Welcome to BICD 100 Genetics! This course aims to develop concepts of genetics, so that we can understand how information is stored, inherited, and utilized life. Fundamental concepts include gene and chromosome structure, genotype and phenotype, chromosome segregation and recombination, regulation of gene expression, random mutation, natural selection, and epigenetics. We will learn these concepts by examining their roles in biological systems and will apply our understanding to explore a wide range of biological and real-life phenomena including forensics, archeology, human health, evolution, biodiversity.

Learning goals

- Collaborate with fellow students and the instructional team to learn concepts in genetics
- Apply knowledge of genetics concepts to analyze data, explain phenomena, and solve problems
- Learn to draw conclusions and construct scientific arguments based on evidence and reasoning
- Develop skills in reading, understanding, and analyzing primary research articles

Learning in this course

BICD 100 is designed to be a collaborative environment for everyone to learn together and construct a shared understanding of the material. Active participation and contribution both in class and in discussion section are essential because many ideas that will be developed in these activities cannot be easily captured otherwise. Being able to communicate understanding, articulate confusion, and defend scientific arguments based on evidence and reasoning is both useful for learning[1] and critical to success in any discipline. To encourage collaboration and community building, class activities will be done in groups, and grades will not be assigned on a curve.

Instead of memorization, we will focus on developing an understanding of fundamental concepts as they apply to different examples. Exams will include questions that are based on solving problems in new contexts. We will use class time to construct and apply our knowledge, troubleshoot challenging topics, practice problem solving, and develop skills in critical thinking. There will often be pre-class assignments to prepare for the more challenging material in class.

[1] Smith et al (2009) Science 323: 122-124. http://science.sciencemag.org/content/323/5910/122.short

Course logistics

The core learning components in this course are comprised of collaborative activities both in class and in discussion sections, in addition to independent work on studying and completing assignments. Course material, announcements, and other important details will be available on the TritonEd (https://tritoned.ucsd.edu). Please check the course website and your @ucsd email regularly for updates and relevant information.

To be part of the course, you should already be enrolled in a discussion section along with the lecture section. You must attend the discussion section that you are enrolled in to receive credit. We are not able to change the maximum number of enrolled students in a section. If a section is full, you must choose another one. If you cannot find one that suits your schedule, you will unfortunately have to decide to enroll in the course another time or to forgo contribution and credit for the discussion section.

 

| | Day | Time | Location |
|---|---|---|---|
| Class meetings A00 | MTuWTh | 9:30a–10:50a | SEQUO 147 |
| Discussion section A01 | F | 9:00a–10:50a | SEQUO 147 |
| Discussion section A02 | F | 9:00a–10:50a | SEQUO 148 |
| Study sessions | MTuWTh | 7:00p–9:00p | Geisel Library 2nd floor east |
| Office hours | Tu | 7:00p–9:00p | Geisel Library 2nd floor east |

Office hours: Consider office hours to be more like study sessions or free-formed fireside chats, where we can talk about anything related to your academic and general experiences on campus. Please feel free to email Dr. Lo and set up a separate appointment if the scheduled times do no work for you.

Course material: Assigned readings for this course will be from online sources, relevant research articles from the primary literature posted on TritonEd, and Klug et al. Essentials of Genetics, 9th edition. We will not be using Mastering Genetics (online homework module associated with this textbook), so you do not need to purchase an access code or purchase a new book to get this access code. Instead, a substantial portion of learning will be from primary research articles, and assignments will be designed to support this more complex level of learning.

Active participation and contribution in class and in discussion section will be mainly through short writing activities and clicker questions. To participate in clicker-based discussions in class, please have an iClicker2 registered on TritonEd. Short writing activities will be done in class and in discussion sections, so please bring paper and pens or pencils.

Podcast: Whenever possible, classes will be recorded and made available online as a resource for learning (http://podcast.ucsd.edu/). However, active participation and contribution are highly encouraged, as substantial portions of class time will be interactive. Many important concepts and ideas that will be developed collaborative in these activities, which cannot be easily captured on video. Therefore, podcasts are provided as for the purpose of review and should not be used solely to substitute for active engagement in class meetings.

Technology: Students are welcome to bring laptop computers, tablets, or similar technology to class and to discussion section for note-taking purposes. Please see this research study, which shows that multi-tasking on computers in class is likely to decrease not only your own grade but also the grades of people around you who can see your screen![2] For this reason, please be considerate to your fellow classmates, and we ask that you do not flip between relevant course material and irrelevant activities on the internet. The use of cell phones, computers, or any other electronic communication devices is not permitted during exams. Use of these devices during an exam is considered a violation of academic integrity and can result in a failing grade in the course.

[2] Sana et al (2013) Computers and Education 62: 24–31
http://www.sciencedirect.com/science/article/pii/S0360131512002254

 

Grading

Our course has the following grading components: contribution (15%), writing assignments (20%), midterm exams (30%), final exam (20%), professionalism (2%), and extra credit (0.5%). Because different people may excel in different aspects of the course, the higher component between writing assignments and the final exam for each individual will be scaled from 20% to 28%, bringing the total to 100%.

The following general grading scheme will be used. Exact grade boundaries will be determined based on final grade distributions: Because course assessments are not perfectly precise, grade cutoffs will be identified by large gaps in between individual scores. For example, grade cutoffs may vary based on different relative percentages: 93.25 (A), 93.21 (A), (big relative difference), 92.91 (A-), 92.89 (A-) vs. 93.25 (A), 93.00 (A), 92.99 (A), (big relative difference), 92.78 (A-).

The course is not graded in a normalized fashion, i.e. 20% of students getting A, B, C, and such. Thus, the ability to do well in this course is not dependent on others doing poorly.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| A+ | 97-100% | B+ | 87-90% | C+ | 77-80% | D | 60-70% |
| A | 93-97% | B | 83-87% | C | 73-77% | F | 0-60% |
| A- | 90-93% | B- | 80-83% | C- | 70-73% | | |

Contribution: Active participation and contribution both in class and in discussion section are essential to learning in this course. There will be many contribution items, including pre-class assignments, clicker questions and writing activities in class, and writing activities in discussion section. Contributions will be graded for thoughtful completion on a scale 0, 0.5, and 1. Because individual students may have different competing schedules and life events, completing 85% or more of all contribution items will earn the full contribution grade. For example, if there are 40 contribution items, completing 34 items will result in 34/34, whereas completing 33 items will result in 33/34 for the contribution grade.

For most classes, there will be reading assignments and associated writing assignments to be completed before class. Check TritonEd regularly for details and due dates. These pre-class assignments are designed to: (1) engage students in exploring new concepts and ideas, so we are prepared for class and can have productive discussions, and (2) help the instructional team know prior to class what material students are struggling with, so we can adjust accordingly to use our class time as efficiently as possible. In class, there will be clicker questions and writing activities on a regular basis. Be sure to bring paper and pens or pencil for the writing activities. Please also note that it is a violation of academic integrity policies to use someone else's clicker in class.

In discussion section, we will engage in collaborative work, analyze research data from primary literature, construct scientific arguments based on data and reasoning, and practice solving problems in preparation for exams. The discussion sections also provide opportunities to build relationships with fellow students and your instructional assistant. Writing activities in discussion sections are structured so that we will get practice for the graded writing assignments.

 

Before discussion section, some assignments will be made available on TritonEd to prepare you for the collaborative work. It is critical that you genuinely attempt the assignments before coming to discussion section, so that you and your fellow students will get the most out of these activities. Then in discussion section, we will work on problems in teams. The problems will focus on drawing conclusions and constructing scientific arguments based on evidence and reasoning from primary research articles. These section activities will mimic the collaborative phase of exams that we will use in midterms (more on that below), and they will give you an opportunity to test your knowledge, practice working at the level that is expected on the exam, and practice working on a complex problem collaboratively in teams. Contributions to the group effort will be noted by the instructional assistant, and this will be part of your contribution and professionalism grades. Thus, it is very important that you arrive at discussion sections prepared.

The best way for you to learn how to solve problems and deepen your understanding of the course material is to work through the section activities and discuss them with your fellow classmates and the instructional assistant. The instructional assistant is there to facilitate students discovering and constructing an understanding for themselves but to give you the answers to the problems.

Writing assignments: There will be four writing assignments (5% each) focused on reading, understanding, and analyzing research data from primary literature articles. The first assignment will be an orientation to primary literature articles and academic integrity in general, and the other assignments will focus on drawing conclusions and constructing scientific arguments based on evidence and reasoning. Details of these assignments will be made available in class and on TritonEd.

The graded writing assignments will complement writing activities in class and in discussion section. The skills developed in these writing assignments will also be tested on midterm and final exams, where you will be challenged to analyze data and construct scientific arguments that answer specific research questions.

The Writing and Critical Expression Hub at the Teaching + Learning Commons located in Geisel Library (http://commons.ucsd.edu/students/writing/index.html) provides support for undergraduates working on course papers, e.g. writing assignments in this course, as well as other independent writing projects. Writing mentors can help at any stage of the writing process, from brainstorming to final polishing. The Writing and Critical Expression Hub offers: one-on-one writing tutoring by appointment; supportive and in-depth conversations about writing, the writing process, and writing skills; help with every stage in the writing process, walk-in tutoring; and workshops on writing.

Midterm and final exams: Questions in exams will challenge us to apply our understanding in new contexts by solving problems and constructing scientific arguments with evidence and reasoning. Therefore, exams will be open resources, e.g. notes and calculators but not electronic equipment that can be used to communicate with others. Exams will be cumulative but will focus on the most recent material. There will be two midterm exams in class (80 minutes and 15% each) and one final exam in exam week (179 minutes and 25%).

To facilitate reflection and learning in the quarter, midterm exams (but not the final exam) will be in conducted two phases: The first phase will be completed individually, and the second phase will be done

 

collaboratively in teams. The team score will be compared to the average of the team's individual scores. If the team score is higher than that average, the difference between the team score and the average will be added to each person's individual score (to a max of 100%). For example, a certain team consists of students A, B, C, and D who score 90%, 80%, 70%, and 60% individually and respectively, with an average of 75%. The team earns 80% on the team portion, so the difference between the average individual score and team score is +5%. Therefore, each individual earns an additional 5% on their scores, and the resulting exam scores will be 95%, 85%, 75%, 65% respectively for students A, B, C, and D.

We are using this two-phase testing method for midterm exams as people learn more from collaborative work compared to individual work.[3] These collaborative testing opportunities allow us to deepen our understanding because we are receiving feedback on our thinking in a very timely fashion, which is critical for learning. It is also an opportunity to practice communicating effectively and collaborating to solve problems.

[3] Gilley et al (2014) Journal of College Science Teaching 43: 83-91 https://jstor.org/stable/43632038

Professionalism: This portion of the course grade is intended to engage students in considering the impact of their actions on their own learning and the learning of others in the course. Unprofessional interactions consume time yet have no meaningful benefits to you, your fellow students, and/or the instructional team. Analogously in the workplace, being unprofessional to your colleagues or supervisors will only discount you. When you are discounted, you may not be invited for new opportunities in the future.

Professionalism can be demonstrated through individual (2% described in this section) and community efforts (extra credit described in the section below). The individual component is to account for demonstrating maturity and professionalism. By default, every student is assumed to be professionally mature. Hence, this component is awarded to every student at the beginning of the quarter. During the quarter, based on observations by the instructional team, which includes but is not limited to one-on-one interactions, electronic communication, and follow-up conversations on different correspondence, your professionalism credit may be deducted in steps of 0.5%.

Example interactions with meaningful benefits that:

- Developing deeper insight into course material, concepts, biology, and/or society in general
- Working collaboratively to improve in skill building and future opportunities
- Learning conceptually and meaningfully why full credit was not awarded for an assignment
- Clarifying course material that facilitates deeper learning
- Reporting errors or problems in class, on assignments, or for other course material

Example interactions that have no meaningful benefits and thus should be avoided:

- Contributing inequitably to team work in class, in discussion section, or on exams
- Harassing and/or bullying the instructional team or other students, either in person or online
- Asking questions when the information is already available or will eventually be known
- Ignoring the directions or requests from the instructional team
- Being disruptive to fellow students in class, in discussion section, or on exams

 

Extra credit: The 0.5% extra credit is based on community professionalism, which can be earned by completing course evaluations and related surveys that are aimed to improve the course and the educational experiences of your future peers. If 90% or more of all students complete CAPEs, instructional assistant evaluations, and other course-based evaluation surveys in a mature and professional fashion (i.e. taking them seriously and providing timely and constructive feedback), 0.5% will be added to everyone in the course. Other than the community professionalism component, there are no other opportunities for extra credit beyond what is already assigned as part of the course by the instructor.

Late or missing assignments: Late contribution items will be not accepted, as completing 85% of all the contribution item will earn the full 15% of contribution grade. This 85% completion system is set up to accommodate individual students' different competing schedules and life events. No late writing assignments will be accepted, and no make-up exams will be offered, except in the case of a documented short-term illness or serious family emergency. In this case, please contact Dr. Lo as soon as possible or as soon as it is reasonable to do so given the individual circumstances.

Regrades: If a grading error has been made, please submit a regrade request to Dr. Lo at the end of a class meeting within one week of the assignments being returned. Attach a separate piece of paper to your assignment as a cover sheet. If you think your work deserves more points, i.e. it is not an arithmetic error, please write on the cover sheet a concise description of how your answer compares to the rubric and why you think it should have earned more points.

Students who submit for regrades understand that we may: (1) regrade the entire assignment, and (2) compare the submitted paper to a copy of the original assignment. As a result, the overall grade may go up or down or remain the same after the regrade.

Teamwork: A major goal of the course is to learn to collaborate with others. Unfortunately, despite best efforts and intentions, teams do not always functional optimally. Dealing with these challenges is a natural part of the learning experience. Everyone is expected to contribute fully and equitably to group work as part of the university learning community.

If significant disputes occur over the relative contribution of individual members of the team, students can submit an appeal. In such cases, the team grade will be multiplied by the number of team members, and the points can be divide among individuals based on each team member's effort and contribution. To submit an appeal, all members of the team need to get together and provide the following information in a document: clear and detailed descriptions of each member's contribution, calculations for how the points should be divided among the members, and signatures from each member with a statement attesting to the fact that everyone in the team has agreed to all information in the appeal document. Please submit the appeal to Dr. Lo at the end of a class meeting within one week of the assignments being returned.

 

Academic integrity

https://students.ucsd.edu/academics/academic-integrity/index.html

Integrity of scholarship is essential for an academic learning community. In this course and at the university, we expect that both students and the instructional team will honor this principle and in so doing protect the validity of university intellectual work. For students, this means that all academic work will be done by the individual to whom it is assigned, without unauthorized aid of any kind. Instructors, for their part, will exercise care in planning and collaborating with students on academic work.

When people collaborate to work toward a common goal, shared values must be established so that everyone understands the acceptable ways for working together. In organizations, these are commonly called codes of conduct or ethics. In this course, we are using a statement of values[4] in support of codes of ethics, like the Policy on Integrity of Scholarship, to state explicitly our values and describe the behaviors for maintaining and protecting those values.

The following values are fundamental to academic integrity and are adapted from the International Center for Academic Integrity. In our course, these values are open to discussions and possible alterations based on mutual agreements among all students and the instructional team. In collaborative work, each team should discuss these values and must articulate the expectations for how they are made manifest within the team's work together.

All course materials are the property of the instructor, the course, and University of California San Diego and may not be posted online, submitted to private or public repositories, or distributed to unauthorized people outside of the course. Any suspected instances of a breach of academic integrity will be reported to the Academic Integrity Office for review.

[4] This class statement of values is adapted from Tricia Bertram Gallant Ph.D.

| | As students, we will ... | As the teaching team, we will ... |
|---|---|---|
| Honesty | • Honestly demonstrate your knowledge and abilities according to expectations listed in the syllabus or in relation to specific assignments and exams<br>• Communicate openly without using deception, including citing appropriate sources | • Give you honest feedback on your demonstration of knowledge and abilities on assignments and exams<br>• Communicate openly and honestly about the expectations and standards of the course through the syllabus and in relation to assignments and exams |
| Responsibility | • Complete assignments on time and in full preparation for class<br>• Show up to class on time and be mentally physically present<br>• Participate fully and contribute to team learning and activities | • Give you timely feedback on your assignments and exams<br>• Show up to class on time and be mentally and physically present<br>• Create relevant assessments and class activities |

 

| | | |
|---|---|---|
| Respect | • Speak openly with one another while respecting diverse viewpoints and perspectives<br>• Provide sufficient space for others to voice their ideas | • Respect your perspectives even while we challenge you to think more deeply and critically<br>• Help facilitate respectful exchange of ideas |
| Fairness | • Contribute fully and equally to collaborative work, so that we are not freeloading off of others on our teams<br>• Not seek unfair advantage over fellow students in the course | • Create fair assignments and exams and grade them in a fair and timely manner<br>• Treat all students and collaborative teams equally |
| Trustworthiness | • Not engage in personal affairs while on class time<br>• Be open and transparent about what we are doing in class<br>• Not distribute course materials to others in an unauthorized fashion | • Be available to all students when we say we will be<br>• Follow through on our promises<br>• Not modify the expectations or standards without communicating with everyone in the course |
| Courage | • Say or do something when we see actions that undermine any of the above values<br>• Accept a lower or failing grade or other consequences of upholding and protecting the above values | • Say or do something when we see actions that undermine any of the above values<br>• Accept the consequences (e.g. lower teaching evaluations) of upholding and protecting the above values |

Accessibility and inclusion

http://disabilities.ucsd.edu | osd@ucsd.edu | 858-534-4382

Any student with a disability is welcome to contact us early in the quarter to work out reasonable accommodations to support their academic success. Students requesting accommodations for this course due to a disability must provide a current Authorization for Accommodation (AFA) letter issued by the Office for Students with Disabilities (OSD). Students are required to present their AFA letters to faculty and to the OSD Liaison in the Division of Biological Sciences in advance so that accommodations may be arranged.

Whenever possible, we will use universal designs that are inclusive. For example, colors used in this syllabus are distinguishable by most colorblind and non-colorblind people, and this font is designed to be dyslexic friendly. If you have feedback on how to make the class more accessible and inclusive, please get in touch!

Discrimination and harassment: The Office for the Prevention of Harassment & Discrimination (OPHD) provides assistance to students, faculty, and staff regarding reports of bias, harassment, and discrimination. OPHD is the UC San Diego Title IX office. Title IX of the Education Amendments of 1972 is the federal law that prohibits sex discrimination in educational institutions that are recipients of federal funds. Students have the right to an educational environment that is free from harassment and discrimination.
Students have options for reporting incidents of sexual violence and sexual harassment. Sexual violence includes sexual assault, dating violence, domestic violence, and stalking. Information about reporting options

 

may be obtained at OPHD at 858-534-8298, ophd@ucsd.edu, or http://ophd.ucsd.edu. Students may receive confidential assistance at CARE at the Sexual Assault Resource Center at 858-534-5793, sarc@ucsd.edu, or http://care.ucsd.edu, or Counseling and Psychological Services (CAPS) at 858-534-3755 or http://caps.ucsd.edu.

Students may feel more comfortable discussing their particular concern with a trusted employee. This may be a student affairs staff member, a faculty member, a department chair, or other university official. These individuals have an obligation to report incidents of sexual violence and sexual harassment to OPHD. This does not necessarily mean that a formal complaint will be filed.

If you find yourself in an uncomfortable situation, ask for help. The university is committed to upholding policies regarding nondiscrimination, sexual violence, and sexual harassment.

Calendar

A general outline for the course is available below. More specific details for each week, including reading and assignments, will be provided on TritonEd and in class. We may also adjust the schedule as necessary, while still focusing on the foundational concepts and laboratory skills.

Week 1 – DNA forensics: How can we use genetics to reconstruct the family tree of King Tutankhamun?
Topics: Molecular markers, alleles, meiosis, biotechnology, Hardy-Weinberg equilibrium, inbreeding
Writing assignment #1 due at 11:59 pm on Sunday 8/13

Week 2 – Human diseases: Why do deleterious genetic diseases continue to persist in populations?
Topics: Mutations, non-Mendelian inheritance, chi-square, population genetics, evolutionary genetics
Midterm exam #1 in class on Thursday 8/17
Writing assignment #2 due at 11:59 pm on Sunday 8/20

Week 3 – Biodiversity: How do new forms and functions evolve in skeletal structures in fish?
Topics: Gene structure, gene regulation, linkage, chromosome mapping, quantitative trait loci, biotechnology
Writing assignments #3 due at 11:59 pm on Sunday 8/27

Week 4 – Biodiversity: How do new forms and functions evolve in coat colors in mice?
Topics: Gene interactions, Hardy-Weinberg equilibrium, chi-square, population genetics, evolutionary genetics
Midterm exam #2 in class on Thursday 8/31
Writing assignment #4 due at 11:59 pm on Monday 9/4

Week 5 – Human genetics: How are complex traits such as human skin color determined by genetics?
Topics: Quantitative genetics, genome-wide association studies, biotechnology
Final exam on Saturday 9/9 at 8:00 am to 10:59 am

 