

Dakota College at Bottineau Course Syllabus

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

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 bioassessment 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, biomanufacturing, 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. Isolate genomic and recombinant DNA from cells and solutions and analyze its purity and concentration.

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.

Instructor: Kenneth C Cabarle

Office: NSC 113

Office hours: M,W,F 11:00-11:50, M,W, 2:00-2:50

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

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

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: The grading scale is listed below.

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 120

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
Mapping transcripts:-Primer extension -S1 mapping
- 9) Overview: Transcription & posttranscriptional modification in eukaryotic cells
*Quantifying transcripts
- 10) Microarrays. Bioinformatics, Databases and large dataset management.
- 11) Quality Control/Quality Assurance and GLP/GMP.

Relationship to Campus Theme:

This course addresses the campus theme by incorporating Biotechnology as applied to natural resource management, the health sciences, industrial and municipal applications and fish and wildlife forensics.

Classroom Policies

- 1) Cell phones, iPods, and related technology are prohibited in the classroom at all times. It is recommended that you do not bring your cell phone into the classroom or, at the very least, turn it off.
- 2) Food and beverages are permitted in accordance with IVN classroom policy.
- 3) Be respectful of other students, technicians, instructors, and guests.

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

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact your instructor and Jan Nahinurk in the Learning Center (228-5479) as early as possible during the beginning of the semester.