BIOL101L- MOLECULAR BIOLOGY LABORATORY
Course Syllabus
UC Santa Cruz
Summer 2019

Instructor: Jimmy Shanks, Ph.D.
Room: Thimann 285
Office Hours: Mondays and Wednesdays 3:30pm-5:00pm
Email: jshanks@ucsc.edu
Please check the syllabus and Canvas for answers to common questions regarding course information, scheduling or resource access prior to emailing the instructor.

Lecture: Mondays and Wednesdays 2:00-3:15pm Earth and Marine B214

Teaching Assistant and Office Hours:
TA: Jeremy Kreher, Ph.D.
Office: Thimann 285
Office Hours: Tuesdays and Thursdays 5:30pm-6:30pm
Email: jkreher@ucsc.edu

Prep Lab Staff:
Suki Arnold and Kayla Higgs
222 Thimann Labs

Enrollment Co/Prerequisite: BIOL 101 or BIOC 100A

Course Format:

Lab Lecture: Mondays and Wednesdays 2:00 – 3:15 pm
Lecture is mandatory for all students.

Lab: One 4-hour lab section per week: 285 Thimann Labs on Mondays and Wednesdays either from 9am-1pm or 1:30pm-5:30pm

Course Goals:

1. Increase proficiency in basic laboratory skills, including solution making, sterile technique, safe handling of hazardous materials, as well as in the proper use of basic lab tools and equipment, including micropipettes, balances, and centrifuges.

2. Gain experience with fundamental molecular biology techniques, including PCR, gel electrophoresis, restriction digest, DNA cloning, Western blotting, affinity chromatography, and spectrophotometry. Understand the basic concepts underlying these techniques.
3. Become familiar with basic bioinformatics tools.
4. Learn and apply techniques for effective group work. Develop teamwork and leadership skills by 1) working in teams of two or more to conduct experiments and 2) coordinating and cooperating with other teams in the lab in the use of equipment and supplies.
5. Learn to keep a well-organized and maintained laboratory notebook.
6. Learn and use a proper format for scientific reports and improve technical writing skills.
7. Learn to organize and present data in an appropriate format.

Course Materials:

There is no textbook or reader/lab manual for this course that can be purchased ahead of time. The online course management system, Canvas, will be used, and all course materials (Power Point slides, lab protocols, handouts etc.) will be made available for download and print in Canvas.

Students are expected to know how to use and navigate Canvas, as well as check it and their email regularly.

Students are required to download and print the lab manual/protocol for each week prior to arriving in lab. No electronic devices are allowed in lab for viewing the lab manual/protocol (hard copy lab manual/protocol only). Students are encouraged to keep their lab protocols in a folder or small binder.

Students are expected to obtain a bound composition notebook for use as a laboratory notebook (see Lab Notebook Guidelines for more information).

Grading and Assessment:

Grades for BIOL101L will be based on pre-lab assignments, a lab notebook, a solutions and dilutions quiz and 2 papers (see below for weighted grade breakdown). Final course grades may be based on a modified curve, where typically, achievement of the class mean would be reflected in a C grade. The instructor takes many considerations into applying a curve, if deemed necessary, and will do so at their discretion and as they feel appropriate. Please familiarize yourselves with new campus and departmental policies on letter grades, particularly the C-grade, and how that may affect your major and graduation. In addition, familiarize yourselves with application requirements to graduate programs of interest, so you are aware of minimum grade requirements. Final grades will not be adjusted for any other reason than grading errors.
2 Lab Papers: 60%
- DNA Research Paper: 25% (due beginning of lab 7/16)
- Protein Research Paper: 35% (due beginning of lab 7/25)
Lab Notebook: 25% (due end of lab 7/18 and 7/25)
Pre-lab quizzes (On Canvas) 15%

Please note the Drop and Withdraw Deadlines for the quarter (https://registrar.ucsc.edu/calendar/academiccalendar.html). The assignment of an Incomplete grading option requires a student to be in passing standing, and a Medical withdrawal can only be pursued through your College (for more information see https://registrar.ucsc.edu/navigator/index.html). Both are reserved for extremely rare circumstances.

There is no extra credit and there are no alternative ways to earn points.

**Attendance and Participation**

Each unexcused absence from lab will result in a deduction of 10% of the total points for the course. As student who misses more than 2 labs, unexcused will not pass the course. To be excused, absences must be approved by the instructor (Dr. Shanks), and are limited to emergencies or extremely important circumstances. TAs cannot and will not excuse absences. To have an absence considered for approval as an excused absence, you must contact Dr. Shanks (NOT your TA) as soon as possible and/or at the time of occurrence. NO EXCEPTIONS.

Tardiness to lab will result in a loss of 1% of a student’s final grade each time you are late. Students who are more than 30 minutes late to lab will incur an unexcused absence and may not be allowed to participate in lab that day due to safety concerns.

Students are expected to be prepared for lab, follow all safety rules and lab rules, and behave respectfully and appropriately in the lab at all times. As such, inappropriate conduct in the lab will be brought to the attention of Dr. Shanks, and the student involved, immediately and may result in a loss of 1% of a student’s final grade for each occurrence and/or in a student being dismissed from lab.

**Academic Integrity**

Students are expected to be familiar with UCSC Undergraduate Academic Misconduct Policy (see https://ue.ucsc.edu/academic-misconduct.html). Academic misconduct includes but is not limited to cheating, fabrication, plagiarism, or facilitating academic dishonesty or as further specified in the Student Policies and Regulations Handbook (see https://deanofstudents.ucsc.edu/student-conduct/student-handbook/index.html, sections 102.01-102.016 and 105.15).
In the event of academic misconduct, a student(s) may face both academic sanctions imposed by the instructor of record and disciplinary sanctions imposed either by the provost of his or her college or the Academic Tribunal convened to hear the case.

Academic misconduct of any form will NOT be tolerated in this course. The instructor is responsible for determining the academic sanctions to be imposed in the event of misconduct and submitting an academic misconduct report to the college provost who is responsible for determining disciplinary sanctions. Academic sanctions may include reduced scores on assignment(s), a reduced grade in the course or failure of the course for all students involved.

**Specific to 101L:** All assignments you submit must be *entirely* your own work. This means you and your lab partner are not allowed to submit copies of the same graphs and tables even if you collected the same data together. Also, you are not allowed to collaborate with another student when actually writing your papers, unless explicitly allowed by the instructor. You may not use any other student’s paper as a template for your own. You may not fabricate data under any circumstances, and you may not use anyone else’s data. Any sharing of data or papers is allowed only with prior approval of the instructor. Sources of information used in your paper must be cited appropriately. Everything you turn in must be stated in your own words even if you cite the source. Changing just a few words or rearranging the words in a sentence from a book, journal article, or internet website is not saying it in your own words; it still constitutes plagiarism. Additionally, if you have taken this course before and are retaking it, you may not submit your own old work for credit. If you allow another student to copy your work or you help another student write his/her paper, you will also be violating the University’s academic integrity policy and can be subject to disciplinary action. These penalties will apply even if you say you did not understand the rules, *so be sure to ask Dr. Shanks if you have any questions about this policy.*

To assist in enforcing this policy, and to be check that you aren’t using papers from other students (including from previous quarters), papers you have previously submitted in another quarter, or from other sources on the web, all assignments are required to be submitted to Turnitin.com.

**Submission of papers to Turnitin.com:**

Turnitin.com submission deadline is the same as the hardcopy turn-in deadline. This means that students must submit their electronic file to Turnitin.com before arriving to class to turn in the hardcopy of their paper.

In addition, the Turnitin.com digital receipt, which is emailed to you upon successful submission, must be printed and stapled to the front of the student’s assignment, to be turned in with the hardcopy. Late penalties will be applied for neglecting to submit to Turnitin.com and/or not attaching the Turnitin.com receipt to one’s paper (see above).
The electronic file submitted to Turnitin.com must be in **PDF** format and identical in content and formatting to the one a student has submitted for grading, or a zero score will be logged for that assignment. Students will not receive credit for an assignment, or have the assignment returned to them until they have submitted the assignment to Turnitin.com.

**Late Submission of Papers or Lab Notebooks**

Unless otherwise indicated, papers and notebooks are due at the beginning of lab on the day of the student's registered lab section.

Students who choose to submit late work are responsible for making arrangements with their TA and Dr. Shanks to turn their work in outside of class time.

Reports or notebooks submitted late will have points deducted according to the following:

- Submitted the same day as due but after the time deadline (until 12:00 midnight that night): 5% deduction of total points possible for that assignment
- Submitted the day after due date or afterward: 10% deduction of total points possible for that assignment per day late (including weekends).

Failure to submit papers to Turnitin.com will be penalized by a loss of 5%/day. Failure to submit papers to Turnitin.com at all will result in a 0 on the assignment.

Exceptions to these point deductions will only be made by Dr. Shanks provided a valid excuse (see attendance policy for details).

**Disability Accommodations:**

UC Santa Cruz is committed to creating an academic environment that supports its diverse student body. If you are a student with a disability who requires accommodations to achieve equal access in this course, please submit your Accommodation Authorization Letter from the Disability Resource Center (DRC) to the instructor privately, during office hours or by appointment, within the first two weeks of the quarter. At that time, we can discuss ways to ensure your full participation in the course.

Students who receive accommodations that extend further than time extensions for assessments must make arrangements to meet with the instructor to discuss those accommodations.

Authorizations must be submitted prior to receiving any accommodations.
We encourage all students who may benefit from learning more about DRC services to contact DRC by phone at 831-459-2089 or by email at drc@ucsc.edu.

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<thead>
<tr>
<th>Lecture</th>
<th>Lab</th>
<th>Date</th>
<th>Lecture topics or Laboratory experiments/papers due</th>
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<tbody>
<tr>
<td>E&amp;MB214 Lecture 1</td>
<td>Thimann 285 Lab 1</td>
<td>Monday 6/24</td>
<td>Course syllabus, experimental overview, laboratory solutions, pipettes, accuracy vs. precision, and serial dilutions</td>
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<tr>
<td>E&amp;MB214 Lecture 2</td>
<td>Thimann 285 Lab 2</td>
<td>Tuesday 6/25</td>
<td>Introduction to Course, Enrollment Use of Micropipettors/Balances/Centrifuges Solution Making, Lab Safety</td>
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<tr>
<td>E&amp;MB214 Lecture 3</td>
<td>Thimann 285</td>
<td>Wednesday 6/26</td>
<td>Central dogma of biology, restriction endonucleases, molecular sub cloning, bacterial transformation, expression vectors, gel electrophoresis, and gel red</td>
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<tr>
<td>E&amp;MB214 Lecture 4</td>
<td>Thimann 285</td>
<td>Tuesday 7/2</td>
<td>Ligation of EGFP into expression vector Agarose gel electrophoresis of Ligation Transformation of Recombinant Plasmid into E. coli</td>
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<tr>
<td>E&amp;MB214 Lecture 5</td>
<td>Thimann 285</td>
<td>Thursday 6/27</td>
<td>Data discussion regarding ligation agarose gel, DNA fragment migration, plasmid isolation, glycerol stock prep, nano-drop spectrophotometry, restriction digests, ligation efficiency</td>
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<tr>
<td>E&amp;MB214 Lecture 6</td>
<td>Thimann 285</td>
<td>Wednesday 7/3</td>
<td>Miniprep (plasmid isolation) from Transformants Quantitation of isolated plasmid DNA Restriction Digest of Recombinant Plasmids</td>
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<tr>
<td>E&amp;MB214 Lecture 7</td>
<td>Thimann 285</td>
<td>Thursday 7/4</td>
<td>NO Lecture due to July 4th Holiday</td>
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<td>E&amp;MB214 Lecture 8</td>
<td>Thimann 285</td>
<td>Monday 7/8</td>
<td>PCR, data discussion, restriction digest experiment, discuss first written assignment</td>
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<tr>
<td>E&amp;MB214 Lecture 9</td>
<td>Thimann 285</td>
<td>Tuesday 7/9</td>
<td>Agarose Gel Electrophoresis of Restriction Digest PCR Screening of Transformants</td>
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<tr>
<td>E&amp;MB214 Lecture 10</td>
<td>Thimann 285</td>
<td>Wednesday 7/10</td>
<td>Data discussion regarding digestion gel, analyzing PCR products, data base analysis, working with your data, organizing paper citations, and Turnitin.com review</td>
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<td>Instructor</td>
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| Thimann 285| Thursday 7/11 | Agarose Gel Electrophoresis of PCR Products  
Inoculate cultures for Western Blot  
Bioinformatics Exercise  |
| E&MB214 Lecture 6 | Monday 7/15 | pET41a+ vector review, Lac operon, X-gal,  
GST-EGFP fusion protein, SDS PAGE gel,  
Western Blot discussion, Antibody detection  |
| Thimann 285 | Tuesday 7/16 | Protein Immunoblot (Western Blot) 1  
SDS/PAGE Electrophoresis & Transfer (blotting)  |
|            |            | **DNA RESEARCH PAPER DUE**  
**(Beginning of lab)**  |
| E&MB214 Lecture 7 | Wednesday 7/17 | Review Western Blot, Discuss Antibody detection, Horseradish peroxidase, Discuss preparing large scale *E. coli* culture for purification  |
| Thimann 285 | Thursday 7/18 | Protein Immunoblot (Western Blot) 2:  
Antibody Detection of EGFP  
Purification of EGFP-GST Fusion Protein by Affinity  
Chromatography 1: Preparation of Cell Lysate  |
|            |            | **NOTEBOOKS DUE**  
**(End of lab - Grading Labs 1-5)**  |
| E&MB214 Lecture 8 | Monday 7/22 | Discuss Western Blot results, Protein purification via affinity chromatography,  
Glutathione-S-Transferase, Bradford assay, discuss second written assignment  |
| Thimann 285 | Tuesday 7/23 | Purification of EGFP-GST Fusion Protein by Affinity  
Chromatography 2: Purification of GST-EGFP with  
Affinity Column  
Protein Quantification of EGFP Levels by Bradford Assay  |
| E&MB214 Discussion | Wednesday 7/24 | Data discussion, final thoughts  |
| Thimann 285 | Thursday 7/25 | **PROTEIN EXPRESSION REPORT and LAB NOTEBOOKS DUE** (Grading labs 6-8)  
Due by 5:30pm in Thimann 285  |