

**Syllabus**  
**Molecular Biology 333 and 333Lab**  
Spring 2020

Lectures: T, Th 9:30 – 10:45  
Dr. Snezna Rogelj  
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Office Hours: Tuesday 11-12, JA315

Lab: W 2:00 PM; Jones Annex 312  
Mr. Joseph Ulbrich  
[Joseph.Ulbrich@student.nmt.edu](mailto:Joseph.Ulbrich@student.nmt.edu)  
Office Hours: Monday 2PM, JA 205

**NMT Mission:** New Mexico Tech is an institute of higher learning that serves the diverse population of New Mexico by integrating education, research, public service, and economic development through emphasis on science, technology, engineering, mathematics, natural resources, communication, and cultural awareness. Our mission is to: 1. help students learn creative approaches to addressing complex issues; 2. acknowledge state and national diversity by developing an inclusive learning environment; 3. create and communicate knowledge; and 4. solve technical and scientific problems.

**Biology Department Mission:** Provide students with a relevant education for biomedical and biotechnological careers, to lead in molecular biological research, and to serve the University and the scientific community.

**Course Objective:** This is a “Molecular Cooking Course”; it will familiarize you with the modern techniques in molecular cell biology while approximating the experience of doing a real research project. You will learn the basic principles of experimental biochemistry and molecular biology by first following explicit instructions but, over time, developing an ability to design your own assays and experiments. By the end of this lab-based course, you will be skilled in calculations needed to prepare a variety of specific reagents, in quantitation of enzyme activities, enzyme purification methodologies, protein separation and analyses by gel electrophoresis, in DNA purification, DNA fragment isolation, restriction fragment analysis, gene identification & subcloning of DNA fragments into prokaryotic expression vectors, and introduction of these novel DNA constructs into bacterial cells. You will also have been familiarized with the broader perspective of gene manipulation in eukaryotic cells and organisms. Ethical issues pertaining to genetic engineering will be periodically discussed.

**Counseling and Disability Services:** 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 of Counseling and Disability Services (OCDS) as soon as possible. In addition, New Mexico Tech offers mental health and substance abuse counseling through the Office of Counseling and Disability Services. The confidential services are provided free of charge by licensed professionals. To schedule an appointment, please call 835-6619.

**Academic Honesty:** New Mexico Tech’s Academic Honesty Policy can be found starting on page 11 of the Student Handbook <https://www.nmt.edu/sur/dos/NMT%20Student%20Handbook%202019-20.pdf>. You are responsible for knowing, understanding, and following this policy.

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**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.”

**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](mailto:titleixcoordinator@nmt.edu) ). Please visit Tech’s Title IX Website ([www.nmt.edu/titleix](http://www.nmt.edu/titleix)) for additional information and resources.

**So what is Molecular Biology?** How does molecular biology pertain to issues in Biology in general, and cell biology in particular? To evolution? To our daily lives? To our health? What is recombinant DNA technology? What is genetic engineering? What is clone? How does it help you understand the structure of a protein? Function of a protein? Structure of the gene that encodes that protein? Regulation of that particular gene? Mechanism of regulation of cell function? Impact the altered structure might have on the entire organism? How can/could diagnosis & correction of genetic abnormalities be carried out? Designing new drugs? Designing a vaccine-making plant? A cow that makes medicinal drugs? A smarter, longer-lived human? Manipulate epigenetic imprinting? What about the ethics of it all? Welcome to the Biology of the 21<sup>st</sup> Century!

### **Course Design:**

On **Tuesdays** we will discuss the topic(s) outlined in the syllabus. Deviations from the specified topic to another relevant issue are bound to occur. Be flexible – we will learn a great deal, regardless of the outline. Molecular Biology concepts, pertinent to the following Wednesday's laboratory experiment, will be covered in that lecture.

On **Wednesdays** we will first take a brief (<10 min) quiz, covering the reading material from the Molecular Biology Laboratory Manual assigned on the previous Monday. This quiz is meant to ensure that you have read & familiarized & prepared yourself for the hands-on experience on that day; it is also meant to give us an opportunity to identify and clarify any confusion ahead of time. We will carry out the experiments as outlined in the manual, but there *will be changes* that will have to be incorporated along the way. There will be many, many days when the lab does *not* get done by 4:30pm or even 5:30pm, but usually there will be enough time for a break and a snack.

On **Thursdays**, in addition to the designated topic, we will discuss the results and analyze the data obtained on that previous Wednesday. On some Tuesdays or Thursdays we may need to move from the lecture hall (Jones Annex 101) to the lab (Jones Annex 230). You will work in groups of three. If you have a preference for a lab partner, let us know ASAP. But remain open minded – accommodation of your choice may not be possible. Pay attention to the details but look at the big picture of what questions you are trying to answer and what data you'll need to do so. Be an active ingredient in this learning process. When something is not clear – ask for a clarification. This will help us help you.

**You are required to attend all lectures and all labs.** If you miss a lab without a formal justification, you will be expelled from the course when this happens for the second time.

Along the way: remember to have fun experimenting!

## Lectures and Reading Materials:

**Lectures:** This course is primarily designed to make your laboratory-experience a great learning opportunity. As such, it varies from year to year; this is in part because you, the students, come in with differing degrees of prior knowledge. It is far from a canned course – while some of you may find this frustrating, please accept and embrace the type of learning that such flexibility affords. You are required to attend **all** the lectures and **all** the labs and will be held responsible for **all** the material that I cover at **any** time.

**Molecular Biology Laboratory Manual** that was used previously for this course undergoes a minor reconstruction every year. You will **absolutely** need the Manual **every** Wednesday. We will follow it closely, but may need to make adjustments to accommodate for our specific situation & progress. Throughout the semester, you will be receiving important handouts, be sure to keep them all inserted into your Manual. Again, be patient; this is what happens in real biology research and is a part of your intended learning.

**Textbooks:** All in all, there really is **no ONE official** textbook. I will tell you to read some chapters from the various text-books (see below). Most importantly, you are responsible for **all** of the material covered in **all** of our lectures and **all** of our discussions in the lab. Pay close attention & take notes during the lectures. **A word of caution:** We'll be moving fast and sometimes unpredictably – such is experimental biology and there simply is no way around that. To ease the pain, we'll make a copy of any formally presented lecture notes and keep them in the lab – you may take cell phone pics, make photocopies or just study them at your convenience. Mostly, it is up to you – stay with it!

**Instant Notes in Molecular Biology** by Turner et al. is required and should be available for purchase at the NMTech Bookstore or online. You will be assigned to read only select chapters from that paperback, but it is a great long-term reference. I recommend that you refer to The Notes often – it clarifies the concepts & issues in Molecular Biology with ease and simplicity – makes learning really painless and enjoyable.

**Cell and Molecular Biology** by Gerald Karp is *not* required, but it is highly recommended. During the semester, we will be discussing topics covered beautifully in Chapters 10-12 (Gene and the Genome, Flow of Information, Control of Gene Expression). We will put this textbook on Closed Reserve in the Library (Under Bio 331 & 333); if you need to borrow the book over the weekend, speak to us.

**Quizzes, hand-outs, a growing glossary etc.** will be kept in ONE three ring binder in the laboratory (Jones Annex 230). This is to make your life easier. However, remember that everyone else in the lab also depends on it, so leave it where others can find it readily.

**Music in the Lab:** We like to have music on while doing the experiments. Let us know if that bothers you, or if you'd rather listen to something else at any time. All in all, your suggestions (and the music on iPads, iPods, phones or CDs) are welcome!

**Attendance:**

Attendance is **MANDATORY** for **all** classes and **all** labs. You may be excused from a lab in the event of an emergency with approval from the Dean of Students and/NMT nurse or your doctor. **Missing more than one laboratory exercise without such a formalized excuse may result in a failing grade for the course.** The intent is not to be punitive. Rather, the experiments are built on top of the previous week's results and there just is not enough time to repeat & catch up on the missed products & data.

**Grades:**

- 1) Lecture material – 3 credit grade: Dr. Snezna Rogelj
  - a) Proteins Test 50%
  - b) Nucleic acids Test 50%
  
- 2) Laboratory work – 1 credit grade: Mr. Joseph Ulbrich
  - a) Lab notebooks 10%
  - b) Lab reports 60%
  - c) Weekly Quizzes 20%
  - d) Participation 10%

**Have fun.  
Be safe.  
Make friends.  
Learn stuff.**

## MolBio 333

### Lecture and Lab Schedule for Spring 2020

<b>Week</b>	<b>Tuesday</b>	<b>Wednesday</b>	<b>Thursday</b>
1/13	Molecular Biology?	Lab overview, Do's & Don'ts	Cellular Information Flow
1/20	Bio-building blocks	Lab1: Protein Isolation	Bacteria
1/27	Bacterial growth	Lab2: Column Chromatography	Protein Properties
2/03	Protein Purification	Lab 3: Column Fraction Assays	Protein Purification
2/10	Protein Purification	Lab 4: SDS-PAGE	Protein / Enzyme Analyses
2/17	Gene and Genome	Lecture: Gene expression	Review; <b>Reports due</b>
2/24	Molecular biology	Lab.5: DNA isolation and digestion	<b>Proteins: Exam Th 2/28</b>
3/2	Hybridization	Lab 6: Southern Transfer	Restriction Mapping
3/9	DNA technology	Lab 7: Nucleic acid hybridization	DNA sequencing
3/16	*****	<b>SPRING BREAK: NO CLASSES</b>	*****
3/23	Libraries and clones	Lab 8: DNA Library Construction	Plasmids
3/30	Cloning enzymes	Lab 9: Bacterial transformation	Transformation
4/6	Screening methods	Lab10: Plasmid DNA Isolation	PCR
4/13	Start Lab 11	Lab 11: Clone confirmation	Genomics/Proteomics
4/20	BioTech Ethics	<b>DNA Lab Reports Due 4/24</b>	iRNA / Prions/ Epigenetics
4/27	Review	TBD	<b>Nucleic Acids: Final TBD</b>