Tompkins Cortland Community College

Master Course Syllabus

Course Discipline and Number: BIOL 221 **Year: 2023-2024**

Course Title: Cell Culture Techniques **Credit Hours: 1**

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

Required in the Biotechnology degree and certificate programs, this laboratory module, a co-requisite to BIOL 220 - Cell Biology, provides hands-on experience with current techniques to isolate and analyze proteins in the research or diagnostic lab. Primary cell cultures and immortalized cell lines are established. The course is applicable to biological, natural, forensic, and agricultural science majors who want to augment their skill set and/or retrain for job advancement in their field. Prerequisites: Previous laboratory course; BIOL 101 and 102, or BIOL 104, or related work experience; RDNG 116 and MATH 095 or MATH 098 if required by placement testing; prior completion or concurrent enrollment in ENGL 101. 1 Cr. (3 Lab.) Fall semester.

Course Context/Audience

A required course for students pursuing an A.S. degree in Biotechnology, this lab experience is generally not encountered until the junior/senior year at 4 year institutions or until individuals have entered the workforce, hence conveying a competitive advantage to our transfer students. The modular lab exercise format should also be of interest to students from non-science degree programs who might not otherwise take additional courses offered in the science, technology; engineering & math (STEM) subject areas.

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

In Cell Culture Techniques the student will learn how to

1. Isolate proteins (chromatography, electrophoresis, Western blot).
2. Maintain animal cell cultures (passage, counting, aseptic tech).
3. Identify differentiated cell types.
4. Establish primary cell cultures.
5. Transform cells.
6. Keep notebooks according to cGLP (current good laboratory practices).

Course Objectives/Topics

Objective/Topic	% Course
Aseptic techniques and sterile environment	10%
Serum and chemically defined media	10%
Passage and maintenance of viable cell cultures	10%
Transfection techniques	10%
Selection, identification, and sub-cloning transformed cells	10%
Immunodetection	10%
Claudogram analysis	10%
Protein extraction and purification by chromatography	10%
Oncogenic transformation	10%
SDS – PAGE (Electrophoresis)	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)
Students will be able to ➢ 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.	Students must propose a hypothesis and employ current tools of molecular biology to address the problem at hand. A project requiring the student to decide which molecular technique to apply to answer his/her query should be assigned. Students complete experimental procedures and evaluate data to determine whether the technology yielded adequate results. The instructor should have students seek their own methods from published material (lab manuals web reference, SOP's, etc., always train them on new technology, and show proper procedures and typical data analysis. Based on the validity of experimental results the student must decide to repeat or progress to the next step of experimentation. The students should be required to evaluate their data in comparison to prototype or a positive control. They must assess whether there were problems in technique or the hypothesis was falsified. Based on expected and actual results, students learn to trouble shoot problems in experimental procedures, relying on their own lab experience and other's success. Depending on the aptitude of the students, the instructor should have the more skilled begin mentoring others in technique, analysis, and trouble shooting.
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)

➢ 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.	Students work on projects manipulating cells isolated from living organisms. Students learn how therapies are developed *in vitro* prior to testing in animals and use on man. The instructor should have the students establish primary cell cultures from chicken embryo's or planaria. They should be able to passage and maintain cultures with appropriate nutrients, investigating factors that influence cell growth. Students learn the basic principles of cancer biology and stem cell research, able to educate the layperson on misconceptions in the field. The instructor should have the students transform cells with oncogenes to understand the inefficiency of cancer. Via detection of stem cells demonstrate the short time frame during which they are available for isolation and manipulation. Students become aware of the long process to develop therapies and the industries that employ those with these specialized skills. Students should be informed that these projects were developed by previous students as 'instructional lab kits' now sold through scientific supply company. Students are taught how to dispose of regulated biomedical waste and guiding practices on use of vertebrate animals for research. The instructor should make available copies of protocols that were submitted for "Institutional Animal Care and Use Committee" review if vertebrate animals are used.

Instructional Methods
Cell Culture Techniques is a laboratory course designed to provide students with hands-on experience. A brief introductory lecture should outline the activities, location of required materials, and expected outcomes. Students should be expected to follow a written protocol to complete the laboratory exercises and to keep lab notebooks according to cGLP. Class discussion on outcomes and interpretation of data should demonstrate to the student how to trouble shoot problems that arise and how to come to rational conclusions based on scientific principles.

Methods of Assessment/Evaluation

Method	% Course Grade
Participation in laboratory exercises	25%
Completion of laboratory exercises	25%
Notebook/record keeping	25%
Lab reports	25%

Text(s)
Gene Transfer and Expression - A Laboratory Manual. Kriegler, Michael. Latest edition, © 1990 Oxford University Press.

Bibliography
Current Protocols in Cell Biology. Bonifacino, Dassco, Harford, Lippincott-Schwartz, Yamada, Eds. John Wiley & Sons, © 2004.

Methods in Enzymology Vol. 182: Guide to Protein Purification. Murray Deutscher, Ed., Academic Press, © 1990.

Protein Methods. Bollag and Edelstein. Wiley-Liss, © 1991.

Audiovisual No resources specified
Electronic American Type Culture Collection, http://www.atcc.org/Home.cfm, and Quarterly Newsletter BIOLINK http://www.bio-link.org/index.htm
Other A course management site such as ANGEL should be set up to post the syllabus and course outline, course materials and related links.

Other Learning Resources