

BME 556 / CBE 499 / CBE 515 / CS 491 / CS 591:  
Protein and Nucleic Acid Engineering  
Spring 2023

Matthew R. Lakin

January 17, 2023

## Course Information

### Lectures

Lecture day/time: Mondays, Wednesdays, and Fridays 11:00–11:50am

Lecture location: Centennial Engineering Center room 1026

### Instructor

Matthew Lakin

Email: [mlakin@unm.edu](mailto:mlakin@unm.edu)

Office hours: Mondays 2-4pm

Office hours location: Farris Engineering Center room 3240

### Course description

The course describes techniques used for the design and manipulation of proteins and nucleic acids. It will cover basic techniques such as PCR as well as more advanced techniques such as Golden Gate assembly of DNA. The course is intended for advanced undergraduates and early stage graduate students and will provide the theoretical background and conceptual understanding of basic tools necessary to carry out research in molecular biotechnology. Some basic molecular biology background will be helpful, but not essential.

This course is cross-listed as BME 556, CBE 499, CBE 515, CS 491, and CS 591.

### Assignments

**There will be a midterm exam, a group “journal club”, and a final exam that covers the entire course. Homework assignments and online quizzes will be given to consolidate lecture material.**

## **Textbook**

There is no required textbook for this course. Reading may be assigned as appropriate throughout the course.

## **Grading**

You are expected to attend class regularly, read any assigned reading before class, and participate in class discussions. Contributions of different assessment types to the overall grade will be determined as follows:

- Homeworks: 40% of total
- Exams: 40% of total
- Journal club: 10% of total
- Online quizzes / other: 10% of total

No requests for grade mode changes will be considered after the final day of classes. There will also be no extra credit assignments or “do-overs” for homeworks, exams, or quizzes.

## **Communication**

The Loboweb email list functionality will be used for administrative announcements. Lecture notes and homework assignments will be uploaded to the UNM Canvas page for the class.

## **Topics covered (subject to change):**

- Central dogma of molecular biology
- Transcription and translation
- PCR
- Cloning techniques
- Codon optimization
- Choice of hosts, vectors, and inducers
- Transformation (antibiotic resistance, vectors, origins)
- Nucleic acid sequencing
- Bioinformatics approaches to sequencing data
- Databases (NCBI, PDB, etc.)

- Protein expression and purification:
- Libraries, directed evolution, SELEX, phage display
- Synthetic biology
- RNA regulators
- Metabolic engineering
- Genome engineering
- CRISPR
- Cell-free transcription and translation
- DNA nanotechnology
- DNA strand displacement
- DNA origami nanostructures
- DNA circuit and sequence design
- Modeling and simulation

## **1 Credit-hour statement**

This is a three credit-hour course. Class meets for three 50-minute sessions of direct instruction for fifteen weeks during the Spring 2023 semester. Students are expected to complete a minimum of six hours of out-of-class work (or homework, study, assignment completion, and class preparation) each week.

## **Academic integrity statement**

Each student is expected to maintain the highest standards of honesty and integrity in academic and professional matters. The University reserves the right to take disciplinary action, up to and including dismissal, against any student who is found guilty of academic dishonesty or otherwise fails to meet the standards. Any student judged to have engaged in academic dishonesty in course work may receive a reduced or failing grade for the work in question and/or for the course.

Academic dishonesty includes, but is not limited to, dishonesty in quizzes, tests, or assignments; claiming credit for work not done or done by others; hindering the academic work of other students; misrepresenting academic or professional qualifications within or without the University; and nondisclosure or misrepresentation in filling out applications or other University records.

**All students will be required to sign and submit a warning regarding issues of academic integrity and possible sanctions prior to any submissions being graded.**

## 2 Accommodation statement

UNM is committed to providing equitable access to learning opportunities for students with documented disabilities. As your instructor, it is my objective to facilitate an inclusive classroom setting, in which students have full access and opportunity to participate. To engage in a confidential conversation about the process for requesting reasonable accommodations for this class and/or program, please contact Accessibility Resource Center at [arcsrvs@unm.edu](mailto:arcsrvs@unm.edu) or by phone at 505-277-3506.

## 3 Title IX statement

To meet obligations under Title IX, UNM faculty, Teaching Assistants, and Graduate Assistants are considered “responsible employees.” This designation requires that any report of gender discrimination which includes sexual harassment, sexual misconduct and sexual violence made to a faculty member, TA, or GA must be reported to the Title IX Coordinator at the Office of Compliance, Ethics, and Equal Opportunity <https://ceeo.unm.edu/>. For more information on the campus policy regarding sexual misconduct, see: <https://policy.unm.edu/university-policies/2000/2740.html>