Genome 371 Autumn 2025

Web site: http://courses.washington.edu/au371mkr/

About this class... We will focus on how one can use genetics to understand biological processes or structures. Along the way, we will look at patterns of inheritance (how inheritance works, how phenotype is determined by genes), mutant analysis, and genomics (what we can learn by studying whole genomes) particularly as applied to understanding human traits. The emphasis throughout will be on thinking, not on memorization.

Instructor

M. K. Raghuraman (aka "Raghu")
raghu@uw.edu

Teaching Associate

Rachel Dam
rdam@uw.edu

Teaching Assistants

Rachel Powell <rlpowell@uw.edu>
Catherine Sniezek <csniezek@uw.edu>
Olivia Waltner <waltno@uw.edu>

Textbook not required

…but if you need a reference book, any standard genetics textbook will do. Examples include:

- Griffiths, A. J. F., et al., *Introduction to genetic analysis*. 9th edition or later.
- Goldberg, M. L., et al., *Genetics from genes to genomes*. 6th edition or later.
- Klug, W. S., et al., Concepts of genetics. 8th edition or later.

Lectures & Quiz Sections

Lectures will be 12:30-2:20 MF, held in person in Foege S060. There will be a short break during each lecture—so each lecture is basically two back-to-back 50-minute periods. Quiz sections will be in **Hitchcock 344**. Lectures (but not quiz sections) will be recorded and be available on Panopto within a day or two.

Grading

Half your grade will be based on demonstration of effort; the remainder will be based on graded homework and exams. See Grading Scheme below.

Schedule

Genome 371 Autumn 2025 Schedule

	Mon	Tue	Wed	Thu	Fri
9:30 AM –			AA 9:30-10:50 Rachel Dam/ Raghu	AE 9:30-10:50 Olivia	
10:30 AM –	Rachel P.'s help hour Foege S040				Rachel Dam's help "hour" Foege S040
11:30 AM –			AB 11:00-12:20 Rachel Powell	AF 11:00-12:20 Catherine	
12:30 PM –	Lecture 12:30-2:20		AC 12:30-1:50 Catherine	AG 12:30-1:50 Rachel Dam/ Raghu	Lecture 12:30-2:20
1:30 PM –					
2:30 PM –			AD 2:00-3:20 Olivia	AH 2:00-3:20 Rachel Powell	
3:30 PM –	TA mtg 2:30-5:00				
4:30 PM –		Catherine's help hour Foege S040	Olivia's help hour Foege S040	Raghu's help "hour" HCK 344	
5:30 PM –					
	Lectures will be in Foege S060. Quiz sections will be in HCK 344. Help may be available by appointment also.				

Midterm Exam Dates:
Fri Oct 17
Fri Nov 14

Final Exam:
Thu Dec 11.

Homework due dates:
Starting Oct. 3, every Friday except Oct. 17, Nov. 14 and Nov. 28 (seven total).

Homework will be online; exams will be in person. See the Grading Scheme section below for more details.

Conflict policy. Our policy is to allow students to take exams a day or two early for only a few reasons:

- Medical/family emergencies. Visiting relatives on their birthday does not count!
- Academic events – e.g., interviewing for a job or medical/graduate school, or attending a conference to present research that was conducted at the University
- University-sponsored sporting events – the student must be part of a University sponsored team. University clubs do not count; if in doubt, check with the Athletics department.
- Religious accommodation: If the scheduled exam conflicts with religious observances, you may request accommodation to take the exam at an alternative time (see below). You do not need to disclose your particular faith or affiliation.

Airline reservations do not constitute a valid excuse. Exams may be taken a day or so early (given sufficient reason), but in general will NOT be given later than the scheduled date. If you do wish to take an exam early, and you have a valid reason, you must let me know by **Monday Sep 29.** For religious accommodation, submit an online request at https://registrar.washington.edu/students/religious-accommodations-request/ by **5:00 pm Friday Oct 10**.

If an exam is missed for medical or other emergencies, I may choose to give an oral exam in its place. If you already know that you cannot meet the exam and homework schedule, you should not take this class.

Re-grades. If you feel that an error was made in grading an exam, use the online form I will provide to describe your issue. In addition, if you wish to discuss your case, you can always make an appointment with me. **I reserve the right to re-grade the entire exam,** not just the isolated question in question.

Code of conduct

Honesty is a highly valued principle in science. In this spirit, we expect that each student will do their own work on exams. If we observe evidence of behavior that does not meet our standards of honesty, we will report the potential breach of conduct to the University Disciplinary Board and the work in question will be given a zero.

On the homework assignments you have the option of group work but may work on your own if you prefer. However, even if you work as a group, you must compose and write the answers individually, *in your own words*. You may not work with or consult anyone who is not currently a student in this class!

Artificial intelligence tools: You may not use AI tools in answering homework or exam questions.

Much of the content in this class was developed by the Genome Sciences faculty. You may not share any of this material with anyone or any site outside of the class.

If you have questions about what is allowed and what isn't, please don't hesitate to ask us! (Better to find out for sure than to assume!) If you have further questions, please refer to the University's Student Conduct Code.

Resources

Make use of one-on-one help hours even if you don't have specific questions—they are an opportunity for you to try out your thinking in a non-threatening environment and will help you integrate the concepts we cover in class. Think of the help hours as moderated group study.

Lectures (but not quiz sections or help hours) will be recorded and be available as streamed video within a day or two. **The videos are not meant to substitute for attending lectures.** They are just intended to help you in case you missed some point in class. And sometimes the video recording fails for technical reasons, so don't count on them!

There is an email group for the class (linked from the web site). **Email that you send to the group will go to everyone in the class**—so if you want to reply to just one person, make sure your reply isn't going out to the whole class! I've also set up a discussion site on Canvas.

Health

We would like everyone to stay safe and healthy! If you are feeling unwell, it is better to stay home and recover. We will make suitable accommodations for exams missed due to health reasons (see Conflict Policy above).

Grading Scheme: How your grade in Genome 371 will be computed

Half your grade will be based on ***effort***. The other half will be based on ***graded work***—*homework* and in-person *exams*.

- For the effort component, we will not grade you on accuracy, only on the thoroughness of your attempt to answer the questions (see examples below).
- So, if you fulfill all the effort requirements, you automatically get a minimum of 2.0 in the class. (If you only fulfill a portion of the effort requirement, your effort grade will be scaled down accordingly.)
- The graded component (homework and exams) can add to this effort grade, i.e., you can make up some or all of the remaining 2.0 grade value—anything you score on the graded component **above a minimum threshold of 30%** will be added to the effort grade described above.
- *A disclaimer:* This "grade for effort" system is pretty new for us, and we appreciate your patience as we work out any hiccups that may occur.

*The **effort** component*

There will be two parts to the effort requirements, a quiz section part and a homework part:

1. **Quiz section component**: Before every quiz section, you will be given a "pre-worksheet" or other information to work on, as preparation for that quiz section exercise. In quiz section, you will be given a few short questions based on the prep work we expect you to have done. You will discuss the question with other students at your table (max of four students per group) and turn in one answer for the table.

    - There are nine weeks of quiz section in total; to get full effort credit, you must attend quiz section and turn in answers for at least seven of the nine. (If, for example, you are sick some week and are unable to attend quiz section, that would be one of the two quiz section attendances you are allowed to miss.) Don't be late for quiz sections—if you miss the questions discussion, you will lose the quiz section effort points for that week.

    - Each quiz section will be worth 6 points. To get full effort credit for quiz section, you would need to get at least 42 quiz section points.

2. **Homework component**: There will be a total of seven homework assignments (usually one a week, except for midterm exam weeks and Thanksgiving—see the schedule on the syllabus page).

    - You must turn in at least five of the seven homework assignments, and for full "effort" credit you must make an honest, thorough attempt at completing each of the assignments that you do turn in.

    - Each assignment will be worth 32 effort points. To get full homework effort credit, you would need to get at least 160 homework effort points.

    - Effort credit will depend on the completeness of your effort, not the accuracy of your answers (see examples below).

    - For the homework assignments, you are *allowed* to work in groups but are *not required* to work in groups. Whether or not you worked as a group, each student should submit answers on their own (**using their own words**), not as a group. Slightly re-phrased versions of the same sentences do

not count as "using your own words"! (You may not work with or consult anyone who is not currently a student in this class!)

- Excess points you get in quiz section (e.g., if you complete effort on all 9 quiz sections) will not count towards the homework effort or vice versa. That being said, we may make rounding adjustments to a student's final grade if we see that they have completed all nine quiz sections and all seven homework assignments. We firmly believe that attending quiz sections are critical to your success in the course, and we want that to be reflected in how we evaluate you!

*The **graded** component*

There will be two components to the graded part: homework (200 pts total) and exams (300 pts total). The two components together, **above a minimum threshold of 30%** (i.e,. 150 pts) will account for 2 grade points. You may **not** use AI tools in doing these assignments. Details…

1. **Graded homework.** The same homework assignments that you turn in for "effort" points will factor into the graded component.
   - Your homework answers will be graded for correctness/accuracy.
   - Note that your score here is distinct from the effort component: even if you get a question completely wrong, you would still be eligible for the full effort credit as long as you've made an honest attempt at answering it fully (see examples below).
   - The graded homework component will comprise 40% of the total graded points. If you turn in more than five homework assignments, we will take the best five scores and drop the other(s).
   - Reminder: For the homework assignments, you may work in groups, but are not required to work in groups. Whether or not you worked as a group, each student should submit answers on their own (**using their own words**), not as a group. Slightly re-phrased versions of the same sentences do not count as "using your own words"! (You may not work with or consult anyone who is not currently a student registered in this class!)

2. **Exams**. There will be three exams in total (two midterms and a final).
   - All exams count toward your overall grade, and the three exams together will be worth roughly 60% of the graded component.
   - No effort points for exams.
   - No group work on exams! The exams will not be open book (it gets too messy in the crowded lecture room), but for each exam you will be given one 5x7 inch note card on which you may write whatever notes you want and bring to the exam for reference. (E.g., if you find that you always have a hard time remembering the direction of transcription relative to DNA strand polarity, you can write a note to yourself on the note card and refer to it during the exam.)
   - Your grade points for the graded component will be based on the aggregate of your HW graded points and your exam scores. Only the aggregate (graded) points **above a minimum threshold of 30%** will count towards the final grade.

So, overall, here's the breakdown of grade points:

Effort (2 grade points)	Homework: ~40% of final grade	Quiz section: ~10% of final grade
Graded work (2 grade points)	Aggregate of homework + exams, above a minimum threshold of 30%	

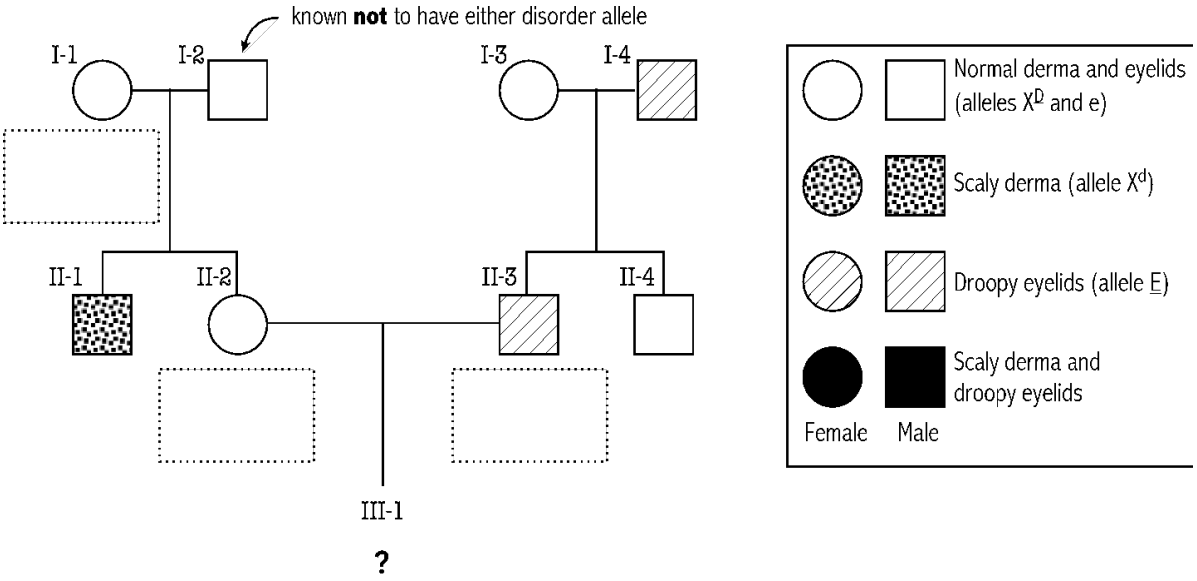
Let's consider some scenarios:

- Student A turns in the required seven quiz section work and turns in the required six homework assignments but gets all the homework problems wrong and does not take any of the exams. Student A could only get effort points and no graded points, and therefore could score a maximum of 2.0 as the final grade.
- Student B does not do any of the quiz section or homework assignments, and only takes the exams. Student B could get no better than a final grade of 1.5.
- Student C completes the quiz section and homework assignments but does not take any of the exams. Student C could get a maximum of 2.0 effort + a maximum of 0.5 on the graded homework, for a maximum of 2.5 as the final grade.
- Student D completes the quiz section and homework assignments. Student D takes all the exams. Student D could get a maximum of 2.0 for effort + a maximum of 0.5 for the graded homework + a maximum of 1.5 on the exams, for a final grade of 4.0 max.

Assessing effort

For full effort credit, you will need to give complete answers that show that you've worked through the questions and addressed all the things each question asks for. Your logic may be flawed, but as long as you've provided a thorough answer based on your logic, you would get the effort points. Below is an example of a question and how various answers would be assessed for effort and graded for correctness (these were taken from a previous exam). Don't worry if you can't interpret pedigrees yet, that's something we'll be covering later!

The pedigree shows inheritance of scaly derma, a recessive trait, and droopy eyelids, a dominant trait. Individual I-2 is known **not** to have either disorder <u>allele</u>. Assume for this question that there is no aberrant event and that X-inactivation is not a factor in the expression of these phenotypes.



a) Using specific individuals to make your case, say what evidence in this pedigree shows that droopy eyelids is **not X-linked**. (The given allele notation does not count as evidence!)
b) II-2 and II-3 are going to have a child (III-1). What is the probability that child III-1 will have scaly derma and droopy eyelids? **You must clearly show the steps leading to your answer**.

Example answers for part (a)—

Student 1: We can tell that droopy eyes are not X-linked because if it were II-4 would have received droopy eyes from I-4's X chromosome. Since II-4 does not express the trait this trait is not X-linked.

Assessment: Answer is incorrect, so 0 points for the graded component (I-4 is a male, would not be passing an X chromosome to his son). But, full points for effort (has clearly analyzed the pedigree and gives a thorough answer with a chain of logic addressing all parts of the question and specifying relevant individuals in the pedigree).

Student 2: If droopy eyes was X-linked II-3 and II-4 would not be different from each other.

Assessment: Full points for effort (student has analyzed the pedigree and is on the right track to address what the question asks), but only partial credit for graded component (logic is incomplete, must connect the dots and say *why* the fact that the children don't show the same trait excludes X-linked inheritance).

Student 3: X-linked traits pass from father to daughter.

Assessment: No points for effort, no points for graded component. (The answer is just a generic statement that does not show any attempt at analyzing this particular pedigree and answering the question asked, so no points for effort. Does not correctly answer the question, so no points when graded.)

Example answers for part (b)—

Student 4:

II-3 is X^D so all daughters will have healthy derma only son can be affected.
II-2 has ½ chance to have X^d
II-2 has ½ chance to pass X^d instead of X^D
II-3 has ½ chance to pass Y instead of X^D
II-2 can only pass e.
II-3 has ½ chance to pass e.
Overall ½*½*½*½ = 1/16 chance.

Assessment: Has clearly analyzed the problem and given a complete answer (showing all the steps as required). Full credit for effort. Every step is correct, so full credit for the graded component.

Student 5: 1/16.

Assessment: No credit for effort (hasn't shown any of the steps). No credit for grade (don't know how they got the answer.)

Student 6:

Droopy eyelids is not X-linked, so 0% chance of female child with droopy eyelids, 100% chance if male, overall 50% chance.
Scaly derma: 100% chance X^D from father, half chance x 1/3 chance X^d from mother (1 x ½ x 1/3)
Chance of male = ½.
Answer ½ x 1 x ½ x 1/3 = 1/12.

Assessment: Student has made an honest attempt at the question, trying to derive all the components of the answer and showing the steps. Full credit for effort. But, logic incorrect, probabilities are incorrect, so 0 points on graded component.