BB 315/BI 315: Molecular Biology Laboratory

Spring 2018 3 credits

Students will participate in one Lecture/Discussion Forum session and two 3-hour lab sessions each week:

Lecture: Tuesday 4:00-4:50 pm
Lab Section: (24 students):
Tuesday and Thursday 9-11:50 am, ALS 0023
Tuesday and Thursday 1-3:50 pm, ALS 0023

Prerequisites: BB 314 [C-] or BB 314H [C-]

Instructor:
Dr. Kari van Zee, Biochemistry-Biophysics Department, ALS 2141
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Office hours: To be announced

TA: To be announced

Course Information:

Molecular Biology Laboratory, BB 315/BI 315 is an intermediate-level laboratory course designed for life science majors. By completing guided research projects focusing on fundamental molecular biology concepts and essential technologies, participating students will explore the functional relationship between DNA sequence and gene products and the transmission of genetic information from storage through expression to function. Through laboratory projects, lectures, and journal-club style discussion forums of selected primary research papers, the course will introduce students to the use of recombinant proteins and how they are used in advancing the field of molecular biology and biochemistry. Students will attend two three-hour lab sessions each week and one lecture/discussion forum.

This course is designed to expose students to how molecular biology research is performed, presented, and analyzed in the academic world. Projects will vary from year to year. An example project for 2017 developed in partnership with Dr. Michael Freitag and Steve Freidman in the Department of Biochemistry and Biophysics is included here.

Molecular characterization of kinetochore proteins in the filamentous fungi Neurospora crassa.
Using the model filamentous fungus Neurospora crassa and basic molecular biology
techniques (genomic DNA isolation, PCR amplification, cloning, mutagenesis, transformation, subcellular localization by fluorescence microscopy), students will isolate, mutate, and characterize several genes encoding kinetochore proteins that assemble at the centromere and are essential for nuclear division. Isolated genes and mutant variants will be transformed into \textit{N. crassa} strains to follow protein subcellular localization and function. During discussion forums, students will read and discuss papers highlighting the value of \textit{N. crassa} as a model organism for studying the blueprint of multicellularity, the development of antifungal drugs and fungicides, and the connection between the establishment of epigenetic marks and cancer. Students will then take their results and produce a manuscript that is written to the standards and format of a real research publication.

**Learning Outcomes**

Students will:

1. Recall and relate foundational molecular biology concepts and laboratory techniques to recent advances in basic research, medicine, and industrial applications.
2. Design experiments including the proper controls to analyze gene expression, construct, express, and characterize recombinant proteins.
3. Demonstrate quantitative skills by preparing accurately and reproducibly reagents and solutions for experiments.
4. Operate safely molecular biology laboratory equipment including micropipettes, thermocyclers, centrifuges, gel electrophoresis chambers, power supplies, incubators, and autoclaves.
5. Interpret and evaluate scientific papers related to the research project, analyzing both scientific methods as well as writing style.
6. Develop an awareness of the major issues at the forefront of the discipline and discuss ethical issues in the molecular life sciences.
7. Communicate and present their work to a science literate audience through a manuscript presenting their data from lab.

**Resources:** Experimental protocols, reading lists, and resources will be posted on Canvas.

**Readings:** will be available through Canvas and the OSU library.

**Evaluation of Student Performance** will be based on the following components:

Lab participation (10%); pre-lab assignments (15%) maintaining experimental records in a lab notebook (20%), completion of written lab reports in the format of a scientific paper including preparation of draft and revision for final submission (30%), discussion and presentation of papers during journal club forums (15%), solutions test (10%).

**Lab Participation:** Students are expected to attend every lab session, observe
safety policies while working in the lab, demonstrate proper care of equipment and reagents, and be responsible for moving their research project forward. Points will be deducted for students who fail to follow safety guidelines, leave messes behind for TAs or another group to clean-up, or who do not display proper lab etiquette.

**Pre-lab assignments:** Students are required to complete the pre-lab assignments on Canvas before attending the first lab of each week. These assignments will test your knowledge on the protocol that will be performed, as well as concepts that will be utilized in the lab.

**Notebook:** Each student will maintain a scientific laboratory notebook recording experimental design notes, procedures, calculations, data, and conclusions. Guidelines for keeping a scientific notebook will be provided in class. Notebooks will be submitted at the end of the term for grading.

**Solutions Test:** Students will be tested on ability to perform calculations for preparing solutions and experimental reactions.

**Manuscript draft and final copy**

  - Manuscript draft 1 (10%)
  - Final Manuscript (20%)

Each student will submit a draft and a final manuscript based on the experimental data they collect and analyze during the term. The reports will be in the format of a scientific manuscript. Students will be expected to identify and read scientific literature relevant to the project, including peer-reviewed articles and reviews from leading molecular biology journals. Students will integrate and cite these outside sources in their writing to provide background information for the project and compare and contrast their findings to the existing scientific literature.

Students will receive instructor feedback on drafts of components (Abstract, Methods, Introduction, Results and Discussion, Conclusions, and References) of both reports and are expected to incorporate this feedback as revisions in the final submission. Deadlines for submission of drafts and the revised final report will be announced in class at the beginning of the term and posted on Canvas. Late submissions will be penalized 20% for each day beyond the posted submission.

**Journal Club (15%):**

An important component of the “practice of everyday science” is reading scientific articles published in peer-reviewed journals. The goals of journal club in this course are to help you 1) develop skills in critical thinking, 2) practice scientific journal article-reading and learn how to extract information from a scientific paper, 3) make connections between the research presented in an article and its significance in the broader world, and 4) have fun learning about research advances in a variety of fields.
Depending on class size, teams of 3-4 students will be formed at the beginning of the term and assigned a date in which to lead a journal club style discussion forum. All students are expected to read all of the articles and resources and participate actively in the discussions. To prepare for the journal club discussions, each student will need to complete a journal club discussion guide ahead of the discussion and post this to Canvas before the discussion. Students must attend the journal club discussion session in order to receive points for the submitted journal club discussion guide.

The presenting team should read the article, 1-2 pertinent background papers, and resources well enough to walk/guide the group through highlights of the paper, explain the paper’s data and figures, and be well-versed in any necessary background knowledge and/or supplemental info.

**University Policies – A reminder:**

**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.

The University student conduct code can be found at: http://studentlife.oregonstate.edu/studentconduct/offenses-0

**Cheating or plagiarism by students is subject to the disciplinary process outlined in the Student Conduct Regulations.** Students are expected to be honest and ethical in their academic work. Academic dishonesty is defined as an intentional act of deception in one of the following areas:

- Cheating-use or attempted use of unauthorized materials, information or study aids
- Fabrication-falsification or invention of any information
- Assisting-helping another commit an act of academic dishonesty
- Tampering-altering or interfering with evaluation instruments and documents
- Plagiarism-representing the words or ideas of another person as one’s own

Behaviors disruptive to the learning environment will not be tolerated and will be referred to the Office of Student Conduct for disciplinary action.
Use of cellular phones is not permitted in the classroom or laboratory during lectures or exams.

“The goal of Oregon State University is to provide students with the knowledge, skill and wisdom they need to contribute to society. Our rules are formulated to guarantee each student’s freedom to learn and to protect the fundamental rights of others. People must treat each other with dignity and respect in order for scholarship to thrive. Behaviors that are disruptive to teaching and learning will not be tolerated, and will be referred to the Student Conduct Program for disciplinary action. Behaviors that create a hostile, offensive or intimidating environment based on gender, race, ethnicity, color, religion, age, disability, marital status or sexual orientation will be referred to the Affirmative Action Office.