

Syllabus
BIOL 410: Molecular Biology Laboratory
Fall 2025

Professors: Dr. Matthew R. Hemm
Professor, Dept. of Biological Sciences
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Student Hours: M: 1:00-2:00 pm, Tues 11:00-12:00 and by appointment

Lab: W: 1:00-2:50 am and F: 1:00-4:50 pm
Rm. 5125 Science Building (and computer lab Rm. 1220)

Text: None; materials provided by the professor throughout the semester

Course Objectives:

This course is designed as an introduction to the molecular biological research methodologies commonly employed by a wide variety of basic, applied, and diagnostic laboratories. **At the same time, this course is a hypothesis-driven, inquiry-based curriculum where students will be participating in an on-going research project studying the prevalence of small proteins (those containing 50 or fewer amino acids) in bacteria.** It is intended that students successfully finishing this course will have the factual background knowledge and the practical experience to participate productively in many academic and industrial research programs. In addition, students will have participated in all of the major steps in performing research, including forming a hypothesis, conducting an experiment to test the hypothesis, and evaluating the results of that experiment. Together, this course will serve as both an introduction to common molecular biological techniques and experimental methods, as well as an opportunity to conduct independent research in a supervised environment.

Specifically, by the end of the lab the student will be able to:

- 1) Use basic laboratory tools and equipment
- 2) Know sterile laboratory technique and how to propagate bacteria
- 3) Use bioinformatics to make predictions of gene expression
- 4) Amplify DNA by Polymerase Chain Reaction (PCR)
- 5) Use PCR to genotype cell samples
- 6) Use antibiotic resistance screening to characterize *E. coli* strains
- 7) Grow and harvest bacteria samples for subsequent analysis
- 8) Perform protein immunoblots (western blots) to identify proteins in a complex mixture
- 9) Present research results at a scientific meeting

Lab Organization:

Groups of two to three students will work together. Every member of the group is expected to participate in laboratory experiments and to have a detailed understanding of each technique. The nature of the techniques and their application to a specific research project will require some work outside of normally scheduled laboratory hours. During the scheduled laboratory period we will start each procedure and demonstrate each step. Some procedures will be completed during the scheduled laboratory period. **Some laboratories will require each group to complete procedures outside of class time, before the next laboratory session.** The entire group does not have to be present for each step of a procedure, but each member is responsible for the group's results. The laboratory is equipped with six work-stations. In addition, the room and its equipment is routinely used by other courses and students participating in independent research projects.

Laboratory Supplies and Notebooks:

You must supply your own lab notebook. A lab coat is not required, but you will be working with solutions that can stain clothes, so it is recommended if you do not want to risk getting marks on your clothes.

The lab notebook may be permanently bound, or it can also be a three-ring binder with loose-leaf paper. Most importantly, all notes, materials and results that are put in a lab book need to remain in the lab book. Permanently-bound lab notebooks are available at the Towson bookstore. To find them, ask customer service for chemistry/biology lab notebooks. All other laboratory equipment, including gloves, will be supplied.

Blackboard Online Communication:

Blackboard will be used extensively during this class. I will post the syllabus, lecture notes, assigned articles and grading keys on blackboard. Blackboard will also be used for other communications to the class. To enroll in blackboard follow the instructions at <https://bbweb.towson.edu/webapps/portal/frameset.jsp>.

Laboratory Safety:

Many of the protocols will involve the use of hazardous materials; therefore certain safety rules must be strictly followed:

- 1) To prevent exposure to hazardous materials, only closed toe shoes are permitted.
- 2) Disposable gloves must be worn at all times when working with ANY samples, reagents or laboratory equipment.
- 3) NO drinking or eating is permitted in the room at ANY time!
(Tables outside the lab are available for these latter activities.)

Attendance:

Laboratory attendance is MANDATORY. Remember that enzymes, bacteria, gels, etc. do not obey a class schedule, and you must schedule your time as efficiently as possible. Arrive on time and do not leave early. **There is virtually no opportunity to make up missed labs.** Although attendance is not part of your grade in this class, if a student misses four or more lab sessions they will not be able to pass the class and will be asked to withdraw.

Student Conduct:

To make our time together more valuable, we are going to establish a basic philosophy: **"Every student has the *right* to learn, as well as the *responsibility* not to deprive others of their right to learn."**

To ensure that we observe this philosophy, I will ask you to respect the following policies:

- 1) Be on time. Late arrival is very disruptive and violates our basic philosophy.
- 2) Do not schedule other engagements during class time. Leaving early is equally disruptive.
- 3) If you have trouble hearing or concentrating due to distractions around you, quietly and politely ask those responsible for the distraction to stop.
- 4) Please let me know if there is any problem that is preventing you from performing well in this class. I will do my best to improve the situation.

Lab Notebooks and Lab Quizzes:

The laboratory notebook is a complete record of what you have done in the laboratory. In a "real life" research situation, someone may have to reproduce your work several years after you have left the laboratory and the only record they will have to reference accurately will be what you wrote in your notebook.

Just like in a normal lab, you will be required throughout the semester to refer to your lab notebook for specific details on what you have done in the lab, results from your experiments and notes you have taken during class. This will most often be done in weekly quizzes that will be given during the first 5-10 minutes of Friday classes. These quizzes will be open notes and will ask for specific details about past experiments or theory we have discussed in class.

Lab Reports:

You will be writing a formal Lab Report for all laboratory exercises in the class. However, many experiments will be conducted over multiple weeks, meaning that you will not have to write a Lab Report each week.

It is very important to keep good notes in lab, however, recording what you did in the lab each day and any thoughts about the results or future work. These are informal records of daily lab work that will then be used as reference for writing Lab Reports.

Grading:

Grades should be viewed not as a reward for effort, but as a general measure of comprehension, although significant effort may enhance your performance:

250 pts	Lab Reports
100 pts	Lab Quizzes
100 pts	Mid-term Exam I
50 pts	Journal Club and Other Supplementary Assignments
<u>100 pts</u>	<u>Final Poster</u>
600 pts.	Total for semester

Grades:	92-100%	A
	90-91.9%	A-
	86-89.9%	B+
	82-85.9%	B
	80-81.9%	B-
	76-79.9%	C+
	70-75.9%	C
	66-69.9%	D+
	60-65.9%	D
	less than 60%	F

Contesting a Grade:

If you believe something was graded incorrectly, you have **one week** after you receive the graded document to provide factual written rebuttal, explaining why you think you deserve credit for your answer. *Oral arguments will not be entertained because of time constraints.* Written comments **will not be accepted** on the day a graded item is returned to allow you time to collect your thoughts. You will not be penalized via a complete re-grading of the document, but I will require the original quiz or exam to be submitted with your rebuttal to ascertain the validity of your argument. All comments will be handled without prejudice.

Academic Dishonesty:

Academic integrity policy as it relates to grades for this course, consistent with TU Academic Integrity Policy available at <http://www.towson.edu/studentaffairs/policies/>. The relevant section for grade penalties reads:

The penalties that may be assessed by a faculty member for a course- related violation may include the following:

1. revision of the work in question and/or completion of alternative work, with or without a grade reduction;
2. reduced grade (including “F” or zero) for the assignment;
3. reduced grade (including “F”) for the entire course.

Diversity Statement

Towson University values diversity and fosters a climate that is grounded in respect and inclusion, enriches the educational experience of students, supports positive classroom and workplace environments, promotes excellence, and cultivates the intellectual and personal growth of the entire university community. Should you feel that you are experiencing a negative environment related to diversity issues or cultural sensitivity, we encourage you to contact the Department's Diversity Committee Chair, [Dr. Brian Masters bmasters@towson.edu]. For more information go to <http://www.towson.edu/fcsm/diversity/>

Americans with Disabilities Act

This course is in compliance with Towson University policies for students with disabilities. Students with disabilities are encouraged to register with Disability Support Services (DSS), 7720 York Road, Suite 232, 410-704-2638 (Voice) or 410-704-4423 (TDD). Students who suspect that they have a disability but do not have documentation are encouraged to contact DSS for advice on how to obtain appropriate evaluation. A memo from DSS authorizing your accommodation is needed before any accommodation can be made.

In Case of Emergency:

In the event of a University-wide emergency, including the impact of the H1N1 flu pandemic, course requirements, classes, deadlines and grading schemes are subject to changes that may include alternative delivery methods, alternative methods of interaction with the instructor, class materials, and/or classmates, a revised attendance policy, and a revised semester calendar and/or grading scheme. In the case of a University-wide emergency, please refer to the Blackboard site for this class for information about specific changes in the course.

For more general information about any emergency situation, please refer to: Towson University's website (www.towson.edu), contact Towson by phone (410-704-2000), or sign up for the TU Text Alert System (<http://www.towson.edu/adminfinance/facilities/police/campusemergency/>)

Copyright:

Our lectures and course materials, including, but not limited to power point presentations, tests, outlines, and similar materials, are protected by copyright. We are the exclusive owner of copyright in those materials we create. You may take notes and make copies of course materials for your own use; however, you may not, nor may you allow others to, reproduce or distribute lecture notes and course materials publicly online whether or not a fee is charged without our express written consent. Similarly, you own copyright in your original papers and exam essays. If we are interested in posting your answers or papers on the course web site, we will ask for your written permission.

Future Scientific Publications:

One of the unique features of the curriculum for this class is the possibility that students' work could be included in a publication describing new small proteins discovered in *E. coli*. The decision to include specific students as authors of the publication will be made by the professor and will be based both on the quality of the students' work and the results of their experiments. At the end of the semester students interested in being included as an

Lab Schedule*:

Weeks	Dates	Topic	Activity
1-3	Aug. 27, 29 Sept. 3, 5 Sept. 10, 12	Lab Introduction and Bioinformatics	Module 1: Introduction to Research Project and review of basic laboratory technique Module 2: Evaluating Small Proteins for Evidence of Protease Degradation
4-5	Sept. 17, 19 Sept. 24, 26	PCR and Primer Design	Module 3: Confirming the Genotype of <i>E. coli</i> Strains Prior to Transductions
6-7	Oct. 1, 3 Oct. 8, 10	Cell Transduction	Module 4: Moving Protease Deletion Cassettes into SPA-tagged Strains by P1 Transduction
7	Oct. 22, 24	Mid-term Exam	Mid-term Exam
8	Oct. 29, Oct. 31	PCR Screening of Transformed Cells	Module 3: Confirming Genotypes of Transduced Cells
9	Nov. 5, 7	Culture Growth and Cell Harvesting	Module 4: Grow Strains and Harvest Cells for Western Blot
10-11	Nov. 12, 14	Western Blots	Module 5: Prepare Samples, Run Gels and Transfer to Membranes
11	Nov. 26, 28	Thanksgiving Break	Thanksgiving Break
12-13	Dec. 3, 5	Poster Presentation	Prepare and present posters
14	TBA	Poster Presentation	Biology Dept Fall Poster Symposium

***Schedule subject to change.**