

QBIO 502: Molecular Biology for Quantitative Scientists

Instructors: Rory Spence, PhD, Remo Rohs, PhD

Office hours: TBA

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Time and Place

Mondays and Wednesdays, 2:00 to 3:50 PM, RRI 121

TEXT: Lewin's GENES XII

I will provide supplemental reading and visual information for you on Blackboard.

I. Learning outcomes

1. Gain a better understanding of the fundamentals of molecular biology for students who have had little to no previous exposure.
2. Develop an appreciation for appropriate experimental design in answering questions in molecular biology for students who have had little to no previous exposure.
3. Understand how "big data" is generated in the field of molecular biology for students who have had little to no previous exposure.
4. Improve ability to critically read primary scientific literature.
5. Improve skills for communicating ideas, both orally and in writing.

II. Course Description

Few fields in biology are developing more rapidly on more fronts and with more excitement than molecular biology. This class serves as an introduction to classical and modern molecular biology techniques for quantitative science students. We will cover the molecular biology methods with emphasis on those that are able generate "big data." We gladly welcome all graduate students who have any interest in the techniques and fundamentals of molecular biology. Classes will be a combination of lectures, group work questions, discussions/presentations of original research articles and exams. An emphasis is placed on developing skills related to independent exploration of the subject. Of course, respect and support for your classmates (and your professors) during discussions is expected. We will also read and analyze original research articles. While the book does an excellent job of giving us the basics of molecular biology, papers will provide us with cutting edge hypothesis and results. Class presentations and discussions based on these papers will improve your critical and creative thinking.

III. Grading

Assignment	Points	% of grade
Midterm exam	100	20
Final exam	100	20
Group work questions	125	25
Paper presentations	125	25
Active participation	50	10
TOTAL	500	100

IV. Description of Assessment of Assignments

There will be 2 exams for the class, one midterm and one final. Each exam will be worth 20% of your grade. The exams will **not** be memorization of facts, instead they will test your ability to think critically and creatively about topics we have covered in class. Exam dates are firm. The evaluation of your effort in the course will depend to a significant degree on active participation (10%) in discussions in addition to paper presentations and group questions. 'Active participation' means not only regular attendance at lectures, but demonstrated intellectual engagement in discussions (e.g. reading the assigned pages prior to class, asking informed questions, raising provocative issues, contributing interesting observations, and helping to answer questions posed by others). Paper presentations will be group assigned (25%). Each group of 2-3 students will be responsible for presenting the paper to the class on the assigned day. It is not expected that you fully understand the paper in its entirety, however, it is expected that you present the basic concepts/figures/questions of the paper so that our class discussions may be fruitful. We are always available to answer any questions you might have via email or office hours prior to assigned presentation. We will be sure to post the paper on blackboard quite a bit ahead of time. We will also present the first paper of the semester myself to establish a guideline for you. Group work questions (25%) will be due to us via email on the dates listed below. You can find the questions at the end of every chapter in the textbook. Groups will be assigned in class. We will post your grades for all assignments on blackboard throughout the semester as quickly as we can so you know your standing in the class. If you ever are unsure of your grade or have any questions please feel free to reach out to us in person or via email. We are willing to regrade all exams and group work questions. However, you must return the assignment to me within one week of when we return it to you with a written response of what you believe should be regraded. We reserve the right to regrade the entire assignment.

V. Schedule

Week 1: DNA, RNA, and Mutations

Textbook: Ch.1.1 - 1.1.4, Genes are DNA and Encode RNA's and Polypeptides

Paper: TBD

Group Questions: TBD

Week 2: Loci, Polypeptides, and Recombination

Textbook: Ch.1.6 -1.27, Genes are DNA and Encode RNA's and Polypeptides

Paper: TBD

Group Questions: TBD

Week 3: Nucleases and Cloning

Textbook: 2.1-2.4, Methods in Molecular Biology and Genetic Engineering

Paper: TBD

Group Questions: TBD

Week 4: Nucleases and Cloning

Textbook: 2.1-2.4, Methods in Molecular Biology and Genetic Engineering

Paper: TBD

Group Questions: TBD

Week 5: DNA Detection and Separation

Textbook: 2.5-2.6, Methods in Molecular Biology and Genetic Engineering

Paper: TBD

Group Questions: TBD

Week 6: PCR, RT-PCR

Textbook: 2.8, Methods in Molecular Biology and Genetic Engineering

Paper: TBD

Group Questions: TBD

Week 7: Midterm (Review and Exam)

Week 8: DNA Sequencing

Textbook: 2.7, Methods in Molecular Biology and Genetic Engineering

Paper: TBD

Group Questions: TBD

Week 9: DNA Sequencing

Textbook: 2.7, Methods in Molecular Biology and Genetic Engineering

Paper: TBD

Group Questions: TBD

Week 10: RNA Sequencing

Textbook: 2.7, Methods in Molecular Biology and Genetic Engineering

Paper: TBD

Group Questions: TBD

Week 11: Blotting and DNA Microarrays

Textbook: 2.9-2.10, Methods in Molecular Biology and Genetic Engineering

Paper: TBD

Group Questions: TBD

Week 12: Chromatin and Immunoprecipitation

Textbook: 2.11, Methods in Molecular Biology and Genetic Engineering

Paper: TBD

Group Questions: TBD

Week 13: Gene Knockouts, Transgenics and Genome Editing

Textbook: 2.12, Methods in Molecular Biology and Genetic Engineering

Paper: TBD

Group Questions: TBD

Week 14: Gene Knockouts, Transgenics and Genome Editing

Textbook: 2.12, Methods in Molecular Biology and Genetic Engineering

Paper: TBD

Group Questions: TBD

Week 15: Gene Knockouts, Transgenics and Genome Editing

Textbook: 2.12, Methods in Molecular Biology and Genetic Engineering

Paper: TBD

Group Questions: TBD

Week 16: Review and Final Exam

VI. Academic Conduct

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

VII. Support Systems

Student Counseling Services (SCS) – (213) 740-7711 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. engemannshc.usc.edu/counseling

National Suicide Prevention Lifeline – 1 (800) 273-8255

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. www.suicidepreventionlifeline.org

Relationship and Sexual Violence Prevention Services (RSVP) – (213) 740-4900 – 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender-based harm. engemannshc.usc.edu/rsvp

Sexual Assault Resource Center

For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: sarc.usc.edu

Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086

Works with faculty, staff, visitors, applicants, and students around issues of protected class. equity.usc.edu

Bias Assessment Response and Support

Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. studentaffairs.usc.edu/bias-assessment-response-support

The Office of Disability Services and Programs

Provides certification for students with disabilities and helps arrange relevant accommodations. dsp.usc.edu

Student Support and Advocacy – (213) 821-4710

Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. studentaffairs.usc.edu/ssa

Diversity at USC

Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. diversity.usc.edu

USC Emergency Information

Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible. emergency.usc.edu

USC Department of Public Safety – UPC: (213) 740-4321 – HSC: (323) 442-1000 – 24-hour emergency or to report a crime.

Provides overall safety to USC community. dps.usc.edu