

**Biology 410: Molecular Biology Laboratory**  
**Spring 2021 Sections 001 and 002**

**Instructor: Dr. Cheryl Warren**

Email: cwarren@towson.edu

Office Hours: Online: Mondays by appointment, After class Tuesdays and Wednesdays

**Teaching Assistant: Jason Wong**

Email: jwong6@students.towson.edu

Office Hours: TBD

**Course times:** This is an online laboratory course with a possible in-person component to be decided after the first two weeks. Content will be delivered online (synchronously and asynchronously). Attendance is required for all synchronous meetings. Synchronous meetings will be announced in Bb and Zoom meeting links will be posted.

**Section 001:**

Tuesday 9:30-1:20; Thursday 9:30 – 11:20

**Section 002:**

Wednesday 10:00 – 1:50; Friday 10:00 – 11:50

**Important dates:**

First day of classes	Tuesday Jan 26 or Wednesday Jan 27
Change of schedule	Jan 25 - Feb 2
Last day to withdraw (W on transcript, not calculated in GPA):	Monday Apr 5
Last day of classes	Tuesday May 11
Midterm Section 001	Thursday Mar.11
Midterm Section 002	Friday Mar 12
Final Exam Section 001	Thursday May 13 12:30-2:30pm
Final Exam Section 002	Wednesday May 12 10:15-12:15pm

**Prerequisite:** This course is intended to follow BIOL 309 (Genetics) with a grade of C or better.

**Course Objectives:** This course is designed as an introduction to molecular biological research methodologies commonly employed by a wide variety of basic, applied, and diagnostic laboratories. This course is also a hypothesis-driven, inquiry-based curriculum where students will be participating in an ongoing research project studying the function of small proteins (those containing 50 or fewer amino acids) in bacteria. It is intended that students successfully finishing this course will have gained the technical background knowledge and the practical experience to be productive in both academic and industrial research programs. In addition, students will have participated in all of the major steps in performing original research, including: forming a hypothesis, designing and conducting experiments to test hypotheses, evaluating the results of experiments, and communicating the results of experiments. Collectively, this course will serve as an introduction to common molecular biological techniques and experimental methods, as well as an opportunity to conduct semi-independent research in a supervised environment.

Specifically, by the end of the lab, the student will be knowledgeable about

- 1) How to use basic molecular biology laboratory tools and equipment
- 2) How to propagate bacteria
- 3) How to set up and evaluate restriction digestion of DNA
- 4) How to isolate plasmid DNA and spectrophotometrically evaluate DNA purity
- 5) Subclone a DNA insert into a plasmid vector
- 6) Transform bacteria with recombinant DNA
- 7) Perform protein immunoblots to identify proteins in a complex mixture
- 8) Sequence DNA and analyze sequencing results
- 9) Amplify DNA by Polymerase Chain Reaction (PCR)

**Text:** There is no required text for this course. Unless otherwise noted, materials for this course will be provided by the instructor.

**Laboratory Supplies and Notebooks:**

Students may be asked to keep a digital laboratory notebook using One Note Class Notebook. It is also recommended that students keep a separate notebook (or electronic notes) specifically for this course.

**Computer access:** This course has an associated website on Blackboard, which is **essential** to this course as this course is offered in an online remote format. You will need to use Blackboard frequently to access lecture and laboratory content and complete assignments, quizzes and exams. It is each student's responsibility to check the course website frequently to stay up-to-date with the course.

**Emails:** Towson University email accounts are the official means of communication between the students and the University (including the instructor). Your Towson supplied address should be used for all course communications. Information about course grades or graded materials cannot be sent via email. If you have a question related to grades, you should request an appointment to speak with the appropriate lecture/recitation instructor. I will do my best to respond to emails within 24 hours during the week and 48 hours on the weekend.

**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 professors and will be based both on the quality of the students' work and the results of their experiments.* This publication may take several years to develop, so any students interested will be asked to provide contact information so they can be reached in the future post-graduation.

**Lab Organization:** Students will primarily work independently during this online course, but will occasionally be asked to work in pairs or small groups, as would be more common in an actual laboratory course.

**Laboratory Safety (in person):** Many of the protocols will involve the use of hazardous materials. Therefore certain safety rules must be strictly followed. Although students may not be in the lab themselves, understanding lab safety is an important part of learning how to do research.

1. Only closed toe shoes are permitted in the laboratory.
2. Midriffs and lower backs must be covered.
3. Tying long hair back is strongly recommended.
4. Disposable gloves must be worn at all times.
5. NO drinking or eating is permitted in the room at ANY time! (Tables outside the lab are available for this.)
6. No make-up or lotion application in lab.

7. Any solutions you make must be labeled with contents, date made, course number/section, and your initials.
8. Always clean up after yourself.

**Other Supplies:** Some of the procedures are messy and may stain clothes, so you may wish to have old clothes or a lab coat. Lab coats can be found online. Students might also wish to have lab safety glasses or goggles for some activities, but these are not required. All other laboratory equipment, including gloves, will be supplied for students.

### **Course Expectations & Descriptions of Graded Assignments**

**Quizzes:** In order to encourage you to keep up with the course materials, there will be quizzes given frequently during the course. They will be given through Blackboard at least once a week, and may or may not be announced in advance. The lowest grade will be dropped at the end of the session. Unexcused missed quizzes cannot be made up and will be scored as a zero. A student's first missed quiz will be counted as the dropped quiz, regardless of whether the quiz was missed for an excused reason.

**Assignments:** Traditionally, this course has a six hour per week in-person component. Thus, you are expected to spend at least six hours per week working on this course. Some of this time will be spent weekly in synchronous lecture or laboratory sessions led by me or our TA/ULAs. Other asynchronous assignments may include bioinformatics work, internet videos, lab simulations, discussion boards, lab notebook assignments, original research articles and traditional worksheets. Assignments must be submitted as Word documents (.doc or .docx) – pages documents will not be accepted as the Blackboard viewer is not compatible with pages documents. Assignments will usually be due at the end of the day (11:59pm) in order to accommodate different study styles and work schedules; however it is highly recommended that you do not leave any assignment until the last minute.

**Midterm Exam:** This exam will primarily cover content from the first half of the course. This exam will be given synchronously online. If you miss the midterm exam for a documented reason, your final exam grade will count for both the final exam and your midterm (ie, you earn 87% on the final, then you will have 87% on your excused midterm). Forgetting to take the exam is not a documented excuse.

**Final Exam:** A graded final exam will be given synchronously online during the final exam period. The final exam schedule is established by the university. For section 001, the exam will be given during the T/TH 11:00 am slot; for section 002, the exam will be given during the MWF 11:00 am slot. The dates and times are on the first page of the syllabus and will be posted in BB in the course schedule. This exam will primarily cover content from the second half of the course, but may also include content from the first half, as the course is based on one research project.

#### **Point Estimates: (this is subject to modification as course progresses)**

150 points	Quizzes (at least 1 per week – lowest quiz dropped)
100 points	Midterm Exam
100 points	Final Exam
100 points	Final poster presentation & poster related assignments
200 points	Online assignments (bioinformatics, primer design, sequencing, discussion boards, etc.)
<b>650 points</b>	<b>Total</b>

#### **Grading scale:**

A	92 - 100%	C+	78 - 79.9%
A-	90 - 91.9%	C	70 - 77.9%
B+	88 - 89.9%	D+	68 - 69.9%
B	82 - 87.9%	D	60 - 67.9%
B-	80 - 81.9%	F	< 60%

### **Student Responsibilities & Course Policies**

1. **Participation in the course.** This program and course depend upon synchronous online meetings and you are expected to be “virtually” present for these just as if you were meeting in a regular classroom. You **MUST** have a working computer, microphone, webcam, and internet connection. You are expected to leave your webcam on during synchronous classes. (If there is an issue that requires you to turn it off more than momentarily, you must notify the instructor.) You are expected to check Blackboard regularly and to participate in all posted exercises. You are expected to keep track of due dates and to submit your coursework on time. Failure to participate may lower your performance on exams (and your grade in the course), as you are responsible for all material presented in the course, on Blackboard and from other provided resources.

*In the event of technical difficulty for the student:* Email your professor immediately. Do your best to resolve the issue before class.

*In the event the instructor has technical difficulty:* If the instructor disappears and doesn't return in 3 minutes, please wait an additional ten minutes before logging off. The instructor will be trying to reestablish the connection and/or may be trying to reach an alternate internet connection. If the professor does not return within those 10-15 minutes, see Blackboard for instructions, which will be posted as soon as possible. You are not expected to wait longer than 15 minutes.

In the event of a snowstorm, hurricane, or any widespread loss of power and/or internet connections which disrupts many participants, alternate materials will be posted on Blackboard. Make sure to check as soon as you are able to connect to the internet.

2. **Attendance:** Synchronous online attendance is REQUIRED. This course will be fast-paced, and opportunities to ask questions and clarify concepts will be available daily during the originally scheduled lab times. Additionally, scientific research is a collaborative activity, and synchronous class sessions give students the opportunity to interact more like they would in a real research lab. Two unexcused absences will lower your final course grade 5% (approximately half a letter grade), three unexcused absences will lower your final course grade 10%, four unexcused absences will lower your final course grade 15%, and five unexcused absences will result in a grade of F for the course. Missing more than 20% of a synchronous class session counts as a absence. Per the Towson Attendance/Absence Policy, absences and late arrivals are excused only for illness, injury, religious observance, University business, or “compelling verifiable circumstances beyond the control of the student”. For a death, please see Towson University’s Bereavement Policy. Documentation of excuse for absences or late arrivals must be provided within three days of an absence, if not before the absence occurs; absences and late arrivals are excused at the sole discretion of the instructor, as is the assignment of any makeup work. Synchronous sessions are recorded for attendance and review purposes.

3. **Class Behavior.** Free discussion, inquiry, and expression are encouraged in this class. Classroom/online behavior that interferes with either (a) the instructor's ability to conduct the class or (b) the ability of students to benefit from the instruction is not acceptable. Examples may include routinely entering a class meeting late or departing early; excessive background noise and/or refusal to mute; talking while others are speaking; or arguing in a way that is perceived as "crossing the civility line." Classroom/online behavior which is determined to be inappropriate and cannot be resolved by the student and the faculty member may be referred for administrative or disciplinary review and the student will be barred from further participation in class.

During synchronous online meetings you are expected to be present, attentive, and engage with the instructor. All students should have their cameras on for all sessions, and should communicate with the instructor when this is not possible. Obviously, allowances will be made (for both the instructor and the student) for quick bathroom breaks, answering the door, dealing with screaming children, vomiting pets, etc. I will sometimes be teaching from the lab, and sometimes from home (where 1, 2 or 3 of my children will also be doing online school), so I may ask for your patience and understanding, and I will grant you the same.

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.

4. **Late Assignment Policy:** Assignments are due on a specific date and time. All due dates are in Eastern time (the same time zone where TU is located). There is a decrease of 20% per day for each day late (for example, assignment is only worth 80% of the original points for 1 day late, 60% for two days late, etc.). In most cases, every effort should be made to complete an assignment even when it is late so that some points can be earned. If the answers to an assignment are posted or released after the due date (for example to an online Bb quiz), late work will not be accepted for that assignment after the release of the answers. Late Labster simulations will be accepted for 3 points instead of 5, but only for 1 week after the original due date. At that time, a grade of zero will be entered, even if the student still chooses to do the simulation as a learning exercise.
5. **Policy for Requesting a Change of Grade on a Submitted Assignment.** Submit a written statement explaining what error you believe exists in the grading of the item. Submit to your lecture or recitation instructor as appropriate. Only written requests will be honored.
6. **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 they 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 whether or not a fee is charged without my 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.
7. **Academic Integrity.** Any form of cheating (including on exams, quizzes, or plagiarism of assignments and term papers) will not be tolerated. Cheating and plagiarism are defined in the Student Academic Integrity Policy (<https://www.towson.edu/about/administration/policies/03-01-00-student-academic-integrity-policy.html>) and should be reviewed by each student. Please also see the italicized text explanations below. **The consequences of violating the Academic Integrity policy will result in the assignment of zero points for**

**the examination, quiz or assignment/paper in question. For any additional violations the student may receive a failing grade for the entire course at the discretion of the instructor.**

*Students are responsible members of the academic community. You are therefore obligated not to violate the basic standards of integrity. You are also expected to take an active role in encouraging other members of the community to respect those standards. Should you have reason to believe that a violation of academic integrity has occurred, you are encouraged to make the suspicion known to a member of the faculty or University administration.*

*Cheating means using, attempting to use, and/or disseminating unauthorized materials, information, notes, study aids, videos or other devices in any academic exercise. This includes unauthorized communication of information during an exercise or exam. Some examples include but are not limited to: Copying from another student's paper or receiving unauthorized assistance during any graded deliverable; using books, notes or other devices (e.g., calculators, phones, watches, laptops, or other internet enabled devices) when these are not authorized; procuring without authorization tests or examinations before the scheduled exercise (including discussion of the substance of examinations and tests when it is expected these will not be discussed); copying reports, laboratory work, computer programs or files and the like from other students; collaborating on laboratory or computer programs or files and the like with other students; collaborating on laboratory or computer work without authorization and without indication of the nature and extent of the collaboration; sending a substitute to take an examination, using solutions manuals, providing exam and assignment questions to student websites or using such a website to complete an assignment and/or exam (including free or pay websites that maintain textbook and/or instructor solutions). To clarify, copying or collaborating with other students or using external resources, including other people, on any type of assignments that are expressly designed to be completed individually is cheating.*

*Recorded sessions and any associated materials are designated ONLY for registered students in the class. Any sharing or dissemination of recordings beyond the student body registered in the course and section constitutes a violation of privacy and may also be categorized as cheating or defamation of character (depending on the circumstance), a possible copyright infringement.*

*Complicity in Academic Dishonesty means helping or attempting to help another commit an act of academic dishonesty. Some examples include but are not limited to: Allowing another to copy from one's paper during an examination or test; distributing test questions or substantive information about the material to be tested without authorization before the scheduled exercise; collaborating on academic work that is expressly designed to be completed individually; taking an examination or test for another student; signing a false name on an academic exercise; or sharing assignment or exam information before, during, or after the deliverable in written, electronic, video, or verbal form. (Note: Collaboration and sharing information are characteristics of academic communities. These become violations when they involve dishonesty. Students should seek clarification when in doubt).*

*Abuse of Academic Materials means destroying, stealing, or making inaccessible library or other resource materials. Some examples include: Stealing or destroying library or reference materials needed for common academic exercises; hiding resource materials so others may not use them; destroying computer programs or files needed in academic work; stealing or intentionally destroying another student's notes or laboratory experiments; receiving assistance in locating or using sources of information in an assignment where such assistance has been forbidden by the instructor.*

- 8. Loaner Laptop Availability and Student Support Funds.** The Office of Technology Services (OTS) has a limited number of laptops to loan to students whose personal computers are unable to run Blackboard, WebEx, Zoom or applications required by the curriculum. If you need to borrow a device, talk to your instructor; they can submit a request on your behalf. The Towson University Foundation has created the Student Emergency Fund, which has some funds available to assist students in purchasing hotspots, upgrading home internet, and other necessary technologies. For more information, see their [website](#).
- 9. 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 Accessibility & Disability Services (ADS), 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 ADS for advice on how to obtain appropriate evaluation. A memo from ADS authorizing your accommodation is needed before any accommodation can be made. Accommodations are not retroactive to previous exams or assignments. Please try to secure and provide your documentation during the first week of class.
- 10. 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 Assistant Chair, [Dr. Colleen Winters [cwinters@towson.edu](mailto:cwinters@towson.edu) ]. For more information go to <https://www.towson.edu/fcsm/departments/biology/diversity.html>
- 11. Course repeat policy:** Students may not repeat a course more than once without prior permission of the Academic Standards Committee.

**Major Campus Emergencies:** In the event of a major campus emergency (including inclement weather, or maybe a pandemic), course requirements, deadlines, and total course points are subject to change. The official source for information about campus closings or emergencies is [www.towson.edu](http://www.towson.edu). Information about changes in this course will be distributed via Blackboard or emails from the instructor ([cwarren@towson.edu](mailto:cwarren@towson.edu)).

#### **Additional Career Planning Resources**

The Career Center can help you with your major/career exploration and planning, developing your personal brand documents (resume, cover letter, LinkedIn, etc.) and job/internship resources and connections. You can make a virtual or phone appointment through Handshake at your convenience. For more information visit: <https://www.towson.edu/careercenter/>

## Lab Schedule\*

**Approximate Lab Schedule:** Due to the nature of the original research conducted in this course, as well as the COVID-19 pandemic, it is impossible to give a specific timeline. Our preliminary schedule is as follows:

Week	Beginning	Topic	Lab Protocol
1	Jan. 25	Course Intro & Project Overview	
2	Feb. 1	Bioinformatics and sORF selection	Lab safety, Micropipetting, Bacteriology
3	Feb. 8	Polymerase Chain Reaction	Practice PCR technique Lab Math, Dilution Problems
4	Feb. 15	Gel electrophoresis & DNA quantification	Perform PCR to amplify and tag sORF
5	Feb. 22	PCR Primer Design	Analyze and isolate PCR products
6	Mar. 1	Bacterial Transformation	Transform bacteria with PCR products
7	Mar. 8	<b>MIDTERM</b> Screening Transformed Cells	Screen positive colonies using antibiotic resistance
8	Mar. 15	<b>Spring Break</b>	<b>Spring Break</b>
9	Mar. 22	Screening Transformed Cells - 2	More transformation & screening PCR screening of transformants
10	Mar. 29	DNA Sequencing	Prep samples to sequence Analyze DNA Sequencing
11	Apr. 5	Intro to Western Blot Restriction Endonucleases	Growing cultures for western blot analysis
12	Apr. 12	Western Blot	E. coli whole cell lysates SDS PAGE
13	Apr. 19	Western Blot	Transfer to membranes Block, probe, wash, image
14	Apr. 26	Poster Prep	
15	May 3	Poster Presentations	
16	May 10	Poster Peer Review Exam Review	
<b>Final Exams</b>	<b>Section 001</b> <b>Section 002</b>	<b>Thurs. May 13 12:30-2:30</b> <b>Wed. May 12 10:15-12:15</b>	

\*this schedule is subject to change beginning on day 1 due to the inherent nature of science, instructor whimsy, global pandemics, extreme weather, etc.