BIO 236
Cell and Molecular Biology Lab
Spring, 2009 Syllabus

Instructors:
Dr. Andre Walther (Section 1,3 and lab coordinator) MIL 25, x3513, awalther@cedarcrest.edu
Dr. Audrey Ettinger (Section 2,4), SC 108, x3512, ajetting@cedarcrest.edu
Dr. Kent Fitzgerald (Sections 5) MIL 27, x3609, kkfitzge@cedarcrest.edu

Time, place:
Section 01, Monday 1-4 PM
Section 02, Tuesday 1-4 PM
Section 03, Thursday 8-11 AM
Section 04, Thursday 1-4 PM
Section 05, Tuesday 8-11 AM
All labs meet in Miller 31

Prerequisites:
Required: successful completion of BIO 121 and BIO122 and Strongly Recommended: CHE 111 and 112

Textbook
A scientific notebook of your choosing

Objectives

The objectives for students in this course are to:

- Learn and gain experience with a range of important experimental techniques in molecular and cellular biology, including microscopy and photomicroscopy, protein analysis, primary cell culture, and common molecular biology techniques such as DNA isolation, Restriction digestion, and DNA sequencing
- Learn to prepare publication quality photographs and to analyze data
- Learn how to write formal scientific reports
- Prepare for advanced lab work and research at Cedar Crest and beyond

Course Outcomes

Upon successful completion of this lab, students will be able to:

- Demonstrate proficiency in laboratory techniques taught in the course
- Demonstrate quantitative reasoning through laboratory-based problem solving and analysis
- Demonstrate written and graphical communication ability through preparation of the photo assignment and lab reports
Assessment

The outcomes described above will be assessed through:

- Quizzes: scientific / quantitative reasoning
- Assignments: scientific / quantitative reasoning, written communication ability
- Class participation: oral communication ability

Student Responsibilities

SAFETY is the highest priority in the lab. You are responsible for understanding and complying with safe lab practices. Read and follow the safety procedures distributed in the first meeting. If anything unexpected happens or you are ever unsure what to do, ASK!

Attendance in lab is required except in case of absence for medical or personal reasons that have been documented through the Office of the Dean of Students. Unexcused absences will result in a 50 pt deduction from the lab grade. Prior permission from your lab section instructor is required to change lab sections. You will occasionally need to work in lab at times outside of scheduled class hours. Travel plans must be made to conform to the Cedar Crest College schedule. IT IS YOUR RESPONSIBILITY TO ARRIVE TO LAB ON TIME. If you are late or do not complete tasks that are assigned outside of class, your instructor may deduct points from that lab’s assignment at his/her discretion.

Readings are assigned to prepare you for lab. Therefore, lab readings must be completed before class. Quizzes based on the reading will encourage this practice.

Scholarship and Integrity: We fully support the Cedar Crest College Honor Code and the Community Standards for Academic Conduct as stated in the Student Guide. You are required to abide by the Honor Code and by accepted practices of scholarship and integrity. All writing and other material that you submit must be your own, original work, unless otherwise acknowledged. Cheating or plagiarism will result in a grade deduction or a zero grade for the entire assignment, at the instructor's discretion. Incidents of academic dishonesty will be reported to the Provost and Dean of Student Affairs. If you have any questions about these issues, please discuss them with the instructor.

Classroom protocol: The Honor Code states, “Appropriate classroom behavior is implicit in the Cedar Crest Honor Code. Such behavior is defined and guided by complete protection for the rights of all students and faculty to a courteous, respectful classroom environment. That environment is free from distractions such as late arrivals, early departures, inappropriate conversations and any other behaviors that might disrupt instruction and/or compromise students’ access to their Cedar Crest College education.”

Students with Disabilities: Students with documented disabilities who may need academic accommodations should discuss these needs with their professors during the first two weeks of class. Students with disabilities who wish to request accommodations should contact Academic Services.
**Assignments and Evaluation**

**Quizzes**

There will be 10 online quizzes offered on the ecollege website worth 10 points each. Quizzes will be based on the information in the lab handouts and assigned readings from the textbook for that week. On weeks with assigned quizzes, they will be made available online at least 48 hours before the start of your lab section and will need to be COMPLETED at least 1 hour before the beginning of your assigned lab period. There will be NO make-ups for quizzes without an excuse from the Dean of Student Affairs.

**Photo Assignment**

The photo assignment will be the culmination of Part I of cell biology lab. The assignment will consist of two photos: one phase contrast photograph and one fluorescent photograph. Each photo will have a legend that will include: a description of the specimen, the technique used (not detailed methods), and an accurate calibration bar. The assignment will also include a title and authors. Keep in mind that your photo assignment should be presentation quality.

**Lab Reports**

Lab reports are an essential aspect of science and allow researchers to record methods and observations and to critically analyze their data. Reports also allow other scientists to repeat experiments and to further discovery by going beyond the data presented in the report. In this lab, you will add to the information gained in freshman lab and continue to learn how to write a formal lab report.

The semester is divided into multiple parts, each covering a different aspect of cell and molecular biology. For Parts II-III, you will be required to write a section of a lab report (i.e., materials and methods, results, and discussion). This will allow you to learn how to write a report a little at a time. The lab write-ups will culminate with the Part IV of the lab, for which you will combine everything that you have learned about writing a lab report into one complete report, which will be worth 200 points.

If you have any questions on the assignments or grading policies, please don't hesitate to ask your instructor.

**Lab Notebooks**

You will be required to have an up to date notebook for the lab course that will be graded as part of the final exam.
Final Exam

There will be a final comprehensive exam in the final week of lab. This will include an open notebook component, a practical component, and a closed notebook component. You will not be allowed to bring class handouts to the final exam.

<table>
<thead>
<tr>
<th>Part I: microscopy</th>
<th>Photo assignment</th>
<th>200 points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part II: Cell Culture</td>
<td>Materials and Methods</td>
<td>150 points</td>
</tr>
<tr>
<td>Part III: Protein Techniques</td>
<td>Results and Discussion</td>
<td>150 points</td>
</tr>
<tr>
<td>Part IV: Molecular Biology</td>
<td>Complete Lab Report</td>
<td>200 points</td>
</tr>
<tr>
<td>Comprehensive Exam</td>
<td></td>
<td>200 points</td>
</tr>
</tbody>
</table>

Lab total: 1000 points

The lab grade will be determined from the total lab points according the table below. Late assignments will be deducted 1% per calendar day.

<table>
<thead>
<tr>
<th>Points:</th>
<th>744-800</th>
<th>720-743</th>
<th>696-719</th>
<th>664-695</th>
<th>640-663</th>
<th>616-639</th>
<th>584-615</th>
<th>560-583</th>
<th>536-559</th>
<th>480-535</th>
<th>479 or less</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade:</td>
<td>A</td>
<td>A-</td>
<td>B+</td>
<td>B</td>
<td>B-</td>
<td>C+</td>
<td>C</td>
<td>C-</td>
<td>D+</td>
<td>D</td>
<td>F</td>
</tr>
</tbody>
</table>

Lab Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan 19-23</td>
<td>Introduction, lab safety, microscopy and measurement</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Jan 26-29</td>
<td>Online Quiz 1 Phase microscopy, photomicroscopy</td>
<td>Book pp728-731</td>
</tr>
<tr>
<td>3</td>
<td>Feb 2-4</td>
<td>Online Quiz 2 Fluorescent microscopy</td>
<td>Book pp731-734 Microscopy handout</td>
</tr>
</tbody>
</table>

Part I: Microscopy
Objectives: Develop expertise in microscope set-up and use, learn applications and use of fluorescent dyes and phase contrast, learn to prepare presentation-quality photomicrographs.

Part II: Cell Culture
Objectives: Learn the art and science of preparing and maintaining primary cell cultures. Measure proliferation, using cell counting techniques.

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Feb 9-12</td>
<td>Cell culture preparation and rehearsal</td>
<td>Cell culture handout/Paper Intro+MM</td>
</tr>
<tr>
<td>5</td>
<td>Feb 16-19</td>
<td>Online Quiz 3</td>
<td>Cell culture handout</td>
</tr>
<tr>
<td>Week</td>
<td>Dates</td>
<td>Activity</td>
<td>Notes</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>--------------------------------------------------------------------------</td>
<td>------------------------</td>
</tr>
</tbody>
</table>
| 6    | Feb 23-26   | **Online Quiz 4**  
Cell counts                                                                 | Cell culture handout  |

**Part III: Protein Techniques**
Objectives: Learn the theory and practice of protein gels and Western blots. Apply these approaches to a phylogenetic comparison of serum proteins from several species

<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Activity</th>
<th>Notes</th>
</tr>
</thead>
</table>
| 7    | Mar 2-5     | **Online Quiz 5**  
Protein electrophoresis                                                    | Protein handout        |
|      | Mar 9-12    | *Spring break - no labs*                                                 |                        |
| 8    | Mar 16-19   | **Online Quiz 6**  
Western blot                                                               | Protein handout/Paper R+D |

**Part IV: Molecular Biology**
Objectives: Learn the theory and practice isolating and characterizing DNA isolated from cows in order to examine the evolutionary diversity amongst different populations.

<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Activity</th>
<th>Notes</th>
</tr>
</thead>
</table>
| 9    | Mar 23-26   | **Online Quiz 7**  
Genomic DNA Isolation and Digestion of Lambda DNA                                             | MolGen Handout         |
| 10   | Mar 30-Apr 2| **Online Quiz 8**  
Genomic DNA gel and PCR of ND3 and D-Loop                                                      | MolGen Handout         |
| 11   | Apr 6-9     | **Online Quiz 9**  
PCR product purification, quantitation, prep of sequencing                                      | MolGen Handout         |
|      | Apr 13-16   | *no labs*                                                                                     |                        |
| 12   | Apr 20-23   | **Online Quiz 10**  
Editing of raw DNA sequence and sequence analysis                                              | MolGen Handout         |
| 13   | Apr 27-30   | **Final Exam**                                                                               |                        |