

Bergen Community College
Division of Mathematics, Science, and Technology
Department of Biology and Horticulture

Introduction to Biotechnology (BIO-210)

General Course Syllabus **Spring 2016**

Course Title:	BIO-210 Introduction to Biotechnology
Course Description:	This course is designed to give students both a theoretical background and a working knowledge of the instrumentation and techniques employed in a biotechnology laboratory. Emphasis will be placed on the introduction of foreign DNA into bacterial cells, as well as the analysis of nucleic acids (DNA and RNA) and proteins.
Prerequisites:	BIO-101 General Biology I
General Education Course:	No
Course Credits	4.0
Hours per week:	6.0: 3 hours lecture and 3 hours lab
Course Coordinator:	John Smalley
Required Textbook:	
	Introduction To Biotechnology, 3rd edition, Thieman, W.J. and M.A. Palladino. Pearson/Benjamin Cummings.
Required Lab Manual:	None

Student Learning Objectives

The student will be able to:

1. Students will demonstrate proper scientific laboratory record keeping.
Students will be evaluated by periodic notebook collections.
- 2 Students will be able to explain the scientificbasis for each technique used.
Students will be required to answer exam questions designed to allow them to demonstrate their acquisition and retention of this knowledge.

3. Students will learn how to introduce foreign DNA into bacterial cells for the purpose of molecular cloning. Students will be evaluated by observation in the laboratory and analysis of experimental results. Assessment will also be based upon performance on exam questions.
4. Students will be able to retrieve cloned DNA and analyze it using restriction endonuclease digestion and agarose gel electrophoresis. Students will be evaluated by observation in the laboratory and analysis of experimental results. Assessment will also be based upon performance on exam questions.
5. Students will be able to create recombinant DNA molecules composed of DNA from multiple sources. Students will be evaluated by observation in the laboratory and analysis of experimental results. Assessment will also be based upon performance on exam questions.
6. Students will be able to amplify DNA using the polymerase chain reaction (PCR). Students will be evaluated by observation in the laboratory and analysis of experimental results. Assessment will also be based upon performance on exam questions.
7. Students will learn the theory and practice of DNA sequencing. Students will be evaluated by observation in the laboratory and analysis of experimental results. Assessment will also be based upon performance on exam questions.
8. Students will be able to analyze gene expression. Students will be evaluated by observation in the laboratory and analysis of experimental results. Assessment will also be based upon performance on exam questions.
9. Students will be able to search and retrieve information from genomic and proteomic databases (e.g. GenBank, Swiss-Prot), and to analyze their search results using software available on the internet (e.g. BLAST, ClustalW). Assessment will be based upon performance on computer assignments and exam questions.
10. Students will be able to properly handle genetically engineered organisms and employ the safeguards necessary when working with such organisms. Students will be evaluated by observation in the laboratory.
11. Students will learn to practice critical thinking skills and apply them to both material presented in lecture and the analysis of data generated in the laboratory. Students will be evaluated by observation in the laboratory and analysis of experimental results. Assessment will also be based upon performance on exam questions.
12. Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.
13. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

Student Assessment Tools:

The above student learning objectives will be generally assessed or evaluated by instructors using a variety of **assessment instruments** including **lecture exams, laboratory exams, quizzes, laboratory reports, written reports, presentations, projects, etc.** The decisions concerning the type or types and number of instruments that are used in a specific section of the course will be left to the instructor of that section. This information, when given by the instructor should be recorded by the student in the **Student Assessment Section** of this document.

Course Content (Lecture):

- Week 1 Introduction, History and scope of biotechnology, Review of DNA replication, transcription, and translation
- Week 2 Review of DNA replication, transcription, and translation continued, Natural and artificial mechanisms of DNA transfer
- Week 3 Introduction to vectors, Selectable markers, Cloning vectors, Expression vectors, Shuttle vectors, Creation of recombinant DNA molecules, Creation of genomic and cDNA libraries
- Week 4 Library screening, Ligation, Restriction endonuclease digestion and mapping, Gel electrophoresis, Northern blotting, Southern blotting
- Week 5 Polymerase Chain Reaction (PCR)
- Week 6 DNA sequencing and sequence analysis
- Week 7 Reverse transcriptase PCR, Real time PCR
- Week 8 Production of monoclonal antibodies, Immunoblotting
- Week 9 DNA microarrays, Protein microarrays
- Week 10 Introduction to bioinformatics
- Week 11 Introduction to bioinformatics continued
- Week 12 Applications of biotechnology: Genetically engineered foods, Bioremediation
- Week 13 Applications of biotechnology: Medical biotechnology
- Week 14 Applications of biotechnology: DNA fingerprinting, Molecular diagnostics, Molecular forensics
- Week 15 Applications of biotechnology: Transgenic organisms, Ethical issues in biotechnology, The future of biotechnology

Course Content (Laboratory):

- Week 1 Safety, Check-in, Laboratory record keeping, micropipetting, bacterial culture techniques.
- Week 2 Bacterial transformation
- Week 3 DNA plasmid mini-prep, Restriction endonuclease digestion of DNA
- Week 4 Agarose gel electrophoresis
- Week 5 Polymerase Chain Reaction (PCR), Introduction to genomic and proteomic databases
- Week 6 Analysis/Confirmation of PCR product
- Week 7 Ligation, Bacterial transformation

Week 8 Analysis of ligation product

Week 9 DNA sequencing, Genomic and proteomic databases continued

Week 10 DNA sequence analysis

Week 11 Reverse transcriptase PCR (RT-PCR)

Week 12 Analysis of RT-PCR products

Week 14 SDS-PAGE of proteins

Week 15 Immunoblotting

Student Assessment:	Lecture Examinations	_____
	_____%	
	Laboratory Component	_____
	_____%	
	Student Project Report	_____
	_____%	
Class Participation	_____	
_____%		
Other	_____	

%		
Total		
100%		

If you have a medical condition or develop a medical condition during this semester, which prevents you from fulfilling the requirements of this course, you must notify your physician. You and your physician must decide whether or not it is appropriate for you to remain in this course. If the decision is to remain in this course, please obtain a letter from your physician indicating that your continued participation in this course is appropriate and present it to the Department Chair.

Faculty Addenda: As per individual faculty member

Lecture Attendance: As per instructor;

Lab Attendance: As per instructor;

Policy Concerning Late Assignments: As per instructor;

Policy Concerning Make-Up Testing: As per instructor;

Safety Information: As per instructor and assigned exercise;

College Policies:

Student Responsibility

Students will be held responsible for reading all pertinent information in college publications regarding withdrawals, course drops, college deadlines, and tuition refunds. Students are responsible for compliance with the rules and regulations as stated in college publications.

Absence of Instructor

Students are expected to wait twenty minutes for a faculty member to come to class. If at the end of twenty minutes, the faculty member does not come, the students should sign an attendance sheet, which indicates the course, date, and time. A student should deliver the attendance sheet to the divisional office (A304) if between 9:00 a.m. and 5:00 p.m. or to the Evening Office (C107) if before 9:00 a.m. or after 5:00 p.m. Students cannot be penalized by faculty for not waiting longer than twenty minutes.

Academic Dishonesty and Plagiarism

Bergen Community College is committed to academic integrity – the honest, fair and continuing pursuit of knowledge, free from fraud or deception. Students are responsible for their own work. Faculty and academic support services staff will take appropriate measures to discourage academic dishonesty. **Plagiarism** is a form of academic dishonesty and may be a violation of U.S. Copyright laws. Plagiarism is defined as the act of taking someone else's words, opinions, or ideas and claiming them as one's own.

Consequences of Violations Academic Integrity

A. Instructor's Sanctions for a Violation

The faculty member will determine the course of action to be followed. This may include:

- Assigning a failing grade on the assignment;
- Assigning a lower final course grade;
- Failing the student in the course
- Other penalties appropriate to the violation;

In all cases, the instructor shall notify the Vice President of Student Services of the violation and the penalty imposed. The student has the right to appeal the decision of the instructor to the appropriate department head.

B. Institutional Sanctions for Violations

When a violation of academic integrity has been reported regarding a student, the Vice President of Student Services may impose disciplinary penalties beyond those imposed by the course instructor, which may include suspension or dismissal from the College. The student shall have the right to a hearing before the Vice President of Student Services or a designated judicial affairs committee. Judicial procedures governing violations of academic integrity are contained in the student handbook.

Class Attendance

All students are expected to attend punctually every scheduled meeting of each course in which they are registered. Attendance and lateness policies and sanctions are to be determined by the instructor for each section of each course. These will be established in writing on the individual course outline. Attendance will be kept by the instructor for administrative and counseling purposes.

Eating and Drinking

Eating or drinking in classrooms, lecture rooms, laboratories, gymnasium, swimming pool, or passageways is forbidden. Covered beverages only are permitted in the library. Eating and drinking are permitted in cafeteria and vending areas only.

Learning Assistance

Henry and Edith Cerullo Learning Assistance Center

The Tutoring Center, English Language Resource Center, Math Walk-In Center and Writing Center are collectively known as the Henry and Edith Cerullo Learning Assistance Center. The Cerullo Learning Assistance Center is located in the Pitkin Education Building, in Room L-125. The telephone number is (201) 447-7489. The Learning Assistance Center, staffed with peer and professional tutors, offers free individual and group tutoring, supplemental instruction, and online tutoring for subjects offered at the College. The Center provides alternative approaches to problem solving and organizational skills. Tutors help clarify classroom lectures and textbooks and help students prepare for exams. These services build student self-confidence and reduce fear of failure. The Center is equipped with the latest technology and software, including tapes, books, review sheets, exercises and software.

Services for Students with Disabilities

Bergen Community College aims to create inclusive learning environments where all students have maximum opportunities for success. Any student who feels he or she may need an accommodation based on the impact of a disability should contact the Office of Specialized Services at 201-612-5269 or via email at ossinfo@bergen.edu for assistance.

Sidney Silverman Library

Main Building, Pitkin Education Center, L-wing, 2nd Floor.

Paramus Library Hours: (201) 447-7131 or visit <http://www.bergen.edu/library/calendar/gcal.htm>

Paramus Service Desk: (201) 447-7970

Meadowlands Location: 1280 Wall Street, Lyndhurst 2nd Floor

Meadowlands Library Hours: <http://www.bergen.edu/library/calendar/gcal.htm>

Meadowlands Service Desk: (201) 301-9692

www.bergen.edu/library

Testing Services

The Bergen Community College Office of Testing Services (OTS) is located in Room S-127. OTS serves the college community by identifying, developing, procuring, administering, processing, and/or evaluating examinations, which meet a variety of administrative and instructional needs. To contact the OTS, please call (201) 447-7202. The Office of Testing Services administers makeup tests as a service for students who, for compelling and exceptional reasons, have missed a scheduled classroom examination. Students must receive prior permission from and make arrangements with their course instructors to take these examinations, under specific conditions, in the Office of Testing Services, Room S-127.

WebAdvisor

WebAdvisor is a web interface that allows students to access information contained in Datatel's Colleague, the administrative database used by Bergen Community College. Students may use WebAdvisor to register for classes, to pay tuition and fees, to view their class schedules, to check grades, to check on progress toward degree requirements, etc. WebAdvisor accounts are available for all students enrolled in credit programs. New students are strongly encouraged to attend an in-person registration or advisement session before using a WebAdvisor account. Eligible students without WebAdvisor user names and passwords may access their WebAdvisor account by going to go.bergen.edu and selecting "I'm new to WebAdvisor." Then, follow the on-screen directions. Check the WebAdvisor FAQ for answers to common questions, such as how to reset your password. Students must have a valid e-mail address on file with the College to use WebAdvisor