SYLLABUS AND COURSE POLICIES

FALL 2021 CORE-UA 303 001, Life Science: Human Genetics

Instructor: Professor David Fitch (Biology) — david.fitch@nyu.edu

NOTICE: By enrolling in this course, it is assumed that you are familiar with and agree to all of the course policies detailed in this document. Please see the instructor if you have any questions.

COURSE DESCRIPTION

We are currently witnessing a revolution in human genetics, where the ability to scrutinize and manipulate DNA has allowed scientists to gain unprecedented insights into the role of heredity. Beginning with an overview of the principles of inheritance such as cell division and Mendelian genetics, we explore the foundations and frontiers of modern human genetics, with an emphasis on understanding and evaluating new discoveries. Descending to the molecular level, we investigate how genetic information is encoded in DNA and how mutations affect gene function. These molecular foundations are used to explore the science and social impact of genetic technology, including topics such as genetic testing, genetically modified foods, DNA fingerprinting, and the Human Genome Project. Laboratory projects emphasize the concepts, methods and problem-solving tools that scientists employ to study heredity.

COURSE OVERVIEW

This is a 4-point lecture-with-lab course that is run in 27 75-minute lecture sessions, 2 of which will be used for in-class exams. The Lecture "section" is designated 001 and will be fully online via Zoom (see Schedule, below). Separate lab/recitations associated with the course are taught by TAs under supervision of the instructor. This year, there are 12 75-minute lab sections, 10 of which (sections 002-011) will be held in-person for hands-on experiments, and 2 of which (012-013) will be online for remote students.

Students are encouraged to use the instructor's Group Study Hours to help answer questions, clarify expectations, review exam questions, talk about challenges, etc. (see Office Hours, below). If students cannot see the instructor during these hours or need to discuss issues on a 1-to-1 basis, they are encouraged to e-mail the instructor to schedule an appointment at a mutually acceptable time. For Fall 2021, all lectures, labs and office hours will be held online via Zoom teleconferencing.

The overall aim of this course is to provide a basic understanding, geared especially to non-biologists, about the biological mechanisms of genetics, and in particular, on the role of genetics in shaping human traits, and how defects in these processes can lead to disease states. The course material is meant to provide a conceptual and practical foundation of biological knowledge to allow non-biologists to critically assess media reports, policies or ethical arguments regarding current developments in biological research.

The course is organized into four conceptual units. First, we will build a basic understanding of the molecules and cellular structures involved in heredity, the mechanisms for how chromosome and cell division mechanisms lead to the transmission of inherited information, and how we can use our knowledge about these mechanisms to make probabilistic predictions about inheritance. Second, we look at how information about traits is encoded in our genes, and how this "blueprint" is interpreted by cellular machinery to build organisms (esp. male and female human organisms), how genes interact with environment to determine traits, and how variation results. Third, we will explore how our heredity continues to result in our evolution and how population dynamics helps to explain the distribution of genetic variation. Fourth, we will briefly explore biotechnologies and their use in helping us understand human genetics, as well as discuss their promise and possible peril for human health and society. Finally, through group projects (presented to the class at the end of the course), students will have the opportunity to explore topics of their own interest in more depth.

SCHEDULE

Meeting times for "lecture sessions" are normally 9:30–10:45 AM Mondays and Wednesdays. (Please note on the syllabus and NYU Academic Calendar any "legislative days" that diverge from these normal meeting times.) All lecture sessions will occur online via *Zoom*, so students are required to have access to an internet-connected computer with a recent version of *Zoom* software uploaded (as well as an internet browser, and other software such as *Microsoft Office* that can be used for accessing all files posted to NYU Brightspace. Lectures themselves will be recorded and *Powerpoint* "slides" will usually be made available on the NYU Brightspace site the night before the lecture. The Zoom lectures will be recorded and posted on the NYU Brightspace site after the live ("synchronous") lectures. Thus, it will be most useful to review the Powerpoint slides and at least skim the suggested readings *prior to* the scheduled lecture session, attend the live lecture, and review using the recorded lecture. The schedule of topics, readings, etc. is detailed in a separate document: Schedule-HumanGenetics-FA2021.xlsx, available on the NYU Brightspace web site for this course (Resources > Syllabus and Course Policies).

LECTURERS

This semester (Fall 2021), Professor David Fitch (david.fitch@nyu.edu) will lead the lectures/discussions, write all the homework assignments and exams, suggest laboratories and supervise the grading by TAs. Because he is responsible for the scientific and other conceptual content of the course, Prof. Fitch should be consulted regarding any questions about the course material. For scheduling of labs, please direct questions to core.cas@nyu.edu.

All recorded lectures will be made available on the NYU Brightspace site.

OFFICE HOURS

Prof. Fitch's optional Group Study Sessions will be held Mondays 2:00–3:30 PM and Wednesdays 11:00 AM–12:30 PM, via Zoom: https://nyu.zoom.us/j/6829232220. These are all group discussion sections and anyone may join at any time. If you have time conflicts or want to meet individually with Prof. Fitch, please e-mail david.fitch@nyu.edu for scheduling mutually convenient office hours. Office hours with TAs will be announced independently by them.

COURSE OBJECTIVES AND EXPECTED OUTCOMES

- To gain an appreciation for the exquisite complexity and beauty of living systems
- To acquire a foundation of knowledge about how organisms store and process information encoded in DNA
- To understand technological advances, particularly in biology, that will shape the future of our world
- To develop skills in problem-solving and interpreting scientific information
- To develop critical-thinking skills and an appreciation for how the scientific method works as a way of knowing
- To gain competence in fundamental aspects of biology and especially genetics to address the complex ethical, social and legal consequences of genetics and genetic information

The expected outcome is that students will gain sufficient competence and background in biology (especially human genetics) to knowledgeably and critically assess information about biological research and the potential societal impacts of biological technology. Students are also expected to come away with a greater appreciation of the kind of critical thinking and approaches used by scientists to test hypotheses, solve problems, and assess the quality of information about the material world. Finally, students are expected to have an augmented appreciation and reverence for all living systems and to develop a compassionate understanding regarding variation within human populations.

COURSE MANAGEMENT AND COMMUNICATION

Course materials and grades will be posted on the NYU Brightspace web site. To access the site, log in at http://home.nyu.edu/, select Academics, select NYU Brightspace, and go to the link for this class.

Important Announcements may be posted intermittently. Please check the site at least once a week. Announcements may be sent out as email as well, using NYU Brightspace, which will send messages to your NYU e-mail address. You are responsible for knowing the information contained in these announcements and e-mails.

When sending messages to the instructor, please put “Human Genetics" in the subject line so your message will not be mistaken for junk mail. Please use courtesy and respect when contacting and interacting with faculty, TAs, staff and other students in the course and such courtesy and respect will be reciprocated.

COURSE MATERIALS

One textbook is required: Michael Cummings, 2015. Human Heredity: Principles and Issues, 11th ed. Pub. by Cengage. ISBN: 978-1-305-25105-2. The e-book version is a recommended alternative.

Some additional timely readings might be assigned from such sources as *Scientific American* or *The New York Times*. Students are expected to read these materials as well as assigned portions of the textbook prior to the lecture/session in which they will be discussed and prepare to contribute to that discussion. Readings outside of the textbook will be uploaded to the NYU Brightspace Site, from which students will be able to access them at least a few days before they are used in class. The average reading load per week is expected to be about 28.5 pages (approx. 400 pages total).

Please note that it is the student's responsibility to obtain all course materials. The instructor has reviewed several textbooks and has chosen the options that offer both a good price point and are best suited to this course. Other course materials may be suitable, but the instructor cannot take responsibility for students missing important information because of the use of alternative materials.

GRADING AND ASSESSMENT COMPONENTS

This course uses several different kinds of assessment tools to evaluate different aspects of a student's learning and performance, including participation in labs, traditional written exams, and homework or other assignments. Details about each of these components are noted below.

Component	Percent of course grade
Homework assignments	18% (total for 9 assignments)
Exams	45% (15% for each of 3 exams)
Laboratory*	37% (includes lab reports, quizzes and a Term Project)

* Expectations for lab work will be discussed in your lab section with your TA.

Participation

Attendance at lectures and labs is a required aspect of participation. Active attentiveness will aid the learning process, but requires effort on the part of the student; the lecturer can only provide the guidance, but the responsibility for learning must be taken up by the student. Although attendance at lecture (online) is required, students are allowed to miss lectures for any reason including but not limited to illness, religious holiday or personal issues. Your attendance may be monitored and could be used to boost the letter grades of otherwise marginal cases.

Assignments

In total, 9 homework problem sets will be assigned. These problem sets are intended to be similar in level to the types of questions on the exams, but are intended to be a little more thought-provoking or challenging. These homework assignments are primarily meant to aid student learning as well as provide feedback on performance and provide practice for the kinds of questions students may encounter on exams. Thus, students are encouraged to take these assignments seriously. Although students are encouraged to discuss course material with each other and form study groups, etc., unless otherwise told explicitly to

collaborate, students are expected to complete homework assignments *independently and individually*. Please see the **Academic Integrity** section below. Any homework or other assignment on which cheating has occurred will be given a zero, and further penalties could result.

Exams

There will be 3 exams, corresponding to the major topical divisions of course material (see course schedule). Exams will be not be "cumulative" in the sense of explicitly testing material covered by previous exams. However, because many of the concepts encountered in the course build on prior ones, understanding of the material covered in the second and third exams will depend on understanding of the material covered by the first exam. Each exam will consist mainly of multiple-choice and some short-answer questions. Many exam questions in this course will be designed to test your understanding of the material, not merely your ability to memorize or recall material. In particular, you could be asked to: (a) recognize a concept when it is presented in a different context than was discussed in lecture, (b) connect ideas between different topics, and (c) apply what you have learned (concepts, reasoning skills and problem-solving skills) to entirely new situations. Simply reading the textbook and passively listening to lectures will thus not be sufficient study strategies. You will also need to *actively* study. Participation in class discussions, forming study groups outside of class, engaging with your TA, and coming to office hours when needed are all good ways to help you actively study.

The exams are required and must be taken during the hours scheduled. Exams will be administered by Prof. Fitch via the Quizzes tool of Brightspace.

What to do in case of illness or emergency: If you are unable to take an exam due to life events or illness, do NOT take the exam, and DO ask for special consideration BEFORE the exam is held. Once an exam is taken, it will be graded and counted toward your grade. Please, if you are ill at the time of the exam, skip the exam, take care of yourself (e.g. seek medical help), and TELL the professor. Exams skipped or unfinished without immediate communication with the professor will be scored zero.

Cheating. Exams are meant to accurately measure an individual student's understanding and problem-solving skills. Thus, any action taken to dilute your input by using other sources violates the assumption that an exam is truly and solely your work. The purpose of such an assessment is to provide the student as well as the professor with honest and accurate information regarding areas to target for personal improvement. Cheating thus also hinders this process of personal self-improvement.

Grading Scale and Criteria

Points earned from all components of the course are added, resulting in a Course Score. This score is then converted to letter grades using the following scale:

Letter grade	Course score	Interpretation
A	≥95	High-level mastery of all material in the course
A-	≥90 but <95	Mastery of most of the material in the course
B+	≥85 but <90	Mastery of much, but not all of the course material
B	≥80 but <85	Mastery of some and proficiency with most of the course material
B-	≥75 but <80	Proficiency with most of the course material
C+	≥70 but <75	Proficiency with much of the material, challenged in some aspects
C	≥65 but <70	Mediocre proficiency
C-	≥60 but <65	Insufficient level of proficiency regarding much of the material
D+	≥55 but <60	Insufficient level of proficiency regarding most of the material
D	≥50 but <55	Insufficient level of proficiency regarding nearly all course material
F	<50	No demonstrable level of proficiency regarding any material

This grading scale may be changed at the discretion of the instructor to correct for particularly challenging aspects of the course. For example, if there are no course scores >90, the scale may be shifted so that at least some percentage of the students fall into the A category. This discretionary shift would NOT be used to shift grades downwardly, but would only be used as a "safety net" to shift grades up if the score distribution is lower than expected. That is, if every student scores > 90, then every student gets an A-range score!

ACADEMIC HONESTY/PLAGIARISM

Carefully read NYU's *Statement on Academic Integrity* (in the Undergraduate Bulletin). Breaches of academic integrity could result in failure of an assignment, failure of the course, or other sanctions, as determined by the Academic Affairs office. The policy pertaining to this course is excerpted and adapted from CAS policies on academic integrity for students at NYU: https://www.nyu.edu/about/policies-guidelines-compliance/policies-and-guidelines/academic-integrity-for-students-at-nyu.html ; https://cas.nyu.edu/content/nyu-as/cas/academic-integrity.html

As scholars in a liberal arts community, we are all obligated to promote an educational environment that is fair to all, where there is mutual trust and respect, and where we all represent ourselves with integrity and honesty. Because of the central importance of these values to our academic life together (as well as to the conduct of science, by the way), students who fail to maintain them will be subject to disciplinary sanction, which may include grade reduction and/or dismissal from the University. In short, **cheating is equivalent to disrespecting your peers as well as your instructors, and such dishonesty and disrespect breeds mutual distrust. Beyond this obligation to others, you have an obligation to *yourself* to building your own understanding and strength of self-integrity and self-respect**.

Academic honesty constitutes several core principles, two of which are:

(1) Your work is original. Copying answers into an exam or homework or term paper violate this principle, even if that copying comes from an anonymous online site. Representing another person's work as your own—even without directly copying it—is plagiarism, a form of fraud.

(2) Assessment of your individual work is based on your individual understanding. Receiving help from—or giving help to—anyone for an assessment tool (exam, homework, etc.) meant to assess your individual understanding is also a violation of this principle. This is also a form of fraud, because you would be trying to deceive your instructor—*and more importantly, yourself*—that your understanding and mastery is greater than it actually is. Anyone who participates in such deception (including the "helper") is also in violation. (Of course, this does not apply to assignments in which collaboration is explicitly permitted by the Instructor!)

Sanctions for this course

Any student caught cheating on an exam or assignment or plagiarizing on a project will receive a zero for that exam/assignment/project. Instructors and TAs are *obligated to report* academic integrity incidents to the Dean of Arts and Sciences. If this is the second violation in your student record, you may be subject to punitive measures, such as expulsion from the university, in addition to the academic measures taken by the professor, i.e. grade reduction for the exam and/or for the course grade. Please note that it is also your duty to report cheating incidents to the professor if you know about them, since failing to report also constitutes a violation of the University's honor code.

DISABILITY DISCLOSURE STATEMENT

NYU is committed to providing equal educational opportunity and participation for students with disabilities. No student with a qualified disability will excluded from participating in any of this course's activities or otherwise subjected to discrimination with respect to participation. Any student who needs a reasonable accommodation based on a qualified disability is required to register with the CSD for assistance. Students can register online through the Moses Center and can contact the Director of the Academic Resource Center with questions or for assistance. Please also notify Dr. Fitch so he can make the proper adjustments. Web site: https://www.nyu.edu/students/communities-and-groups/students-with-disabilities/academic.html

HOW TO EXCEL IN THIS COURSE

- Check the Course website regularly for announcements.
- Read the textbook chapter and other assigned readings *before* coming to class.
- Attend all of the lectures, as they are an efficient means of being introduced to required material and obtaining explanations and insights that may differ from the textbook. However, do not just "attend" the

lecture passively, but actively listen, actively participate in simulations or clicker questions, and perhaps actively take notes or write down questions about concepts that were unclear to you. If you printed an outline of the lecture, add notes to it in your own words.

- Prevent distraction. During the lecture, unless otherwise instructed to do so, do not have conversations, use electronic devices, shop on the internet or watch sports games. Focus on the actual lecture.
- After the lecture (preferably within 12 hours), review the lecture, read the relevant parts of the book, and add to your notes. This will help fill in gaps in your understanding.
- Study actively. Put away the books and lecture notes and use blank sheets of paper. Construct tables or make your own diagrams to reconstruct your understanding of the key concepts, processes and mechanisms. Just rereading the textbook or listening to the lecture over and over does not help your learning process. Learning works best when you *actively* engage different senses and active processes.
- Often we will use simulations or solve problems in class or in the labs. Play with the simulations on your own and solve the problems on your own as well to explore the concepts and ways of thinking and solving problems.
- Study in groups and teach each other; ask each other to explain difficult concepts. Peer learning can be extremely powerful (as long as the group is serious about cooperative learning and distractions are limited).
- Practice answering questions from different sources, such as chapter questions in the textbook. Just be aware that other sources will not always reflect what the lecturer emphasizes. You should try writing down your own questions as you study and then coming back to answer them later; you can also share these questions with your classmates. You can also share them with your Professor! If a question you sent to a professor is used as an exam question, you will be awarded a bonus point on that exam. (Such questions must be well thought out to be competitive, however.)
- One other source of help is the University Learning Center (http://www.nyu.edu/ulc), which offers tutoring sessions and study workshops.
- Use the free office hours! Expert tutoring by the professor—no fee!

OTHER MATTERS

Special needs

Please inform the Professor of any accommodations you require in writing at least 10 days before the exam.

Withdrawing from the course

If life events are preventing you from doing well in this course, you should consider withdrawing. This is *not* a sign of weakness or failure, but rather can be a good strategy to optimize your performance and resources.

Letters of recommendation and comment forms

Letters of recommendation should only be requested *after* completion of the course (but please contact the TAs or professors in a timely fashion if a letter is required earlier than course termination). Please note that letters of recommendation will only be useful if you have *excelled* in the course *and* if you have *interacted* with the professor and/or TA in an academically *meaningful* way (and the professor reserves the option to decline writing such a letter for any reason).