

Tompkins Cortland Community College
Master Course Syllabus

Course Discipline and Number: BIOL 220
Course Title: Cell Biology

Year: 2023-2024
Credit Hours: 3

Attendance Policy: *To maintain good grades, regular attendance in class is necessary. Absence from class is considered a serious matter and absence never excuses a student from class work. It is the responsibility of all instructors to distribute reasonable attendance policies in writing during the first week of class. Students are required to comply with the attendance policy set by each of their instructors. Students are not penalized if they are unable to attend classes or participate in exams on particular days because of religious beliefs, in accordance with Chapter 161, Section 224-a of the Education Law of the State of New York. Students who plan to be absent from classroom activity for religious reasons should discuss the absence in advance with their instructors. See college catalog for more information.*

Services for Students with Disabilities: *It is the College's policy to provide, on an individual basis, appropriate academic adjustments for students with disabilities, which may affect their ability to fully participate in program or course activities or to meet course requirements. Students with disabilities should contact the Coordinator of Access and Equity Services, to discuss their particular need for accommodations. All course materials are available in alternate formats upon request.*

Course Description

Intended for students pursuing careers in the biological or health sciences. The fundamental structure and function of the eukaryotic cell, from proteins to DNA, to signal transduction, and development of cancer are covered. Students present topics of discussion related to advances in cell biology as they are applied to medicine (stem cells) and industry (cloning). Corequisite: BIOL 221. Prerequisites: BIOL 104 or equivalent; RDNG 116 and MATH 095 or MATH 098 if required by placement testing; prior completion or concurrent enrollment in ENGL 101. 3 Cr. (3 Lec.) Fall semester.

Course Context/Audience

Cell Biology is designed as an overview of cell structure and function. Topics covered include membrane and cell signaling, the energy flow, the translation of genetic information within the cell, cell mobility and the biology of cancer. The course will help prepare a student for transfer to a baccalaureate program in the natural, life, and health sciences. Upon completion of advanced studies, he/she will be qualified for a broad range of careers in the medical, biological, forensic, agricultural, etc., fields. Advanced learning skills acquired from this course include comprehension and analysis that are developed through discussion and the presentation of current concepts in cell biology. The student's demonstrated mastery of the subject matter reflects on his/her capacity to succeed in a 4-year degree program.

Basic Skills/Entry Level Expectations

Writing: WC College level writing skills are required. See course co-requisites or pre-requisites.

Math: M4 MATH 095 or MATH 098 if required by placement testing.

Reading: R4 Before taking this course, students must satisfactorily complete RDNG 116 or have assessment indicating that no reading course was required.

Course Goals

As a result of completing this course, the student will be able to explain: the overall structure of cells and the function of component parts; how genetic information is transmitted throughout the cell; and how cancer cells develop. He/she will be able to demonstrate the skills necessary to lead discussions and present scientific information. In addition, he/she will be able to explain current methods in cell biology research and how cell biology is applied in the fields of medicine and biotechnology.

Course Objectives/Topics

Objective/Topic	% Course
Overview of structure and function of cells	10%

Membranes and cell signaling	10%
Energy flow in cells	10%
Information flow in cells	10%
The cytoskeleton and cell mobility	5%
Biology of Cancer	20%
Current methods in cell biology research - computer-assisted labs	10%
How to critically evaluate scientific literature in the field of cell biology	15%
Discussion and presentation of scientific information	10%

General Education Goals - Critical Thinking & Social/Global Awareness

CRITICAL THINKING OUTCOMES	HOW DOES THE COURSE ADDRESS THE OUTCOMES (Include required or recommended instructional resources, strategies, learning activities, assignments, etc., that must or could be used to address the goal/outcomes)
<p>Students will be able to</p> <ul style="list-style-type: none"> ➤ develop meaningful questions to address problems or issues. ➤ gather, interpret, and evaluate relevant sources of information. ➤ reach informed conclusions and solutions. ➤ consider analytically the viewpoints of self and others. 	<p>Based on a historical perspective of developments in cell biology students will identify current problems and begin to focus on a specific issue. As part of assessment, the instructor should require identification of technologic hurdles needed to address scientific inquiries.</p> <p>Students are required to research outside resources relevant to topics in cell biology. The instructor should require the students to choose a topic relevant to the field of cellular biology and develop a lecture presentation.</p> <p>Based on case scenarios students must delineate their thought process to defend their perspective based on factual knowledge. Assessment should include take home exams that require more than textbook knowledge to adequately provide a reasonable solution to the problem posed.</p> <p>Students are exposed to the perspective of others, using a plethora of facts to defend their ideas. The instructor should play the devil's advocate and be sure both sides of the 'issue' are represented or discussed (e.g. stem cells and regenerative medicine). He/she should take to the extreme current technologies to address current and future issues.</p>
SOCIAL/GLOBAL AWARENESS OUTCOMES	HOW DOES THE COURSE ADDRESS THE OUTCOMES (Include required or recommended instructional resources, strategies, learning activities, assignments, etc., that must or could be used to address the goal/outcomes)
<ul style="list-style-type: none"> ➤ Students will begin to understand how their lives are shaped by the complex world in which they live. ➤ Students will understand that their actions have social, economic and environmental consequences. 	<p>Students will learn the basics of cellular biology and how technology and science drive each other, leading to new discoveries that have shaped our world. For each chapter, the instructor should review the concept's impact on our understanding of life in the context of the time period it was discovered.</p> <p>Students learn that advances in cell biology have led to entire industries involving therapeutics, agriculture, and entertainment. The instructor should discuss how experiments investigating the totipotency of carrot cells have led to stem cell therapies. Since the advent of cloning tadpoles there are now industries in cloning animals.</p> <p>From an evolutionary perspective students learn that long-term reproductive success is still dependent on random, non-obvious mutations in cellular</p>

	functions we cannot predict. During discussion on cloning and GMO's, the instructor should bring to light that man made recombinants do not possess the genetic diversity to survive evolutionary constraints in terms of millennium.
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Instructional Methods

Cell Biology is generally based on the fundamental facts of structure and known function. Topics should be introduced from the perspective of how small component parts function in the context of the larger complex organism. Advancements in modern cell biology as applied in the fields of biotechnology and medicine should be expanded upon in detail.

The lectures should reinforce textbook material as it applies toward developing problem solving skills. The use of case studies as a teaching tool is appropriate. Exams for each section should test for recall of basic factual information and application of fundamental principles. Testing can be in the form of take home exams where the student must formulate their own unique solutions to the proposed problem. There should be a comprehensive final exam that emphasizes important fundamental principles in cell biology.

To further enhance the learning experience and to facilitate the development of independent study skills, students are required to research and present data on a current topic of cell biology. Students should be encouraged to actively participate in discussions and question the validity of the research findings.

Methods of Assessment/Evaluation

Method	% Course Grade
Worksheets	20%
Discussion	10%
Exams	30%
Special Topic Presentation	10%
Final Exam	30%

Text(s)

The World of the Cell, Becker, WM, Kleinsmith, LJ, and Hardin. J., 7th edition, Pearson-Benjamin/Cummings Publishing Company, Inc., San Francisco, CA, 2009.

Bibliography

Science published weekly by the American Association for the Advancement of Science, 1200 New York Avenue, NW, Washington, DC 20005 (www.sciencemag.org)

Principles of Biochemistry, Lehninger, A.L., Nelson, D.L., and Cox, M.M., 3rd edition, © 1999 Worth, New York

Biochemistry, C.K., Mathews, K.E., van Holde, K.G., and Adhern, 3rd edition, © 2000, Benjamin/Cummings, Menlo Park, CA.

The Journal of Cell Biology, Rockefeller University Press, New York (monthly periodical)

Other Learning Resources

Audiovisual

No resources specified

Electronic

e-PAK and supplemental CD-ROM that accompany the recommended text.

BIOLINK <http://www.bio-link.org/index.htm>

The National Center for Case Study Teaching in Science Case Collection

<http://ublib.buffalo.edu/libraries/projects/cases/ubcase.htm>

Other

Students will need computer access to perform database searches related to their research paper and PowerPoint presentation materials.