

INSTRUCTOR(S):

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School of Biological Sciences and the Petit Institute
for Bioengineering and Bioscience

Georgia Institute of Technology

IBB 2313, 315 Ferst Drive

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Invited guest lecturers from Georgia Tech and other universities.

Teaching Assistant: Yeunsoo Lee; Email: ylee43@gatech.edu

CLASS HOURS: Monday/Wednesday 12:30pm - 1:45 pm

LOCATION: BlueJeans On-line Lectures

COURSE DESCRIPTION:

Epigenetics has become a significant field with ever expanding landscapes. This seminar and lecture course intends to introduce basic concepts and mechanisms of epigenetics and to discuss the central and emerging roles of epigenetic regulation in stem cell biology, development and human disease, as well as the analysis tools used for studying epigenetics and epigenomes. The course will consist of diverse topics in epigenetics, such as mechanisms in epigenetic regulation, chromatin biology, gene regulation, and current research of epigenetics in cell reprogramming, regenerative medicine, and disease. The course is aimed to promote in-depth discussions of current topics and to enhance appreciation of how epigenetics regulates genome function. Prior basic background knowledge in DNA and molecular biology is recommended. The **FORMAT** of the course will consist of lectures, critical reading of the scientific literature, student oral presentations, as well as in class discussions and debates. This course will be of interest to students of all majors related to biomedical sciences, bioengineering and health.

LEARNING OBJECTIVES:

Upon completion of this course, students will be able to:

1. Understand the definition of epigenetics and recognize various epigenetic phenomena
2. Outline the major epigenetic mechanisms
3. Know current techniques developed to study epigenetics and epigenomes.
4. Appreciate the role of epigenetic regulation in normal development and in diseases.

TEXTBOOK AND MATERIAL:

Epigenetics (2014) by Lyle Armstrong; Published by Garland Science, Taylor & Francis Group
(ISBN-13: 978-0815365112; ISBN-10: 081536511X)

Research papers to be discussed will be assigned in class.

PREREQUISITES:

Undergraduate Semester level BIOL 2344 or BIOL 2354 or BIOL 3450 or BIOL 2800, or permission from course instructor.

OFFICE HOURS: By appointment. Please email or consult with instructor after class to set up a meeting.

CLASS ATTENDANCE/GRADING POLICY:

You are expected to attend all lectures on-line at the assigned class times (Mon/Wed 12:30PM-1:45PM, EST).

GRADING:

Students will be evaluated on performances on exams, oral presentation, term report and class participation.

The final course grade is composed of:

- 1. Exams - 40%
- 2. Paper presentation - 20%
- 3. Term-report: 20%
- 4. Class discussion and participation - 20%

Grading	BIOS 4510	BIOL 8510
Exam 1	20%	20%
Exam 2	20%	20%
Presentation	20%	20%
Class participation	20%	20%
Term report	Paper critique 20%	Proposal/review 15%/5%

Final grading scale: The final mean class score will be the breakpoint between B's and C's. A's will be assigned to students with scores >10% above the mean, D's to students with scores > 10% points below the mean and F's to students with scores >20% below the mean. If the final mean class score is > 80%, the following grading criteria will apply: > 90% (A); 80-89% (B); 70-79% (C); 60-69% (D); Less than 60% (F).

Exams will consist of multiple choices questions. Each exam accounts for 20% of the final grade. There are no make-up exams. If you miss an exam, you will receive a "0" score unless your absence is for a validated medical or other reason deemed acceptable by the Dean of Students. In that case, you will be excused for that exam and your other exam grade will account for 40% of final grade. If you miss 2 exams, you will receive an "I" for the course and you will have 1 year to retake the course, otherwise your grade will revert to a "D" or "F" depending on your grades from other grading components.

Paper presentation will be based on research papers assigned in class. The format and guidelines of oral presentation will be distributed in class.

Class participation will be judged by the extent to which each student participates in class discussions (by asking questions, answering questions, comments, and critiques of student presentations, etc.).

Term report for BIOS 4510 Students will be paper critiques based on research papers assigned in class. Your term report is due on **2:10PM of April 30**.

Term report for BIOL 8510 Students will be a mini-grant proposal on a topic related to Epigenetics and a brief review of 3 de-identified grant proposals submitted by other students in BIOL 8510 (see below).

Proposal: The proposal should be 3 pages in length (Single space, Times New Roman 12 font) and describe an experimental project to be completed in 3 years. Proposals should include a description of *project aims, significance, innovation, research plan/key methods, alternative approach, and the long-term impact/goals of the work*. A reference page(s) should be added and is not included as part of the 3-page limit. **The deadline for proposal submission is 5PM of April 21, 2021.**

Review: You will be assigned 3 de-identified student proposals to review by **April 24** and your **completed reviews must be submitted no later than 2:10PM of April 30**. Reviews of each proposal should be no more than one page in length and should be scored from 1 (best) to 5 (less-best) for each of the following topics: 1) Significance- how significant do you think the impact of the study will be if successful?; 2) Innovation- how innovative is the proposed study relative to previous work in the field?; 3) Feasibility- how likely do you think it is that the proposed study can be successfully carried out in 3 years?

For each of these 3 scoring categories, provide a brief justification of your score of 3-5 sentences). In a cover letter, present the average score for each proposal and rank each of the 3 proposals in order of merit for funding.

HONOR CODE: All students are required to adhere to Georgia Tech Academic Honor Code (<http://www.osi.gatech.edu/>). Violations and plagiarism will be reported to the Dean of Students.

LEARNING ACCOMMODATIONS:

Necessary accommodations for students with documented disabilities will be made as appropriate. These accommodations must be arranged in advance and in accordance with the Office of Disabilities Services office (<http://disabilityservices.gatech.edu/>).

RECORDINGS OF CLASS SESSIONS AND REQUIRED PERMISSIONS

Due to Covid-19 concerns and the increased use of distance learning, our class sessions may be audio visually recorded for use by enrolled students. Class recordings, lectures, and other classroom presentations presented through video conferencing and other materials posted on Canvas are for the sole purpose of educating the students enrolled in the course. Students may not record or share recordings, including screen capturing, unless the instructor states so or individual permission is obtained. Exams and tests may require students to engage the video camera, but those recordings will not be shared with or disclosed to others without consent unless legally permitted.

For classes where participation is voluntary, students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded.

For classes requiring class participation, if students are identifiable by their names, facial images, voices, and/ or comments, written consent must be obtained before sharing the recording with persons outside of students in the class.

SPRING 2021 IMPORTANT GEORGIA TECH DATES

Jan 14 CLASSES BEGIN

Jan 18 OFFICIAL SCHOOL HOLIDAY

Jan 18-22 Verification of student participation in class

Jan 22 Last day to register and/or make schedule changes

Mar 17 Grade mode deadline, Last day to withdraw from individual courses with a grade of "W"

Mar 16, Mar 24, 2021 Spring mid-semester breaks

Apr 26-27 Final Instructional Days

Apr 28, April 29 (8am-2:20pm), May 4 (8am-2:20pm) Reading Period

Apr 29-May 6 FINALS WEEK

TENTATIVE SCHEDULE/TOPICS:

Week	DATE	TOPIC	LECTURER
1	14-Jan (Th)	Semester begins	
2	18-Jan (M) 20-Jan (W)	Martin Luther King Jr. Day (official school holiday) Introduction and overview	Y. Fan/GT
3	25-Jan (M) 27-Jan (W)	The basis of transcription process Epigenetic mechanisms - DNA methylation and demethylation (I)	Y. Fan/GT Y. Fan/GT
4	1-Feb (M) 3-Feb (W)	Epigenetic mechanisms - DNA methylation and demethylation (II) Epigenetic mechanisms - histones and nucleosomes (I)	Y. Fan/GT Y. Fan/GT
5	8-Feb (M) 10-Feb (W)	Epigenetic mechanisms - histones and nucleosomes (II) Guest lecture: Epigenetics in social insects	Y. Fan/GT M.Goodisman/GT
6	15-Feb (M) 17-Feb (W)	Epigenetic mechanisms - histone modifications (I) Guest lecture: Epigenetic mechanisms - histone modifications (II)	Y. Fan/GT H. Wang/UAB
7	22-Feb (M) 24-Feb (W)	Review 1 Exam 1	Y. Fan/GT Y. Fan/GT
8	1-Mar (M) 3-Mar (W)	Epigenetic mechanisms - Polycomb complex and Trithorax complex Epigenetic mechanisms – ncRNA, Higher order chromatin structure	Y. Fan/GT Y. Fan/GT
9	8-Mar (M) 10-Mar (W)	Genomic imprinting in mammals; Dosage compensation Epigenetic regulation in stem cells and cell reprogramming	Y. Fan/GT Y. Fan/GT
10	15-Mar (M) 17-Mar (W)	Epigenetics and disease Guest lecture: Epigenetic control in gametogenesis and development	Y. Fan/GT R. De La Fuente/UGA
11	22-Mar (M) 24-Mar (W)	Computational analysis of transcriptome and Epigenome No class – mid-semester break	Y. Fan/GT
12	29-Mar (M) 31-Mar (W)	Guest lecture: Epigenetic control of the mitotic cell cycle Review 2	E. Bouhassira/Einstein Y. Fan/GT
13	5-Apr (M) 7-Apr (W)	Exam 2 Guest lecture: Epigenetic Drug Design	Y. Fan/GT Y. Oyelere/GT
14	12-Apr (M) 14-Apr (W)	Guest lecture: Epigenetic regulation of stem cell maintenance and differentiation Student Presentation 1: Epigenetics and transgenerational inheritance	K. Cao/CWRU Entire class
15	19-Apr (M) 21-Apr (W)	Student Presentation 2: Epigenetic heterogeneity New technologies in epigenetics analysis BIOL8510 proposal due: 5PM, 4/21/2021	Entire class R. Deal/Emory
16	26-Apr (M) 28-Apr (W)	Term report prep (Final instructional days) No class (Reading Period)	Y.Fan/GT
17-18	4/29-5/6	Final Exams Days	
17	30-Apr (Fri)	BIOS4510 paper critique/ BIOL8510 proposal review due: 2:10PM, 4/30/2021	Y.Fan/GT