BB 493/593 Biochemistry Laboratory Molecular Techniques 1
Fall 2019 (3 credits)

Class meetings

Laboratory sections

MW 14:00-16:50 ALS 0023 and ALS 2034
TR 8:30-11:20 ALS 0023
TR 12:00-14:50 ALS 0023

Lecture (common to all sections) T 16:00-16:50, Johnson 102

Instructors

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Teaching Assistants:

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Prerequisites: Completion of BB 451 or BB 492 or departmental approval.

Course Description

BB 493/593 is a laboratory course that focuses on nucleic acid biochemistry and making students familiar with and proficient in the use of molecular biology techniques to investigate the functional relationship between nucleic acid sequence, gene expression, and protein function. The course will emphasize the critical analysis of data and a clear understanding of the theory behind these techniques.

Learning Outcomes:

After completing this course, students will be able to:

1. Define specialized language of the biochemistry laboratory with an emphasis on molecular biology.

2. Describe concepts fundamental to biochemistry techniques, focusing on the functional relationship between nucleic acid sequence, gene expression, and gene function.
3. Record their experimental procedures and results in a notebook, in a manner that allows reproduction of the work by others with a similar level of training.
4. Safely operate biochemistry laboratory equipment, including micropipets, thermocyclers, centrifuges, gel electrophoresis chambers, power supplies, incubators, and autoclaves.
5. Understand and comply with rules of safety and waste disposal.
6. Demonstrate quantitative skills by accurately and reproducibly preparing reagents and solutions for experiments.
7. Design experiments, including the proper controls, to isolate, modify, and characterize nucleic acids and proteins.
8. Follow and adapt protocols and procedures described in manuals.
9. Organize and analyze experimental data. Interpret data presented as tables, graphs or figures.
10. Evaluate experimental findings in the context of scientific literature and communicate an understanding of core concepts, experimental details, and calculations used in each experiment in written tests, manuscripts, and oral presentations.

Additional Learning Outcomes for BB 593 graduate students

Graduate students gain additional experience in critical analysis and problem solving skills through a literature-based term proposal project. After completing the course graduate students will be able to:

1. Evaluate scientific contributions of recent publications in molecular biology and biochemistry.
2. Defend their analysis in written and oral communications.
3. Propose next-step approaches to advancing the area of research.

Molecular Biology Techniques Covered include

- Sterile technique and media preparation
- Plasmid isolation, restriction enzyme analysis and agarose gel electrophoresis
- Polymerase Chain Reaction (PCR)
- Molecular cloning
- DNA sequencing and analysis
- Molecular barcoding
- Bacterial transformation
- Expression of recombinant proteins, SDS-PAGE and immunoblot analysis
- Use of software and databases

Learning Resources: Laboratory manual chapters, additional reading materials, lecture slides, data sets, and homework assignments will be posted on the Canvas learning portal under the lecture CRN that is accessible to students in all laboratory sections. Students

are expected to make their own printed copy or have access to an electronic copy in lab. Please contact Dr. van Zee if this poses any challenges for you.

Evaluation of Student Performance
Your grade will be based on the distribution of points as follows:

BB493:
Experimental flow chart and pre-lab assignments 20%
Safety training 5%
Lab techniques assessment 5%
Lab notebook 20%
Calculations test 10%
Problem sets/homework assignments 20%
Exam 20%

BB593:
Pre-lab assignments 10%
Safety training 5%
Lab notebook 20%
Lab calculations test 10%
Problem sets/homework assignments 20%
Exam: 20%
Term paper 15%

Experimental Flow Chart and Pre-labs: Experimental flow charts and pre-lab assignments are designed to help students understand important background material, prepare for laboratory sessions, and be ready to work efficiently during the lab time. Thus, pre-labs assignments must be completed and submitted in advance, and late submissions will receive zero points. Be aware of the due dates—they are in advance of your scheduled lab day so that students have to prepare ahead of time. Assignments will be posted on Canvas. In addition to Canvas pre-lab submissions, in advance of each lab session, students are expected to read the appropriate sections of the lab manual and set up their lab notebook with headings and prepare in advance to work efficiently in lab.

In-lab work and lab techniques assessment: Each student will need to demonstrate mastery of core laboratory techniques to TAs at designated times throughout the term. More information on the format and timing of this assessment component will be provided in lecture and lab.

Students are expected to be punctual and prepared for class, and to conduct their experiments safely, efficiently and with consideration for others in the lab. Students will be expected to complete all assigned work, complete safety training modules, follow lab rules, demonstrate care in performing protocols, ensure proper disposal of waste, maintain a clean and tidy workspace and be responsible for the fate of bacterial plates, plasmid digests, and all other experimental materials through proper labeling and storage.

Arriving late for class, departing early and leaving completion of the lab up to your partner on a regular basis, failure to follow instructions or keep track of experimental materials, as well as leaving workspaces or instruments messy are grounds for losing points. Safety or disposal violations will also result in significant loss of points.

Lab notebooks: Students are required to maintain a lab notebook as outlined in the lab manual. Electronic notebooks will not be accepted. Refer to the lab manual chapters posted on Canvas for detailed instructions on how to keep a lab notebook. Entries in the lab notebook must be made in class in **non-erasable pen**. **Lab notebooks that are rewritten at the end of term to improve legibility will not be accepted and thus will receive a zero.**

Lab notebooks will be graded twice during the term. Using the rubric provided as a guide, each student will then grade their own notebook, noting what needs improvement and what was done well, including page numbers on where to find information. TAs will review the completed rubrics and provide feedback so students can improve future entries. At the end of the term, after students have had ample opportunity to perfect their notebook-keeping skills, the lab notebooks will be collected by the instructors/TAs who will assign a grade using the same rubric.

Calculations Test: There will be a test during one of the lab periods on calculations that are used in the lab.

Homework and Deliverables: Students will be assigned 5 homework/deliverables throughout the term. They must complete and turn in these assignments according to the indicated schedule. Deliverable/homework instructions will be posted at the Canvas site together with the due date for the assignment.

Exam: There will be one 50-minute exam held during the lecture time in Week 10. This Exam will cover material from the entire term and include assessment of experimental design.

General Class Policies:
All students are expected to be in the lab on time and prepared for the experiment that is to be conducted that session. If, for some unavoidable reason, you need to be absent for a class period, *it is your responsibility to speak to/email the instructor ahead of time and arrange to make up the work that you miss*. Please keep in mind that materials for a given experiment may or may not be available outside of class hours.

Assignments must be turned in by the due date and time indicated when the assignment is posted. *Pre-lab assignments will not be accepted late. Problem sets/homework assignments that are turned in late lose 10% of the total points for that assignment for each day (including week-ends) that they are late.*

University Policies

Regarding Students with Disabilities:
Statement Regarding Students with Disabilities: Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval please contact DAS immediately at 541-737-4098 or at http://ds.oregonstate.edu. DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations.

Student Conduct:
Students are expected to adhere to the OSU Student Conduct Regulations described at http://studentlife.oregonstate.edu/code

Reach Out for Success: University students encounter setbacks from time to time. If you encounter difficulties and need assistance, it is important to reach out. Consider discussing the situation with an instructor or academic advisor. Learn about resources that assist with wellness and academic success at oregonstate.edu/ReachOut. If you are in immediate crisis, please contact the Crisis Text Line by texting OREGON to 741-741 or call the National Suicide Prevention Lifeline at 1-800-273-TALK (8255)

BB593 Graduate Student Term Paper

Graduate students will select and write a critical analysis of a recent (within the last 2 years) primary research article that uses novel techniques and molecular approaches to study gene expression. These techniques must be described explicitly in this paper's methods section or supplementary materials available on-line. The selection of the article should be discussed with the instructors prior to week 5. Your term paper should be written in your own words and include a clear summary and critical analysis of the article, cite additional literature to support the analysis, and address the following questions:

- Does this paper significantly advance the field?
- How are these experimental methods novel? What are the limitations of this approach?
- How does this compare to other existing approaches?
- Does the experimental evidence provided in the paper support the authors' conclusions?
- What future directions will this technique open up/advance?

Guidelines:
The written report **must** be < 3 pages, single-spaced and typed in 12 point Times, Times New Roman, or in 11 point Arial font. A separate page may be used for literature citations. You are expected to use clear and coherent writing with correct use of grammar, punctuation, etc.

Deadlines:
Friday of Week 5 by 5 pm—approval of scientific paper

Friday of Week 10 by 5 pm- submission of report to BB main office. Late submissions will receive a 10% deduction in points for each day late.

Grading: 100 points total assigned as follows:
Meeting selection/approval deadline (10), overall grammar and style report (10), summary (20), use and citation of supporting literature (10), addressing each of the questions above (50)