

## Course Information

**Course number and title:** BCHM 422 or CS 490CG, Computational Genomics

**CRN:** 21888/ 27603

**Meeting time:** WF 3:30-5:20pm

**Course credit hours:** 3

**Course web page:** Brightspace

**Prerequisites:** Some knowledge or experience with programming and basic molecular biology is welcomed. Necessary concepts from biology, statistics, and computational algorithms will be provided during the course.

## Course Session

**Class location:** LILY G428

**Meeting time:** WF 3:30-5:20pm

## Information About the Instructor(s)

**Name of the instructor:** Dr. Majid Kazemian

**Office Location:** HANS-225

**Email Address:** [kazemian@purdue.edu](mailto:kazemian@purdue.edu)

**Office hours, times and location:** By email appointment, Meeting in-person or online via Zoom

**Name of the TA:** Shyaman Jayasundara

**Office Location:** HANS-225

**Email Address:** [sjayasun@purdue.edu](mailto:sjayasun@purdue.edu)

**Office hours, times and location:** Fridays from 5:30-6:30pm, right after the class at HANS 221. Also by email appointment, Meeting in-person or online meeting via Zoom.

Note that the zoom session for office hours might be different than the course zoom session and will be communicate with you via email.

## Course Description

This course introduces undergraduates and graduate students to basics of modern genomics and computational tools that will be used for screening. We will review the notion of gene, genome, transcriptome, and epigenome, and show how next generation sequencing technologies are utilized to measure these within cells.

## Learning Outcomes

- Evaluate features of a genome (e.g. conservation, GC content, gene coding potential)
- Understand how data from next-generation sequencing experiments (e.g. RNA-seq, ChIP-seq, Exome-seq) are generated and processed
- Analyze next-generation sequencing data (e.g. RNA-seq, ChIP-seq) from various experiments
- Integrate various genomics data to answer specific biological question related to genomics and gene regulation

## How to Succeed in this Course

If you want to be a successful for this course:

- Be self-motivated and self-disciplined.
- Keep up with the material as soon as they become available.
- Read the materials and watch the videos and ask questions.
- Be willing and able to commit to 4 to 6 hours per week per course.
- Practice the inquired skills in the lab sections.
- Perform the assignments and quizzes on time.

In contrast, here are some common issues that lead to inadequate success in the course.

- Don't read until the night before the discussion.
- Wait until the last day to begin assignments and neglect deadlines.
- Ignore emails from the instructor and/or your TA regarding course activities.
- Don't get familiar with the grade book and syllabus.

## Learning Resources, Technology, & Texts

Textbooks below are not required but are great additional resources and are also on reserve at the Hicks Undergraduate Library and/or the Lilly Life Sciences library.

Textbooks

- Introduction to Genomics 3rd Edition, Arthur Lesk, 2017
- Bioinformatics and Functional Genomics 3rd Edition, Jonathan Pevsner, 2015
- Bioinformatics Algorithms: An Active Learning Approach, Phillip Compeau and Pavel Pevzner, 2018
  - <https://cogniterra.org/course/64/promo>

Online resources

- <http://www.ee.surrey.ac.uk/Teaching/Unix/>
- <http://www.cyclismo.org/tutorial/R/>

Brightspace

- The syllabus for the course, lecture notes, and grading keys for quizzes and exams will be available via the Purdue University Brightspace at <https://purdue.brightspace.com/>

## Course Logistics

Our course has two components, Lectures and Labs. Lectures will be held on Wednesdays and Labs will be on Fridays.

Wednesday sessions will be a “**flipped classroom model**”, meaning that I will post the lecture videos for Wednesday session 4-5 days in advance (Typically by Saturday evening). You are required to watch the video and prepare yourself for quizzes embedded in the video assignments or discussions during online Wednesday class sessions.

Friday sessions are lab only sections where students will practice their skills behind their personal computers or computers located at LILY G428 (which are reserved for BCHM422/CS490CG students WF 3:30-5:20pm). For personal computers, you need to be connected to Purdue VPN. This session is also managed via Zoom where students will work together in Zoom breakout sessions or individually. Computer problems will be addressed by TA and/or instructor via remote desktop support during this class.

- Deadlines are an unavoidable part of being a professional and this course is no exception. Course requirements must be completed and posted or submitted on or before the specified due date and delivery time deadline. Due dates and delivery time deadlines are defined as Eastern Standard Time (as used in West Lafayette, Indiana). To encourage you to stay on schedule, due dates have been established for each assignment

- An assignment file should be appended by your username, such as “assignment1-kim53.doc”. This will make it easier for me to manage assignment files.

## Instructor’s Face-to-Face Office Hours

Due to ongoing COVID situation the face-to-face office hours might be limited. Student and instructor may need to agree prior to the meeting to have their face masks on during the meeting. Additional requirements might be communicated prior to the meeting.

## Instructor’s Email Availability and Policies

Your TA and I will be available via email daily and will try to respond as soon as possible (generally within 24-48) hours. When emailing us, please place the course number and the topic in the subject line of the email (*e.g.*, BCHM422/CS490CG – Assignment 2 Question). This will help us tremendously in locating and responding to your emails quickly. However, it is your responsibility to meet deadlines and/or due dates for your assignments/quizzes. So plan ahead and if you do not hear from us before your deadline, submit your quiz/assignment with added explanation.

## Virtual Office Hours

Virtual Office Hours are available via appointment by Zoom to discuss questions related to weekly readings and/or assignments. Office hours will be held within the same week of request and/or right after Friday lab sections.

## Extra credit

There will be several opportunities for extra credit.

## Assignments and Points

Midterm and final assignments are cumulative, open book, and have firm overnight deadlines. The grading for this course will be as follows:

Midterm assignment	100 points (take home)
Final assignment	100 points (take home)
Video assignments	130 points
Other assignments/quizzes	140 points
Active class participation	30 points

If you have any disagreements with the way any of your quizzes or exams have been graded, please consult and discuss them with the TA. In the event this does not resolve your concerns, please take them up with the instructor. Requests for re-grades must be submitted no later than the end of the second-class period after the graded test or assignment has been returned.

## Missed or Late Work

Missing a quiz or exam deadlines will result in a **grade of 0** being recorded unless documented justification is presented. Any request to be excused from a quiz or exam must include official documentation (doctor’s note, request from academic advisor, etc) explaining why the exam was or will be missed. Makeup tests will be scheduled in consultation with the TA and instructor.

There will be no opportunity for late assignment submissions. In rare cases with medical justifications, requests will be accepted at instructor's discretion and may include a point penalty of 10% per day late. Asking for an extension does not guarantee it will be granted.

## Grading Scale

In this class grades reflect the sum of your achievement throughout the semester. You will accumulate points as described in the assignments portion above, with each assignment graded according to a rubric. At the end of the semester, final grades will be calculated by adding the total points earned and translating those numbers (out of 200) into the following letters (there will be no partial points or rounding).

A+: 480 - 500, A: 460 - 479, A-: 440 - 459  
B+: 420 - 439, B: 400 - 419, B-: 380 - 399  
C+: 360 - 379, C: 340 - 359, C-: 320 - 339  
D+: 300 - 319, D: 280 - 299, D-: 260 - 279  
F: 259 or below

## Incompletes

A grade of incomplete (I) will be given only in unusual circumstances. To receive an "I" grade, a written request must be submitted prior to December 1, and approved by the instructor. The request must describe the circumstances, along with a proposed timeline for completing the course work. Submitting a request does not ensure that an incomplete grade will be granted. If granted, you will be required to fill out and sign an "Incomplete Contract" form that will be turned in with the course grades. Any requests made after the course is completed will not be considered for an incomplete grade.

## Attendance Policy

Students are expected to be present for every meeting of the classes in which they are enrolled. Only the instructor can excuse a student from a course requirement or responsibility. When conflicts or absences according to [specific policies allowing absences](#) policies can be anticipated, such as for many University sponsored activities and religious observations, the student should inform the instructor of the situation as far in advance as possible. For unanticipated or emergency absences when advance notification to an instructor is not possible, the student should contact the instructor as soon as possible by email. When the student is unable to make direct contact with the instructor and is unable to leave word with the instructor's department because of circumstances beyond the student's control, and in cases of bereavement, the student or the student's representative should contact the Office of the Dean of Students via [email](#) or phone at 765-494-1747.

## Use of AI policy

Artificial intelligence (AI) language models, such as ChatGPT, may be used for assignments in this course. In any cases where students use AI, it is critical that they cite their work; students are also required to submit: 1) any prompts they used and 2) the output generated by AI. Students are responsible for fact checking information provided by AI language models and are expected to use AI ethically and responsibly.

Students who do not disclose the use of AI in an assignment will be in violation of the academic integrity expectations for this course. Violations can include a failing grade on the assignment. All suspected incidents of academic dishonesty will also be referred to the Office of Student Rights and Responsibilities for further review of the student's status with the University.

## Tentative Course Schedule

Week	Topics (Lecture)	Hands-on Lab	NOTES
1	Introduction	Unix commands and shell programs	
2	Genomes and features	UCSC genome browser	
3	Gene prediction tools and methods	Identifying new genes (e.g. from a plasmid)	
4	Sequence alignment and mapping techniques	BLAST	
5	Genome sequencing technologies	File formats (FASTQ, BED) and Quality Control	
6	Genome assembly techniques	De-novo assembly (e.g. wide-seq data)	
7	Mid-term		
8	Transcriptome and cells	RNA-seq data analysis	
9	Transcriptomic data analysis	Finding differentially expressed genes (DEGs)	
10	Biological Networks and Pathway	Pathway analysis of DEGs	
11	Epigenetics: techniques and applications	ChIP-seq data analysis and visualization	
12	Gene Regulatory networks	Motif finding using meme suite	
13	Genetic variation and diseases	SNP calling	
14	Genomic structural variations	Structural variation identification	
15	Biological databases	information integration from SRA	

## Academic Integrity/misconduct

Academic misconduct of any kind will not be tolerated in any course offered by the Department of Biochemistry. Information on Purdue's policies with regard to academic misconduct can be found at [http://www.purdue.edu/studentregulations/student\\_conduct/regulations.html](http://www.purdue.edu/studentregulations/student_conduct/regulations.html)

Any incidence of academic misconduct will be reported to the Office of the Dean of Students. Academic misconduct may result in disciplinary sanctions including expulsion, suspension, probated suspension, disciplinary probation, and/or educational sanctions. In addition, such misconduct will result in punitive grading such as:

- receiving a lower or failing grade on the assignment, or
- assessing a lower or failing grade for the course

Punitive grading decisions will be made after consultation with the Office of the Dean of Students. Please note reported incidences of academic misconduct go on record for reference by other instructors. Further, a record of academic misconduct is likely to influence how current/future situations are handled.

To provide you with an unambiguous definition of academic misconduct, the following text has been excerpted from "Academic Integrity: A Guide for Students", written by Stephen Akers, Ph.D., Executive Associate Dean of Students (1995, Revised 1999, 2003), and published by the Office of the Dean of Students in cooperation with Purdue Student Government, Schleman Hall of Student Services, Room 207, 475 Stadium Mall Drive West Lafayette, IN 47907-2050.

"Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty." [Part 5, Section III-B-2-a, *Student Regulations*] Furthermore, the University Senate has stipulated that "the commitment of acts of cheating, lying, and deceit in any of their diverse forms (such as the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest." [University Senate Document 72-18, December 15, 1972]

More specifically, the following are a few examples of academic dishonesty which have been discovered at Purdue University.

- substituting on an exam for another student
- substituting in a course for another student
- paying someone else to write a paper and submitting it as one's own work
- giving or receiving answers by use of signals during an exam
- copying with or without the other person's knowledge during an exam
- doing class assignments for someone else
- plagiarizing published material, class assignments, or lab reports
- turning in a paper that has been purchased from a commercial research firm or obtained from the internet
- padding items of a bibliography
- obtaining an unauthorized copy of a test in advance of its scheduled administration
- using unauthorized notes during an exam
- collaborating with other students on assignments when it is not allowed
- obtaining a test from the exam site, completing and submitting it later
- altering answers on a scored test and submitting it for a regrade
- accessing and altering grade records
- stealing class assignments from other students and submitting them as one's own
- fabricating data
- destroying or stealing the work of other students

Plagiarism is a special kind of academic dishonesty in which one person steals another person's ideas or words and falsely presents them as the plagiarist's own product. This is most likely to occur in the following ways:

- using the exact language of someone else without the use of quotation marks and without giving proper credit to the author
- presenting the sequence of ideas or arranging the material of someone else even though such is expressed in one's own words, without giving appropriate acknowledgment
- submitting a document written by someone else but representing it as one's own”

Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breaches of this value by either emailing [integrity@purdue.edu](mailto:integrity@purdue.edu) or by calling 765-494-8778. While information may be submitted anonymously, the more information that is submitted provides the greatest opportunity for the university to investigate the concern.

The [Purdue Honor Pledge](#) was developed by students to advance a supportive environment that promotes academic integrity and excellence. It is intended that this pledge inspires Boilermakers of all generations to stay "on track" to themselves and their University. “As a boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue.”

## Notice of copyright protection of course materials

Among the materials that may be protected by copyright law are the lectures, notes, and other material presented in class or as part of the course. Always assume the materials presented by an instructor are protected by copyright unless the instructor has stated otherwise. Students enrolled in, and authorized visitors to, Purdue University courses are permitted to take notes, which they may use for individual/group study or for other non-commercial purposes reasonably arising from enrollment in the course or the University generally.

Notes taken in class are, however, generally considered to be “derivative works” of the instructor’s presentations and materials, and they are thus subject to the instructor’s copyright in such presentations and materials. No individual is permitted to sell or otherwise barter notes, either to other students or to any commercial concern, for a course without the express written permission of the course instructor. To obtain permission to sell or barter notes, the individual wishing to sell or barter the notes must be registered in the course or must be an approved visitor to the class. Course instructors may choose to grant or not grant such permission at their own discretion, and may require a review of the notes prior to their being sold or bartered. If they do grant such permission, they may revoke it at any time, if they so choose.

## Nondiscrimination Statement

Purdue University’s non-discrimination policy will be upheld in this classroom. Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life.

Purdue University views, evaluates, and treats all persons in any University related activity or circumstance in which they may be involved, solely as individuals on the basis of their own personal abilities, qualifications, and other relevant characteristics.

In this course, each voice in the classroom has something of value to contribute. Please take care to respect the different experiences, beliefs and values expressed by students and staff involved in this course. We support Purdue's commitment to diversity, and welcome individuals of all ages, backgrounds, citizenships, disability, sex, education, ethnicities, family

statuses, genders, gender identities, geographical locations, languages, military experience, political views, races, religions, sexual orientations, socioeconomic statuses, and work experiences. For more information, see [Link to Purdue's nondiscrimination policy statement](#).

## Students with Disabilities

Purdue University strives to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center at: [drc@purdue.edu](mailto:drc@purdue.edu) or by phone: 765-494-1247.

Purdue has assistance available to help you make learning materials accessible. Some examples include:

- Information on [Universal Design for Learning](#)
- Guidance on [creating accessible documents](#)

## Emergency Preparation

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. Relevant changes to this course will be posted onto the course website or can be obtained by contacting the instructors or TAs via email or phone. You are expected to read your @purdue.edu email on a frequent basis. Further [emergency information and details here](#).

Guidelines regarding ensuring access to emergency information:

- Keep your cell phone on to receive a Purdue ALERT text message.
- Log into a Purdue computer connected to the network to receive any Desktop Popup Alerts.
- If you have a "no cell phone" in class policy allow one or two students who have signed up for Purdue ALERT to keep their phones on to receive any alerts

## Mental Health Statement

Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at (765)494-6995 or <http://www.purdue.edu/caps/> after hours, on weekends and holidays, or by going to the CAPS office of the second floor of the Purdue University Student Health Center (PUSH) during business hours.

- **If you find yourself beginning to feel some stress, anxiety and/or feeling slightly overwhelmed, try [WellTrack](#).** Sign in and find information and tools at your fingertips, available to you at any time.
- **If you need support and information about options and resources,** please see the [Office of the Dean of Students](#) for drop-in hours (M-F, 8 am- 5 pm).
- **If you're struggling and need mental health services:** Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact [Counseling and Psychological Services \(CAPS\)](#) at 765-494-6995 during and after hours, on weekends and holidays, or by going to the CAPS office of the second floor of the Purdue University Student Health Center (PUSH) during business hours.

## Netiquette

We all wish to foster a safe learning environment. All opinions and experiences, no matter how different or controversial they may be perceived, must be respected in the tolerant spirit of academic discourse. You are encouraged to comment, question, or critique an idea, but you are not to attack an individual. Our differences, some of which are outlined in the University's nondiscrimination statement below, will add richness to this learning experience. Please consider that sarcasm and humor can be misconstrued in online interactions and generate unintended disruptions. Working as a community of learners, we can build a polite and respectful course ambience. Please read the Netiquette rules for this course:

- Do not dominate any discussion. Give other students the opportunity to join in the discussion.
- Do not use offensive language. Present ideas appropriately.
- Be cautious in using Internet language. For example, do not capitalize all letters since this suggests shouting.
- Avoid using vernacular and/or slang language. This could possibly lead to misinterpretation.
- Keep an “open-mind” and be willing to express even your minority opinion.
- Think and edit before you push the “Send” button.
- Do not hesitate to ask for feedback.

## Violent Behavior Policy

Purdue University is committed to providing a safe and secure campus environment for members of the university community. Purdue strives to create an educational environment for students and a work environment for employees that promote educational and career goals. Violent Behavior impedes such goals. Therefore, Violent Behavior is prohibited in or on any University Facility or while participating in any university activity.

See the [University's full violent behavior policy](#) for more detail.

## Diversity and Inclusion Statement

In our discussions, structured and unstructured, we will explore a variety of challenging issues, which can help us enhance our understanding of different experiences and perspectives. This can be challenging, but in overcoming these challenges we find the greatest rewards. While we will design guidelines as a group, everyone should remember the following points:

- We are all in the process of learning about others and their experiences. Please speak with me, anonymously if needed, if something has made you uncomfortable.
- Intention and impact are not always aligned, and we should respect the impact something may have on someone even if it was not the speaker's intention.
- We all come to the class with a variety of experiences and a range of expertise, we should respect these in others while critically examining them in ourselves.

## Course Evaluation

During the last two weeks of the course, you will be provided with an opportunity to evaluate this course and your instructor. Purdue uses an online course evaluation system. You will receive an official email from evaluation administrators with a link to the online evaluation site. You will have up to two weeks to complete this evaluation. Your participation is an integral part of this course, and your feedback is vital to improving education at Purdue University. I strongly urge you to participate in the evaluation system.

## Disclaimer

This syllabus is subject to change. Describe how you will announce and share changes made to the syllabus.