



## **Molecular Biology**

**4 Credits**  
**BIO 409-1**

### **Spring Semester, 2022**

Instructor: Dr. Palmer Masumbe Netongo

Office: Nursing Building Room 213

Office Hours: Monday: 8:00-9:30 am.

Class Location: Wet Lab 109/ Face-to-Face/Online (Hybrid).

Class/Lab Meeting Times: TR: 2:00 PM– 3:20 PM      Lab: F 8.00 AM - 9.20 AM

#### **Required Materials:**

E-mail: [pnetongo@navajotech.edu](mailto:pnetongo@navajotech.edu)

Office Phone: 505-387-7391 # 1035

**Textbook:** David Clark, Nanette Pazdernik, Michelle McGehee, Molecular Biology 3rd Edition (2018).

ISBN: 978-0-12-813288-3

**Laboratory Manual:** Sue Carson, Heather Miller, Melissa Srougi, D. Scott Witherow. Molecular Biology Techniques: A Classroom Laboratory Manual 4th Edition (2019).

ISBN: 978-0-12-818024-2

**Tools:** Color pencils.

**Lab Fee:** \$125.00

**Tools:** Every student is required to have a laptop.

#### **Mission, Vision, and Philosophy**

**Mission:** Navajo Technical University honors Diné culture and language, while educating for the future.

**Vision:** Navajo Technical University provides an excellent educational experience in a supportive, culturally diverse environment, enabling all community members to grow intellectually, culturally, and economically.

**Philosophy:** Through the teachings of Nitsáhákees (thinking), Nahátá (planning), Íina (implementing), and Siihasin (reflection), students acquire quality education in diverse fields, while preserving cultural values and gaining economic opportunities.

**Course Description:** This course is designed to introduce the notion of molecular biology and help students to interpret scientific literature on the subject. as well as specifically understand the use of molecular methods and their application to biological research. There would be Lectures, labs to cover molecular tools (techniques) and paper discussions/scenarios to enhance understanding of the subject. Emphasis will be laid on understanding the structure and function of DNA and RNA while the focus on proteins will be shifted to Biochemistry classes. At NTU, you will require BIOL 2130 C - Introduction to Biochemistry, to enhance your understanding of Molecular Biology (Bio 409-1). It is also understood that many of the same general topics are covered in Genetics so Molecular Biology will emphasize on complementary notions rather than repetitions of these aspects.

#### **Course Objectives**

After successfully completing this course, students should be able to:

1. Understand the basic notions in Molecular Biology
2. Become familiar with commonly used molecular biology laboratory techniques.
3. Understand the use of these techniques in the discovery of DNA (The genetic material) and RNA metabolism and function
4. Read and critique primary literature involving molecular biology techniques.
5. Apply knowledge to resolve common problems rather than memorization of the details of the molecular machinery of the cell. Emphasis will be laid on developing skills to apply the learned techniques to the understanding of scientific discovery (data interpretation), as well as to suggest ways to study the function of molecules (experimental design).

<b>COURSE OUTCOMES</b>	<b>COURSE MEASUREMENTS</b>
Understand the basic notions in molecular Biology	Understanding the basic notions in molecular Biology will be measured by class tests and quizzes, and exercises that present a scenario to resolve a particular problem using molecular biology knowledge and techniques.
Become familiar with commonly used molecular biology laboratory techniques	Familiarity with commonly used molecular biology laboratory techniques will be evaluated by quizzes, essays, oral presentations, homework and exams.
Understand the use of molecular biology techniques in the discovery of DNA (The genetic material) and RNA metabolism and function	Understanding the use of molecular Biology techniques in the discovery of DNA (The genetic material) and RNA metabolism and function will be analyzed by essays, oral presentation, observations of student's performance at tasks, quizzes, homework and exams.
Apply concepts and knowledge gained in molecular biology to resolve common problems	Knowledge application will be examined by the students' ability to read and critique primary literature involving molecular biology techniques, Examination, quizzes, poster and/or oral presentations, interpretation of case studies, homework assignments, lab write-ups, research papers, portfolios, and small group exercises would be used to measure outcomes.

Week	Date	Chapters	Assignment	Quiz
1	01/18-01/22	<b>Module 1: Basic Chemical and Biological Principles</b> 1-2: Cells and Organisms and Basic Genetics	Read Pp. 1-62	
2	01/24/-01/29	3: DNA, RNA, and Protein 4: Genes, Genomes, and DNA	Read Pp. 63-130	
	<b>02/01</b>	<b>Quizz/Assignment on Chapters 1-4</b>	<b>Quiz</b>	<b>Chpt. 1 -4</b>
3	02/01-02/05	5: Manipulation of Nucleic Acids	Read pp 132-166	
4	02/07-02/12	<b>Module 2: The Genome</b> 6: The Polymerase Chain Reaction 7: Cloning Genes for Analysis	Read pp. 169-239	
5	02/14-02/19	8: DNA Sequencing 9. Genomics And Systems Biology	Read pp. 240-293	
	<b>02/21</b>	<b>Holiday-President's Day</b>		
	<b>02/22</b>	<b>Quizz/Assignment on Chapters 5-9</b>	<b>Quiz</b>	<b>Chpt. 5-9</b>
6	02/22-02/26	<b>Module 3: The Central Dogma of Molecular Biology</b> 10. Cell Division and DNA Replication	Read pp. 295-330	
7	02/28-03/05	11. Transcription of Genes	Read pp. 332-361	
8	<b>03/07-03/11</b>	<b>Midterm Exam Covering Chapters 5-10</b>	<b>Midterm</b>	<b>Chpt. 5-10</b>
9	<b>03/14-03/18</b>	<b>SPRING BREAK</b>		
10	03/21 - 10/26	12. Processing of RNA 13. Protein Synthesis	Read pp. 362-443	
11	03/28-04/02	14: Protein Structure and Function 15. Proteomics: Global Analysis of Proteins	Read pp. 445-520	
	<b>04/05</b>	<b>Quiz on Chapters 11-15</b>	<b>Quiz</b>	<b>Chpt. 11-15</b>
12	04/04-04/09	<b>Module 4: Regulating Gene Expression</b> 16. Regulation of Transcription in Prokaryotes 17. Regulation of Transcription in Eukaryotes	Read pp. 522-580	
13	04/11- 04/16	18. Regulation of protein synthesis 19-20. Non coding RNA, Genome Defense 21-22. Analysis of Gene Expression, Epigenetics and Epigenomics	Read pp. 581-710	
	04/25	<b>Quiz on Chapters 16 -20</b>	<b>Quiz</b>	<b>Chpt. 16-20</b>
14	04/25-04/30	<b>Module 5: Subcellular Life Forms</b> 23. Plasmids 24. Viruses 25. Mobile DNA	Read pp. 711-829	
15	05/02-05/07	<b>Module 6: Changing the DNA Blueprint</b> 26. Mutations and Repair 27. Recombination  <b>REVISION</b>	Read pp. 831-895  <b>REVISION</b>	<b>REVISION</b>

<b>16</b>	<b>05/10</b>	<b>FINAL EXAMINATION</b>	<b>FINALS</b>	
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<b>Week</b>	<b>Date</b>	<b>Lab Exercises</b>	<b>Lab Manual</b>
1	01/18-08/22	<b>Part I: Manipulation of DNA</b> Advanced Alternatives Within Part I 1. Getting Oriented; Practicing With Micropipettes	Complete Exercises on Pp. 1-10
2	01/24-01/29	2.1 Purification of Plasmid (Vector) DNA	Complete Exercises on Pp. 11-18
	<b>02/01</b>	<b>Holiday-Labor Day</b>	
3	02/01-02/05	2.2 and Digestion of plasmid	Complete Exercises on pp. 18-20
4	02/07-02/12	3. Completion of Vector Preparation and Polymerase Chain Reaction Amplification of egfp	Complete Exercises on pp. 21-30
5	02/14-02/19	4. Preparation of Insert DNA (egfp) PCR Product	Complete Exercises on pp. 31-34
6	02/22-02/26	5. DNA Ligation and Transformation of Escherichia coli	Complete Exercises on pp. 35-42
7	02/28-03/05	<b>Part II: Screening Transformants</b> Advanced Alternatives Within Part II 6A. Screening of Transformants, Part I	Complete Exercises on pp. 43-45
	02/22-02/26	<b>Midterm Exam Covering Chapters 5-10</b>	<b>Midterm</b>
	<b>03/07-03/11</b>	<b>SPRING BREAK</b>	
8	03/14-03/18	Screening of Transformants, Part II 7A. Completion of colony hybridization: monoclonal antibody probe 7B. PCR screening	Complete Exercises on pp. 51-56
9	03/21 - 10/26	7C Prepare fresh replica plates 8. Isolation of miniprep DNA from potential transformants	Complete Exercises on pp. 57-63
10	03/28-04/02	8D, 9A and 9B. Visualization of green fluorescent protein and characterization of recombinant clones 3	Complete Exercises on pp. 64-72
11	03/28-04/02	9C and 10. Computational Analysis of DNA sequences from a positive clone	Complete Exercises on pp. 73-85
	<b>04/05</b>	<b>HOLIDAY – Veterans Day</b>	
12	04/04-04/09	<b>Part 3. Expression, Detection and Purification of Recombinant Protein from bacteria</b>  11. SDS-PAGE and Western blot Part 1.	Complete Exercises on pp.89-97
13	04/11- 04/16	12. SDS-PAGE and Western blot Part 2. Probing the western blot. 13. Extraction of recombinant protein using glutathione Affinity Column	Complete Exercises on pp.98-112
14	04/25-04/30	<b>Part 4. Analysis at the mRNA level</b> 15-16. Working with RNA: Total RNA extraction and RT-qPCR	Complete Exercises on pp.121-140
<b>15</b>	05/02-05/07	<b>REVISION</b>	<b>REVISION</b>
<b>16</b>	<b>05/10</b>	<b>FINAL EXAMINATION</b>	<b>FINALS</b>

## Grading Plan:

A = 100-90%  
B = 89-80%  
C = 79-70%  
D = 69-60%  
F = 59% or less

## Allocation of Grades

Exams (Midterm & Finals)	40%
Homework/Presentations	10%
Tests/Quizzes	20%
Class participation	5%
Lab work	25%

## Grading Policy

Students must do their own work. Cheating and plagiarism are strictly forbidden. Cheating includes (but is not limited to) plagiarism, submission of work that is not one's own, submission or use of falsified data, unauthorized access to exams or assignments, use of unauthorized material during an exam, or supplying or communicating unauthorized information for assignments or exams.

## Participation

Students are expected to attend and participate in all class activities. Points will be given to students who actively participate in class activities including guest speakers, field trips, laboratories, and all other classroom events.

## Cell phone and headphone use

Please turn cell phones off **before** coming to class. Cell phone courtesy is essential to quality classroom learning. Headphones must be removed before coming to class.

## Attendance Policy

Students are expected to attend all class sessions. A percentage of the student's grade will be based on class attendance and participation. Absence from class, regardless of the reason, does not relieve the student of responsibility to complete all course work by required deadlines. Furthermore, it is the student's responsibility to obtain notes, handouts, and any other information covered when absent from class and to arrange to make up any in-class assignments or tests if permitted by the instructor. Incomplete or missing assignments will necessarily affect the student's grades. Instructors will report excessive and/or unexplained absences to the Counseling Department for investigation and potential intervention. **Instructors may drop students from the class after three (3) absences unless prior arrangements are made with the instructor to make up work and the instructor deems any excuse acceptable.**

## Study Time Outside of Class for Face-to-Face Courses

**For every credit hour in class, a student is expected to spend two hours outside of class studying course materials.**

## Study Time for Hybrid or Blended Courses

**For a hybrid or blended course of one credit hour, a student is expected to spend three hours per week studying course materials.**

## Study Time for Online Courses

**For an online course of one credit hour, a student is expected to spend four hours per week studying course materials.**

## Academic Integrity

Integrity (honesty) is expected of every student in all academic work. The guiding principle of academic integrity is that a student's submitted work must be the student's own. Students who engage in academic dishonesty diminish their education and bring discredit to the University community. Avoid situations likely to compromise academic integrity such as: cheating, facilitating academic dishonesty, and plagiarism; modifying academic work to obtain additional credit in the same class unless approved in advance by the instructor, failure to observe rules of academic integrity established by the instructor. **The use of another person's ideas or work claimed as your own without acknowledging the original source is known as plagiarism and is prohibited.**

### **Diné Philosophy of Education**

The Diné Philosophy of Education (DPE) is incorporated into every class for students to become aware of and to understand the significance of the four Diné philosophical elements, including its affiliation with the four directions, four sacred mountains, the four set of thought processes and so forth: Nitsáhákees, Nahát'á, Íina and Siih Hasin which are essential and relevant to self-identity, respect and wisdom to achieve career goals successfully.

At NTU's Zuni Campus, the A:shiwí Philosophy of Education offers essential elements for helping students develop Indigenous and Western understandings. Yam de bena: dap haydoshna: akkya hon detsemak a:wannikwa da: hon de:tsemak a:ts'umme. *Our language and ceremonies allow our people to maintain strength and knowledge.* A:shiwí core values of hon i:yyułashik'yanna:wa (respect), hon delank'oha:willa:wa (kindness and empathy), hon i:yyayumola:wa (honesty and trustworthiness), and hon kohoł lewuna:wedyahnan, wan hon kela i:tsemanna (think critically) are central to attaining strength and knowledge. They help learners develop positive self-identity, respect, kindness, and critical thinking skills to achieve life goals successfully.

### **Students with Disabilities**

Navajo Technical University is committed to serving all students in a non-discriminatory and accommodating manner. Any student who feels that she or he may need special accommodations should contact the Accommodations Office (<http://www.navajotech.edu/student-services#accomodations-services>) in accordance with the university's Disability Accommodations Policy (see [http://www.navajotech.edu/images/about/policiesDocs/Disability\\_Exhibit-A\\_6-26-2018.pdf](http://www.navajotech.edu/images/about/policiesDocs/Disability_Exhibit-A_6-26-2018.pdf)).

### **Email Address**

Students are required to use NTU's email address for all communications with faculty and staff.

**Final Exam Date: May 10, 2022**