DNA Sequencing (BIO 344)
Spring 2010

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Office Hours: Monday 1-3, and by appointment

Prerequisites
BIO 231 and junior or senior status

Required Texts
1) None

Course Information
Course Description: This course is a laboratory-intensive course covering the theory and practical aspects of current DNA sequencing techniques.

Goals: The goal of the course is to prepare you for either graduate studies in molecular biology or a technician position in a research lab. The lecture portion of this course will help you to better understand both the Sanger Method and the Maxam-Gilbert Method of sequencing. The laboratory portion of the course will allow you to experience Sanger sequencing through both manual and automated sequencing methods. You will also learn how to interpret your data as we use biotechnology to identify sequences and build basic sequence comparisons.

Objectives: At the completion of this course, students will be a to:
1) Understand both Sanger and Maxam-Gilbert Sequencing.
2) Prepare sequencing gels, run sequencing reactions, and use the silver staining technique to detect DNA bands on a gel.
3) Understand how an automated sequencer operates.
4) Interpret sequencing data and use biotechnology to apply this data to research scenarios.

Outcomes and Assessment:
1) Students will have a general knowledge of two methods used to determine the sequence of nucleotides. This knowledge will be assessed through a final examination in which students will be asked to design sequencing protocols and interpret sequencing data.
2) Students will demonstrate the ability to use both manual and automated sequencing methods to determine the sequence of nucleotides in a given piece of DNA. Students will be assessed by both class participation and through data in their lab notebooks.
3) Students will have a general understanding of how an automated sequencer operates. This information will be assessed in a final examination in which students will be asked to recall details from information presented in lectures.

4) Students will apply biotechnology to data interpretation. They will be asked to use basic programs to interpret their results and draw conclusions. Students will be assessed through the data interpretation section of their laboratory notebooks.

Grading

1. Lab Notebook (20%): You will be expected to keep an updated lab notebook in which you will demonstrate your knowledge of the projects, the work that you did both in and out of class, and the application of biotechnology to your data. At the front of this notebook please write your name and make a table of contents. Each following page should be dated. As this course will involve three separate projects, they should be detailed in three separate sections of your lab notebook. In each section you should include information about:

1. The purpose of the project
2. The materials used
3. What protocol was used, including where to find it (text and page number) and any modifications you made to it
4. Results of the experiment (including data)
5. Interpretations of the experiment and any conclusions that you could draw from the project
6. Suggestions for next time you conduct a similar project

2. Bioinformatics Questions (20%): You will be asked to answer questions related to exercises performed in the lab. These answers should be recorded in your lab notebook with the page numbers of these assignments clearly indicated in your Table of Contents.

3. Class Participation (20%): Class participation is obviously crucial to laboratory performance. I expect every lab group member to attend every class and lab group meeting and participate equally in all exercises.

4. Final Exam (40%): We will have a lab final on the last day of class during which you may demonstrate your mastery of the material presented in this class.

Grading Scale:

92.0 – 100	A	72.0 – 77.9	C
90.0 - 91.9	A-	70.0 – 71.9	C-
88.0 – 89.9	B+	68.0 – 69.9	D+
82.0 – 87.9	B	62.0 – 67.9	D
80.0 – 81.9	B-	60.0 – 61.9	D-
78.0 – 79.9	C+	less than 59.9	F

Academic Philosophies

Honor Code: Students are expected to comply with the Cedar Crest College Honor Code as stated in the Catalog.

Classroom Protocol: Students are expected to comply with the Cedar Crest College Classroom Protocol Code as stated in the Catalog.

Plagiarism: Students are expected to comply with the Cedar Crest policy on plagiarism. Cases of plagiarism, whether deliberate or accidental, will not be tolerated and will result in an "F" for the given assignment.

Learning Disabilities: Students with documented disabilities who may need academic accommodations should discuss these needs with me during the first two weeks of class. Students with disabilities who wish to request accommodations should contact the Advising Center.

Attendance: You are expected to attend and actively participate in all lectures and laboratory exercises. I expect you to arrive to class in a timely manner. It is your responsibility to inform me of planned absences and it is your responsibility to obtain any assignments, handouts, etc. Absences on days of exams, presentations, or the collection of assignments will have to be approved by the Dean of Students. If the Dean of Students does not approve the absence, you will receive a zero for that portion of your grade.

Be warned: manual sequencing and data interpretation does not fit neatly into a three-hour time period. You will be expected to come into lab on other days and times to continue your work. Make arrangements with your lab partner to pick a time best suited to your schedules. Realize, however, that I am a *morning* person, so if you choose to come to lab late in the evening/night, I will not be available to help you.

COURSE SCHEDULE

Date	Course Activities and Information	Manual Sequencing Project	Automated Gene Sequencing	Automated Mitochondrial Sequencing
Friday, Jan 29th 5pm-8pm	Introduction to Sequencing Methods	Pour gels Sequencing Reactions	Mini-Prep and PCR	
Saturday, Jan 30th (AM) 9am-12pm		Load Sequencing Gel	PCR Clean-up and Gel Run DNA synthesis reactions	Mitochondria prep and PCR reaction
Saturday, Jan 30th (PM) 12pm-5pm		Develop Sequencing Gel	Ethanol precipitation of reactions Run automated DNA sequencer	
Sunday, Jan 31st (AM) 9am-12pm	Principles of Sequencing and Biotechnology Exercises (manual sequencing)			PCR Clean-up and Gel Run DNA sequencing reactions
Sunday, Jan 31st (PM) 12pm-5pm	Principles of Sequencing and Biotechnology Exercises continued (automated sequencing)			Ethanol precipitation of reactions Run automated DNA sequencer
On Your Own		Analysis of Results	Analysis of Results	Analysis of Results
Friday, Feb 5th 5pm-8pm	**Final Exam Bioinformatics Questions Due Lab Notebooks Due**			