San José State University
Computer Science Department
CS 286: Advanced Topics In Computer Science, Sec-01
Computational Epigenetics, Fall 2022

Course Information

Instructor:	Leonard Wesley
Office Location:	MH 212
Telephone:	408.924.5287 (Office, however, I will not be on campus very frequently during the Fall 2022 semester.)
Email:	Leonard.Wesley@sjsu.edu
Office Hours:	Tuesdays 6:30AM – 8:30AM, Zoom Link For Office Hours For Fall 2022:: https://sjsu.zoom.us/j/81579190359?pwd=RlMwU GduVy9rSUFMeVZnU2YyMTdIZz09 Passcode 355621
Class Days/Time:	Section 01: Tuesdays and Thursdays 6:00PM – 7:15PM Via Zoom.
Classroom:	Online. See Canvas for Zoom link information.
Prerequisites:	Completion of CS123B, Biol 115, and Math 161A or equivalent courses or instructor consent.

CoS COVID-19 Safety Language for Syllabi

All students registered for a College of Science (CoS) class with an in-person component must view the [CoS COVID-19 Training](#) slides and the [SJSU Phased Adapt Plan](#) website and acknowledge reading them according to their instructor's directions. By working together to follow these county and SJSU safety practices, we can keep our college safer. Students who do not follow COVID-19 Safety practice(s) outlined in the training, the SJSU Phased Adapt Plan, or instructions from their instructors, TAs or CoS Safety Staff may be dismissed from CoS buildings, facilities or field sites. Please review this training as needed throughout the semester, as updates will be implemented as changes occur (and posted to the same links).

Course Description

Epigenetics is a field of biological study that is concerned with the mechanisms that switch genes on and off, and to varying degrees determine our uniqueness. Computational epigenetics involves applying bioinformatic and data analytic methods to help answer and explain epigenetic questions that are related to the mechanisms for differential gene expression, silencing, genomic imprinting, and microarray analysis.

After completing this course, students will know the history and state-of-the-art of computational epigenetics, various types and methods of chromatin and genetic regulation (e.g., chromatin rearrangement, methylation, and acetylation), various DBs used in epigenetics work (e.g., 3DIV, MethDB, Pubmeth, and ChromDB), imprinting, impact of the environment on epigenetic control, STEM cell reprogramming, and disease epigenetics.

Learning Outcomes

Upon successful completion of this course, students will:

1. SLO-1: Be familiar with both biology basics and the epigenetic and computational epigenetic technology landscape.
2. SLO-2: Know the methods of eukaryotic chromatin and DNA regulation, and have competency with using selected computational models of eukaryote chromatin and DNA regulation.
3. SLO-3: Understand the mechanisms of epigenetic imprinting and impact of the environment on epigenetic control.
4. SLO-4: Know how to use selected epigenetic DBs to help answer questions of interest.
5. SLO-5: Understand the mechanisms STEM Cell reprogramming, and some of the diseases related to epigenetic factors. Understanding the mechanisms of plant epigenetics.

Each CLO above corresponds to a learning module that is described in the course calendar below. That is, there are five (5) learning modules that cover the CLOs described above.

Required Texts

Epigenetic Gene Expression and Regulation   (2016) Edited by S.Huang, M.Litt, and C.Blakey, Elsevier Academic Press, 525 B Street, Suite 1800, San Diego, CA 92101-4495, USA.

The epigenetic field is evolving very rapidly. The required textbook material will be supplemented with relevant and more recent publications. Selected research articles and reviews will be provided on various topics. Examples include

1. [Epigenetics and Metabolism in Health and Disease](#) Tzika, Evangelia ; Dreker, Tobias ; Imhof, Axel, Frontiers in Genetics, Sept 18, 2020
2. [Epigenetics in Gastrointestinal Health and Disease: Spotlight on DNA Methylation in the Intestinal Epithelium](#) Zilbauer, Matthias ; Kraiczy, Judith Nestle, Nutrition Institute workshop series, 2017, Vol.88, pp.35-44
3. [Epigenetics, the environment, and children's health across lifespans](#) 2016

These and other relevant articles and text books will be accessed via the on-line library or provided as pdf files.

Other Optional Reading Material

Epigenetics 2nd Edition by C. David Allis, Marie-Laure Caparros, Thomas Jenuwein, and Danny Reinberg, Cold Fall Harbor Laboratory Press, 2015, ISBN 978-1-936113-59-0 Hardcover. Electronic versions available from Cold Fall Harbor Laboratory Press.

From Molecular Biology Prerequisite – **Molecular Biology of the Gene**, 6th/7th ed., by Watson, James D., et al. Pearson/Benjamin Cummings, 2008/2013.

Course Requirements and Assignments

Course Logistics
Students should expect to spend approximately nine (9) hours per week (on average) outside of the classroom preparing for and completing the assigned course work. This includes reading papers, viewing videos as appropriate, completing homework and programming exercises, and so forth. The amount of time that a student actually spends studying and completing assignments will depend on individual skills and the time allocated to the course. The nine (9) hours per week estimate is based on previous experiences of the instructor and students. So please plan and schedule accordingly.

Previously, students have asked for special exception to policies and procedures for this course. An example includes asking the instructor for extra assignments or work to help improve a grade. Even if such a request is reasonable in the opinion of the instructor, no exception will be given to a student unless it can be made available to the entire class, AND does not constitute significant extra work on the part of students, instructors, graders and so forth. Students should have no concern that other students will receive special exceptions that will not be available to the entire class.

NOTE: University policy F69-24 at http://www.sjsu.edu/senate/docs/F69-24.pdf states that "Students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because active participation is frequently essential to insure maximum benefit for all members of the class. Attendance per se shall not be used as a criterion for grading." However, attendance will be required in order to complete and submit many in-class exercises, quizzes, and exams.

Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally three hours per unit per week) for instruction, preparation/studying, or course related activities, including but not limited to internships, labs, and clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus.

Classroom Protocol
Instruction will begin at or within several minutes of the official published start time for the course. Please make sure that cell phones, beepers, and texting devices are turned off during the entire scheduled class time. Excessive audible discussions with fellow students is prohibited so that others are not disturbed. If any subject matter is not understood, please do not hesitate to ask for clarification. If an extended response is necessary to remove doubts, then a request to follow up outside of scheduled classroom instruction time might be made.

Quizzes and Exams
There will be three quizzes, one midterm and a final exam all of which will count toward the final grade as specified in the "Grades" section below. During quizzes and exams, communication with other individuals via any means is strictly prohibited without the express permission of the instructor. Violations will be met with the full impact of SJSU's academic integrity policy and procedures.

Projects
Several life science or genomics-based projects will be described near the start of the course. Projects will involve applying the skills and knowledge learned in the course to the project. Teams of 2-3 students will be formed to work on a selected project topic. Teams will be required to submit a project proposal before starting on a project, and submit a project report along with

working code at the end of the course. Individual student scores on a project will be determined by the content and quality of the contribution of each student toward the project. The score on the course project and project presentation will count toward the final grade (percentage wise) as specified in the "Grades" section below.

Reading, Homework, Programming, In-Class Exercises, Participation Assignments

Graded reading, homework, programming, and class participation and brief course feedback assignments will be given almost weekly, and will count toward the final grade. There will be 4 In-class Exercise sessions. These will typically involve forming teams of 2-3 students that work on assigned exercises in the classroom. They provide an opportunity to get started on homework or programming assignments that are to be submitted on a designated due date. Participation is mandatory, and scores will count toward the final grade.

Computational Resources

Students are required to make sure that they have access to sufficient UNIX, Windows, or Mac based computational resources (e.g., computers and software) to carryout assignments in the course. An attempt to offer the course in a classroom with sufficient computation resources will be made by the department to support classroom instruction and demonstrations. However, students should be prepared to bring their portable laptops to class.

Tentative course calendar of assignment due dates & exam dates:
(Please note that course calendar below, and its content is "subject to change with fair notice")

Week #	Tue	Thur	Module # & Name	TOPIC	Assignment See Canvas For Assignment Details and Due Dates
Week 1	N/A	1/27	#1 Intro & Background	1/27: - Course Intro, Class background survey/skills assessment - Biology Basics What is Epigenetics & Computational Epigenetics.	Module #1
Week 2	2/1	2/3	#1 Intro & Background #2 Epigenetic Regulation & Comp. Models	2/1: - Previous work in epigenetics State-of-the-art in epigenetics and computational epigenetics - Chromosome Structure & Eukaryote Regulation I 2/3: - Chromosome Structure & Eukaryote Regulation I (cont.)	Module #1 Module #2 February 7, 2022 Last Day To Drop Classes Without An Entry On The Student's Records
Week 3	2/8	2/10	#2 Epigenetic Regulation & Comp. Models	2/8: - Chromosome Structure & Eukaryote Regulation II 2/10: - **In-Class Exercise 1** Topics Covered Week 1 to Week 3	Module #2

Week 4	2/15	2/17	#2 Epigenetic Regulation & Comp. Models	Tue: - Chromosome Structure & Eukaryote Regulation II (cont.) Thur: - DNA & Histone Modification	Module #2
Week 5	2/22	2/24	#2 Epigenetic Regulation & Comp. Models	2/22: - **Quiz 1 (~35 mins): Covers Topics Week 1 thru Week 4** - DNA & Histone Modification (cont.) 2/24: - RNAi	Module #2
6	3/1	3/3	#2 Epigenetic Regulation & Comp. Models	3/1: - RNAi (cont.) 3/3: Computational Epigenetic modeling *(BiQAnalyzer, BiQAnalyzer HT, EpiGRAPH, EpiExplorer)*	Module #2
7	3/8	3/10	#2 Epigenetic Regulation & Comp. Models	3/8: - **In-Class Exercise 2** Topics Covered Week 3 to Week 6 3/10: - **Midterm (Full period): Covers Topics from Week 1 thru Week 6**	Module #2
8	3/15	3/17	#3 Epigenetic Imprinting & Environmental Control	3/15: - Epigenetic Imprinting 3/17: - Epigenetic Imprinting (cont.)	Module #3

9	3/23	3/25	#3 Epigenetic Imprinting & Environmental Control	3/23: - Epigenetics and environmental Control 3/25: - **Quiz 2 (~35 mins): Covers Topics Week 7 thru Week 8** - Epigenetics and environmental Control (cont.)	Module #3
	3/28	**4/1**		**FALL BREAK**	
10	4/5	4/7	#4 Epigenetic DBs	4/5: - MethDB & Pubmeth 4/7: - ChromDB & Histone DB	Module #4
11	4/12	4/14	#4 Epigenetic DBs	4/12: - **In-Class Exercise 3** Topics Covered Week 7 to Week 10 4/14: - ChromDB & MethyLogiX DNA Methylation DB	Module #4
12	4/19	4/21	#5 Epigenetic Diseases & STEM Cell Reprogramming , Plant epigenetics	4/19: - Epigenetic Diseases I 4/21: - **Quiz 3 (~35 mins): Covers Topics Week 9 thru Week 11** - - Epigenetic Diseases I (cont.)	Module #5
13	4/26	4/28	#5 Epigenetic Diseases & STEM Cell Reprogramming , Plant epigenetics	4/26: - **In-Class Exercise 4** (Work on Team Projects, Q&A) 4/28: - Epigenetic Diseases II	Module #5

14	5/3	5/5	#5 Epigenetic Diseases & STEM Cell Reprogrammin, Plant epigenetics	5/3: - Epigenetic Diseases II (cont.) - STEM cells and reprogramming 5/5: - STEM cells and reprogramming (cont.)	Module #5
15	5/10	5/12	#5 Epigenetic Diseases & STEM Cell Reprogramming, Plant epigenetics	5/10: - Epigenetic Regulation In Plants 5/12: - Review, Q&A, and preparation for Final exam.	Module #5
			Final Project Report and Code Due To Canvas **Wednesday May 25, 2022 By 11:59PM**		

SCHEDULE FOOTNOTES:
NONE AS OF AUGUST 2022

Grades *
WRITTEN HOMEWORK (4 at 20 points each)   80 pts
QUIZZES (3 at 50pts each)   150 pts
MIDTERM   100 pts
IN-CLASS EXERCISES (4 at 50pts each)   200 pts
WEEKLY COURSE FEEDBACK (14 at 5pts each)   70 pts
PROGRAMMING ASSIGNMENTS (2 @ 100pts each)   200 pts
FINAL PROJECT REPORT & CODE   300 pts

Total Course Points   =   1,100 pts Total

* The total points for each category might change depending on the number of project teams and assignments. The instructor reserves the right to adjust, with sufficient advanced notice, the above point distributionby$_{+5}$ pts. Such adjustments might be based on the difficulty or simplicity of assignments or quizzes or exams.

Grading Policy
Grading Percentage Breakdown

Grading Percentage Breakdown		
Percent of Total Points	**Points**	**Letter Grade**
96.66%	≥ 1063	A plus
93.33%	≥ 1027	A
90.00%	≥ 990	A minus
86.66%	≥ 953	B plus
83.33%	≥ 917	B
80.00%	≥ 880	B minus
76.66%	≥ 843	C plus
73.33%	≥ 807	C
70.00%	≥ 770	C minus
66.66%	≥ 733	D plus
63.33%	≥ 697	D
60.00%	≥ 660	D minus
59.99%	< 660	F

HOW TO CALCULATE/ESTIMATE YOUR GRADE
If students would like to calculate their numeric grade percentage, the formula is as follows:

Numeric CS 286 Grade Percentage =

$$\frac{Total\ points\ from\ assignments}{Total\ course\ points} x\ 100\%$$

There is no guarantee that grades will be curved. If so, it will be done at the end of the semester. The instructor is already aware that graduate students need to maintain an overall GPA of B or better. Just because a student NEEDS a particular grade doesn't mean that the instructor will automatically GIVE the student that grade. Students must EARN a passing grade based on submitted and evaluated course work.

Extra Credit Options, If Available
There are no extra credit assignments in this course except for completing designated "Advanced" assignments. However, homework assignments and exams might contain extra credit options.

Penalty For Late Or Missed Work
Late assignments will receive a 25% deduction for every 24hr period the submission is late. There will be partial credit for assignments.

Receiving An Incomplete (I) Grade
Receiving a grade of incomplete (I) is not automatic. Students must complete at least 80% of course assignments by the end of the semester to be eligible to receive a grade of incomplete. Students must also provide documentation to support the reason for the request to receive an incomplete grade. The instructor reserves the right to make a final decision regarding giving an incomplete grade. If the instructor agrees to give a student an Incomplete grade, the instructor will enter the remaining work to be completed as part of the PeopleSoft grade submission process.

Grade Change Policy
It is a university policy that course grade changes must be made within one semester from the end of the course. Requests for exceptions to this policy must be accompanied with a documented and compelling reason.

University Policies

General Expectations, Rights and Responsibilities of the Student
As members of the academic community, students accept both the rights and responsibilities incumbent upon all members of the institution. Students are encouraged to familiarize themselves with SJSU's policies and practices

pertaining to the procedures to follow if and when questions or concerns about a class arises. See [University Policy S90–5](#) at http://www.sjsu.edu/senate/docs/S90-5.pdf. More detailed information on a variety of related topics is available in the [SJSU catalog](#), at http://info.sjsu.edu/web-dbgen/narr/catalog/rec-12234.12506.html. In general, it is recommended that students begin by seeking clarification or discussing concerns with their instructor. If such conversation is not possible, or if it does not serve to address the issue, it is recommended that the student contact the Department Chair as a next step.

Dropping and Adding

Students are responsible for understanding the policies and procedures about add/drop, grade forgiveness, etc. Refer to the current semester's [Catalog Policies](#) section at http://info.sjsu.edu/static/catalog/policies.html. Add/drop deadlines can be found on the current academic year calendars document on the [Academic Calendars webpage](#) at
 http://www.sjsu.edu/provost/services/academic_calendars/. The [Late Drop Policy](#) is available at http://www.sjsu.edu/aars/policies/latedrops/policy/**.** Students should be aware of the current deadlines and penalties for dropping classes. Information about the latest changes and news is available at the [Advising Hub](#) at http://www.sjsu.edu/advising/.

Consent for Recording of Class and Public Sharing of Instructor Material

[University Policy S12-7](#), http://www.sjsu.edu/senate/docs/S12-7.pdf, requires students to obtain instructor's permission to record the course and the following items to be included in the syllabus:

- "Common courtesy and professional behavior dictate that you notify someone when you are recording him/her. You must obtain the instructor's permission to make audio or video recordings in this class. Such permission allows the recordings to be used for your private, study purposes only. The recordings are the intellectual property of the instructor; you have not been given any rights to reproduce or distribute the material."

    o It is suggested that the Greensheet include the instructor's process for granting permission, whether in writing or orally and whether for the whole semester or on a class by class basis.

- o In classes where active participation of students or guests may be on the recording, permission of those students or guests should be obtained as well.

- "Course material developed by the instructor is the intellectual property of the instructor and cannot be shared publicly without his/her approval. You may not publicly share, or upload instructor generated material for this course such as exam questions, lecture notes, or homework solutions without instructor consent."

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs' Syllabus Information web page at http://www.sjsu.edu/gup/syllabusinfo/. Make sure to review these policies and resources.

Academic Integrity
Your commitment, as a student, to learning is evidenced by your enrollment at San Jose State University. The University Academic Integrity Policy S07-2 at http://www.sjsu.edu/senate/docs/S07-2.pdf requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. The Student Conduct and Ethical Development website is available at http://www.sjsu.edu/studentconduct/.

Campus Policy in Compliance with the American Disabilities Act
If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Presidential Directive 97-03 at http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf requires that students with disabilities requesting accommodations must register with the Accessible Education Center (AEC) at http://www.sjsu.edu/aec to establish a record of their disability.