

COURSE NAME; NUMBER; SEMESTER; MEETING DAYS, TIMES, AND PLACE.

Methods and Applications in Molecular Biology

11:126:427 Fall 2025

Monday 10:20-11:40 a.m. **Foran 138A** (Lecture)

Section 1: Tues. 12:10-5:10 p.m. Foran 193 (Main Lab); Wed. 10:20-11:40 a.m. Foran 193 (Follow-up Lab)

Section 2: Wed. 12:10-5:10 p.m. Foran 193 (Main Lab); Thurs. 10:20-11:40 a.m. Foran 193 (Follow-up Lab)

CONTACT INFORMATION:

Instructor Section 1: Dr. Amanda Jetzt

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Course Preparator: Ralph Dapsis

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COURSE WEBSITE, RESOURCES AND MATERIALS:

Required Text and Readings: There is no required textbook for this course. “*Methods and Applications in Molecular Biology: A Laboratory Manual*” by W.S. Cohick, R. Di, A. Jetzt, M. Lawton and R. Dapsis will be available electronically through Canvas. *For tech help with Canvas, please visit <https://it.rutgers.edu/help-support>.* Reading to accompany lecture and laboratory material will be assigned through Canvas. We will also use short videos to supplement the lectures. Laboratory exercises are found in the manual. ***Be sure to read the exercises thoroughly before coming to lab.***

COURSE DESCRIPTION:

This course is designed to introduce you to general techniques used in molecular biology as well as their application in research and industry. Lecture slides will be made available on Canvas. Lectures will be used to orient you to the upcoming laboratory, teach the theory behind the techniques you will be using, and acquaint you with additional methodologies and their applications that we do not have time to cover in lab. In this course you will learn fundamentals such as cloning and DNA sequencing. We will use CRISPR gene editing technology to knock out the heat shock protein 70 (HSP70) gene in mammalian cells. With your lab partners, you will also conduct your own experiment to study the regulation of HSP70 in a mammalian cell line. You will determine how your experimental treatments regulate HSP70 mRNA and protein levels using quantitative RT-PCR and western immunoblotting, respectively. In the last laboratory session of the semester, each lab group will present their results to their classmates using a PowerPoint presentation.

COURSE SCHEDULE:

Week	Dates	Lecture	Main Lab	Follow up	Important notes
1	9/2-9/5	No lecture or labs			
2	9/8-9/12	Lecture 1: Class Intro/CRISPR	CRISPR 1; generate the guide RNA (gRNA)	Run gRNA on agarose gel	<i>Assign treatments for research project</i>
3	9/15-9/19	Lecture 2: QUIZ (lecture 1, lab 1) CRISPR/PowerPoint presentation guidelines	CRISPR 2; transfect MAC-T cells	<i>Work on group proposal PowerPoint</i>	gDNA collection 72 hr (Ralph)
4	9/22-9/26	Lecture 3: QUIZ (lecture 2, lab 2) CRISPR/primer design	CRISPR 3; determine editing efficiency	Verify editing results by agarose gel electrophoresis	Primer design assignment assigned
5	9/29-10/3	Lecture 4: QUIZ (lecture 3, lab 3) cloning	CRISPR 4; Clone edited HSP70 into TOPO vector; transformation of competent cells <i>present proposal PPT</i>	Pick colonies to inoculate cultures for minipreps	
6	10/6-10/10	Lecture 5: QUIZ (lecture 4, lab 4) DNA sequencing; plasmid preps	CRISPR 5; plasmid preps	Restriction digest to confirm insert; prepare plasmids to send for sequencing	Primer design assignment due
7	10/13-10/17	Lecture 6: QUIZ (lecture 5, lab 5) Next Gen sequencing	Experimental set-up 1		
8	10/20-10/24	Lecture 7: RNA analysis and RNA interference	RNA 1: isolation, quantitation, and assessment of RNA		Sequencing assignment assigned
9	10/27-10/31	Lecture 8: qRT-PCR	RNA 2: qRT-PCR	run qRT-PCR products on gel	
10	11/3-11/7	Lecture 9: TEST (lectures 6, 7; RNA 1 lab)	Experimental set-up 2	qRT-PCR results analysis	Sequencing assignment due

Week	Dates	Lecture	Main Lab	Follow up	Important notes
11	11/10-11/14	Lecture 10: protein quantitation	Protein 1: protein assay		
12	11/17-11/21	Lecture 11: SDS-PAGE and western blotting	Protein 2: run SDS-PAGE and begin western blot	Finish western blot	
13	11/24-11/26	Lecture 12: single cell RNA sequencing (sc-RNAseq)			Thanksgiving
14	12/1-12/5	Lecture 13: review			
15	12/8-12/10	Lecture 14: TEST (lectures 8, 10, 11, 12; RNA 2 lab, protein 1 and 2 labs)	Final PPT Presentations		

ATTENDANCE POLICY

Attendance at each main laboratory and follow-up session is mandatory, with the exception of illness or emergency. If you are unable to attend lab for such a reason, contact your section professor and TA as soon as possible and use the self-reporting absence form at <https://sims.rutgers.edu/ssra/>. For periods of absence longer than two days due to serious illness, confidential, or sensitive personal reasons, you should contact the office of the Dean of Students (<https://deanofstudents.rutgers.edu/>) to verify your extended absence from class.

Unexcused absences from the main lab will result in a zero for that week's notebook assignment. Unexcused absence from the follow-up lab will result in half credit for that week's notebook assignment. Three or more absences over the course of the semester without a valid excuse will result in an automatic failing grade for the course.

All sessions, including lecture and lab, will begin at the time posted on the course schedule. Lecture quizzes and tests will be given at the beginning of lecture. Tardiness to lecture will NOT result in extra given time on assessments. Tardiness to lab will result in a loss of 1 point from your total grade. Repeated lateness will result in an increasing number of points deducted with each additional instance of tardiness.

LABORATORY NOTEBOOK AND ASSIGNMENT LATENESS POLICY

Laboratory notebook entries are due 11:59 pm the night before the next main lab. The notebook assignment on Canvas will remain open another week after the due date and it may be submitted during that time for reduced credit (10% deduction per day). The notebook assignment will not be accepted after the assignment closes on Canvas.

The Primer Design Assignment and the Sequence Analysis Assignment will have due dates posted on Canvas. These assignments on Canvas will remain open another week after the due dates and they may be submitted during that time for reduced credit (10% deduction per day). The assignments will not be accepted after the assignments close on Canvas.

If you have technical difficulty submitting on Canvas then immediately email the notebook/assignment directly to the TA.

GRADING and ASSESSMENT:

Grading Component	Percent of Final Grade
Lab Notebook	20
Assignments (2)	10
Quizzes (5)	15
Tests (2)	30
Proposal PowerPoint Presentation	10
Final PowerPoint Presentation	15
Total	100

Grading Scheme

Letter grade	Range
A	100% to 90%
B+	<90% to 85%
B	<85% to 80%
C+	<80% to 75%
C	<75% to 70%
D	<70% to 65%
F	<65%

Final course grades will not be rounded up.

Laboratory Notebooks: All students are required to keep a detailed laboratory notebook. Digital notebook entries will be turned in each week on Canvas and graded according to the provided rubric. Instructions for how to keep your lab notebook are on Canvas.

Assignments: There will be two assignments that are designed to assist you with data analysis and highlight important concepts. Due dates will be indicated on Canvas.

Quizzes/Tests: Quizzes and tests will be completed in person at the start of lecture (Monday 10:20-11:40 a.m. [Foran 138A](#)). The lowest of the 5 quiz grades will be dropped.

Proposal and Final PowerPoint presentations for your group's experiment: A rubric describing the required components of the presentations will be provided.

UNDERGRADUATE MAJOR PROGRAM LEARNING GOALS:

1. Be able to describe the basic molecular concepts essential for understanding the field of biotechnology and the applications of biotechnology.
2. Demonstrate proficiency in using the tools of biotechnology in an applied laboratory setting.
3. Be able to find and read published scientific research in biotechnology and summarize and communicate that research effectively and critically.
4. Acquire knowledge of ethical aspects of biotechnology and be able to analyze alternate viewpoints.
5. Learn to work as a team in the laboratory setting or group presentations.

COURSE LEARNING GOALS:

1. To master basic laboratory techniques and the use of standard equipment used in molecular biology studies.
Assessment: quizzes, exam (PLG 2)
2. To understand the principals that underlie molecular biology techniques and their applications.
Assessment: assignments, quizzes, exam, and laboratory notebook (PLG 1)
3. To learn proper experimental design with appropriate controls.
Assessment: group research presentations
4. To learn how to formulate and test a scientific hypothesis, i.e., how to conduct hypothesis-driven research.
Assessment: group research presentations
5. To learn how to document, record, and interpret scientific data.
Assessment: laboratory notebook and group research presentations
6. To develop effective oral and written communication skills.
Assessment: short essay component of exam, group research presentations
7. To build skills required to work as a member of a team (PLG 5).
Assessment: group research presentation

ACCOMODATIONS FOR STUDENTS WITH DISABILITIES

Rutgers University welcomes students with disabilities in all educational programs of the University. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: <https://ods.rutgers.edu/students/documentation-guidelines>. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible.

Please follow the procedures outlined at <https://webapps.rutgers.edu/student-ods/forms/registration>. Full policies and procedures are at <https://ods.rutgers.edu/>

FAIR USE OF AI

AI tools (e.g., ChatGPT, Copilot) may be used to support learning in this course—for example, to clarify concepts and explore data analysis approaches. However, all submitted work must reflect your own understanding and critical thinking. Use AI ethically: do not submit AI-generated responses as your own on assignments and always cite any substantial AI assistance. **Misuse may be considered academic dishonesty.**

ACADEMIC INTEGRITY

The university's policy on Academic Integrity is available at <http://academicintegrity.rutgers.edu/academic-integrity-policy>. The principles of academic integrity require that a student:

- properly acknowledge and cite all use of the ideas, results, or words of others.
- properly acknowledge all contributors to a given piece of work.

- make sure that all work submitted as his or her own in a course or other academic activity is produced without the aid of impermissible materials or impermissible collaboration.
- obtain all data or results by ethical means and report them accurately without suppressing any results inconsistent with his or her interpretation or conclusions.
- treat all other students in an ethical manner, respecting their integrity and right to pursue their educational goals without interference. This requires that a student neither facilitate academic dishonesty by others nor obstruct their academic progress.
- uphold the canons of the ethical or professional code of the profession for which he or she is preparing.

Adherence to these principles is necessary in order to ensure that

- everyone is given proper credit for his or her ideas, words, results, and other scholarly accomplishments.
- all student work is fairly evaluated and no student has an inappropriate advantage over others.
- the academic and ethical development of all students is fostered.
- the reputation of the University for integrity in its teaching, research, and scholarship is maintained and enhanced.

Failure to uphold these principles of academic integrity threatens both the reputation of the University and the value of the degrees awarded to its students. Every member of the University community therefore bears a responsibility for ensuring that the highest standards of academic integrity are upheld.

SEBS DEI STATEMENT

It is our intention that students of all backgrounds will be well served by this course. We will work to create an environment of inclusion which respects and affirms the inherent dignity, value, and uniqueness of all individuals, communities and perspectives. We are lucky to have a diverse university. Diverse voices and life experiences enhance the learning process, and we welcome students to share their personal experiences. We will not tolerate disrespectful language or behavior against any individual or group. If you feel as though you have been disrespected or treated unfairly by the instructors or any other individual, please let us know. You may speak with the instructors in person, over email or report anonymously via the Office of Academic Programs. In addition, you may also report bias to the Rutgers Diversity and Inclusion initiative using this link: <http://inclusion.rutgers.edu/report-bias-incident/>.

STUDENT WELLNESS SERVICES

Counseling, Alcohol and Other Drug Assistance Program & Psychiatric Services (CAPS)

<http://health.rutgers.edu/medical-counseling-services/counseling/>

DoSomething button through Rutgers Dean of Students office

<http://health.rutgers.edu/do-something-to-help/>

Wellness Coaching through Rutgers HOPE

<http://health.rutgers.edu/education/hope/wellness-coaching/>

Self-Help Apps found on the Rutgers Student Health website:

<http://health.rutgers.edu/education/self-help/self-help-apps/>

Violence Prevention & Victim Assistance (VPVA)

(848) 932-1181 / 3 Bartlett Street, New Brunswick, NJ 08901 / www.vpva.rutgers.edu/

The Office for Violence Prevention and Victim Assistance provides confidential crisis intervention, counseling and advocacy for victims of sexual and relationship violence and stalking to students, staff and faculty.

NJ Hopeline (1.855.654.6735) <https://njhopeline.com/>

National Suicide Hotline (1.800.273.8255) <https://suicidepreventionlifeline.org/>

988 is now active across the United States. This new, shorter phone number will make it easier for people to remember and access mental health crisis services. (Please note, the previous 1-800-273-TALK (8255) number will continue to function indefinitely.) <https://988lifeline.org/>

COMPLIANCE AND TITLE IX

Rutgers faculty are committed to helping create a safe learning environment for all students and for the university as a whole. If you have experienced any form of gender or sex-based discrimination or harassment, including sexual assault, sexual harassment, relationship violence, or stalking, know that help and support are available. Rutgers has staff members trained to support survivors in navigating campus life, accessing health and counseling services, providing academic and housing accommodations, and more. The University strongly encourages all students to report any such incidents to the University. Please be aware that all Rutgers employees (other than those designated as confidential resources such as advocates, counselors, clergy and healthcare providers as listed in Appendix A to Policy 60.1.33) are required to report information about such discrimination and harassment to the University. This means that if you tell a faculty member about a situation of sexual harassment or sexual violence, relationship violence, stalking or other related misconduct, the faculty member must share that information with the University's Title IX Coordinator. If you wish to speak to a confidential employee who does not have this reporting responsibility, you can find a list of resources in Appendix A to University Policy 60.1.33. For more information about your options at Rutgers, please visit endsexualviolence.rutgers.edu.

BASIC NEEDS RESOURCES

Any student who has difficulty affording groceries or accessing sufficient food, or who lacks a safe and stable place to live, is urged to contact the Rutgers Student Food Pantry and/or the Dean of Students (details below). Furthermore, please notify the professor if you are comfortable doing so, as they may be able to provide additional support.

Rutgers Student Food Pantry

848-932-5500 / College Ave Student Center, Room 115 (126 College Ave) / <http://ruoffcampus.rutgers.edu/food/>
Check their website for hours and additional locations. The Rutgers Student Food Pantry is dedicated to helping all Rutgers students in need of food, no questions asked. Students will be provided with groceries that typically last about one week.

Dean of Students Office

848-932-2300 / 88 College Avenue, New Brunswick, NJ 08901 / <https://deanofstudents.rutgers.edu/>
Mon-Fri, 8:30am-5:00pm

The Dean of Students Office at Rutgers University-New Brunswick provides solutions, services, and support to help students navigate Rutgers University. The Office serves as a student support network by providing advocacy, problem resolution, and critical incident intervention for those times when additional assistance is needed. Please call to schedule an appointment to meet with a representative from the Dean's office.