

# California State University | Stanislaus

## BIOL 4840- Genetic Biotechnology

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Instructor:	Dr. James J. Youngblom	Term:	Spring 2015
Office:	Naraghi Hall 264	Lecture Times	Mon., Wed. 11:00-11:50
Office Phone:	667-3950	Lab Times:	Fri. 11:00-12:50
Best way to contact me:	jyoungblom@csustan.edu	Place:	Naraghi Hall 334
Office Hours:	Mon. 12- 1, more pending or by appt.		

### **University Course Catalog Description**

BIOL 4840 3.0 units. Principles and applications of recombinant DNA technology. Emphasis on the tools of gene manipulation, genomic scale analysis, and bioinformatics. Weekly activity involving DNA analysis software. **Prerequisite: BIOL 3350.** (Lecture, 2 hours; activity, 2 hours)

### **Course Requirements**

Students need knowledge of DNA structure, eukaryotic gene organization, transcription and translation, Mendelian genetic terminology, molecular properties, and chemical bonds. Basic level computer skills are required (web browsing, word, excel).

### **Course Learning Outcomes**

By the end of this course students will understand how to clone a gene and the value of genomic and cDNA libraries. Students will be able to explain PCR, RNAi, DNA sequencing methods, gel electrophoresis, Southern and Northern blotting. Students will know how to select the appropriate molecular tools given a particular biological question. Students will appreciate the various approaches to gene mapping. Students will understand why various methods are used for expression of gene products. Student will be able to select and utilize the appropriate DNA sequence analysis software.

### **Required Texts-**

- 1) From Genes to Genomes: Concepts and Applications of DNA Technology by Jeremy W. Dale, Malcolm von Schantz and Nicholas Plant, 3<sup>rd</sup> edition.
- 2) Neanderthal Man: In Search of Lost Genomes by Svante Pääbo (paperback available soon)

### **Dates to Remember-**

Mon. Feb. 9- Lecture online only (YouTube)

Mon. Feb. 23- Last day to drop a course

Tues. Mar. 31 -Cesar Chavez Day

Spring Break- No classes, Apr. 6-10

Fri. May 8- Warrior Day

Fri. May 15- Last day of classes

Final Exams- May 18-22

## Exams:

Mon. Mar. 2- **Exam #1 (60 pts)**

Mon. April 13- **Exam #2 (60 pts)**

May 1- **Quiz #4 (22 pts)**

Monday, May 18 11:15 am - **Final Exam (115 pts)**

## Exams/Quizzes/Reports-

Lab Reports (weeks 1-4) 20 pts. possible

EXAM 1-Mon. Mar. 2- 60 pts.

Quiz #1- Friday, Mar. 13, 6 pts (Neanderthal Man: Chapters 1 → 6)

Quiz #2- Friday, Mar. 20, 6 pts (Neanderthal Man: Chapters 7 → 16)

Quiz #3- Friday, Mar. 27, 6 pts (Neanderthal Man: Chapters 17 → end)

EXAM 2- Mon. Apr. 13- 60 pts.

Journal Article Quiz- Friday May 8, 22 pts.

Final Annotation reports, Friday, May 1, 11 am. 50 points

Oral Presentation, Friday May 8 or 15, 20 points

Class assignments, 25 pts.

FINAL EXAM- Monday, May 18 11:15- 115 pts.

Assessment	Date	Points	Percent of Final Grade
Lab Report 1-4	varies	20 pts.	5.1%
Exam 1	Mar. 2	60 pts.	15.4%
Quiz #1-3	varies	18 pts.	4.6%
Exam 2	Apr. 13	60 pts.	15.4%
Quiz #4	May 8	22 pts.	5.6 %
Annotat. Reports	May 1	50 pts.	12.8%
Oral Presentation	May 8 or 15	20 pts.	5.1%
Class assignments	varies	25 pts.	6.4%
Final Exam	May 18	115 pts.	29.5%
		390 pts.	100%

**Each exam will be a mixture of different types of questions (such as true/false, multiple choice, problems, short answer, and short essay).** The first two exams will be based on lecture material and reading in the text. The first two exams are not comprehensive. The final exam is comprehensive and will include questions about genome annotation from those laboratory exercises. A simple calculator may be used during the exams. **No leaving** the classroom during exams. The quizzes on Mar. 6, 13, and 20 will be taken entirely from the book “Neanderthal Man: In Search of Lost Genomes” by Svante Pääbo. This book is available in paperback soon and is found in some libraries now. Read it in its entirety and you will do well on these quizzes.

## Grading Scale (%)

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

<u>%</u>	<u>Grade</u>	<u>%</u>	<u>Grade</u>
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 have 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.

## Other Assessments

**Lab Reports 1-4-** 5 pts. each. These are submitted via email and are due on Fridays at 11 am. Late reports are penalized 1 pt. per day. Each person submits a report.

**Quiz #4-** The quiz is based on a journal (a soon to be selected article). This is a test of your ability to read and understand a primary journal article related to molecular genetics. A copy of the article will be available on Blackboard. You will be quizzed on content of the article and the tables and figures in the article.

**Annotation reports-** The annotations reports are the final products from your gene annotation projects. The type of reports for each gene in your fosmid is well documented and will be explained as you learn how to annotate genes. Your grade will be determined by the neatness, accuracy, thoroughness, and timeliness of your reports. Reports can be submitted throughout April. All reports are due at 11 a.m. on May 1. Tardiness on the annotation reports will result in a penalty: 10% if it is one workday late, or 20% for 2-5 workdays late, 30% if 6-10 workdays late. These assignments will not be accepted if overdue by more than 10 workdays.

**Oral presentation-** You should create a PowerPoint lecture to summarize the key findings of your gene annotation. You do not need to explain basic genetic terms that have already been explained in class. Rehearse your PowerPoint presentation. The presentation should be 10-13 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 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 your analysis of protein orthologs and explain them to the class.

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 1/4 and bottom 1/4 of student scores are ignored. Students that give all presenters high scores (A- or A) are not utilized in giving out grades.

**Inverted Lectures-** This term we will engage in some inverted lectures. Some of the inverted classes will include activities for credit or quizzes on things you need to analyze before class. All such activities will be announced in the previous class period (or earlier).

### The labs:

BIOL 4840 provides CSU Stanislaus undergraduates the opportunity to contribute to original research involving a large-scale DNA sequencing projects from Washington University St. Louis Genome Sequencing Center. Students will analyze portions of chromosome 3 of *Drosophila biarmipes* and compare the data to chromosomes of *D. melanogaster* to determine genome *D. biarmipes* organization. The lab tools will be various examples of DNA sequence analysis software. If you successfully complete the annotation of your *Drosophila* clone, give your instructor reliable contact information. You will be contacted to see if you want to be a co-author when Washington University is ready to publish a paper on the comparative genomics of various species of *Drosophila*.

- During the 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup> Fridays of the semester, the class will work together to explore several DNA analysis software tools. During this time, students will learn how to analyze genomic data. Homework from these labs is due at the start of the next lab.
- At the 5th lab meeting of the semester, each student will be assigned a file of DNA from *Drosophila biarmipes* (35-50 kb).
- Independent project work will happen in class and outside of class.
- On May 8 or 15 **each student will give a ~10 minute PowerPoint presentation, summarizing their Annotation lab work.**

### Class information:

The website <http://www.csustan.edu/Blackboard/> will have a link for this class. Note this is a new campus-wide link to the latest version of Blackboard. On Blackboard, I will post journal articles pertaining to this class. The lectures for this class will be presented in PowerPoint. The PowerPoint lectures will also be available on-line at <http://www.csustan.edu/Blackboard/>. Lab handouts are also available.

## **Notes:**

Each Friday you work on a computer (provided if needed). The first four weeks are structured and will include a lab handout that is due the following week. The first hour (or so) of class will be your instructor introducing some important concepts. Both the lab exercises and demonstration materials will be available electronically on the class Blackboard site.

The lectures will relate to the tools of biotechnology. These tools will be introduced more or less chronologically starting with the usage of restriction enzymes for gene cloning in the 1970s and concluding with next generation sequencing and other tools of the last few years.

## **Email**

I will use email to send you course announcements. The emails are sent to your csustan email account. Email is the good way for you to communicate with me outside of class time. I check my email many times per day on weekdays and periodically on weekends.

**Student Conduct-** The Friday activities will run the full two hours. Attendance is required. Do not enroll in this class if you have conflicts or other commitments on Friday afternoons. Be on time for class. During the first minutes of many Friday lab 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-** Students caught cheating are prosecuted as described in the university catalog. A report is filed with the Dean of Student Affairs. 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.

## **How to do well in this class-**

1. **COME TO CLASS** and ask questions. Take good notes, Review and rewrite your notes.
2. Read the chapters accompanying each lecture. Highlight important sections.
3. Reread the chapters if necessary
4. Study the new terms- use the internet for extra help (there is unlimited amounts of information related to course topics online)
5. If material is unclear, see me during my office hours
6. Start early and work diligently on your lab projects. Keep good lab notes.