**MB 538: Cell and Molecular Biology**

**INSTRUCTOR:** Delisha Patel  
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Webpage: Using the class D2L page

**TEXT/MATERIALS** None. We will be reading original papers. Daily lab protocols will be posted on the D2L site. It is your responsibility to read the protocols before class.

You will need a hardbound notebook as your lab notebook.

**DESCRIPTION:** The course will focus on both the fundamental principles and techniques of molecular biology. Students will gain an in-depth knowledge of nucleic acid structure, molecular genetics and the biochemistry of transcription and protein synthesis. Methods of functional cloning will be discussed. Each lecture will directly relate molecular biology concepts with the latest laboratory techniques. The topics covered in lecture will also coordinate with the techniques used in each laboratory exercise. The major goal of the laboratories will be the application of molecular biology concepts presented during lecture. The laboratory portion will comprise of learning techniques including gene manipulation/cloning, primer design, PCR, gel electrophoresis and protein assays.

**LEARNING OUTCOMES:** Upon successful completion of this course, the student will:

- Demonstrate an advanced understanding of current molecular biology techniques principles.
- Demonstrate a basic understanding of study design and application of molecular biology
- Be able to describe and analyze molecular biology data tables and figures routinely obtained in basic and applied biology research laboratories.
- Be able to interpret and communicate results to scientific AND lay audiences.

**GRADING:** Grades will be assessed as follows: 90-100% A, 80-89% B, 70-79% C, 60-69% D, and <60% F. Your grades will be distributed as follows:

**Presentation** – 30%  
Each student will be assigned a presentation generally consisting of a 20-minute report using PowerPoint slides on a technique related to the coursework. The talk will be followed by a question period in which class participation will be noted. Slides will be posted on the D2L page after the presentation.
**Assignments and Quizzes - 15%**
There will be certain assignments you will work on outside of class and turn in. Each student must turn in their own work, but you may help each other and/or share data. These include: 1) A one page paper describing the mutation you propose to make and your hypothesis concerning the predicted effects of this mutation on the structure and function of the protein, complete with references supporting your analysis and predictions. 2) The design of the primers you propose to use for the mutagenesis, along with the computer analysis of their properties. There will be short quizzes from time to time during a lab period, covering the procedures to be done that day or any aspect of what we have learned to date.

**Final Paper - 30%**
The Final Exam will consist of a research article describing the work done by the entire class, in a form suitable for publication in a major scientific journal. It will be due July 24th, 2018.

**Notebook - 20%**
The notebook MUST BE PERMANENTLY BOUND, not a ring binder nor spiral bound.

- Pages must be numbered consecutively and none may be ripped out.
- Work should be written in pen.
- Mistakes are to be crossed out but left on the page.
- No writing on loose sheets of paper, paper towels, backs of hands, or anywhere but the notebook while you are in the lab and doing your work.
- All assignments pertaining to the work on the project should be included.
- Experiments should have:
  - a title
  - a short purpose statement
  - a brief protocol written or inserted before class (work to be done)
  - a clear, succinct record of what you did, to be written down in lab while **work is being performed**
  - comments, observations, and additional information or theory discussed in class
  - drawings, photos, or printouts of results as they appear
  - calculations and graphs (if these were done in a spreadsheet, printouts and sample calculations or formulas should be in the notebook)
  - a discussion of results/conclusion paragraph at the end of each experiment discussing the results obtained and what they might mean, problems encountered, where the research will go next.

**Lab Performance - 5%**
See note below.

**Notebooks are of prime importance in this course;** the notebook, together with lab performance, will comprise 25% of the course grade. Lab performance includes such things as preparedness when arriving to class, understanding of experiment
design & aim, proficiency of the techniques taught, attentiveness to details, and accuracy in both laboratory work and results. Assignments, such as the mutation hypothesis, primer design, primer analysis, and kinetic calculations will be turned in on separate sheets or electronically and graded separately (see above), but **they must also be included in the notebook!** Notebooks will likely be examined once or twice without prior warning during the semester, then will be turned in at the end of the semester together with the final paper.

**TENTATIVE SCHEDULE:**

<table>
<thead>
<tr>
<th>Day</th>
<th>Lecture/Lab material covered</th>
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<tbody>
<tr>
<td>Monday</td>
<td>Class introduction, syllabus. Lecture on bioinformatics tools, history about molecular biology techniques. Assign Primer Design Assignment.</td>
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<tr>
<td>Tuesday</td>
<td>Lab: Plasmid DNA extraction, PCR. Lecture: Gene manipulation tools. Student presentation. <strong>Assignment on choice of gene for manipulation due.</strong></td>
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<tr>
<td>Wednesday</td>
<td>Lab: DNA gel electrophoresis, DNA extraction from gel. Lecture Protein expression and protein assays. Student presentations <strong>Primer design assignment due.</strong></td>
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<tr>
<td>Thursday</td>
<td>Lab: Protein quantification and western blot-day 1. Lecture: protein purification techniques. Student presentations</td>
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<tr>
<td>Friday</td>
<td>Lab: Western blot-day 2. Lecture: Protein assays. Student presentations.</td>
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