

BME 556 / CBE 499 / CBE 515 / CS 491 / CS 591:
Protein and Nucleic Acid Engineering
Spring 2021

Matthew R. Lakin

January 13, 2021

Course Information

Lectures

Day/time: Tuesdays and Thursdays 11:00am–12:15pm

Teaching modality: Remote scheduled

Location: Zoom

Instructor

Matthew Lakin

Email: mlakin@cs.unm.edu

Office hours: Tuesdays 3:00pm–5:00pm

Office hours location: Zoom

Course delivery

This class will be offered via the Remote Scheduled modality for Spring 2021. This means that classes will be streamed on Zoom at the scheduled class meeting time. Classes will also be recorded and uploaded to UNM Learn to enable offline viewing. Additional class materials will also be uploaded to UNM Learn where appropriate. Office hours will also take place on Zoom. **Zoom meeting information for classes and office hours can be accessed via the class UNM Learn page.**

COVID-19 statement

Due to the COVID-19 pandemic, UNM and the School of Engineering will require students, staff, and faculty to follow all health guidelines of the New Mexico Department of Health. Specifically, students, faculty and staff will adhere to social distancing guidelines, will wear masks in all buildings on campus

(students are expected to provide their own masks), will maintain a distance of at least six feet from others, and will wash their hands frequently when on campus.

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: 50% of total
- Exams: 30% 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 Learn 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

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.

ADA accommodation statement

In accordance with University Policy 2310 and the Americans with Disabilities Act (ADA), academic accommodations may be made for any student who notifies the instructor of the need for an accommodation. It is imperative that you take the initiative to bring such needs to the instructor's attention, as I am not legally permitted to inquire. Students who may require assistance in emergency evacuations should contact the instructor as to the most appropriate procedures to follow. Contact Accessibility Resource Center at 277-3506 for additional information.

If you need an accommodation based on how course requirement interact with the impact of a disability, you should contact me to arrange an appointment as soon as possible. At the appointment we can discuss the course format and requirements, anticipate the need for adjustments and explore potential accommodations. I rely on the Disability Services Office for assistance in developing strategies and verifying accommodation needs. If you have not previously contacted them I encourage you to do so.

Title IX statement

In an effort to meet obligations under Title IX, UNM faculty, Teaching Assistants, and Graduate Assistants are considered "responsible employees" by the Department of Education (see pg 15 - <http://www2.ed.gov/about/offices/list/ocr/docs/qa-201404-title-ix.pdf>). 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 Equal Opportunity (<http://oeo.unm.edu>). For more information on the campus policy regarding sexual misconduct, see: <https://policy.unm.edu/university-policies/2000/2740.html>