Syllabus – IB204: Genetics

Fall 2025; updated: 2025-08-22

Course Overview

Welcome to Genetics! As you might know from reading the news, genetic techniques and genetic research are exciting, fast-moving, and critical for solving many of the grand challenges facing society. Genetics is a “core” course for all Integrative Biology (IB) majors. Our lectures and labs are designed for students with career interests in a diversity of areas, including medicine and other health sciences, biological research, science writing, or education. This course will emphasize genetic data analysis, and we will cover the topics of molecular genetics, gene mapping, genetics of complex traits, genomics, and population and evolutionary genetics. This course aims to build a solid foundation in biology, develop critical thinking, and help students sort through various possible explanations for genetic data. It also applies genetic knowledge to multiple areas of endeavor, extending beyond the field of genetics itself.

Course Goals

- Know what genetics is, how geneticists do their work, and what sorts of questions geneticists ask.
- Think like geneticists, using “genetic logic” based on an intuitive understanding of genetic mechanisms operating both at the level of individuals and populations.
- Synthesize facts and concepts to think critically and reason through problems.
- Apply abstract/mathematical models to biological processes.

Academic Calendar

A course week is defined as the period between Monday, 12:00 AM Central Time and Sunday, 11:55 PM Central Time. For more information, see the University's Academic Calendar.

This is a **4-credit-hour** course. The course is **16 weeks long** and consists of 4 content modules, with 3 lectures a week in addition to a lab. You should dedicate approximately **12 hours per week** to working on the course itself, but actual time commitments will vary depending on your input, needs, and personal study habits. You are required to log on to the course website and check your email a minimum of 3 days per week, but as discussions develop, you will probably need to do so more frequently.

Optional Textbook

Pierce, B. A. Genetics, A Conceptual Approach (2019), 7th Edition by W. H. Freeman ISBN-13: 978-1319216801 ISBN-10: 1319216803

Please note that purchasing this book is not essential. We include it here as some students may find the structure of a textbook useful. However, free online materials will also be provided

through the course webpage. As the textbook is optional, it is highly unlikely that it will be available through the Illini Union Bookstore.

Required materials

Calculator, and a pen or pencil.

Optional materials

iClicker, for participation in in-class (ungraded) polling. Physical iClickers are available from the University bookstore, or the iClicker Student Mobile App can be purchased from the Apple App Store or Google Play.

Location

Lecture: Natural History Building (NHB) 2079, Monday, Wednesday, Friday, 12-12:50 PM

Course website

The course webpage will be hosted at https://canvas.illinois.edu/. After you log in with your University NetID and password, select “IB 204 Genetics (Fall 2025)” from your list of courses, and click the “IB 204 All FA25: Genetics (Burgess, S)” link to enter the course. **Assignments will not appear in your Canvas calendar. You must also access the grade book from the course view (i.e., not the Canvas grade book).**

Communication

Your instructors are here to help, so please reach out if you need help. As a first step, we encourage you to post questions on the Q & A Forum on the course webpage if you have queries regarding the material. If you are struggling, others will likely be in the same situation, so your actions will benefit everyone in the class. If you need a more personal one-on-one consultation, you are welcome to contact the instructors (ib204-course@illinois.edu) to set up an office hours appointment or ask questions before, during, or after class. We will do our best to respond within 24 hours, Monday through Friday, between 8 AM and 5 PM, although response times may be longer at weekends. Please follow up if you have yet to hear back within several days. It is likely your message was missed.

Instructors

Facilitator: Steven Burgess,
Email: ib204-course@illinois.edu
Location: 283 Morrill Hall

One-on-one support: August 25th – October 15th. Study club Monday: 2 – 3 PM NHB 2004, or one-on-one by appointment (Zoom and evening sessions available).

About me: I am an Assistant Professor in the Plant Biology department at UIUC. My research aims to develop better crops which produce higher yields and withstand climate change through understanding the genetic basis of photosynthesis. We use a variety of approaches from molecular biology, genomics, genetics, biochemistry and synthetic biology. Visit our website to learn more about the exciting things going on. I am originally from the UK and obtained a Bachelor's degree in Biochemistry from the University of Edinburgh and a PhD in Molecular Biology from Imperial College London. I came to UIUC as it is a fantastic place to conduct research on photosynthesis. When I'm not doing science I enjoy soccer, attempting to bake and hanging out with my cat.

Facilitator: Nick Anderson (he/him)
Email: ib204-course@illinois.edu
Location: 2006A Natural History Building
One-on-one support: October 16th - December 19th. Study Club: TBA NHB 2004 or by appointment (Zoom and evening sessions available)

About me: I am a lecturer in the School of Integrative Biology. I teach several courses for undergraduates and graduate students in the MS in IB program. I maintain a small research group investigating the importance of predators and habitat restoration in structuring native bee communities. I am originally from north-central Wisconsin and obtained my Bachelor's degree in Biological Sciences from the University of Notre Dame and a Master's degree and Ph.D. in Entomology from UIUC in Dr. Alex Harmon-Threatt's lab. I came to UIUC to work specifically with Dr. HT and to be part of a globally renowned Department of Entomology. I chose to stay because of all the wonderful people and learning community. Outside of work, I enjoy spending time with my daughter, wife, and two cats and trying to relearn the guitar.

Teaching Assistants (TAs)

Teaching assistants are graduate students in the School of Integrative Biology. They teach the lab and merit sections of the course and are an excellent source of information about the topics covered in class and beyond. Your TAs are your first point of contact for concerns about your lab grades. Office hours will be held Monday through Thursday, from roughly 1 to 4 PM, in the IB Resource Center, Natural History Building (NHB) 2092. Please check the "Course Help" tab on the course website for a visual representation of the office hour schedule.

Name and email	Sections	Study club times and location
Vincent Prayugo prayugo2@illinois.edu	Lecture Merit (Thursday 3-4:50 PM, NHB 4004)	Wednesdays 2 – 4 PM NHB 2092
Aly Alvey apalvey2@illinois.edu	Lab: ABD: Tuesdays 3-5:50 PM, NHB 3002 ABF: Wednesdays 1-3:50 PM, NHB 3002	Mondays 3 – 5 PM NHB 2092
Arnav Kaushik arnavk5@illinois.edu	Lab: ABC: Tuesdays 12-2:50 PM, NHB 3002 ABJ: Wednesdays 1-3:50 PM, NHB 3011	Mondays 1 – 2 PM and Thursdays 3 – 4 PM NHB 2092

Jingyi Li jingyi58@illinois.edu	Lab: ABB: Tuesdays 9-11:50 AM, NHB 3002 ABK: Wednesdays 9-11:50 AM, NHB 3011	Tuesdays 2 – 4 PM NHB 2092
Tylor Miller tylorm2@illinois.edu	Lab: AKL: Mondays 1-3:50 PM, NHB 3002 ABE: Wednesdays 9-11:50 AM, NHB 3002	Wednesdays 1 – 2 PM and 4 – 5 PM, NHB 2092
Minxing (MZ) Zhu minxing8@illinois.edu	Lab: ABG: Thursdays 9-11:50 AM, NHB 3002 ABI: Thursdays 3-5:50 PM, NHB 3002	Thursdays 1 – 3 PM NHB 2092

Course Components

This course will consist of the following components:

Lectures

Lectures will be 50 minutes long and involve a mixture of in-class activities and a more traditional format, with opportunities to ask questions and try practice problems. The material covered in the lecture will focus on major topics from the pre-lecture videos and reading, but does not necessarily include all the important information.

Pre-lecture activities

Each class has a pre-lecture activity to complete before the start of the lecture (11:59 AM). These activities provide content to *understand* for class and assist with short-term and long-term memory recall. Activities will be varied but typically consist of an assigned reading, video, or tutorial and an associated quiz delivered on Canvas. These questions are to help you gauge your understanding.

Post-lecture activities

Each class has a post-lecture activity to complete before the start of the next lecture (11:59 AM). These activities are designed to help consolidate knowledge and prepare for some of the types of questions that will be found on exams.

Practice problems

There will be four practice problems throughout the semester. These are in the form of extended answer questions and are included to provide an opportunity to practice exam-style questions. They are to be handed in before class (11:59 AM) on 09/12, 10/03, 10/29, and 11/21.

Exams

There are four non-cumulative exams and an optional cumulative final exam. Exams will be in person during the designated class schedule. The optional final will replace your previous lowest score. Your final grade cannot be negatively impacted by attempting the optional final. All exams are graded out of 50 points. The four non-cumulative exams will consist of 40 multiple-choice questions and 10 points of free response, drawing, labelling, etc. questions. They are designed to be completed within 50 minutes. The optional final is cumulative and will consist of 50 multiple-choice questions on topics from across the whole semester. Please note the optional final exam is on Thursday of Finals Week. Please plan your winter break travel plans accordingly.

Exam dates and locations

Exam	Date	Time	Location (by last name)
Exam 1	September 19th	12-1 PM	A-L: NHB 2079, M-Z: Gregory Hall 100
Exam 2	October 15th	12-1 PM	A-L: NHB 2079, M-Z: Gregory Hall 100
Exam 3	November 7th	12-1 PM	A-L: NHB 2079, M-Z: Gregory Hall 100
Exam 4	December 10th	12-1 PM	A-L: NHB 2079, M-Z: Gregory Hall 100
Optional Final Exam	December 18th	1:30-4:30 PM	TBD (Likely NHB 2079)

Make-up exams

This course follows the guidelines outlined in the Student Code, whereby accommodations can be made for individuals on the basis of religious observances, participation in activities of officially recognized groups, or serving as a volunteer emergency worker when notice is given at least one week in advance. If you are unable to take an exam due to illness, you will need to obtain a letter from a physician following the university's excused absence policy and submit it to ib204-course@illinois.edu. We recognize that it is common for courses to hold examinations on roughly the same schedule (i.e., some exams are on the same day). Due to the class size, we cannot offer make-up exams on this basis.

Accommodations

To obtain disability-related academic adjustments and/or auxiliary aids, contact your instructor and the Disability Resources and Educational Services (DRES) as soon as possible. To contact DRES, you may visit 1207 S. Oak St., Champaign, call (217) 333-4603, e-mail disability@illinois.edu, or go to the DRES website (https://dres.illinois.edu/).

Course Outline

Week	Date	Topic	Topic	Instructor
1	Aug-25	Introduction	Course introduction	Dr. Anderson Dr. Burgess
	Aug-27	PCR and Sequencing	DNA replication and PCR	Dr. Burgess
	Aug-29		Eukaryotic DNA replication	Dr. Burgess
2	Sep-1	**No class - Labor day**		
	Sep-3	DNA damage and repair	DNA damage	Dr. Burgess
	Sep-5		DNA repair	Dr. Burgess
3	Sep-8	Cancer biology	Cancer Biology	Dr. Burgess
	Sep-10		Tumor suppressor genes	Dr. Burgess
	Sep-12		Oncogenes	Dr. Burgess
4	Sep-15	Application	Personalized medicine	Dr. Burgess
	Sep-17	REVIEW	Review	Dr. Burgess
	Sep-19	Exam 1	Exam 1	Dr. Burgess
5	Sep-22	Gene expression	Nature vs Nurture	Dr. Burgess
	Sep-24		Transcription	Dr. Burgess
	Sep-26		Lac operon	Dr. Burgess
6	Sep-29	Regulation of gene expression	Eukaryotic transcriptional regulation	Dr. Burgess
	Oct-1		Post-transcriptional regulation	Dr. Burgess
	Oct-3		Epigenetics	Dr. Burgess
7	Oct-6	Gene regulation and non-mendelian inheritance	Epigenetic inheritance	Dr. Burgess
	Oct-8		Non-Mendelian inheritance	Dr. Burgess
	Oct-10		Penetrance and Expressivity	Dr. Burgess
8	Oct-13	REVIEW	Review	Dr. Burgess
	Oct-15	Exam 2	Exam 2	Dr. Burgess
	Oct-17	Chromosomal Mutations	Meiosis & Aneuploidy	Dr. Anderson
9	Oct-20		Polyploidy & Structural Changes	Dr. Anderson
	Oct-22	Genetics of Sex	Sexual life cycles	Dr. Anderson
	Oct-24		Sex determination	Dr. Anderson
10	Oct-27	Quantitative Traits	How do we get some traits that are so variable?	Dr. Anderson
	Oct-29		Variance components and response to selection (breeder's equation) **Practice Problems 3 due**	Dr. Anderson

	Oct-31	Evolutionary and Population Genetics	Defining species and inferring evolutionary relatedness	Dr. Anderson
11	Nov-3		Hardy-Weinberg Equilibrium & the genetics of inbreeding	Dr. Anderson
	Nov-5	REVIEW	Review	Dr. Anderson
	Nov-7	Exam 3	Exam 3	Dr. Anderson
12	Nov-10	How do we find genes?	Fly screens and Linkage mapping	Dr. Anderson
	Nov-12		QTL Mapping	Dr. Anderson
	Nov-14		Genome-wide association studies (GWAS)	Dr. Anderson
13	Nov-17	Strange Genetic Material	Bacterial Genetics	Dr. Anderson
	Nov-19		Viral Genetics	Dr. Anderson
	Nov-21		Transposons **Practice Problems 4 due**	Dr. Anderson
14	Nov-24	**No class - Fall Break**		
	Nov-26	**No class - Fall Break**		
	Nov-28	**No class - Fall Break**		
15	Dec-1	Biotechnology	mRNA vaccines and DNA fingerprinting	Dr. Anderson
	Dec-3		Plasmids and transformation	Dr. Anderson
	Dec-5		RNAi, CRISPR, and beyond	Dr. Anderson
16	Dec-8	REVIEW	Review	Dr. Anderson
	Dec-10	Exam 4	Exam 4	Dr. Anderson
	Dec-12	No Class - Start of the final exam period		
	Dec-18	Optional Final Exam	FINALS WEEK: 1:30-4:30 PM	Both

Grading

Grading Distribution

Instructional Activity	Weight
Pre-lecture assignments	10%
Post-lecture assignments	10%
Practice problems	10%
Exams	40%
Lab	30%
Total	100%

Grading Scale

Percentage	Letter Grade
>97.50	A+
92.50-97.49	A
89.50-92.49	A-
87.50-89.49	B+
82.50-87.49	B
79.50-82.49	B-
77.50-79.49	C+
72.50-77.49	C
69.50-73.49	C-
67.50-69.49	D+
62.50-67.49	D
59.50-62.49	D-
Below 59.5	F

*Grade cutoffs account for rounding, and we will not apply any further rounding when assigning final grades. For example, we hold that 90% is an A-. We set the cutoff at 89.50%, which rounds up to 90%.

Grade curves and extra credit

We will not curve individual grade items - such as an exam - or final grades. Extra credit can be obtained by completing 3 out of 4 in-class quizzes per quarter. Each completed quiz will earn 1% extra credit toward the next exam, with a maximum of 3% extra credit. Additionally, you will have the opportunity to replace your lowest exam score by taking an optional final exam (see the "Exam information" section).

Process for dealing with missed assignments

We understand that life can be unpredictable, whether you're dealing with illness or a personal emergency. Therefore, we will drop your three lowest pre-lecture and post-lecture activity scores. This allows you to miss one week of course material due to illness without requiring a letter from the Dean of Students. **These dropped assignments take the place of extensions on or make-ups for individual assignments.** Drops will be applied automatically and reflected in the course grade book. Missed coursework can negatively impact performance, so we do not recommend relying on drops unless necessary. If you want assistance reviewing material for a class you missed, please contact ib204-course@illinois.edu for further information. Any requests beyond the drops provided above require a letter from the Dean of Students following the university's excused absence policy and should be submitted to ib204-course@illinois.edu.

Assessment feedback turnaround time

It is recommended that you check the course webpage regularly to ensure your assignments are submitted correctly and being marked. Please allow 1-2 weeks for grading exams and assignments. You can review graded exams during office hours.

Academic integrity

This course will follow the University's Student Code (http://studentcode.illinois.edu). The code defines infractions of academic integrity, which include but are not limited to cheating, fabrication, and plagiarism. You are responsible for knowing what these infractions are and following these guidelines. If you do not feel you fully understand what constitutes plagiarism, please ask the instructor. For this course, the use of Generative AI tools (e.g., ChatGPT, DALL-E, Claude, Gemini, etc.) to complete your work will be considered plagiarism. Posting course content to online study help sites (e.g., CourseHero) and accessing content from previous semesters (e.g., past exams from friends) violates the Student Code.

Additional Resources

- Are you interested in a career in science? If so, we encourage you to get involved in research. See more here, or talk to the instructors for advice:
  - https://sib.illinois.edu/academics/undergraduate-programs/research-experiential-learning/undergraduate-research
  - https://undergradresearch.illinois.edu/
- If you are experiencing personal difficulties and need someone to talk to, you can contact the Student Counseling Services here: http://counselingcenter.illinois.edu/

- Emergency Response information: http://police.illinois.edu/emergency-preparedness/.
- Sexual Misconduct Support: https://wecare.illinois.edu/resources/students/#confidential.
- Student code for academic integrity: http://studentcode.illinois.edu.

If you have suppressed your directory information in accordance with the Family Educational Rights and Privacy Act (FERPA), it is advised that you self-identify to the instructors to ensure privacy protection: https://registrar.illinois.edu/academicrecords/ferpa/.