Advanced Molecular Biology Laboratory

BIOL 6020 2 Credit Hours
Online work: June 29 to July 20, 2015
Lab work: July 21-25, 2015
9:00 a.m. - 5:00 p.m. in WO1256

Instructor

Dr. Robert Steven
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Email: robert.steven2@utoledo.edu
Office Hours: By appointment
Website: www.utoledo.edu/nsm/bio/research/steven.html

Course Description

Students will gain a working knowledge of essential laboratory techniques used for research in molecular biology and the study of cell function. These techniques, including polymerase chain reaction (PCR), electrophoresis, DNA cloning, mammalian cell culture, transfection and protein expression, will be used in course projects to express and analyze proteins of interest in cultured mammalian cells. The concepts underlying these procedures will be studied online before the lab sessions. This course is designed to prepare students for careers in research, biotechnology and science education.

Main Learning Outcomes

Students who successfully complete the course will be able to:

- Perform the techniques essential for the operation of a molecular biology lab including those required for the manipulation and analysis of DNA, protein and tissue culture cells.
- Understand the chemistry underlying the techniques used in a molecular biology lab.
- Apply the techniques of molecular biology to the analysis of cell and protein function.
- Apply the scientific method and understand what constitutes good experimental design.
- Analyze and interpret data sets.

Teaching Strategies

This course will be taught using a combination of 1) online delivery of reading and video materials, 2) mini-lecture presentations and 3) hands-on demonstrations of lab techniques and computer applications.
Required Materials

Most materials required to complete this course will be supplied online through the Blackboard course management website (https://blackboard.utdl.edu). Computer and internet access will therefore be required. The following Browser Check Page will enable you to perform a systems check on your browser to ensure that your browser settings are compatible with Blackboard:
http://www.utdl.edu/utlv/Bb9BrowserCheck/innovation/blackboard/browsercheck.html

- **Lab notebook**: Students are required to provide a ruled notebook to be used for class preparation, note taking, and data collection.
- **Supplementary resources**: The following resources contain a wealth of information and may be referenced as necessary. Molecular Cell Biology (Lodish; 7e), Current Protocols in Molecular Biology (Wiley Publisher), and Molecular Cloning (Green and Sambrook; Cold Spring Harbor Laboratory Press).

Prerequisites

Instructor approval is required.

Homework

- Most of the homework will be completed using the Blackboard course website.
- Online homework will be available on Blackboard starting June 29. **Students must pace themselves and be sure to allow enough time to complete the 8-10 hours of online homework, which will be due at 6 pm on July 20.**
- Online homework will consist of reading and viewing online materials and assessment in the form of online quizzes, brief writing assignments and discussion group posts.
- The format of online quiz questions will be mixed and will include fill-in-the-blank, multiple choice, short answer, and short essay questions.

Expectations for the Lab Sessions

- You are expected to read the online material concerning the lab, write out any notes or questions, and outline the experimental procedure in your lab notebook before the session. Knowing what to do before you get to the laboratory bench will allow you to work efficiently and help you better understand the experiments.
- Bring your lab notebook containing your experiment outline for the day as well as a copy of the formal lab protocol. Use the notebook for writing out exactly what you have done at each step, especially if it deviates from the protocol. Also use the notebook for recording data and making observations. Be sure to write out everything you do in the lab as this will make it easier to write the lab reports. Keep in mind that the lab notebooks will be collected and graded.
Student Evaluation

Your final grade will be calculated as follows:

15% Online Homework (Quizzes, writing assignments and discussion posts*)
40% Four In-Lab Quizzes (10% of your final grade for each)
10% Assessment of In-Lab Activities
5% Lab Notebook (Evaluated at the end of the course)
15% Final Exam (Covers all aspects of the course)
15% Lab Report
100%

*The online quizzes and writing assignments will make up 80% of the online homework grade, while the discussion posts will be worth the remaining 20%)

Grading Scale:

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<tr>
<th>Percentage</th>
<th>Grade</th>
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<tbody>
<tr>
<td>90-100%</td>
<td>A</td>
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<tr>
<td>87-89%</td>
<td>A-</td>
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<tr>
<td>83-86%</td>
<td>B+</td>
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<tr>
<td>79-82%</td>
<td>B</td>
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<tr>
<td>75-78%</td>
<td>B-</td>
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<tr>
<td>71-74%</td>
<td>C+</td>
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<tr>
<td>&lt;50%</td>
<td>F</td>
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<table>
<thead>
<tr>
<th>Percentage</th>
<th>Grade</th>
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<tbody>
<tr>
<td>67-70%</td>
<td>C</td>
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<tr>
<td>63-66%</td>
<td>C-</td>
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<tr>
<td>59-62%</td>
<td>D+</td>
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<tr>
<td>55-58%</td>
<td>D</td>
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<tr>
<td>50-54%</td>
<td>D-</td>
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General Information

• Information required for online homework and in-lab activities will be available on Blackboard.
• All grades will be posted in the Gradebook on Blackboard. Contact the instructor immediately if there are any issues regarding the posted grades.
• Put away your cell phone while in the lab. Make sure it is off or in silent mode.
• If you bring a laptop or tablet to the lab please use it for note taking only.
• If you wish to make audio recordings of the mini-lectures for your personal use, please ask the instructor first. Recordings are not to be distributed without the permission of the instructor.
• A list of valuable resources, to help students with their academic and social life at the University of Toledo, can be found at “www.utoledo.edu/menu/current.html”. This includes tutoring services, the writing center, library information, and IT services among others.

Lab Safety

• Do not enter the lab without the instructor present.
• Strict adherence to the dress code (see below) is required.
• No drinking, eating, or chewing of gum or tobacco in the lab.
• Keep your lab bench clean and free of books, papers, coats, etc.
• Wear protective eyewear as necessary.
• Do not wear contact lenses in the lab.
• Do not pipette by mouth.
• Dispose of solutions and other waste products in the correct location.
• Broken glass must be carefully placed in the labeled glass disposal box.
• No unauthorized experiments are to be performed.
• Wash hands during the lab as necessary and at the conclusion of the lab.

Dress Code

Shoes must completely cover the feet. No sandals are allowed. Pants/shorts/skirts must be at least knee length to provide adequate protection. Tops must have a sleeve and cover the shoulder and body areas. Protective goggles and lab coats are not required, but you may bring a lab coat if you want to protect your clothes from accidental spills.

Absences

• Students are expected to attend all of the lab sessions. This is particularly important since we will cover a lot of material in each session of this week-long course.
• Make-up tests/assignments and adjustments to homework deadlines will only be provided for serious medical or personal reasons that are backed up with the proper documentation such as a doctor's note. Accommodations will be made only if the instructor is notified by email or phone call as soon as possible after the absence.
• It will not be possible to make up any missed lab sessions, so if you are excused from a session it will be your responsibility to obtain any data or other necessary information from a classmate for inclusion in lab reports.
• Additional information regarding absences can be found in the University of Toledo Missed Class Policy, located at www.utoledo.edu/facsenate/missed_class_policy.html.

Technical Support

If you encounter technical difficulties with Blackboard, please contact the UT Online Help Desk at (419) 530-8835 or utdl@utoledo.edu. The Help Desk offers extended hours in the evenings and on weekends to assist students with technical problems. When calling after hours, leave a detailed message, including your Rocket Number and phone number, and an Online Learning staff member will respond on the next business day. The UT Online Help Desk website is available at: http://www.utoledo.edu/dl/helpdesk/index.html

Technical questions related to on-campus Internet access, hardware, and UTAD account management can be directed to UT’s IT Help Desk at (419) 530-2400 or ithelpdesk@utoledo.edu. The IT Help Desk website is http://www.utoledo.edu/it/CS/HelpDesk.html.
University Policies

Policy Statement on Non-Discrimination on the Basis of Disability:
• The University of Toledo abides by the Americans with Disabilities Act (equal and timely access) and Section 504 of the Rehabilitation Act of 1973 (non-discrimination on the basis of disability). If you have a disability and are in need of academic accommodations, but have not yet registered with the Office of Academic Access (OA) please contact the office by phone (419-530-4981) or email as soon as possible for more information and/or to initiate the process of accessing academic accommodations.
• Students receiving accommodations through OA are encouraged to discuss these with the instructor, after class or during my office hours, so that s/he may be better informed on how to assist you during the semester.

Academic Dishonesty:
• The university policy on academic dishonesty can be accessed at: "http://www.utoledo.edu/dl/students/dishonesty.html"
• Do not talk to other students or use electronic devices during quizzes and examinations. Keep your eyes on your own work. Those who violate these rules will receive an F for that evaluation.
• Each student must individually prepare for each lab, analyze the data, answer the questions, and write their own lab reports. Plagiarism of lab reports or notebooks will not be accepted. Students violating these rules will be given a zero for that assignment and may be given an F for the course.
## Course Schedule

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<thead>
<tr>
<th>Date</th>
<th>Day</th>
<th>Activity</th>
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<tr>
<td><strong>June 29 - July 20</strong></td>
<td></td>
<td><strong>Online:</strong>&lt;br&gt;Self-Paced Online Work: Advanced Readings, Videos, Quizzes and Discussion Board Contributions in Blackboard Modules 1 – 5:&lt;br&gt;1) Biological Macromolecules&lt;br&gt;2) DNA Production and Analysis&lt;br&gt;3) Manipulation of DNA&lt;br&gt;4) Protein Analysis&lt;br&gt;5) Mammalian Tissue Culture&lt;br&gt;&lt;br&gt;<strong>All Online Work Due by 6 pm July 20</strong></td>
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<td><strong>In Lab:</strong></td>
<td></td>
<td><strong>July 21</strong>&lt;br&gt;1  Discussion: Cell Culture and DNA Cloning Basics&lt;br&gt;Lab Project 1: PCR Product Cloning&lt;br&gt;Lab Project 2: Cell Transfection&lt;br&gt;Quiz 1</td>
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<td><strong>July 22</strong></td>
<td>2</td>
<td>Instruction: DNA Sequence Analysis Software&lt;br&gt;Lab Project 1: Bacterial Culture Inoculation&lt;br&gt;Quiz 2</td>
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<td><strong>July 23</strong></td>
<td>3</td>
<td>Lab Project 1: DNA Minipreps and Analysis&lt;br&gt;Quiz 3</td>
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<tr>
<td><strong>July 24</strong></td>
<td>4</td>
<td>Lab Project 1: DNA Fragment Purification and Cloning&lt;br&gt;Lab Project 2: Cell Lysis, PAGE and Western Blotting&lt;br&gt;Quiz 4</td>
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<tr>
<td><strong>July 25</strong></td>
<td>5</td>
<td>Lab Project 1: DNA Minipreps and Analysis II&lt;br&gt;Lab Project 2: Probe Western Blot and Analyze Final Exam</td>
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