

BIO5150/7150 (Genomics)

Instructor: Dr. Chuanzhu Fan
Building and office number: BSB 5107
Office phone: 313-577-6451
Email address: cfan@wayne.edu
Web address: <http://fanlab.wayne.edu/>

CLASS MEETING LOCATION

0027 State Hall

CLASS MEETING TIME

Tuesday and Thursday, 10 a.m. to 11:15 a.m.

OFFICE HOURS

Tuesday and Thursday 2-3pm, BSB5107

COURSE REQUIREMENTS

A familiarity with biology, basic biochemistry, genetics, and molecular and cellular biology is necessary. It is assumed that students have basic training in computation, math and statistics. All students should be able to access computers and Internet.

PREREQUISITE

BIO3070 Genetics or equivalents, or consent of instructor.

COURSE MATERIALS

Textbook: not required.

Recommended reading textbook:

Introduction to Genomics, 2nd edition, by Arthur M Lesk, Oxford University Press, 2012.

Genomes 4, by T.A Brown, Garland Science 2017.

Lecture slides: Lecture slides will be provide on Blackboard one day before class

Papers assigned in class and homework: journal articles for lecture and homework assignments will be posted in Blackboard before the lecture and/or homework assignment.

COURSE DESCRIPTION AND OBJECTIVES

This course will introduce the theory and practice of genomics. Topics include overview of genomes, sequencing and mapping, comparative genomics, transcriptomes, population genetics and genomics, basic bioinformatics, population-level variation (SNPs, MNPs, indels), ethics, evolutionary genomics, and functional genomics. This course is designed to lead biology, genetics, and molecular and cellular biology-oriented junior and senior undergraduate and graduate students to the field of genomics.

The objective of this course will familiarize students with the tools and principles

of contemporary genomics. By the end of the course, students will have a working knowledge of current genomics technology and approaches as well as the types of databases and computational tools available.

- Familiarize students with genomic methods.
- Encourage students to think on genomic scale.
- Excite students about hottest areas of biology.
- Demystify modern genomics methods and concepts.
- Introduce *necessary* jargon.
- Discover basic biology in the context of theoretical and applied genomics research.
- Know the broad applications of genomics.
- Become proficient with basic web-based tools to "do" genomics.
- Appreciate the benefits of using math and computer sciences to understand biology in genome scale.

METHOD(S) OF INSTRUCTION:

Lectures

EXAMS

There will be one in-class midterm examinations on Oct 19th, 2017. There will also be one final exam that will be comprehensive and cumulative in that will cover all of the material presented during semester. The final exam will be held on Dec. 19th, 2017, 8am-10am.

Both exams are mandatory and may not be dropped.

HOMEWORK ASSIGNMENTS

There will be four open-book homework assignments. The homework assignment is due in one (1) week after it is assigned. Sixty (60) points/assignment.

QUIZZES

Six quizzes will be held in unannounced lecture day. Quiz will be held in before or last 5-10 minutes of lecture. Each quiz has 2-5 short-answer questions. Each quiz will cover the material from the lectures preceding the quiz. Each quiz will have a maximum core of 10 points.

No make-ups for quizzes.

TEAM PROJECT AND PRESENTATION

A team will be formed to conduct a genome project and write a term paper. The topics of project will be distributed and selected by the team. The project will be performed as team (2 students/team). The team must be one BIO7150 student and one BIO5150 student, unless assigned otherwise by instructor. The format of term paper will follow the formal review paper including Introduction from literature review, current progress, genome data set, future perspective, and references. References must be organized using Endnote. Five pages with single space (12/11 Times New Roman) is minimum. **NO COPYING AND PLAGIARISM**. It is unacceptable for you to "borrow" text from another student or any document, or electronic source unless you explicitly cite

the reference. Copying, plagiarism, academic theft or dishonesty for term paper will be treated as fail for the project. The term paper will have to be typed and handwriting is unacceptable. The term paper is due on December 15, 2017.

Project presentation: each team member will have to present. The final score of presentation will be judged by team (50 of 100) and individual performance (50 of 100). The presentation time will be 5-10 min/team member using power point slides.

GRADING:

- Midterm: 200
- Final exam: 300
- Homework assignments: 240 (4×60)
- Project term paper: 100
- Project presentation: 100
- Quizzes: 60 (6*10)
- Total: 1,000

Conversion of total grades to Letter Grade		
	A=1000 - 910	A- = 909 - 880
B+ = 879 - 850	B = 849 - 820	B- = 819 - 780
C+ = 779 - 750	C = 749 - 720	C- =719 - 680
D+ = 679 - 650	D = 649 - 620	D- = 619 - 580
	F < 580	

Score will not be curved. No make-up exams will be given. Reasonable exceptions may be granted in cases of illness which will require notification prior to the exam and must be followed up with an original signed note from a physician.

SCHEDULE OF TOPICS COVERED

Some chapters may require more or less time to cover than indicated on this schedule, so the actual chapter that I cover on given days is subject to changes depending on the rate of progress. Dates of exams and holidays are **not** flexible.

Week 1

Chapter 1 (08/31) Overview of genomics. Databases, databanks, and genome browsers

Week 2

Chapter 2 (09/05). DNA, RNA, protein, codon, central dogma, gene structure
Chapter 3 (09/07). Computer program overview for genomics: Linux, NCBI blast tools.

Week 3

Chapter 4 (09/12). Genome sequencing projects and genetic mapping.
Chapter 5 (09/14). Contents and organization of genomes
 First homework assignment

Week 4

Chapter 6 (09/19). Nucleotide substitution
Chapter 6 (09/21). Nucleotide substitution.
First homework assignment due

Week 5

Chapter 7 (09/26). DNA sequence and structure variations.
Chapter 8 (09/28). Comparative genomics

Week 6

Chapter 9 (10/03). DNA sequencing technology: Sanger sequencing, automated sequencing, shotgun sequencing.
Chapter 10 (10/05). BAC by BAC DNA sequencing: BAC library construction, finger printing, FPC (finger printing contig), MTP (minimum tiling path).
Second homework assignment

Week 7

Chapter 11 (10/10). Next-gen sequencing
Chapter 12 (10/12). Genome assembly
Second homework assignment due

Week 8

Chapter 13 (10/17). Genome annotation, resequence mapping and GWAS
Midterm (10/19). Midterm

Week 9

Chapter 14 (10/24). Phylogenetics and phylogenomics
Chapter 14 (10/26). Phylogenetics and phylogenomics

Week 10

Class tour (10/30). Tour to AGTC
Chapter 15 (11/02). Population genetics and genomics
Third homework assignment

Week 11

Chapter 16 (11/07). Gene and genome duplications, and transposable elements
Chapter 17 (11/09). Paleogenomics and synthetic genomics
Third homework assignment due

Week 12

Chapter 18 (11/14). Functional genomics
Chapter 18 (11/15). Functional genomics

Week 13

Chapter 18 (11/21). Functional genomics

Week 14

Chapter 19 (11/28). Domestication: animals and plants (crops)

Fourth homework assignment

Student presentation (11/30). Term project presentation

Week 15

Student presentation1 (12/05). Term project presentation

Overview (12/07). Overviews

Fourth homework assignment due

Week 16

Final exam, Tuesday, December 19, 2017, 8:00am-10:00am.

SPECIAL CONSIDERATIONS FOR INDIVIDUALS WITH DISABILITIES

If you have a documented disability that requires accommodations, you will need to register with Student Disability Services (SDS) for coordination of your academic accommodations. The Student Disability Services (SDS) office is located at 1600 David Adamany Undergraduate Library in the Student Academic Success Services department. The SDS telephone number is 313-577-1851 or 313-577-3365 (TDD only). Once you have your accommodations in place, Dr. Fan will be glad to meet with you privately during his office hours to discuss your special needs. Student Disability Services' mission is to assist the university in creating an accessible community where students with disabilities have an equal opportunity to participate fully in their educational experience at Wayne State University.

Please be aware that a delay in getting SDS accommodation letters for the current semester may hinder the availability or facilitation of those accommodations in a timely manner. Therefore, it is in your best interest to get your accommodation letters as early in the semester as possible.

RELIGIOUS HOLIDAY CONFLICTS

Students who have a conflict with any of the scheduled class or exam times due to religious reasons must notify Dr. Fan in writing by class time on or before Friday, September 22nd, 2017. No make-up exams will be given unless he is notified in writing by this date.

ADD/DROP POLICY

Add requests will not be approved after the second week of class, i.e. Wednesday, September 13th, 2017. Drop requests must be approved before the fifth week of class (<http://reg.wayne.edu/students/information.php#dropping>). Beginning the fifth week of class students are no longer allowed to drop but must withdraw from classes. Students who sign up for a class, stop attending, and fail to withdraw will receive an F for the course. Students who withdraw from the course after the fifth week will be assigned one of the following three grades: WP (withdrew but was passing at the time), WF (withdrew but was failing at the time), WN (withdrew and never attended class or no graded work). An "I" grade earned by a student will automatically revert to "F" if the work is not completed within one calendar year. There are no

exceptions. Further information on the grading policy can be found at <http://sdcl.wayne.edu/RegistrarWeb/Registrar/policies.htm>.

UNEXPECTED UNIVERSITY CLOSURES.

If the University is officially closed on an exam day, the exam will be held on the next regularly scheduled class day. Closure of the University is announced by the following mechanisms:

1. WSU Homepage (www.wayne.edu) *
2. The University Newslines (313) 577-5345 *
3. WSU Academica (www.a.wayne.edu) *
4. WDET-FM (Public Radio 101.9)
5. By other local radio and television stations

* Note: The information on closures and class cancellations is likely to be found at these locations before it is broadcast by local radio and television stations

OTHER

Please turn off cell phones and all other electronic communication devices during class, during laboratory/discussion sections, and during exams.

Any specific issue not covered by this syllabus will be resolved using University policies.

Disputes that cannot be resolved following the guidelines present in this syllabus will be resolved by following the guidelines of the University "Student Due Process".