

Syllabus

Course Director:

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Course Preparator:

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Section 1

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Section 2

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Ms. Yee Chen Low (TA)
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All Office Hours: By Appointment

Class Times: **Lecture:** Monday 2:15-3:35 Foran Hall 138A

	<u>Section 1</u>	<u>Section 2</u>	<u>Location</u>
Main Lab	Tues 12:35 – 5:15	Wed 12:35 – 5:15	Foran Hall 193
Follow-up Lab	Wed 9:15 – 10:35	Thurs 9:15 – 10:35	Foran Hall 193

Course Overview:

This course is designed to introduce you to general techniques used in molecular biology as well as their application in research and industry. Monday 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 don't have time to cover in lab. You will be assigned reading to help enrich this laboratory experience.

Over the course of the semester you will learn fundamentals such as cloning and DNA sequencing. With your lab partners, you will design and conduct your own experiment, including writing a research proposal, to study the regulation of heat shock protein 70 (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.

Required Text and Readings: There is no required text for this course. “*Methods and Applications in Molecular Biology: A Laboratory Manual*” by W.S. Cohick, R. Di, A. Jetzt, and R. Dapsis will be available electronically through Sakai. Reading to accompany lecture and laboratory material will be assigned through Sakai. Laboratory exercises are found in the manual. ***Please print out the entire lab manual and syllabus and put it in a three-ring binder before the first class meeting. Be sure to read the exercises thoroughly before coming to lab.***

Grading Component	Percent of Final Grade
Research Proposal	15
Midterm Exam	25
Final PowerPoint Presentation	20
Final Exam	25
Subjective Evaluation	10
Laboratory Notebook	5
Total 100	100

Exams will be based on both lecture material and laboratory work.

PowerPoint presentations will consist of an overall group grade (8 points) and two individual grades (6 points each), one given by the instructors and one given by your group peers.

Subjective evaluation will include assessment of (a) preparedness for laboratory, (b) general competence in the laboratory (*e.g.*, ability to follow instructions, care in doing experiments and interpretable results) and (c) timeliness to lab and attendance.

Laboratory Notebooks: All students are required to keep a detailed laboratory notebook. You need a spiral or bound “composition book” that is only used for this class – do not use a notebook that is used for other classes. Refer to the lab manual for instructions on how to prepare your lab notebook each week.

Course Schedule

<u>Date</u>	<u>Topic</u>	<u>Lecturer</u>
<u>Sept. 5-9</u>		
Monday Sept. 5	No Lecture (Labor Day)	
Main Lab	Course Orientation, research proposal, hypothesis testing/experimental design in LAB (assign treatments) <i>Start literature search for research proposal</i>	Cohick/Di
No Follow-up labs this week		
<u>Sept 12-16</u>		
Lecture	Primer Design and RT-PCR; Cloning in Plasmid Vectors/Plasmid Isolation	Di
Main Lab	Primer Design; Cloning Part 1: Generation of HSP70 cDNA by RT-PCR <i>Work on Research Proposal</i>	
Follow-up	Verify RT-PCR product by agarose gel electrophoresis	
<u>Sept 19-23</u>		
Lecture	DNA Sequencing and Analysis	Di
Main Lab	Cloning Part 2: Cloning of HSP70 RT-PCR product into TOPO vector and transformation of competent cells <i>Work on hypothesis and experimental design of research proposal</i>	
Follow-up Lab	Check plates for colonies <i>Continue working on research proposal</i> <i>Turn in hard copy of individual PDF paper to instructor by end of follow-up</i>	
<u>Sept 26- 30</u>		
Lecture	Next Generation Sequencing Dr. Debashish Bhattacharya, Rutgers University Dept. Ecology, Evolution and Natural Resources	Bhattacharya
Main Lab	Present overview of proposal and make suggested changes	
Follow-up	Pick colonies for next week's lab.	

Oct 3-7

Lecture	HSP70, Apoptosis and Working with Mammalian Cells	Cohick
Main Lab	Cloning Part 3: Plasmid Isolation and Insert Verification	
Follow-up	Run gels to verify cDNA inserts; set up DNA sequencing reactions <i>Turn in Research Proposal to Sakai by 10 PM</i>	

Oct 10-14

Lecture	RNA Analysis	Cohick
Main Lab	Experimental set-up and collection of samples	
Follow-up	Complete collection of samples if needed <i>Turn in Revised Research Proposal if needed</i>	

Oct 17-21

Lecture 6	qRT-PCR Analysis	Di
Main Lab	RNA analysis Part 1: Isolation, quantitation and assessment of RNA	
Follow-up	Data analysis	

Oct 24-28

Lecture	Mid-Term Exam	
Main Lab:	RNA Analysis Part 2: qRT-PCR, pour gel for follow-up lab	
Follow-up Lab	Run PCR products on gel	

Oct 31 = Nov 4

Lecture 7	Small Interfering RNA/CRISPR/Cas 9	Cohick/Jetzt
Main Lab	Repeat of experimental set-up for protein analysis	
Follow-up Lab	Analysis of qRT-PCR data	

Nov 7-11

Lecture 8 **Protein Gel Electrophoresis and Western Blot Analysis** **Cohick**

Main Lab Protein Analysis Part 1: Quantitation of protein in cell lysates

Follow-up Lab Data Analysis

Nov. 14-18

Lecture **New Approaches in Gene Modification** **Di**

Main Lab Protein Analysis Part 2: Protein gel electrophoresis:
run gel and begin immunoblotting for Hsp70;
Work on PowerPoint presentations

Follow-up Complete immunoblotting for Hsp70

Nov 21-25 **Thanksgiving No Lecture or Labs**

Nov 28 - Dec 2

Lecture **Transgenic Animals** **Cohick**

Main Lab Protein Analysis Part 3: Western Immunoblot for actin (housekeeping gene)
Work on PowerPoint presentations

Follow-up Lab: Develop actin immunoblot

Dec. 5-9

Lecture **SPECIAL TOPIC LECTURE**

Main Lab PowerPoint presentations

Follow-up None

Dec. 12-16

Lecture Review Session

~~Last Day of Classes~~ — Dec 14^m

Final Exam **TO BE HELD DURING Final Exam Period**

Learning Goals and Measures of Assessment

1. To master basic laboratory techniques and the use of standard equipment used in molecular biology studies.
Assessment: Exams and evaluation of weekly performance in the laboratory.
2. To understand the principals that underlie molecular biology techniques and their applications.
Assessment: Exams and laboratory notebook.
3. To learn proper experimental design with appropriate controls.
Assessment: Group research proposal and oral presentation.
4. To learn how to formulate and test a scientific hypothesis, i.e. how to conduct hypothesis-driven research.
Assessment: Group research proposal and oral presentation.
5. To learn how to document, record, and interpret scientific data.
Assessment: Laboratory notebook and oral presentation.
6. To develop effective oral and written communication skills.
Assessment: Short essay component of exams, group research proposal, oral presentation.
7. To build skills required to work as a member of a team.
Assessment: Group research proposal and oral presentation.
8. To develop critical thinking skills needed for 21st century science.
Assessment: Exams and group research proposal

Specific Measures of Assessment

1. Two exams (short essay, multiple choice, true/false)
2. Group Research Proposal: Students will work in a group to design an experimental approach that tests how a specific factor of their choosing regulates expression of a given gene in mammalian cells. The written proposal will state a specific hypothesis and objectives, give the rationale behind the hypothesis based on current scientific knowledge, and describe the general methods to be used to test the hypothesis. The draft proposal will be evaluated and feedback given by the instructors on how to improve the proposal for the final version. The hypothesis will be tested by experimentation in the laboratory over the course of the semester.
3. Oral Powerpoint Presentation of Group Project
4. Subjective Evaluation of Laboratory Performance
5. Laboratory Notebook (to be recorded in weekly)

ACCOMODATIONS FOR STUDENTS WITH DISABILITIES

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

ABSENCE POLICY

Students are expected to attend all classes; if you expect to miss one or two classes, please use the University absence reporting website <https://sims.rutgers.edu/ssra/> to indicate the date and reason for your absence. An email is automatically sent to me.

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.

Counseling, ADAP & Psychiatric Services (CAPS)

(848) 932-7884 / 17 Senior Street, New Brunswick, NJ 08901/ www.rhscaps.rutgers.edu/

CAPS is a University mental health support service that includes counseling, alcohol and other drug assistance, and psychiatric services staffed by a team of professional within Rutgers Health services to support students' efforts to succeed at Rutgers University. CAPS offers a variety of services that include: individual therapy, group therapy and workshops, crisis intervention, referral to specialists in the community and consultation and collaboration with campus partners.

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. To reach staff during office hours when the university is open or to reach an advocate after hours, call 848-932-1181.

Disability Services

(848) 445-6800 / Lucy Stone Hall, Suite A145, Livingston Campus, 54 Joyce Kilmer Avenue, Piscataway, NJ 08854 / <https://ods.rutgers.edu/>

Rutgers University welcomes students with disabilities into all of the University's educational programs. 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. To begin this process, please complete the Registration form on the ODS web site at:

<https://ods.rutgers.edu/students/registration-form>.

Scarlet Listeners

(732) 247-5555 / <http://www.scarletlisteners.com/>

Free and confidential peer counseling and referral hotline, providing a comforting and supportive safe space.