California State University | Stanislaus

BIOL 4850- DNA Technology in Forensic Science

Instructor:	Dr. James J. Youngblom	Term:	Spring 2020
Office:	Naraghi Hall 260	Class Meeting Day:	Thursday
Phone:	664-6924	Class Meeting Hours:	12:30-4:20
Best way to contact me:	jyoungblom@csustan.edu	Class Location:	Naraghi 334
Office Hours:	11-12:30 on Tues. & 9:30-11 on Thurs. or by appt.		

University Course Catalog Description

(2 Units) Applications of DNA technology in forensic investigation will be explored. The laboratory segment will expose students to a variety of molecular biology techniques used in forensic laboratories. The lecture component will introduce fundamental concepts in molecular biology and expound on the analysis and interpretation of results obtained in the lab. Prerequisites: BIOL 2310 and CHEM 1100 or BIOL 3350 with a grade of C- or higher. (Lecture, 1 hour; laboratory, 3 hours)

Course Requirements

Students need knowledge of DNA structure, genetic terminology, molecular properties, and chemical bonds. Students need proficiency in elementary probability and statistics. Basic computer skills are required.

Course Learning Outcomes

By the end of this course students will be able to properly use microliter pipetmen, gel electrophoresis equipment, a thermocycler, and mini- and micro-centrifuges. Students will be able to analyze and explain human forensic DNA profiles and accurately determine genotypes, including genotypes from DNA mixtures. Students should be capable of generating STR profile frequency estimates. Students will be able to analyze forensic DNA output from Y-chromosome STRs and human mitochondrial DNA. Students will be able to explain PCR, DNA isolation protocols, DNA quantification methods, and the historical changes in DNA forensic technology.

Required Texts- "Fundamentals of Forensic DNA Typing" by John Butler (Acad. Press, 2009)
"The Blooding" by Joseph Wambaugh

Dates to Remember-

Fri. Feb. 21- Last day to drop a course
Mar. 23 to 27- No classes, Spring Break Week
Tues. Mar. 31- Campus closed, Cesar Chavez Day
Fri. May 8- Warrior Day
Fri. May 15- Last day of classes
Final Exam- Thurs. May 21, 11:15

In Class Exams/Quizzes:

Mar. 12- **Exam #1 (60 pts)**

Thursday May 21, 11:15 a.m. **- Final Exam (120 pts)**

Apr. 30- **Book Quiz (20 pts)**

Feb. 27, Apr. 16**- 10 pt. Quizzes**

Assessment: Due dates	Date	Points	Percent of Final Grade
Lab notes due	Feb. 20	10 pts.	2.8%
Take home Exam 1	Feb. 27	20 pts.	5.5%
Quiz #1	Feb. 27	10 pts.	2.8%
Lab notes due	Mar. 12	25 pts.	6.9%
Mid-term Exam	Mar. 12	60 pts.	16.7%
Writing Assgn. due	Apr. 2, May 7	25 pts.	6.9%
Take home Exam 2	Apr. 16	20 pts.	5.5%
Quiz #2	Apr. 16	10 pts.	2.8%
Class Presentations	Apr. 30, May 7, May 14	20 pts.	5.5%
Quiz-The Blooding	Apr. 30	20 pts.	5.5%
Final Exam	May 21	140 pts.	38.9%
		360 pts.	100.0%

Each exam will be a mixture of different types of questions (such as true/false, multiple choice, problems, short answer, and short essay). The exams will be based on lecture material, reading in the text, and the laboratory exercises. The final exam is comprehensive. The others are not. A simple calculator may be used during the exams. **No leaving** the classroom during exams. The quiz on Apr.30 will be taken entirely from the book "The Blooding" by Joseph Wambaugh. This book is available in paperback (< $10) and is found in many libraries. Read it in its entirety and you will do well on this quiz.

Grading Scale* (%)

(*these numbers will not be raised; they could be lowered slightly)

%	Grade	%	Grade
94-100	A	74-76	C
90-93	A-	70-73	C-
87-89	B+	67-69	D+
84-86	B	64-66	D
80-83	B-	60-63	D-
77-79	C+	0-59	F

Make-up:

If you know you can not be in class on the day of an exam, please see me beforehand so we can discuss the situation. I may allow you to take the exam at a later date. If something comes up unexpectedly on the day of an exam, please contact me. If you a leave a message, leave a phone number and so we can be in touch. Don't 'let it ride' and plan on discussing it with me later. If I don't hear from you promptly, you get a 0.

Notes:

Take home exams- 30 (20+10) pts. each = 60 pts.
Lab Notes #1= 10 pts.
Lab Notes #2= 25 pts.

Take home exams and lab notes are due at the beginning of the lab. See the lab schedule for the due dates.

Take home exams are not group activities. Do your own work and don't copy the answers from someone else's exam. These exams are designed as a checkpoint- a chance for you to see if you are learning the right things. If you are unable to complete them, you need to see your instructor for extra help. Save these. They are valuable study guides. Every time a take home exam is due, there is an in-class quiz at the beginning of class. All of the quiz questions relate to the take home exam and are designed to make sure that everyone takes the take home exams seriously. The take home exams are 20 pts and the quizzes are 10 pts.

The lab write-ups are an exercise in taking good lab notes. The first one is designed to give you feedback for the second lab write up. We will discuss good note taking in class.

Writing Assignment:

You will be given a short article to read. At the end of the article is a related question. Your **assignment** is to answer the question by writing a 200-300 word response. Make sure you have 200-300 words in your response (don't count the words in your title, references, your name, etc.). Don't copy text from any sources. Don't copy this article! Read the article, highlight important points, and then write your answer in your own words. Run a spelling and grammar check. Proof read your writing to make sure your sentences are coherent. Write a thoughtful, nuanced reply. Use complete sentences. Print your document. It should all be on one page. Make sure it is double-spaced. The assignment is due on Apr. 2. It will be graded and returned to you on Apr. 9. Grades are based on the quality of your writing (grammar, coherency) and the strength of your arguments. Between Apr. 9 and Apr. 30 you need to spend 5 minutes with your instructor reviewing your writing. This part of the assignment is worth 10 pts. On Apr. 30 everyone is giving a second question related to another article. Your 2nd writing **assignment** is to answer the 2nd question with a 200-300 word response. This part of the assignment is worth 15 pts and is due on May 7.

Notes:

Each Thursday you will complete a laboratory exercise. A PowerPoint lecture of 30-60' will be presented some time on Thursday afternoon. The lecture will not be given at 12:30 but will be presented when there is an appropriate window of time in the lab protocol. At some time during the afternoon, there will be a formal break (~10') where everyone should step out of the lab.

All work will be done in pairs. There are 12 sets of equipment and will be 24 students in this class. The lab exercises will be described in lab handouts. Both the lab exercises and the PowerPoint lectures will be available electronically on the class Blackboard site.

The lectures will relate to the use of DNA in U.S. courtrooms. I will describe how DNA evidence was introduced in the late 1980s, modified in the mid 1990s and how it is used today. I have a number of interesting films we will watch. Some of these films document important criminal cases that hinged on DNA evidence. Some analyze the U.S. criminal justice system.

It is expected that each student in this class will be willing to donate tissue for purposes of isolating and analyzing your own DNA. The tissue requirements are minimal- cheek cells removed with a mouthwash. It is unlikely but possible that we could discover an abnormality in your DNA should such an abnormality exist. However it is not possible that we could uncover an informative abnormality as all of the DNA sites examined are specifically selected as nonphenotypic loci. The only exception would be in the multiplex PCR analysis where one of the sites analyzed will reveal the sex chromosome constitution of

the donor. Should someone possess something outside the norm (XX in females, XY in males) it could be revealed in this exercise. Students have the option of declining to use their DNA in this exercise.

Late Work
Take home exams and lab notes turned in late will be assessed a penalty: 10% if it is one day late, or 20% for 2-7 days late. These assignments will not be accepted if overdue by more than seven days.

Email
Course announcements will be sent to your csustan email account. Email is the good way for you to communicate with me outside of class time. Most days, I check my email many times.

Student Conduct- Most labs will run 3½ - 4 hours. Attendance is required. Do not enroll in this class if you have conflicts or other commitments on Thursday afternoons. If you fail to attend you are guilty of dumping extra work on your partner. Be on time for class. During the first few minutes of each class period we will discuss the day's activities. Do not leave the classroom in the middle of a lecture. Do not use cell phones, ipods, or other electronic devices during class. Computers are only allowed in class as a tool for note taking or class exercises.

Cheating/Academic Dishonesty- Students caught cheating are prosecuted as described in the university catalog. A report is filed with the Dean of Student Affairs. Class homework assignments and take-home exams are not group projects. Copying from someone's paper and presenting it as your own is a form of academic dishonesty. All electronic devices (including phones) & headphones must be kept in purses or backpacks during the exams and quizzes. No exceptions. You can use a real calculator and not the calculator function on a cell phone or PDA.

Taping Policy- Audiotaping of classes is permitted only with prior permission of the instructor; videotaping is not permitted under any circumstances. Authorized tapes are for the personal use of the student, and may not be distributed to others without the permission of the instructor.

Guest Policy- Guests are generally not permitted in this class. For an exception to this policy you must request prior permission.

Student Presentations-
Each student must find a partner and together select one article from the Journal of Forensic Science (full text of this journal is available from Electronic Journal Collection of the CSUS library at http://library.csustan.edu/serialsolutions/onlineJournals/jnlsIndex.html). The article must pertain to **Forensic DNA** and have been published in 2017, 2018, 2019, or 2020. You and your partner must work together to assemble a PowerPoint presentation. This presentation must explain the article. You do not need to explain basic genetic terms that have already been explained in class. Rehearse your PowerPoint presentation. Each person must present half of the slides. The presentation should be 8-11 minutes in length. **Your score will be deducted if your presentation is too long or too short**. You are not allowed to read anything during your presentation. No reading of notes, and no reading off of your PowerPoint slides. Use your PowerPoint slides as a rough outline for you to follow and then know the material well enough to explain each slide without reading it or using notes. Show important diagrams from the paper and explain them to the class. Generally it is a good idea to avoid discussing the methods in too much detail. All presenters must answer questions at the conclusion of their presentation. All students must ask questions of other presenters (at least once during the semester). Students that fail to ask a question during the term lose 5 pts. on their own presentation score.

Your classmates will help in grading your presentation- 1/2 of your class presentation score is determined by your classmates. All students in attendance will rate your presentation but the top ¼ and bottom ¼ of

student scores are ignored. Students that give all presenters high scores (A or A-) are not utilized in giving out grades. Your grade based on the quality of your presentation. High grades will be awarded to students that are well rehearsed, professional, and know the article well and present it clearly. Members of the audience should understand the significance of the article. In addition the power point should include clear figures and good graphics.

Laboratory Schedule; **Lecture Schedule- in bold** ↘

Jan. 30 (1) Metric System, Use of Pipettors, Lab Safety (video-Sex, Lies, and DNA)

Feb. 6 (2) Pipetting tests: DNA isolation (human cheek cells) **(Forensic DNA Overview)**
Set up PCR (*Actinin-3*)

Feb. 13 (3) Agarose gel electrophoresis **(Basics of PCR)**
(take lab notes) **(Taking good lab notes)**

Feb. 20 (4) Finish PCR Analysis **(PCR2, α-*Actinin-3*)**
Lab Notes due

Feb. 27 (5) Blood presumptive test, AP testing for seminal fluid (**DNA detection and**
Take home exam 1 due/quiz #1 **collection methods)**

Mar. 5 (6) DNA isolation (DNA from human blood) **(RFLP, early Forensic DNA Tests)**
(take lab notes)

Mar. 12 (7) **Exam #1** Analyze DNA Typing Sticks **(DNA Quantitation)**
Lab notes due

Mar. 19 (8) Set up Identifiler Reactions **(Allelic Frequencies 1)**
Select topics/dates for presentations
Check Software

Mar. 26 No Class, Spring Break

Apr. 2 (9) Analyze Identifiler Results **(Allelic Frequencies 2)**
Writing Assignment due

Arp. 9 (10) Set up PowerPlex Y reactions **(Allelic Frequencies 3)**

Apr. 16 (11) Analysis of DNA mixtures **(DNA mixtures)**
Take home exam 2 due/quiz #2

Apr. 23 (12) DNA mixtures, Analyze Y chromosome sequences (**Y chromosome STRs)**

Apr. 30 (13) Analyze Y chromosome sequences, DNA mixtures **(CODIS 1)**
Quiz #3, Student Presentations (4), Writing Assn. due

May 7 (14) Analyze mtDNA, **Student Presentations (4)** **(Forensic Analysis of mtDNA, CODIS 2)**

May 14 (15) Video, Clean up (**Future Forensic DNA Trends)**
Student Presentations (4)