**Biology 3180L – Principles of Genetics Laboratory**

Fall 2015, Section 702

W 1:25 PM TO 3:15 PM

2114 Oxendine Science Building

**INSTRUCTOR Dr. Conner Sandefur**

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 Office Location: 2230 Oxendine Science Building

 Office Phone: 910-521-6870

 Office Hours: TR 9:00-10:30 AM; W 11:15 AM to 1:15 PM

 *I am also available by appointment.*

**BLACKBOARD blackboard.uncp.edu**

The Blackboard course site will have postings for the laboratory including background reading, protocols and prelab quizzes. I will also post announcements to this site. *It is your responsibility to check it regularly.*

**COURSE GOALS**

**In this course, you will learn and practice genetics laboratory techniques.** You will learn laboratory safety procedures as well as how to apply classical and molecular genetic principles in a laboratory setting. You will also be challenged to think critically about the experimental design and analyze your results.

**COURSE POLICIES**

**Tests:** two tests will be given. The first test will cover material from the first six labs and is worth 2.5% of your final genetics grade. The second test will cover material from the entire semester and is worth 10% of your final genetics grade. *All students are expected to take the tests when they are scheduled*.There are no make-up tests. If you feel an error has been made in determining your test score, you may submit the test for a re-grade within 3 school days after the test has been returned to the class. You must submit in writing your reasons for a re-grade. Staple the request to your test and give it to your instructor. Legitimate reasons for a re-grade request include, for example, incorrect summation of scores and bona fide errors in grading a particular problem; *this does not include student judgments about the amount of partial credit deserved for incorrect answers*. Written responses to student requests will be returned in class.

**Prelabs:** each lab will have pre-lab exercises, listed in the course schedule below, that you are required to do prior to each lab. I will occasionally check to see if you have completed the pre-lab exercises or post prelab quizzes on Blackboard. These are important preparatory steps for each lab and therefore account for 2.5% of your final lab grade.

**Lab Report:** one exhaustive lab report will be collected based on one of the labs, which will be likely occur during the first half of the semester. The lab report accounts for 5% of your final lab grade. *To receive credit, each student should complete the lab report individually, in their own words*. Copying another student and plagiarizing from the provided lab materials or any other resources is a violation of the academic honor code. The lab report should be in Word or PDF format, free of grammar and spelling errors and include the following sections:

 Cover page: title of lab, date, your name, name of lab partner(s), lab section

Introduction: three to four sentences, which should begin with the background principles for the experiment and end with a statement of the purpose of the lab

Procedure: in paragraph format, include details of each step written so that someone could read your procedure and repeat your experiment. Make sure to list essential materials and any special instructions, including how to setup and/or use equipment and the type of reagents/media you used. Do not copy the methods from the lab manual, instead report what you did and any modifications made.

Results: present the data and results you collected during the experiment (and save discussion of why you think something occurred for the next section. Include figures and tables from the lab manual making sure to number each figure/table and include a description/caption with each.

Discussion: summarize your results and discuss their meaning. Include an interpretation of your data. If you can interpret the data in more than one way, discuss each alternative and indicate which option you think is correct. Discuss all your results, even if they are unexpected or negative. Did you experiment work? Why or why not? If not, what went wrong and why? What would you do differently next time in order to make it work?

Conclusion: summarize what you did in this experiment, the results you obtained and should make a clear connection back to the to the original purpose of the lab stated in the Introduction

If you have never completed a lab report before, you might perform a web search (e.g. use Google) for lab report examples. You can also check the following website, which includes a good example (although you are not required to include an abstract or as comprehensive of an introduction): **http://www.ncsu.edu/labwrite/res/labreport/sampledescriptlab.html**.

**Grading**

 12.5% Two tests

 5% Laboratory report

 2.5% Pre-labs

**Expectations:** Lab attendance and participation are mandatory. There are no make-ups for missed lab work. If you miss lab, try to make arrangements to attend one of the other lab sections. It is expected that you will contact me before missing a lab.

**ACADEMIC HONOR CODE**

I expect each student in this course to abide by the highest standards of academic integrity as outlined by the UNCP honor code. Just as plagiarizing, falsifying data, or other forms of cheating are not tolerated in the professional world, they will not be tolerated here. Anyviolation of the honor code will result in a 0 on the assignment, will be reported to the University, and a note will be placed on your academic record, per UNCP policy (**http://www.uncp.edu/student-life/student-services/student-conduct/academic-honor-code**). Your grade is a reflection of your performance in this class, not a reflection of you. However, cheating is a reflection on you. If you look at/copy from another student’s test OR if you assist another student during a quiz or exam by allowing them to copy from you, I will consider you in violation of the honor code.

**RELIGIOUS HOLIDAY POLICY STATEMENT**

The University of North Carolina at Pembroke has a legal and moral obligation to accommodate all students who must be absent from classes or miss scheduled exams in order to observe religious holidays; we must be careful not to inhibit or penalize these students for exercising their rights to religious observance. To accommodate students’ religious holidays, each student will be allowed two excused absences each semester with the following conditions:

1. Students, who submit written notification to their instructors within two weeks of the beginning of the semester, shall be excused from class or other scheduled academic activity to observe a religious holy day of their faith. Excused absences are limited to two class sessions (days) per semester.
2. Students shall be permitted a reasonable amount of time to make up tests or other work missed due to an excused absence for a religious observance.
3. Students should not be penalized due to absence from class or other scheduled academic activity because of religious observances.

A student who is to be excused from class for a religious observance is not required to provide a second- party certification of the reason for the absence. Furthermore, a student who believes that he or she has been unreasonably denied an education benefit due to religious beliefs or practices may seek redress through the student grievance procedure.

**ADA STATEMENT**

Federal laws require UNCP to accommodate students with documented learning, physical, chronic health, psychological, visual or hearing disabilities.

In post-secondary school settings, academic accommodations are not automatic; to receive accommodations, students must make a formal request and must supply documentation from a qualified professional to support that request. Students who believe they qualify must contact the Accessibility Resource Center (ARC) in DF Lowry Building, Room 107 or call 910-521-6695 to begin the accommodation process. All discussions remain confidential. Accommodations cannot be provided retroactively. More information for students about the services provided by ARC and the accommodation process may be found at the following link: http://www.uncp.edu/arc

**ALTERNATIVE FORMAT STATEMENT**

This publication is available in alternative formats upon request. Please contact the Accessibility Resource Center in the D. F. Lowry Building, 521-6695.

**ABSENCES FOR UNIVERSITY-SANCTIONED EVENT**

If a student is representing the University in an official capacity (e.g.: academic conference, student government, course field trips, ROTC events, athletics, band) at an official University-sanctioned event, that absence shall be excused. Students are responsible for all coursework missed and must make up the work within three university business days after the student returns to campus. Any student who anticipates missing more than 15% of the course should not enroll in the course without prior approval from the instructor.

It is the responsibility of the student to communicate with the professor or instructor about classes missed for any reason, including University sanctioned events. *Students must provide official documentation of proposed University-sanctioned events that will result in excused absences during the first week of each semester*. Prior written documentation must be provided for each excused absence.

**NC-HCAP**

Located in Jacobs Hall Suite F, the Health Careers Access Program offers assistance to students seeking to be employed in healthcare through test preparation workshops, course tutoring, guidance during the application process for healthcare programs, job shadowing, internships, and advisement; contact hcap@uncp.edu or 910-521-6673.

**TRANSFER TRANSITION OFFICE**

The Transfer Transition Office, located in Jacobs Hall Suite H, provides student support services and academic resources for students transferring from community colleges and other institutions of higher education to the campus of UNC Pembroke; contact transfer.transition@uncp.edu or 910-521-6269.

**COURSE CALENDAR**

Instructor reserves the right to amend syllabus as needed depending on work accomplished and the needs of the class.

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| **Week** | **Topic** | **Assignments to complete BEFORE this lab** | **Objectives for this class** |
| 1: Aug 19 | Syllabus and Blackboard |  | * Introduce myself
* List the basic components of the course
 |
| 2: Aug 26 | Lab 1: Basic techniques | Basic techniques prelab reading and **Blackboard quiz** | * Use a micropipette to load a gel
* List safety considerations when working with an electric current
* Estimate sample concentrations within a gel
* Describe how gel electrophoresis is able to separate molecules
 |
| 3: Sept 2 | Lab 2: Bacterial DNA Extraction | DNA extraction prelab and quiz | * Extract DNA from a liquid bacterial culture
* Describe the appearance of extracted DNA
* List methods used to quantify DNA
 |
| 4: Sept 9 | Lab 3: Restriction Digestion/Gel Electrophoresis of DNA | Restriction digest prelab and quiz | * Outline a procedure for using restriction enzymes to digest DNA
* Describe a protocol for using gel electrophoresis to separate digested DNA fragments
* Estimate the size of a DNA fragment by comparison to a known DNA molecular size
* Describe how restriction enzyme produced DNA fragments can be used for mapping the DNA of an organism
 |
| 5: Sept 16 | Lab 4: Bacterial Mutagenesis | Bacterial mutagenesis prelab and quiz | * Discuss the difference between spontaneous and induced mutations
* Describe the procedure for determining the spontaneous and induced mutation rates for a particular gene
* Discuss the induction of mutation by ultraviolet light and the significance of DNA repair mutations
 |
| 6: Sept 23 | Lab 4 Follow-up |  |  |
| 7: Sept 30 | Lab 5: Sickle Cell | Sickle cell prelab and quiz | * Describe the mechanism of the blood disease sickle cell anemia
* State how many polypeptides are contained in hemoglobin
* State the type and location of the mutation underlying sickle cell anemia
* Discuss the methods used to detect sickle cell in patients
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| 8: Oct 7 | **Test #1** | Study |  |
| 9: Oct 14 | Lab 6: Gene Activity/Expression | Gene activity prelab and quiz | * Outline a protocol for quantitatively demonstrating the synthesis of the enzyme β-galactosidase in *E. coli*
* Write a summary statement correlating bacterial growth with β-galactosidase activity given the spectrophotometric data collected in this experiment
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| 10: Oct 21 | Lab 7: Karyotyping | Karyotyping prelab and quiz | * Describe the morphology of human chromosomes with reference to size, centromere position, and presence or absence of satellites
* Describe representative structural chromosome abberations using standard numerical and letter symbols
* Prepare a karyotype of HeLa cells
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| 11: Oct 28 | Lab 8: Amplification of DNA Polymorphisms | Amplification of DNA Polymorphisms prelab and quiz | * Outline a procedure for conducting the polymerase chain reaction (PCR)
* Discuss the principles upon which PCR is based
* Analyze a human DNA fingerprint based on the D1S80 locus
* List possible uses of DNA polymorphisms
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| 12: Nov 4 | Lab 8 Follow-up |  |  |
| 13: Nov 11 | Lab 9: DNA Paternity | DNA Paternity prelab and quiz | * Explain why siblings have different restriction enzyme recognition sites
* Describe the function of PCR primers used in DNA paternity analyses
* Discuss why there is more than one single locus used in an actual DNA paternity test
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| 14: Nov 18 | Lab 10: Cancer Gene Detection | Cancer gene detection prelab and quiz | * Construct a pedigree given a family history
* Explain the ‘two-hit’ hypothesis
* Discuss the difference between tumor suppressors and oncogenes
* Define a “hot spot” using the p53 protein as an example
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| 15: Nov 25 | NO LAB THIS WEEK (THANKSGIVING BREAK) |
| 16: Dec 2 | **Test #2** | Study |  |