project 30%

Other Assignments: 20%

Final Examination (Included in the 60% Lecture Examination)

**TO PASS THIS CLASS, A STUDENT MUST HAVE A PASSING GRADE OF 60% OR MORE IN LECTURE AND A PASSING GRADE OF 60% OR MORE IN THE LABORATORY PORTION.**

BMCC is committed to the health and well-being of all students. It is common for everyone to seek assistance at some point in their life, and there are free and confidential services on campus that can help.

**Single Stop** [www.bmcc.cuny.edu/singlestop](http://www.bmcc.cuny.edu/singlestop), room S230, 212-220-8195. If you are having problems with food or housing insecurity, finances, health insurance or anything else that might get in the way of your studies at BMCC, come by the Single Stop Office for advice and assistance. Assistance is also available through the Office of Student Affairs, S350, 212-220-8130.

**Counseling Center** [www.bmcc.cuny.edu/counseling](http://www.bmcc.cuny.edu/counseling), room S343, 212-220-8140. Counselors assist students in addressing psychological and adjustment issues (i.e., depression, anxiety, and relationships) and can help with stress, time management and more. Counselors are available for walk-in visits.

**Office of Compliance and Diversity** [www.bmcc.cuny.edu/aac](http://www.bmcc.cuny.edu/aac), room S701, 212-220-1236. BMCC is committed to promoting a diverse and inclusive learning environment free of unlawful discrimination/harassment, including sexual harassment, where all students are treated fairly. For information about BMCC's policies and resources, or to request additional assistance in this area, please visit or call the office, or email [olevy@bmcc.cuny.edu](mailto:olevy@bmcc.cuny.edu), or [twade@bmcc.cuny.edu](mailto:twade@bmcc.cuny.edu). If you need immediate assistance, please contact BMCC Public safety at 212-220-8080.

**Office of Accessibility** [www.bmcc.cuny.edu/accessibility](http://www.bmcc.cuny.edu/accessibility), room N360 (accessible entrance: 77 Harrison Street), 212-220-8180. This office collaborates with students who have documented disabilities, to coordinate support services, reasonable accommodations, and programs that enable equal access to education and college life. To request an accommodation due to a documented disability, please visit or call the office.

### **College Attendance Policy**

At BMCC, the maximum number of absences is limited to one more hour than the number of hours a class meets in one week. For example, you may be enrolled in a three-hour class. In that class, you would be allowed **4 hours of absence (not 4 days)**. In the case of excessive absences, the instructor has the option to lower the grade or assign an F or WU grade.

**AN ABSENCE OF MORE THAN 3 LABS CONSTITUTES AN AUTOMATIC FAIL IN THIS COURSE.**

### **BMCC Policy on Plagiarism and Academic Integrity Statement**

Plagiarism is the presentation of someone else's ideas, words or artistic, scientific, or technical work as one's own creation. Using the idea or work of another is permissible only when the original author is identified. Paraphrasing and summarizing, as well as direct quotations, require citations to the original source. Plagiarism may be intentional or unintentional. Lack of dishonest intent does not necessarily absolve a student of responsibility for plagiarism. Students who are unsure how and when to provide documentation are advised to consult with their instructors. The library has guides designed to help students to appropriately identify a cited work. The full policy can be found on BMCC's Web site, [www.bmcc.cuny.edu](http://www.bmcc.cuny.edu). For further information on integrity and behavior, please consult the college bulletin (also available online).

## LECTURE SYLLABUS

WEEK	TOPICS	CHAPTER
1	<b>Lecture: Introduction to the cell</b> The Eukaryote cell – structure and organelles nucleus, mitochondria, chloroplasts, internal membranes, cytosol, cytoskeleton Unity and diversity of cells Chemical components of cells	1, 2
2	<b>Lecture: Proteins - Folding and function</b> Shape and structure of proteins How proteins work – enzymes, motor proteins	4
3	<b>Lecture: DNA structure and function</b> Structure and function of DNA DNA replication DNA repair	5,6
4.	<b>Lecture: Gene expression</b> DNA to RNA RNA to protein RNA and the origins of life	7,8
5.	<b>Lecture: Regulation of gene expression and evolution of genomes</b> Structure of eukaryotic chromosomes Gene regulation Genetic variation	8,9
6	<b>Lecture: Plasma membrane – structure and function</b> The lipid bilayer Membrane proteins Carrier proteins and their functions Ion channels and the membrane Ion channels and signaling in nerve cells Intercellular junctions	11,12
7, 8,	<b>Lecture: Enzymes and Biosynthesis</b> Catalysis and the use of energy by cells <b>Lecture Cell Respiration and Photosynthesis</b> Break down of sugars and fats Electron transport and proton pumping Regulation of metabolism Photosynthesis	3, 13,14
9	<b>Lecture: Intracellular trafficking</b> Membrane-bound organelles Protein sorting Vesicular transport Secretory pathways Endocytic pathways	15
10	<b>Lecture: Cytoskeleton</b> Intermediate filaments Microtubules Actin filaments	17
11	<b>Lecture: Signal transduction pathways and cell communication</b> General principles of cell signaling G-protein-linked receptors Enzyme-linked receptors	16

12	<b>Lecture: Cell cycle, mitosis, meiosis</b> Overview of cell cycle Mitosis and cytokinesis Meiosos	18
13	<b>Lecture: Control of cell cycle and apoptosis</b> Cell-cycle control system Control of cell numbers in multicellular organisms.	19
14	<b>Lecture: Cancer biology</b> Tissue maintenance and renewal Tissue disruption by cancer	20
15	<b>Cumulative Final Exam</b>	

### LABORATORY SYLLABUS

WEEK	Lab topic
1	<b>Microscopy I</b> Review of the light microscope Viewing prepared slides Making wet mounts Oil immersion
2	<b>Making solutions, determining pH, and dilutions</b> Basic tissue culture techniques, serial dilutions Determining cell density by spectrophotometry and by hemocytometer direct counting
3.	<b>Microscopy II – light and electron microscopy</b> Students view cells and tissues using light microscope Students examine cell structure and organelles using electron micrographs (provided by Dr. E. Robbins) Use of electron microscope
4	<b>Immunofluorescence</b> Staining of cells (prokaryote and eukaryote) using fluorescent dyes
4	<b>Immunofluorescence</b> Staining of cells (prokaryote and eukaryote) using fluorescent labeled antibodies
5	<b>Protein concentration and standard curve</b> Measuring protein concentrations using the BCA assay Generation of a protein standard curve Determining concentration of unknown proteins
6	<b>Protein expression and purification</b> Extraction of protein from a source
7	<b>Protein expression purification</b> SDS-PAGE gel electrophoresis and chromatography
8	<b>Protein expression and purification</b> Western blotting
9.	<b>Cell Viability assay</b> Mitochondrial viability (MTT) assay
10	<b>Cell culture</b> Setting up cell cultures Establishing growth curve assays
11	<b>Enzyme assay</b>
12	<b>Restriction digestion and mapping</b> P glo plasmid restriction mapping
13	<b>rRNA isolation from bacteria</b> Qiagen kit

14	<b>Final project</b>
15	<b>Final exam</b>