

Last Updated Spring 2025

San José State University
Computer Science Department
CS286-02 Computational Epigenetics

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 Spring 2025 semester. I suggest contacting me via email.)

Email: Leonard.Wesley@sjsu.edu

Office Hours: Tuesdays 7:00AM – 9:00AM,
Zoom Link For Office Hours For Spring 2025
[https://sjsu.zoom.us/meeting/85152031440?occurrence=173807640000&meetingMasterEventId=obIP9RmRue3ddxxFv2p5A](https://sjsu.zoom.us/j/85152031440?occurrence=173807640000&meetingMasterEventId=obIP9RmRue3ddxxFv2p5A)
PASSCODE: 168356

Class Days/Time: TuTh 10:30AM – 11:45AM

Classroom: MH 233

Prerequisites: Completion of CS/BIOL123B, Biol 115, and Math 161A or equivalent courses or instructor consent.

Course Description

The application of bioinformatic and data analytic methods to answer and explain epigenetic questions are presented. Epigenetic databases and various types of genetic regulation methods related to gene regulation, stem cell reprogramming and diseases are also presented.

Extended 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 databases used in epigenetics work (e.g., Enrichr, 3DIV, MethDB, Pubmeth, and ChromDB), imprinting, impact of the environment on epigenetic control, stem cell reprogramming, and disease epigenetics.

Course Learning Outcomes

Upon successful completion of this course, students will:

1. CLO-1: Know the epigenetic and computational epigenetic technology landscape.
2. CLO-2: Know the methods of eukaryotic chromatin, DNA, and RNA regulation, and have competency with using selected computational models of eukaryote chromatin, DNA, and RNA regulation.
3. CLO-3: Understand the mechanisms of epigenetic imprinting and impact of the environment on epigenetic control.

4. CLO-4: Know how to use selected epigenetic databases to help answer transcriptional, chromatin, and methylation related questions of interest.
5. CLO-5: Know how to design and implement epigenetic pipelines that use the APIs to methylation and transcriptional DBs to identify potential causes of neurodegenerative or cancer-related diseases.

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

Computational Epigenetics and Diseases (2019) Edited by Loo Keat Wei, Academic Press, an imprint of Elsevier 125 London Wall, London EC2Y 5AS, United Kingdom ISBN: 978-0-12-814513-5

The epigenetic field is evolving very rapidly. The required textbook material will be supplemented with relevant 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.
4. [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.

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 3 hours of lecture per week plus nine or more (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](http://www.sjsu.edu/senate/docs/F69-24.pdf) 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 3 hours per unit per week with 1 of the hours used for lecture) for instruction or preparation/studying or course-related activities including but not limited to internships, labs, and clinical practice. Other course structures will have equivalent workload expectations as described in the syllabus.

Classroom Protocol

When Off-Campus (e.g., via Zoom):

Students must make sure that their microphone is muted at all times unless instructed otherwise, e.g., to ask a question. Most of the time, interactions will be via Chat or responding to Polls.

During quizzes and exams, computer cameras **MUST BE ON** and the student visible at all times during the quiz or exam. Failure to have a working camera during exams will result in a minimum 50% reduction of the quiz or exam score.

When On Campus:

<*THE OFFICIAL ASSIGNED CLASSROOM*> is a dual purpose room. It can be a regular lecture room or a computer laboratory. Please note that “or” in the last sentence is exclusive. In other words, SCI 311 is never a lecture room AND a computer lab at the same time.

Lecture Mode: This is when <*THE OFFICIAL ASSIGNED CLASSROOM*> is used as a regular lecture room. Students are expected to listen and follow the Lecture. <*THE OFFICIAL ASSIGNED CLASSROOM*> can be a noisy room because of the large number of laptops/workstations and the server. Be considerate to your classmates and follow the Lecture. Do not use the computer (workstation) during lectures, and do not talk to your classmates during lectures. Do not open your laptops, or check email, web-chat, tweet, web-surf on the internet, and so forth. If you cannot follow these simple rules, please do not enroll in this class.

Lab Mode: This is when <BUILDING AND ROOM NUMBER> is used as a computer lab for in-class exercises, Canvas exams, and related assignments that involve the use of computers. Use the computers and share your ideas and solutions with your classmates except during exams or when otherwise instructed. For in-class exercises, the results of your work for that class session will need to be uploaded to an appropriate Canvas assignment for review and possible grading. We shall alternate between the two modes. A typical class will begin with a short lecture (Lecture Mode) to describe the in-class exercise that will reinforce the assignment. This will be followed by a hands-on (Lab Mode). There will be a number of in-class exercises or hands-on-exercises. The purpose of the in-class exercises and hands-on exercises is to develop your understanding of the course lectures, homework assignments, videos, and e-materials.

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. The minimum requirement: 32 GB Ram, Min 2.5 GHz Processor, 100GB Storage, and be network capable to carry out assignments for 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:

Week #	Tue	Thur	Module # & Name	TOPIC	Assignment See Canvas For Assignment Details and Due Dates
Week 1	N/A	1/23	#1 Intro & Background	1/23: - Course Intro, Class background survey/skills assessment. - Epigenetic and computational epigenetic technology landscape.	Module #1

Week 2	1/28	1/30	#2 Epigenetic Methods	<p>1/28:</p> <ul style="list-style-type: none"> - Epigenetic methods of eukaryotic chromatin, DNA, and RNA regulation, and computational models of eukaryote chromatin, DNA, and RNA regulation. (Wei Chaps 1 & 2) <p>1/30:</p> <ul style="list-style-type: none"> - CONTINUED epigenetic methods of eukaryotic chromatin, DNA, and RNA regulation, and computational models of eukaryote chromatin, DNA, and RNA regulation. (Wei Chaps 1 & 2) 	Module #2
Week 3	2/4	2/6	#2 Epigenetic Methods	<p>2/4:</p> <ul style="list-style-type: none"> - Whole Genome Bisulfite Sequencing (Wei Chap 4) <p>2/6:</p> <ul style="list-style-type: none"> - ChIP & Data Analysis of ChIP-Seq Experiments (Wei Chap 5) 	Module #2
Week 4	2/11	2/13	#2 Epigenetic Methods	<p>2/11:</p> <ul style="list-style-type: none"> - Computational Tools for microRNA Target Prediction (Wei Chap 6) <p>2/13:</p> <p>In Class Exercise 1 Topics Covered Week 1 to Week 4</p>	Module #2

Week 5	2/18	2/20	#3 Epigenetic Imprinting	2/18: - CONTINUED Computational Tools for microRNA Target Prediction (Wei Chap 6) 2/20: - Mechanisms of epigenetic imprinting and impact of the environment on epigenetic control.	Module #3
Week 6	2/25	2/27	#3 Epigenetic Imprinting	2/25: - CONTINUED Mechanisms of epigenetic imprinting and impact of the environment on epigenetic control. 2/27: Quiz 1 (~45 mins): Covers Topics Week 1 thru Week 5	Module #3
7	3/4	3/6	#4 Epigenetic Databases	3/4: - Epigenetic Databases: transcriptional, chromatin, and methylation (Handouts APIs to epigenetic DBs) 3/6: - In-Class Exercise 1 Topics Covered Week 3 to Week 6	Module #4
8	3/11	3/13	#4 Epigenetic Databases	3/11: - CONTINUED Epigenetic Databases: transcriptional, chromatin, and methylation (Handouts APIs to epigenetic DBs) 3/13: - CONTINUED Epigenetic Databases: transcriptional, chromatin, and methylation (Handouts APIs to epigenetic DBs)	Module #4

9	3/18	3/20	#4 Epigenetic Databases	3/18: - KEGG & Epigenetic DBs (Handouts APIs to KEGG and Epigenetic DBs) 3/20: Midterm (Full period): Covers Topics from Week 1 thru Week 8	Module #4
10	3/25	3/27	#4 Epigenetic Databases	3/25: - CONTINUED KEGG & Epigenetic DBs (Handouts APIs to KEGG and Epigenetic DBs) 3/27: - Stem Cell reprogramming & Plant Epigenetics (Handouts)	Module #4
	3/31	4/4		SPRING BREAK	
11	4/8	4/10	#5 Epigenetic pipeline	4/8: - In-Class Exercise 3 Topics Covered Week 7 to Week 10 4/10: - Design and implement epigenetic pipelines that use the APIs to methylation and transcriptional DBs to identify potential causes of neurodegenerative or cancer- related diseases. (Wei Chap 9)	Module #5

12	4/15	4/17	#5 Epigenetic pipeline	<p>4/15: - CONTINUED Design and implement epigenetic pipelines that use the APIs to methylation and transcriptional DBs to identify potential causes of neurodegenerative or cancer-related diseases. (Wei Chap 9)</p> <p>4/17: Quiz 2 (~35 mins): Covers Topics Week 5 thru Week 11</p>	Module #5
13	4/22	4/24	#5 Epigenetic pipeline	<p>4/22: - CONTINUED Design and implement epigenetic pipelines . . . Breast Cancer (Wei Chap 15)</p> <p>4/24: - CONTINUED Design and implement epigenetic pipelines . . . Breast Cancer (Wei Chap 15)</p>	Module #5
14	4/29	5/1	#5 Epigenetic pipeline	<p>4/29: - CONTINUED Design and implement epigenetic pipelines . . . Breast Cancer (Wei Chap 15)</p> <p>5/1: - CONTINUED Design and implement epigenetic pipelines . . . Breast Cancer (Wei Chap 15)</p>	Module #5
15	5/6	5/8	#5 Stem Cell Reprogram ming & Plant Epigenetics	<p>5/6: In-Class Exercise 4 (Work on Projects, Q&A)</p> <p>5/8: Quiz 3 (~35 mins): Covers Topics Week 9 thru Week 14</p>	Module #5

	<p>Final Project Report and Code Due To Canvas Wednesday May 14, 2025 By 11:59PM</p> <p>No Final Exam. The Project Takes The Place Of The Final Exam</p>
--	--

SCHEDULE FOOTNOTES:
 NONE AS OF AUGUST 2022

Grades *

WRITTEN HOMEWORK (4 at 20 points each)	80 pts
QUIZZES (3 at 50 pts 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 at 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 distribution by plus or minus 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%	greater than or equal 1063	A plus
93.33%	greater than or equal 1027	A

90.00%	greater than or equal	990	A minus
86.66%	greater than or equal	953	B plus
83.33%	greater than or equal	917	B
80.00%	greater than or equal	880	B minus
76.66%	greater than or equal	843	C plus
73.33%	greater than or equal	807	C
70.00%	greater than or equal	770	C minus
66.66%	greater than or equal	733	D plus
63.33%	greater than or equal	697	D
60.00%	greater than or equal	660	D minus
59.99%	Less than	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 286-02 Grade Percentage =

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

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.

Late Assignment Submission

Late assignments will receive a 25% point deduction of a graded assignment for each 24hr period after the submission deadline. For example, if an assignment is worth 10 points, and the grade for the assignment is 8/10, and the assignment is submitted one day late, then the point deduction equals 2.5, and the final grade for the assignment is $\text{MAX}(0, 8 - 2.5) = \text{MAX}(0, 5.5) = 5.5$.

Missed Assignments, In-Class Exercises, Quizzes, and Exams

A. QUIZZES:

- a. The grade for one missed quiz will be replaced with the average of the remaining two quizzes. The average is calculated as the sum of current quiz grades / the number of quizzes for the semester. For example, if quiz 1 = 85, quiz 2 = 95, and quiz 3 is missed, the quiz 3 grade will be replaced by $(85+95)/3 = 60$.
- b. More than one missed quiz will result in a grade of incomplete provided the total missed points for the semester is less than 20% of the total course points.

B. MIDTERM:

- a. The grade for a missed midterm exam will be 75% of the average score for quizzes, programming assignments, and homework assignments provided the total missed points for the semester is less than 20% of the total course points. Or, provide acceptable documentation of the reason for missing the midterm as described in version 1 of this course syllabus and a makeup exam will be provided.

C. HOMEWORK ASSIGNMENTS:

- a. The grade for one missed homework assignment will be replaced with the average of the remaining three homework assignments. The average is calculated as the sum of current homework grades / the number of homework assignments for the semester.
- b. The grade for the second missed homework assignments will be replaced with 75% of the average of the remaining two homework assignments.
- c. More than two missed homework assignments will result in a grade of incomplete provided the total missed points for the semester is less than 20% of the total course points. An alternative is to accept zeros for the missed homework assignments, or if acceptable documentation of the reason for missing the homework assignments is provided, makeup assignments will be provided.

D. PROGRAMMING ASSIGNMENTS:

- a. The grade for one missed programming assignment will be replaced with 50% of the remaining programming assignment.
- b. Two missed programming assignments will result in a grade of incomplete provided the total missed points for the semester is less than 20% of the total course points. An alternative is to accept zeros for all missed programming assignments, or if acceptable documentation is provided, makeup assignments can be provided

E. IN-CLASS EXERCISES:

- a. The grade for one missed In-Class Exercise will be replaced with the average of the remaining three In-Class Exercises. The average is calculated as the sum of current in-class exercise grades / the number of in-class exercises for the semester.
- b. The grade for two missed In-Class Exercises will be replaced with 75% of the average of the remaining two In-Class Exercises.
- c. More than two missed In-Class Exercises will result in a grade of incomplete provided the total missed points for the semester is less than 20% of the total course points. An alternative is to accept zeros for all missed in-class exercises, or if acceptable documentation of the reason for missing the IN-Class Exercises is provided, a makeup assignment can be provided.

F. WEEKLY FEEDBACK:

- a. All missed weekly feedback assignments will receive zero points.

G. FINAL PROJECT REPORT & CODE:

- a. The grade for a missed final project report and code will be 75% of the average of all other course assignments, exams, and quizzes provided the total missed points for all other assignments is less than 5% of the total course points.
- b. If the total missed points for all other assignments is more than 5% but less than 20% of the total course points, a grade of incomplete will be given.

H. TOTAL MISSED POINTS MORE THAN 20% BUT LESS THAN 30% OF TOTAL COURSE POINTS AND TOTAL MISSED POINTS MORE THAN 30%.

- a. **Missed between 20% and 30% of total course points:** A course grade that equal to $(100\% - \text{missed points } \%) * \text{Average of remaining assignments, quizzes, exams, and programming assignments}$.
- b. **Missed more than 30% of total course points:** If the percentage of total missed points is greater than 30%, a course grade that is the result of assigning a zero grade for all missed assignments will be assigned. An alternative grade or options can be discussed with the instructor.

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:

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.

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](http://info.sjsu.edu/static/catalog/policies.html) 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](http://www.sjsu.edu/provost/services/academic_calendars/) at

http://www.sjsu.edu/provost/services/academic_calendars/. The [Late Drop Policy](http://www.sjsu.edu/aars/policies/latedrops/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](http://www.sjsu.edu/advising/) 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), <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.”

- It is suggested that the Syllabus 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.
- 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](http://www.sjsu.edu/senate/docs/S07-2.pdf) 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](http://www.sjsu.edu/studentconduct/) 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](http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf) 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](http://www.sjsu.edu/aec) (AEC) at <http://www.sjsu.edu/aec> to establish a record of their disability.

