

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

Molecular Genetics Laboratory

11:126:482 Spring 2017

Lecture, laboratory and follow-up laboratory (recitation). All sections meet once a week for one 80-minute lecture period. Sections are comprised of one three-period laboratory (4 hr 40 min) combined with a follow-up laboratory (recitation period of 55 min) the next day.

Lecture: 138A Foran Hall

Laboratory: 193 Foran Hall

INSTRUCTORS: Dr. Donald Kobayashi, Dr. Faith Belanger, Dr. Nrupali Patel

COURSE DESCRIPTION:

In this course, students are introduced to both chemical and transposon mutagenesis as approaches to gene identification in bacteria. Students also investigate gene identification in bacteria by direct cloning for phenotype expression in heterologous hosts. Advantages and disadvantages of the various approaches are discussed.

This course also uses yeast as a model system to provide an introduction to laboratory methods used to investigate the genetics of eukaryotic organisms. The labs illustrate: 1) the use of genetic crosses to create individuals with particular genetic characteristics; 2) cloning a gene by complementation; and 3) deletion of a gene from the yeast chromosome.

LEARNING GOALS:

Upon completion of course requirements, students will be able to:

1. Use standard skills to perform basic methods in molecular genetics;
2. Apply concepts in molecular genetics for experimental design and data interpretation;
3. Use appropriate quantitative formulas for experimental procedures and analyses in molecular genetics experimentation; and
4. Effectively communicate experimental results in oral and written forms

ASSIGNMENTS/RESPONSIBILITIES & ASSESSMENT:

Course Grading Requirements

The following is a breakdown of grading for the course:

25%	Lab reports
10%	pop quizzes (4 to 6)
10%	oral lab presentation
50%	exams (2)
5%	Lab notebook/attendance/lab participation and performance
100%	Total

Learning Goal Assessment by evaluation of:

1. Performance on specific questions within quizzes and exams (Goals 1, 3 and 4)
2. Laboratory performance evaluation -- lab notebook, lab participation and lab performance (Goals 2 and 3)
3. Written laboratory reports (Goals 1, 3 and 4)
4. Oral presentation (Goals 1, 3 and 4)

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 laboratory classes. All excuses for absences will be evaluated for legitimacy on a case-by-case basis. **Unacceptable absences and tardiness to lab class will not be tolerated. Repeated offenders will be removed from the course.** Your weekly performance in the laboratory will also be evaluated.

COURSE SCHEDULE:

Week 1 (Jan 19)	No Class
Week 2 (Jan 25) Kobayashi	Laboratory 1 P. 6 Growth curves of <i>Serratia marcescens</i> Recitation lab: count colonies on plates for growth curve
Week 3 (Feb 1) Kobayashi	Laboratory 2 P. 9 Chemical mutagenesis: generation of kill curves Recitation lab: count colonies on plates for kill curves
Week 4 (Feb 8) Kobayashi	Laboratory 3 P. 14 Chemical mutagenesis (cont.): generation of NTG mutants for selection of <i>lipA</i> activity loss dilution plating of mutagenized cells Transposon mutagenesis: mating of donor and recipient cells and plating of matings Recitation lab: Plating of matings 3,4 and 5 of transposon mutagenesis
Week 5 (Feb 15) Kobayashi	Laboratory 4 P. 21 Chemical mutagenesis (cont.): Select bacterial colonies and replica-plate onto LB agar and LB agar supplemented with 1% Tween 80. Transposon mutagenesis (cont.): Selection of mutants and replica plating Recitation lab: Observation of mutants and restreaking of <i>lipA</i> mutants
Week 6 (Feb 22) Kobayashi	Laboratory 5 P. 23 Direct cloning Isolation of plasmid DNA from lipase expressing clones Recitation lab: none

- Week 7**
(Feb 29)
Kobayashi
- Laboratory 6 **P. 25**
Direct cloning (cont.):
Restriction analysis of isolated plasmid DNA from lab 5
- Recitation lab: none
- Week 8**
(Mar 7)
- MIDTERM EXAM: Monday, Mar 7**
Laboratory 7. (First week of yeast labs)
Reassortment of Yeast Mutant Genes P. 2-7
Mating Yeast
Cloning of a Plant Gene Using Yeast P. 18-24
Yeast transformation with *A. thaliana* cDNA library
- Week 9
(March 13)
- Spring break (no class)
- Week 10
(March 20)
- Laboratory 8
Reassortment of Yeast Mutant Genes
Evaluation of Matings **P. 8**
Cloning of a Plant Gene Using Yeast
Replica plating of yeast transformants. **P.25**
Deletion of a Gene from the Yeast Chromosome P. 33-44
Preparation of pRS403 plasmid and PCR of HIS3 gene
- Recitation Lab:
Reassortment of Yeast Mutant Genes
Sporulations of diploids **P. 9**
Cloning of a Plant Gene Using Yeast
Replica plating of yeast transformants – selection **P.26**
- Week 11
(March 27)
- Laboratory 9
Reassortment of Yeast Mutant Genes
Meiospore enrichment **P. 10**
Cloning of a Plant Gene Using Yeast
Observe plates. **P.26**
Deletion of a Gene from the Yeast Chromosome
Gel Analysis of PCR Reaction **P. 45**
- Recitations Lab:
Reassortment of Yeast Mutant Genes
Plate meiospores **P. 11**
- Week 12
(April 3)
- Laboratory 10
Reassortment of Yeast Mutant Genes
Plating of germinated spores onto YDP **P. 12**
Cloning of a Plant Gene Using Yeast
Selection of positive yeast colony. **P.27**
Deletion of a Gene from the Yeast Chromosome
Yeast transformation **P. 46**
- Recitation Lab: None

- Week 13 (April 10) Laboratory 11
- Reassortment of Yeast Mutant Genes**
Replica plating onto dropout media, **P. 13**
 - Cloning of a Plant Gene Using Yeast**
Rescue of a positive *A. thaliana* clone from yeast, **P. 28**
Transformation of electrocompetent *E. coli* cells, **P. 29**
 - Deletion of a Gene from the Yeast Chromosome**
Replica plating yeast colonies, **P. 46**
Recitation Lab:
Cloning of a Plant Gene Using Yeast
Identification of *E. coli* transformed with the positive clone, **P. 30**
- Week 14 (April 17) Laboratory 12
- Reassortment of Yeast Mutant Genes**
Record results of replica plating, **P. 14**
 - Cloning of a Plant Gene Using Yeast**
Mini-prep and restriction digest of positive *E. coli* clone, **P. 31-32**
 - Deletion of a Gene from the Yeast Chromosome**
Colony PCR of red and white yeast colonies, **P. 48-49**

 - Recitation Lab:
Deletion of a Gene from the Yeast Chromosome
Agarose gel analysis of the PCR products, **P. 50**
- Week 15 (April 24) Laboratory 13
- Laboratory presentations by students**

FINAL EXAM/PAPER DATE AND TIME

Online Final exam Schedule: <http://finalexams.rutgers.edu/>

TBD

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.

STUDENT WELLNESS SERVICES

Just In Case Web App <http://codu.co/cee05e>

Access helpful mental health information and resources for yourself or a friend in a mental health crisis on your smartphone or tablet and easily contact CAPS or RUPD.

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.