Department of Biology
The DNA Sequencing Revolution
Summer 2022
July 18th – 29th, 2022
Speare 4: 10am – 12:00pm
Jones Annex 234; W 2:00pm – 4:00pm

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Office Hours: M-F 4-5pm; https://zoom.us/j/92339435547?pwd=Vm5DTkNuMWw5UkVIaVFaN3hmNUg3UT09

Course Description:

DNA Sequencing has revolutionized the biological sciences, and in many ways the world. The technology development has occurred at a frenetic pace, so much so many have been left behind by the rapid evolution of the discipline. Still, Biology undergraduates are expected to translate a classical education in the Biological Sciences to incorporate the massive insights and upheaval that DNA sequencing has wrought. This course will provide an introduction to the DNA Sequencing Revolution for Master of Science Teachers students at New Mexico Tech, in which teacher-students learn the *why* along with the *how* of DNA sequencing technology and applications. To accomplish this, the course will provide basic, publicly available, and teachable skills in DNA sequence production, manipulation, and analysis. The course will culminate with the production of an instructional module that students will design with their future classrooms in mind. The course is designed for science teaching graduate students of all skill levels in all disciplines. The course will be divided into morning (dry-lab) and afternoon (wet-lab) sessions, that will provide teachers the tools and skills necessary to kickstart their own students careers in the Biological Sciences. Morning sessions will consist of three elements: (1) lecture to disseminate information, (2) discussion sessions to process the material and contextualize it into the lives of their students, and (3) practical activities geared towards designing specific classroom activities at appropriate levels. Instructional modules produced during the course will be presented and discussed during the final day of the course. Students will also write reflections each day, thinking about how they can employ the previous day's methods in their own classrooms.

Mode of Instruction:

The course will be delivered both in person and via zoom, as needed. In-person attendance is limited to the room capacity defined in accordance with COVID-19 safety protocols. All lectures and associated slides will be recorded and posted on Canvas and on the course's GitHub page.

Pre-requisites:

None

Place in Curriculum:

The DNA Sequencing Revolution is intended for graduate students in the Master of Science for Teachers program and other interested graduate students.

Learning Objectives:

By the end of this course, students should be able to:

- Understand the importance of the DNA sequencing revolution in the context of modern Biology education
- Navigate browser-based bioinformatic tools that provide access to publicly available data (e.g., NCBI, UCSC Genome Browser, Flybase, etc.)
- Understand the problems and pitfalls associated with genetic analyses, as well as how to evaluate DNA sequencing information
- Develop targeted learning activities incorporating aspects of DNA sequencing technology/analysis

Program learning outcomes:

https://www.nmt.edu/academics/psych-ed/graduate.php

Grading:

Item	
Participation	60%
Class-based Activities (10)	20%
Discussion Activities	10%
DNA Sequencing Module*	10%

**** – Enrollees will be required to develop an instructional module (in their preferred format) that will put DNA and/or the DNA sequencing revolution at its core. Students will present a 5-minute summary of their module, and other students will provide feedback/discussion of the module.**

Participation:

Participation includes attending classes, asking questions, contributing to group/class discussions, reading assigned papers, and completing daily education reflections.

Class-Based Activities:

Activities will be due every day by the end of the morning session (noon) and submitted through Canvas. New assignments will be made available by noon the day before and will be announced to the class via Canvas, email, and in person. Difficulties interfacing with Canvas should be brought up with the instructor so that appropriate accommodations can be made.

Instructional Module:

Students will produce an instructional module highlighting the DNA sequencing revolution. Students will need to include sample lesson plans, lists of materials, and address student learning outcomes.

Schedule:

#	Day	Morning Dry-Lab (Speare 4)	Afternoon Wet Lab (Jones Annex 234)
1	M – 7/18	Introduction to the DNA Sequencing Revolution	DNA Extractions
2	T – 7/19	Understanding and Navigating Genetic Data	EtOH Precipitations
3	W – 7/20	Patterns of Human Variation	DNA Extraction Quality Control
4	R– 7/21	Understanding Genomes	DNA Sequencing Library Preparation
5	F – 7/22	DNA Sequencing Technology & Applications to the Classroom	DNA Sequencing Library Preparation
6	M – 7/25	Biotechnology, CRISPR, & Ethics	DNA Sequencing
7	T – 7/26	Applications to Public Health	Module Building
8	W – 7/27	Applications to Agriculture	Module Building
9	R – 7/28	Applications to Conservation/Naturalism	Module Building
10	F – 7/29	Module Presentations/Discussion	Sequencing Data Analysis/ Wrap-Up

Policies on attendance, late assignments, and missed in-class discussion:

This summer presents unique challenges as a result of COVID-19. As such absences, late assignments, and missed discussion will be handled on a case-by-case basis, but ***communication with the Instructor is required***. Students are expected to do their best to attend classes, participate in group discussions, and turn in homeworks and writing assignments on time. For the most up-to-date information on COVID-19, visit the NMT COVID-19 page at https://www.nmt.edu/covid19/.

Academic Honesty:

New Mexico Tech's Academic Honesty Policy for undergraduate and graduate students is found in the student handbook, which can be found at: https://www.nmt.edu/studentlife/dos/NMT%20Student%20Handbook%202019-20.pdf. You are responsible for knowing, understanding, and following this policy.

Reasonable Accommodations:

New Mexico Tech is committed to protecting the rights of individuals with disabilities. Qualified individuals who require reasonable accommodations are invited to make their needs known to the Office for Disability Services (ODS) as soon as possible. To schedule an appointment, please call 835-6209, or email disability@nmt.edu.

Counseling Services:

New Mexico Tech offers individual and couples counseling, safety assessments, crisis intervention and consultations through The Counseling Center. These confidential services are provided free of charge by licensed professionals. For more information, please call 835-6619, email counseling@nmt.edu or complete an Intake Form on our website at https://www.nmt.edu/cds/. All services are provided via phone or Zoom during the Covid-19 pandemic.

Respect Statement:

New Mexico Tech supports freedom of expression within the parameters of a respectful learning environment. As stated in the New Mexico Tech Guide to Conduct and Citizenship: “New Mexico Tech’s primary purpose is education, which includes teaching, research, discussion, learning, and service. An atmosphere of free and open inquiry is essential to the pursuit of education. Tech seeks to protect academic freedom and build on individual responsibility to create and maintain an academic atmosphere that is a purposeful, just, open, disciplined, and caring community.”

COVID-19 Safety Issues for Face-to-Face Instruction:

Students must follow campus-wide safety protocols, including mandatory use of face coverings and maintaining a minimum of 6 ft social distance from other students and faculty. Students should not enter the classroom earlier than 10 minutes prior to start of class, and should exit the classroom within 10 minutes of the end of class. Students who fail to comply are subject to disciplinary procedures. High quality facemasks (surgical + cloth, KN95, or N95) are highly recommended.

Title IX Reporting:

Sexual misconduct, sexual violence and other forms of sexual misconduct and gender-based discrimination are contrary to the University’s mission and core values, violate university policies, and may also violate state and federal law (Title IX). Faculty members are considered “Responsible Employees” and are required to report incidents of these prohibited behaviors. Any such reports should be directed to Tech’s Title IX Coordinator (Dr. Peter Phaiah, 20D Brown Hall, 575-835-5187, titleixcoordinator@nmt.edu). Please visit Tech’s Title IX Website (www.nmt.edu/titleix) for additional information and resources.