MB311: Molecular Microbiology Laboratory – A Writing Intensive Course

Winter Term:
Tuesday & Thursday 14:00-16:50 pm; Nash 304

Instructor:
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Office Hours:
Monday & Wednesday 1:00-3:00 pm (or by appointment)

Teaching Assistants:
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Co-requisite:
MB310: Bacterial Molecular Genetics

Required Texts:

- Day, R. A., and Gastel, B. **(**2011). *How to Write and Publish a Scientific Paper.* **7**th ed. Santa Barbara, CA: Greenwood. ISBN 978-0-313-39197-2.

Suggested Texts:

- Online Manual (Uploaded to Canvas)
- Ream, W. Geller, B., Trempy, J. and Field, K. (2013). *Molecular Microbiology Laboratory*, 2nd ed. Waltham, MA: Academic Press. ISBN: 978-0-12-397044-2
- Bruslind, L., Burke, M. and Ream, W. (2001). *Scientific Writing for Microbiology Majors*. http://microbiology.science.oregonstate.edu/files/micro/WIC_WritingManual.pdf

Attendance:
Attendance is **mandatory**. Each unexcused absence reduces your final grade 5%. Three absences result in an “Incomplete”. Arrival more than 15 minutes late counts as half an absence. Requests for an excused absence will be considered on a case-by-case basis. Acceptable reasons include illness, a family emergency, or interviews for admission to graduate or professional schools. **Please do not attend class if you have influenza or another contagious illness.** To request an excused absence, contact the instructor **before** class. Students with an excused absence must complete missed assignments.

Assignments:
You will be evaluated based on multiple assignments specific to each of the experiments you will perform during this course (Tables 1 & 2, and Figure 1). Quizzes are designed to reinforce the methodological and analytical training for each experiment using hand-on problem sets and questions that evaluate your understanding of a topic. There are multiple writing assignments designed to encourage frequent writing by students in order to develop their scientific writing and critical thinking skills. These will include peer-reviews of draft assignments and subsequent revision of drafts, there are no explicit "participation points" given for completion of peer-reviews, but it is required of all students for the process to effectively work. These exercises are meant to help students improve their writing through receiving and responding to constructive criticism. You will also be expected to complete multiple formal writing assignments (i.e., three formal lab reports and the *Genome Announcements* manuscript). These will help train students how to write in a scientific style appropriate for the field of microbiology and to develop in-depth thoughts about specific science-related topics.

Table 1. MB311 assignments and available points

Assignments	Due Date	Due Time	Points
Exp. 1 Flow Chart	1/9/18	16:50	5
Exp. 1 Clinical Report	1/23/18	23:59	50
Exp. 1 Manuscript Draft*	3/1/18	13:59	10
Exp. 1 Quiz	3/1/18	16:50	50
Exp. 1 Manuscript Final	3/8/18	23:59	150
Exp. 2 Group Research Proposal Draft	1/16/18	13:59	10
Exp. 2 Group Research Proposal Final	1/18/18	23:59	50
Exp. 2 Flow Chart	1/23/18	14:00	5
Exp. 2 Lab Report Draft*	3/13/18	13:59	10
Exp. 2 Quiz	3/13/18	16:50	10
Exp. 2 Lab Report Final	3/20/18	23:59	200
Exp. 2 Group Presentations	3/15/18	16:50	0
Exp. 3 Flow Chart	2/1/18	14:00	5
Exp. 3 Lab Report Draft*	2/8/18	13:59	10
Exp. 3 Quiz	2/8/18	16:50	10
Exp. 3 Lab Report Final	2/15/18	23:59	200
Exp. 4 Flow Chart	2/13/18	14:00	5
Exp. 4 Lab Report Draft*	2/20/18	13:59	10
Exp. 4 Quiz	2/20/18	16:50	10
Exp. 4 Lab Report Final	2/27/18	23:59	200
Total			1000

Grading:

A = 94-100% *of top score*
A- = 90-93%
B+ = 87-89%
B = 83-86%
B- = 80-82%
C+ = 76-79%
C = 70-75%
C- = 65-69%
D = 50-65%
F = <50%

Figure 1. MB311 point breakdown

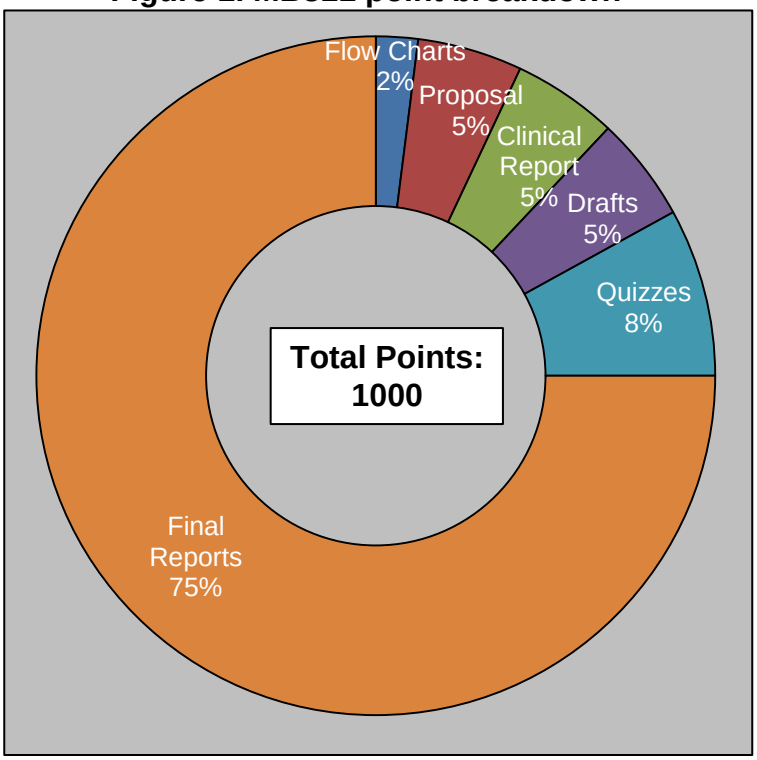

Table 2. MB311 Cumulative Points

Assignment Type	Cumulative Points
Flow Charts	20
Proposal	50
Clinical Report	50
Drafts	50
Quizzes	80
Final Reports	750
Total	**1000**

Note on Grading Assignments:

- Drafts will be graded on a 3-tier scale. **(+) = Full Credit; ()= Half Credit; (−) = No Credit**
- Final lab reports, the *Genome Announcements* manuscript, quizzes, and the clinical lab report will be graded using defined evaluation rubrics.
- Flow charts must be approved by TAs prior to the start of an experimental module for full credit. Ask questions when you do not understand the instructions or the principles involved.

Notes on Drafts and Peer Review:

- The peer-review process will be carried out during class in most cases, and comments must be uploaded to Canvas by the end of the following day when the draft is due (23:59).
- Drafts for peer review must be complete to earn full credit (10 points).

Notes on Assignment Submissions:

- Flow charts must be submitted and checked by a TA prior to the start of an experimental module.
- Quizzes must be completed and submitted by the end of the class in which they are administered (16:50).

- Drafts must be uploaded to Canvas prior to the start of class on their due date (13:59).
- Final versions of laboratory reports, the manuscript, the research proposal, and the clinical report must be uploaded to Canvas by the end of day (23:59) on the dates indicated on the schedule.
- **Do not expect credit for assignments submitted after the deadline.**

Safety rules:

- Wear a laboratory coat, safety glasses, and closed shoes as requirements. Do not wear shorts or sandals.
- Do not eat, drink, or chew gum in the laboratory.
- Disinfect bench surfaces and contaminated equipment before and after use.
- Assume all bacteria may cause disease.
- Place used cultures, supernatant solutions, and glassware in autoclave containers. Discard contaminated plates, pipette tips, and plastic tubes in autoclave bags.
- Wash your hands after you finish working.

WIC Course Expected learning outcomes:

- Develop and articulate content knowledge and critical thinking in the discipline through frequent practice of informal and formal writing.
- Demonstrate knowledge/understanding of audience expectations, genres, and conventions appropriate to communicating in the discipline.
- Demonstrate the ability to compose documents of at least 2000 accumulated words through multiple aspects of writing, including brainstorming, drafting, using sources appropriately, and revising comprehensively after receiving feedback on a draft.

Outcomes will be assessed based on a variety of formal and informal written assignments that develop scientific writing, editing, and reading skills. In completing some of these assignments, students review one another's writing and revise drafts. Students use sources outside the manual and distributed protocols to complete laboratory reports, to compose a manuscript in the style prescribed by the *Genome Announcements* journal, to summarize primary research journal articles, and to solve a thought exercises relevant to microbiology experiments.

The Writing Center:

Students are encouraged to take advantage of the OSU writing resources. The Writing Center offers free help with any writing task at any stage of the writing process and is open to all OSU students, as well as to staff, faculty, and members of the Corvallis community. Writing assistants can help with all aspects of the writing process from brainstorming and organization to questions of grammar and usage. Call (541) 737-5640 for an appointment. Students may also submit their works-in-progress to the Center's Online Writing Lab.

MB311 Learner Outcomes:
Students shall acquire and/or demonstrate:

1. Proficiency in molecular biology techniques commonly used in the life sciences.
2. Proficiency in common bioinformatics methods used to analyze microbial DNA sequences obtained from DNA sequencing technologies.
3. The ability to communicate scientific concepts, experimental results, and analytical arguments clearly and concisely, both orally and in writing.
4. An understanding of research methods that permits students to read articles from current journals, to extract pertinent information, and to judge the quality of the work described.
5. The ability to provide constructive peer review of other students' writing.

MB311 Learner Expectations:

1. Attend class on time, and stay the entire class period.
2. Read experimental procedures before they are discussed in class.
3. Bring to class your lab manual and other required texts and reading.
4. Participate in reading and writing activities, and complete all assignments on time.

Overall Course Goals:
This ten-week course teaches undergraduate students molecular biology techniques commonly used in the life sciences, introduces students to bioinformatics approaches used in analyzing DNA sequence data, and develops the students' scientific writing skills.

Course Content:
The course contains four modules that introduce procedures most life scientists will encounter during their careers. In the first unit, each student will isolate a bacterium in pure culture and characterize phenotypes of this isolate. Students will also extract genomic DNA from this isolate and sequence its 16S rDNA gene to determine its identity. The isolate will be further subjected to whole genome sequencing. All students will assemble and annotate this genome and report their findings in a manuscript written in the style of articles submitted to the journal *Genome Announcements*. In the second unit, students work as a group to write as experimental proposal to examine microbial communities within the environment. All students will participate in the design of the experiment and work as a group to carry out the experimental plan. As part of this work students will prepare community DNA from an environmental sample, and PCR amplify a fragment of the 16S genes for all the populations within the sample to determine the community composition of each environmental sample. Students use Illumina MiSeq DNA sequencing to sequence the 16S locus from these uncultured environmental microbial communities. In the third unit, students prepare plasmid DNA, construct a restriction map of the plasmid, and transform the DNA into *E. coli*. The plasmid contains a luciferase reporter gene, which introduces the concept of reporter genes through first-hand experience. In the fourth unit, students express, purify, and analyze an affinity-tagged protein using SDS-PAGE. The methods in this course are common techniques that introduce fundamental principles of molecular biology and microbial ecology, in addition to providing students with an introduction to bioinformatics programs used to analyze DNA sequence data.

This is also a writing-intensive course. The manual for this course (sections of which will be available through canvas) contains a general discussion of scientific writing and critical reading, and includes detailed instructions for preparation and peer review of laboratory reports. Writing exercises may involve referencing and research of primary research literature. By evaluating these papers, students reinforce their understanding of the technology or theories taught, and learn to use these citations as evidential support for their claims. Lectures based on the book "How to Write and Publish a Scientific Paper" by Robert Day and Barbara Gastel discuss each section of a scientific paper in detail. To build their writing skills and enhance their understanding of molecular microbiology, students compose and revise laboratory reports, edit their peers' reports, and study the writing manual by Day and Gastel.

Course Policies:

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. 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.

Class Schedule:

Class	*Experimental Module 1*	*Experimental Module 2*	*Experimental Module 3*	*Experimental Module 4*	*Supplemental Activities*	*Lecture*
1	Isolate Microscopy	-	-	-	-	Overview
2	Diagnostic Cultivation & Genomic DNA Extract.	-	-	-	Proposal Discussion	Genomic DNA Purification
3	Diagnostic Cultivation & Gel Electrophoresis	-	-	-	Proposal Writing	How to Peer-Review
4	Isolate 16S PCR	-	-	-	Proposal Review & Selection	PCR
5	-	Sample Collection & DNA Extraction	-	-	-	DNA Sequencing
6	PCR Purification & Gel Electrophoresis	Community 16S PCR	-	-	-	PCR Purification & DNA Gel Electrophoresis
7	-	PCR Purification & Gel Electrophoresis	-	-	-	-
8	-	-	Plasmid Extraction & Restriction Digestion	-	-	Plasmids & Reporter Genes
9	-	-	DNA Transformation	-	-	DNA Transformation
10	-	-	Check Transformation Plates	-	Quiz, Peer-Review	16S rDNA Genes & Phylogeny
11	-	-	-	Protein Purification	-	Protein Purification
12	-	-	-	Protein Gel Electrophoresis	-	Protein Gel Electrophoresis
13	16S Sequence Analysis	-	-	-	Quiz, Peer-Review	Sequence Analysis
14	Genome Assembly	-	-	-	-	Genome Assembly
15	Genome Annotation	-	-	-	-	DNA Sequence Annotation
16	-	-	-	-	Quiz, Peer-Review	How to Write a Scientific Paper
17	-	MOTHUR Analysis	-	-	-	Community Diversity Analysis I
18	-	PRIMER Analysis	-	-	-	Community Diversity Analysis II
19	-	-	-	-	Quiz, Peer-Review, Presentation Prep.	-
20	-	-	-	-	Group Presentations	-