# BIOLOGY 499: GENOMICS

**Spring 2010**

**Instructor:** Dr. Joyce Stamm

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**Office hours:** Monday, Wednesday, Thursday: 1 – 2 p.m.

Friday: 10 a.m – 12 p.m.

Please email or call for an appointment outside office hours.

This is a research-based class run in collaboration with the Genomics Education Partnership (GEP) based at Washington Univ. in St. Louis ([http://gep.wustl.edu](http://gep.wustl.edu/)). In this class, we will be studying how DNA sequence affects chromosome organization by comparing the sequences of various *Drosophila* (fruit fly) species. These sequences are publicly available, but they are 'draft' sequences and not highly reliable. In the first phase of the project, you will look at the sequence data to determine if there are errors or gaps, and 'finish' the sequence to high quality. The second phase of the project, annotation, involves identifying genes and other features in your sequences. You will do this by comparison to *Drosophila melanogaster*, which is much better studied so that data about gene expression is available for at least some of the genes. This is a great project to look at evolutionary questions, and to see the divergence that has occurred over a rather short time frame, between very similar species.

The GEP consists of partner schools throughout the country, all involved in this finishing and annotation work. The goal of the GEP is to publish the research data in a peer-reviewed scientific paper. If you successfully complete your projects and participate in the manuscript preparation, you will be listed as a co-author. Authorship requires that you review the drafts, submit any comments, and approve the final version. This means that you must keep me up to date on your contact information, so that you may be contacted when the paper is being prepared.

**COURSE OBJECTIVES:**

1. To understand the structure and organization of genomes
2. To gain hands-on experience with the techniques of sequence finishing and annotation, and the use of genomic databases.
3. To appreciate the open-ended nature of scientific research
4. To gain experience in reading and analyzing scientific literature
5. To develop skills in oral and written scientific communication

**COURSE FORMAT:**

This class meets for twice a week for two hours each session. Lecture and lab will be interspersed within each class meeting. In addition to lab work, class activities will include lectures, discussion of scientific papers, and presentation of your data. Most of your grade will depend on work done inside the classroom, therefore attendance is required. You should attend the section in which you are registered; however, you may make up a missed class by attending the other section. Otherwise, true make-up sessions are generally not possible. If you must miss a class due to legitimate reasons, and are unable to attend the other section, you should contact me as far in advance as possible to be excused. If you miss a class, you are responsible for obtaining notes and information from your lab partner, and consulting with the instructor and/or TA as necessary to gain an understanding of the material covered and catch up on your work as needed.

**COURSE MATERIALS:**

There are no required texts in this course.

Lab materials and readings will be handed out throughout the course of the semester. You are required to pay a $15 cash fee to Mrs. Brenda Kuenzli (in KC 231) to cover the cost of lab materials. Please do this prior to the second class meeting.

Course materials will be available on Blackboard. In addition, the Genomics Education Partnership website ([http://gep.wustl.edu](http://gep.wustl.edu/)) contains useful resources that you may be directed to during the course of the semester.

**COURSE REQUIREMENTS:**

Your grade will be based on the following components:

Quizzes and discussion of readings: 20%

Problem sets: 10%

Progress reports: 10%

Oral and written reports on fosmid finishing: 25%

Oral and written reports on fosmid annotation: 25%

Submission of data: 10%

There are no examinations in this course.

We will discuss a number of scientific articles related to genomics this semester. Reading quizzes will be given during these discussions. You will also be graded on your contributions to these discussions.

There are several problem sets designed to familiarize you with the tools needed for your research work. These will be completed mainly during class time.

Progress reports will be due every third class while you are working on finishing and annotation projects. These reports should summarize what you have accomplished, state any problems that you have encountered, and list goals for the next progress period.

You will need a spacious lab notebook and a thumb or flash drive to store many screen shots to prepare your progress reports, as well as your oral and written reports.

**About written assignments:**

All written assignments will be checked for originality by computer. This means that any use of uncited text or copying will be detected. In addition to turning in a paper copy of your work to the instructor, you must submit an electronic copy to

<http://www.turnitin.com>. The ID for this class is **3059813**and the enrollment password is **genome**. Your assignment will not be graded until the computer originality analysis is complete. Students are encouraged to visit the turnitin.com website for more information on this plagiarism prevention system.

**GRADING:**

Your final letter grade for the course will be based on the following percentages of the maximum points possible:

90 – 100% A

80 – 89% B

70 – 79% C

60 – 69% D

Below 60% F

Plus/minus grades will be given within the ranges above.

**HONOR CODE:**

It is expected that students are familiar with and will comply with the terms of the University’s Academic Honor Code. This means that you will not give or receive unauthorized aid on examinations or assignments. Sharing data on lab assignments is encouraged (and necessary!) but sharing figures and text will be considered a violation of the honor code. When writing, all citations must be properly referenced. Do not use uncited text from any source, even with minor modifications. This constitutes academic dishonesty and will be detected and harshly penalized.

**COURSE SURVEY:**

This course was developed at Washington University through funds from the Howard Hughes Medical Institute. We are part of a consortium of undergraduates and faculty from a number of universities and colleges. One of the goals of the consortium is to learn more about how research-based courses affect student learning. To accomplish this, I would like you to participate in the course survey and test that can be accessed from the “Assessment” drop-down menu at the GEP website.

Both the survey and the test should be taken twice: once at the beginning of the course, and again at the completion of the course to assess learning outcomes. You will be asked to select a code number to identify yourself so that your pre- and post-course responses can be matched. Be sure to note this identification code somewhere so that you can use the same code for the post-course survey and test.

Please note that participation in both the survey and test is anonymous and voluntary, and that your participation or lack thereof will not affect any aspect of your grade in the course. However, if you do participate, you will be entered into a drawing for a prize gift card.

# COURSE SCHEDULE (this schedule may be modified to enhance student learning)

|  |  |  |
| --- | --- | --- |
| Week | beginning | Topic |
| 1 | 1/11 | Research problem Overview of DNA sequencingGenome sequencing strategies |
| 2 | 1/18 | Genome structureIntroduction to ConsedIntroduction to Unix |
| 3 | 1/25 | Chromatin structureConsed exercises |
| 4 | 2/1 | Begin finishing project  |
| 5 | 2/8 | Continue finishing work |
| 6 | 2/15 | Continue finishing work |
| 7 | 2/22 | Continue finishing workBegin preparing reports |
| 8 | 3/1 | Final finishing labIntroduction to BLASTGene finding: Detecting and interpreting genetic homology  |
| **SPRING BREAK 3/6 – 3/14** |
| 9 | 3/15 | Finishing oral reports |
| 10 | 3/22 | Introduction to Flybase and genome browserBLAST exercises |
| 11 | 3/29 | Genes and pseudogenesMultiple sequence alignments/ClustalWBegin annotation project |
| 12 | 4/5 | Sequence repeatsContinue annotation |
| 13 | 4/12 | Finding repeatsContinue annotation  |
| 14 | 4/19 | Final annotation labBegin preparing reports |
| 15 | 4/26 | Annotation oral reports |