Course:	BIOL3525/CHEM3525, Molecular Biology of DNA - Lab
Instructors:	Martin P. Horvath, horvath@biology.utah.edu, ASB350, 801.891.3477 David Blair, blair@bioscience.utah.edu, LS105, 801.585.3709
TAs:	Anna Shestakova [anna.shestakova@gmail.com], 501.681.0819 Zivile Dobson [zivile.dobson@utah.edu], 801.910.8293 Sara Robison [srobison123@gmail.com], 801.694.7042 John Tyrrell [u0010300@utah.edu], 801.209.1116
Schedule:	Monday AEB350 12:55-1:45 p.m. (all sections) Tues&Thurs SB180 1:00-5:00 p.m. (section 002) Wed&Fri SB180 1:00-5:00 p.m. (section 003)

Summary
In this lab course, we will explore the structure of DNA, mechanisms of DNA damage, the consequences of unrepaired DNA damage, and how cells repair DNA damage. DNA is continually exposed to damage causing agents such as sunlight, cosmic rays, and free radicals. From the simplest bacterium to multicellular mammals, each living organism shares vital mechanisms to repair its DNA. Through studying DNA damage and repair we'll integrate several areas of research including Biology, Chemistry, and Molecular Evolution.

Team Building
Everyone will be part of a two or three student team. Teams execute experiments, complete assignments and write the lab reports. Ideally, the team structure will make it possible to group results and data in ways that make the final analysis richer and more rewarding than if each person wrote their own report. Please be patient during the team building process and take your team seriously. A PORTION OF YOUR GRADE (100 POINTS) DEPENDS ON TEAM CITIZENSHIP. Treat your team and teammate(s) with respect. Keep appointments, be on time for lab experiments, let each other know if you are running late, share work fairly, create a positive enthusiastic team spirit and you will get maximum points.

Lab Notebook
The lab notebook should be a record of everything that you do to accomplish an experiment as well as the thinking and analysis that occurs before and after the experiment is completed. Begin each experiment with a Title, a Goal (why are we doing this experiment?), and continue with a Method section (what is to be done? and how are these tasks performed?), an Observation section (what results were obtained?), and a Conclusion section (what ideas can you form on the basis of the experimental results?). From your notes, you (or someone else) should be able to repeat the entire experiment. We will work on notebook skills throughout the semester and notebooks will count for 100 points of the student-earned grade.

Lab Reports
The course is writing-intensive. Experiments will culminate in six lab reports, each of which count 100 points towards a student-earned grade. Writing style, efficiency, grammar, and spelling are as important as the scientific content. The TAs and/or instructors will review initial drafts report. Final reports are then submitted once suggestions have been incorporated. The entire post-lab writing should take 1-2 weeks depending on the complexity of the experiments. The Lab Report comprises 5 sections which are: *Introduction*, *Results*, *Discussion*, *Methods* and *Author Contributions*. A hypothesis should be clearly identified in the *Introduction*. Experimental results will be distilled into figures, graphs, and/or tables with accompanying text in *Results*. The *Discussion* should highlight the meanings and conclusions that can be inferred from the experimental results, especially as they relate to the original hypothesis. Experimental conditions should be efficiently described in the *Methods*. Division of labor and acknowledgment of where ideas came from are stated in the *Author Contributions*. All sections except the *DIscussion* will be prepared as a team. The *Discussion* will be prepared individually. An efficiently written lab report may consist of 2-3 pages.

Quizzes
There will be three quizzes, 100 points each, that evaluate learning outcomes by testing concepts learned in lecture and lab. Each quiz will focus on the 4-5 proceeding weeks, but some of the ideas like DNA structure will be emphasized throughout the course. We'll incorporate problem sets and review sessions to prepare for each quiz.

Course Learning Outcomes
Relate the shape and structure of DNA to its chemical and biological functions
Calculate volumes and concentrations in the preparation of solutions and reactions
Relate the configuration of chemical groups at an enzyme active site to catalysis
Identify the hypothesis being tested in an experiment
Analyze data, identify patterns and trends, argue for or against a hypothesis

Accommodations Policy
The instructors do not grant content accommodation requests as the course content fulfills legitimate pedagogical goals.

Compliance with ADA Regulations
The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations.

All written information in this course can be made available in alternative format with prior notification to the Center for Disability Services.

EXPERIMENTS, LECTURES AND LAB REPORTS

Instructor: Horvath, M.

Week	Date	Lecture/ Experiment
1	8/23	Hypothesis construction
	8/24, 25	Pour media plates; Review volume transfer technique
	8/26, 27	Dilute cells and seed plates
2	8/30	Identify questions & scientific writing
	8/31, 9/01	Count colonies; Team Building; Data analysis
	9/02, 03	Cell size report writing; Report Draft due by end of class; Final Report (100 pts)
3	9/06	LABOR DAY (no class)
	9/07 – 10	DNA structure – computer modeling (no report); Prepare plates for next week
4	9/13	DNA structure (review), genes, mutations, fitness
	9/14, 15	UV exposure of cells with and without Rec A, with and without sunscreen
	9/16, 17	UV Data analysis; Report Draft due +1 week; Final Report (100 pts) +2 weeks
5	9/20	DNA damage & repair, recombination, Rec A, trans-lession DNA synthesis
	9/21 – 24	Reagents, solutions, and buffers (no report); Prepare plates for next week
6	9/27	QUIZ ONE
	9/28, 29	Hydrogen peroxide exposure
	9/30, 10/01	HOOH exposure data analysis; Draft optional; Final Report (100 pts) +2 weeks
7	10/04	Molecular Biology Methods; Episomes, Plasmid DNA
	10/05, 06	Purify plasmid DNA (include with Methods in future report)
	10/07, 08	Restriction enzyme digestion of plasmid DNA (no report)
	10/11-15	FALL BREAK (no class, no lab)

Instructor: Blair D.

Week	Date	Lecture/ Experiment
8	10/18	Oxygen metabolism and Reactive oxygen species (ROS)
	10/19, 20	HOOH treatment of DNA – in vitro
	10/21, 22	HOOH + DNA data analysis (Report combined with next week's lab)
9	10/25	Cells are complex, test tubes less so...
	10/26, 27	HOOH mechanism – in vivo
	10/28, 29	HOOH mechanism data analysis; Report (100 pts)
10	11/01	QUIZ TWO
	11/02 – 05	Mutation rates and Mut Y experiment setup
11	11/08	DNA damage and mutation
	11/09 – 12	Mutation rates and Mut Y experiment and data analysis; Report (100 pts)
12	11/15	Experimental design; thinking like a scientist
	11/16 – 19	Independent Project Design

EXPERIMENTS, LECTURES AND LAB REPORTS (CONT.)

13	11/22	TBA
	11/23, 24	Independent Project
	11/25, 26	THANKSGIVING (no lab)
14	11/29	TBA
	11/30 – 12/03	Independent Project
15	12/06	QUIZ THREE
	12/07 – 10	Independent Project; Lab clean up; Report (100 pts)

QUIZZES *

Quiz	Subject (points)	Date
1	Hypothesis construction, DNA structure, DNA damage & repair, Preparation of solutions (100 pts)	9/27
2	Molecular biology, Oxygen radical chemistry, DNA polymerase (100 pts)	11/01
3	Mutations, Mut Y, Experimental design (100 pts)	12/06

* Quizzes will be in-class and closed-book.

LAB NOTEBOOK REVIEWS *

Portion	Experiments (points)	Date
Initial	First 5 weeks (not graded, 0 pts)	9/23, 24
Final	Remaining 10 weeks, including Independent project (graded, 100 pts)	12/09, 10

* Notes from the initial part of the course will NOT count towards the final Lab Notebook evaluation.

TEAM CITIZENSHIP

Portion	Experiments (points)	Date
A	Mock survey; Constructive feedback; Does not count towards grade	10/07, 08
B	Final survey (100 pts)	12/09, 10

* Notes from the initial part of the course will NOT count towards the final Lab Notebook evaluation.