

Course Prefix/Number/Title: BIOL 200 – Biotech and Laboratory Techniques

Number of credits: 4

Course Description:

This course is designed to introduce students to the skills and protocols used in modern laboratories for Fish and Wildlife Agencies, the health sciences, academic research, forensic and industrial applications of biotechnology.

Pre-/Co-requisites: None

Instructor: Shubham Datta

Office: NSC 114

Office hours: By appointment.

Office phone: 701-228-5463

E-mail: shubham.datta@ndus.edu

Lecture/Lab Schedule: Lecture: M,W,F, 12:00-12:50, Lab: Tues, 10:00-11:50

Textbook(s): None, selected readings and lab protocols.

Course Objectives:

Successful completion of this course enables students to:

- 1) Demonstrate an understanding of required safety practices and procedures in the classroom and laboratory environment.
- 2) Understand the basis for biotechnology products and how such products affect the quality of life.
- 2) Analyze macroinvertebrate sampling as related to water quality and Fish and Wildlife diet and stomach contents. Learn EPA Rapid Bio assessment protocols for water quality. Understand basic soil and water quality testing procedures. These tests are often needed in basic Fish and Wildlife and Environmental lab research.
- 3) Analyze careers in research and development, human health and diagnostics, bio manufacturing, environmental applications, and agriculture that utilize biotechnology. Students seeking to become a lab tech will be exposed to possible

career paths positions related to lab work in Fish and Wildlife jobs and in the medical, agricultural, and industrial fields.

4) Utilize electrophoresis, chromatography, microscopy and spectrophotometry to identify, separate and to draw conclusions about biological molecules. These skills are used in basic tests that environmental Techs, lab techs and medical technicians perform.

5) Compare and contrast common organisms used in biotechnology and relate the manipulation of living organisms to product and procedure development.

6) Demonstrate how manipulation of nucleic acids through genetic engineering (recombinant DNA and RNA technologies) alters the function of proteins and subsequent cellular processes. These skills are essential skills utilized in the development and analysis of Fish and Wildlife management and conservation plans. Additionally, these are essential skills for technicians working in the health sciences and environmental compliance.

a. Describe the function of DNA, RNA, and protein in living cells and the Central Dogma.

b. Demonstrate how the structure of DNA influences its function, analysis, and manipulation. Explain and demonstrate the principles involved in DNA analysis via agarose gel electrophoresis.

Describe previous and current DNA sequencing technologies.

c. Explain the role of enzymes (e.g., restriction enzymes, DNA polymerases, and nucleases) in the production and manipulation of DNA molecules.

d. Determine and analyze the effect of qualitative and quantitative changes of specific proteins on cell function.

7) Analyze economic, social, ethical, and legal issues related to the use of biotechnology.

a. Differentiate between moral, ethical, and legal biotechnology issues.

b. Research ethical issues presented by evolving science, including genetically modified foods, cloning, bioterrorism, gene therapy, and stem cells.

c. Compare and contrast attitudes about the use of biotechnology regionally, nationally, and internationally.

d. Evaluate the regulatory policies impacting biotechnology research - e.g., use of animals in research and applications of recombinant DNA

8) Explore the calibration and maintenance of modern laboratory instrumentation.

9) Study quality assurance/Quality Control and chain of command in lab environments including GLP/GMP.

Course Requirements: Students are required to complete in class assignments, answer questions from the text, complete lab assignments where they simulate biotechnology applications in the real world.

Grading Scale:

Percentage Grade

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
< 60	F

Tentative Grade Allocation:

Homework	~200
Projects	~400
Midterm Exam	~50
Final Exam	~100

Tentative Course Outline:

- 1) Safety and General Lab Protocols
- 2) Measuring and Weighing
- 3) Pipetting and Accuracy
- 4) MSDS and standards for Hazardous and Biohazardous waste.
- 5) Review: Flow of Genetic information---Central dogma, Recognition of DNA as genetic material. Review: DNA replication.
- 6) Molecular cloning, methods and tools for studying genes and gene activity*Introduction to gene manipulation: DNA cloning, restriction enzymes and maps
- 7) Molecular cloning, methods and tools for studying genes and gene activity *PCR, Real time PCR, DNA sequencing. Directed mutagenesis.
- 8) Overview: Transcription & posttranscriptional modification in prokaryotic cells
Overview: Transcription & posttranscriptional modification in eukaryotic cells
*Quantifying transcripts
- 9) Microarrays. Bioinformatics, Databases and large dataset management.
- 10) Quality Control/Quality Assurance and GLP/GMP.

Relationship to Campus Focus/Theme

This course addresses the campus theme by incorporating the latest diagnostic procedures, treatments, and other technologies that are used to identify and treat human diseases and disorders.

Classroom Policies

- 1) Be respectful of other students and the instructor
- 2) Notify the instructor of any coursework that may be late prior to the due date

Student Email Policy

Dakota College at Bottineau is increasingly dependent upon email as an official form of communication. A student's campus-assigned email address will be the only one recognized by the campus for official mailings. The liability for missing or not acting upon important information conveyed via campus email rests with the student.

Academic Integrity

All students are expected to adhere to the highest standards of academic integrity. Dishonesty in the classroom or laboratory and with assignments, quizzes, and exams is a serious offense and is subject to disciplinary action by the instructor and college administration. For more information, refer to the Student Handbook.

Disabilities and Special Needs

Students with disabilities or special needs (academic or otherwise) are encouraged to contact the instructor and Disability Support Services. If you have a disability for which you need accommodations, you are encouraged to contact your instructor and Jackie Migler at 701-228-5672 to request disability support services as early as possible during the beginning of the semester.

Title IX:

Dakota College at Bottineau (DCB) faculty are committed to helping create a safe learning environment for all students and for the College as a whole. Please be aware that all DCB employees (other than those designated as confidential resources such as advocates, counselors, clergy and healthcare providers) are required to report information about such discrimination and harassment to the College Title IX Coordinator. This means that if a student tells a faculty member about a situation of sexual harassment or sexual violence, or other related misconduct, the faculty member must share that information with the College's Title IX Coordinator. Students wishing to speak to a confidential employee who does not have this reporting responsibility can find a list of resources on the DCB Title IX webpage.