
**IB 204: GENETICS** Lecture Syllabus

Professors:

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Email is the GREATLY preferred method of contact. Please only phone in an emergency. For students enrolled in laboratory, your laboratory TA is your first point of contact for questions about lecture or laboratory. For students enrolled in only the lecture section, your first point of contact will be the lecture coordinator. Students should attend the office hours of their own TA (or Lecture TA in the case of lecture-only students) whenever possible.

COURSE INFORMATION

**Course Moodle can be found at**: https://learn.illinois.edu/
**Classes**: MWF 12:00-12:50 pm; 2079 Natural History Building
**Lab**: 3002 Natural History Building
**Credit**: 4 hours (3 hours for students who are only enrolled in lecture)
**Prerequisites**: IB 150 and MCB 150

REQUIRED TEXTS and MATERIALS (at the Illini Union Bookstore or online)
SaplingPlus for reading quizzes. See Moodle site for instructions: https://learn.illinois.edu/

eBook is included with purchase of SaplingPlus. eBook Pierce, B. 2017. *Genetics: A conceptual approach.* W.H. Freeman & Co., 6th edition.

Note: THERE IS NO HARD COVER BOOK FOR THIS COURSE. You can purchase access cards for SaplingPlus/eBook from the Illini Union Bookstore or online ONLY through MacMillan Publishing: http://www.saplinglearning.com/ibiscms/

*iClicker:* Register your iClicker on the Moodle site:
https://learn.illinois.edu/blocks/iclicker/registration.php

**INTRODUCTION TO IB 204**

Welcome to Genetics! As you know from reading the newspapers and other popular media, Genetics is an exciting and fundamental discipline within biology. Genetics is a core course in IB, and is therefore required for all IB majors. Many students with majors in MCB and in other fields also enroll in this course. Our lectures and labs are designed for students with career interests in a diversity of areas, including medicine and other health sciences, research, science writing, or education. We assume that you have mastered all the genetic material covered in IB 150 and MCB 150, and we will not revisit most of this information. This course will emphasize genetic data analysis throughout and will introduce you to the topics of molecular genetics, gene mapping, genetics of complex traits, genomics, and population and evolutionary genetics. This course is aimed at building up a solid foundation for biology students, developing students' abilities in critical thinking, sorting through many possible explanations for genetic data, and applying the knowledge of genetics to many areas of endeavor even outside the field of genetics itself.

**Learning outcomes: After succeeding in IB 204, students will be better able to:**

- 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.
- Draw and interpret graphical representations of data.
- Apply abstract/mathematical models to biological processes.

We frequently use active learning activities in lecture, because these have been demonstrated to improve student learning. These include clicker questions and small group discussions (think-pair-share) to help you synthesize the lecture material and better prepare you for exams.

SUGGESTED LEARNING STRATEGIES FOR LECTURE

1. **Listen and think during lecture – it is a very efficient use of your time. Don't attempt to multitask. Take good notes. Did you know that taking notes by hand might be better than typing?** https://www.chronicle.com/blogs/wiredcampus/taking-notes-by-hand-benefits-recall-researchers-find/51411
2. Read the textbook (following lecture outline) before and after each lecture.
3. **Slides are not lecture notes**. Take detailed notes on separate paper during lecture.
4. Participate fully in all active learning exercises. Engage with your peers. Ask for help when you need it.
5. Learn definitions of all unfamiliar terms that appear in slides, and in the assigned reading.
6. Review figures in text and on PPT slides to practice generating and interpreting figures. Pay particular attention to understanding how to interpret figures and tables.
7. Master all computational skills and data interpretation skills that are critical components of the scientific process; be able to apply these skills when confronting a new genetics problem.

## COURSE POINT BREAKDOWN

Lecture: 70% of total for students enrolled in lecture and lab
100% of total for students enrolled in lecture only

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|---|---|---|
| Exams (3 + cumulative final) | 100 pts each | 300 pts (drop lowest) |
| SaplingPlus reading quizzes | Scaled to 100 total | 100 pts |
| In-class activities (hand up) | Scaled to 25 total (drop 2) | 25 pts |
| In-class quizzes (hand up) | Scaled to 25 total | 25 pts |
| iClickers (a lot!) | Scaled to 50 total (drop 2) | 50 pts |
| Total | | 500 pts |

## COURSE POLICIES

**No Screen Policy:** Screens (laptops, iPads, cell phones, etc.) are not permitted for use during the 50 minute lecture. Calculators are allowed for in-class activities, quizzes, and exams. If you must take or make a call during lecture you must excuse yourself from the room. Students using the above mentioned devices during lecture will first be asked to put it away, then asked to leave after subsequent violations; any missed points will not be allowed to be made up and will not be pro-rated.

**Absences:** The University does not have a comprehensive system for tracking student absences, and students have taken advantage of that in the past. Therefore, we have a strict absence policy. The only excuse for missing labs or exams is personal illness or tragedy in your immediate family. Notify your lecture coordinator and your TA BEFORE the lab or the exam if you have a problem. **Include "IB 204" in email subject headings** so we don't miss your email. You must provide documentation (i.e. written doctor's note excusing the student for specific days). Any documentation must be submitted no later than two weeks after the absence. Travel, weddings, jobs, other courses, etc., must be planned around IB 204 lecture, laboratory, and exams. We WILL NOT make special concessions for these events. Assignments turned in AFTER the start of class on the day in which they are due are considered late. Late assignments will continue to lose points for every day they are not turned in. Assignments will not be accepted after grades have been entered for on-time assignments.

If there is a chronic illness or multiple missed labs/exams, the student should work with a Dean to verify and document their absences. If a student misses many major assignments, then they may have to withdraw from the class. If you have any questions regarding these policies, please see the lecture coordinator. If you foresee having any long-term problems, or will need accommodations for religious absences or athletic department requirements (as described in the student code), please contact us immediately to make arrangements at the beginning of the semester. **Such accommodations cannot be made after the fact.**

**Exams**: Exams will cover lecture material, assigned readings (emphasis on lecture concepts), and material covered in in-class and online quizzes. Format of exams will be a combination of multiple choice and short answer/essay questions. Calculators (not phones or smart watches) may be used to perform calculations. Storing formulae or notes in a calculator is a violation of course policy.

*Any requests to regrade exam questions must be submitted in writing by email to the instructors **within one lecture** after the rubric is posted online. Afterwards, all regrade requests will be denied.*

This course includes three 50-minute exams (during class time) as well as a cumulative final exam that will occur according the university's official final exam schedule. The lowest

**Class Attendance**: Your grade will benefit from attendance and from reading the assigned material before lectures. In general, students that regularly attend lectures achieve a full letter grade higher than those who do not. There will be iClicker questions in each lecture. These questions are not extra credit and there is no chance to make-up the points if you forget your iClicker, it does not function properly, or are absent. Students are responsible for bringing a working clicker to class. Each student may only register one clicker. All iClickers need to be registered by the first exam, or students will not receive their points. You will receive 1 pt for answering each question. At the end of the semester, the total will be added up and scaled to 50 points. Bringing in someone else's iClicker in their absence is cheating. If a student is found using an iClicker of another student or otherwise misusing the iClicker system, students will receive a minimum penalty of zero iClicker points for the semester.

**Reading quizzes on SaplingPlus:** Reading quizzes are due most Mondays and cover the previous week's assigned readings. See the full schedule below for readings and due dates. Unlimited attempts are allowed; however, there is a penalty for each incorrect attempt.

**In class activities and in-class quizzes:** Throughout the semester, there will be several opportunities to test your knowledge of course material during class. Some of these will be graded ("quizzes") and some will be worth participation points ("activities"). See the lecture schedule below for quiz dates.

**Final Grades:** The TA's are required to have their final grades entered in the Moodle gradebook by the last day of class. If you see an error, then you have until the day of the final at noon to notify your TA of any errors. The faculty roughly set the grading scale at 100-90% (A+/A/A–), 89-80 (Bs), and so forth. Any curve up is only applied after looking at the entire class distribution at the end of the semester and is at the discretion of the instructors. We typically do not curve the class.

**General policies:**
This course will follow all policies in the Student Code: http://studentcode.illinois.edu

**Academic Integrity:**
This course will follow the Student Code. The code defines infractions of academic integrity, which include but are not limited to cheating, fabrication, and plagiarism. To learn about possible penalties for such a violation, see http://studentcode.illinois.edu. You are responsible for being knowledgeable of what these infractions are and for following these guidelines. **Plagiarism in the lecture and laboratory portions of the course will be carefully monitored.** If you do not feel you fully understand what constitutes plagiarism, please ask the instructors, your TA, or lab coordinator Nick Morphew. Posting of course content to online study help sites (e.g. CourseHero) is a violation of the Student Code and will be treated accordingly. **All course material is copyright protected. Copyright is held by the instructors of this course.**

**Accommodations:**
If you require special accommodations, please tell faculty or the lecture coordinator within the first two weeks of class. All accommodations will follow the procedures as stated in Article 1-110 of the Student Code at http://studentcode.illinois.edu.

## Lecture Schedule, Reading Assignments and Associated Quizzes, In-class Quizzes, and Exam Dates

Reading quizzes (most Mondays) are due before lecture (12pm) and will cover the previous week's readings.

| Date | Day | Quiz | Unit | Topic | Professor | Chapter |
|---|---|---|---|---|---|---|
| 26-Aug | M | | Intro to Genetics | Course Introduction | KH & AMC | N/A |
| 28-Aug | W | | Intro to Genetics | Learning strategies, Genes and traits | KH & AMC | 1.1; 1.3 |
| 30-Aug | F | | Intro to Genetics | Cancer genetics | KH & AMC | 23.1; 23.2 (Oncogenes and Tumor-Suppressor Genes); 23.6 |
| 2-Sep | M | | *Labor day* | *No class* | | |
| 4-Sep | W | 1 | Understanding DNA | Chromosome structure | AMC | 11.1 |
| 6-Sep | F | | Understanding DNA | Organelle DNA | AMC | 11.4 |
| 9-Sep | M | 2 | Understanding DNA | DNA replication & Recombination | AMC | 11.2; 12.1; 12.2 (Requirements of replication & Direction of replication);12.3; 12.4; 12.5 (intro paragraph) |
| 11-Sep | W | | Understanding DNA | **Quiz 1** & Transcription | AMC | 13.1 (Structure of RNA, Classes of RNA); 13.2; 13.3 (Intro & Initiation section); 13.4; 14.1; 14.2 (Intro – Alternative Processing) |
| 13-Sep | F | | Molecule to phenotype | Translation | AMC | 15.1 (Structure and Function of Proteins section); 15.2 (Degeneracy of the code – end of section); 15.3 |
| 16-Sep | M | 3 | Molecule to phenotype | Expression regulation in eukaryotes | AMC | 17.1-17.4 |
| 18-Sep | W | | Molecule to phenotype | Expression regulation in bacteria | AMC | 16.1, 16.2 |
| 20-Sep | F | | Molecule to phenotype | Gene mutations and DNA repair | AMC | 18.1-18.2, 18.5 (focus on mechanisms covered in lecture) |
| 23-Sep | M | 4 | Inheritance | Bacterial Genetics I | KH | 9.1 |
| 25-Sep | W | | Inheritance | Bacterial Genetics II | KH | 9.2-9.3 |
| 27-Sep | F | | | **EXAM 1** | | |
| 30-Sep | M | 5 | Inheritance | Mitosis and meiosis I | AMC | 2.1-2.2 |
| 2-Oct | W | | Inheritance | Mitosis and meiosis II | AMC | 2.3 |
| 4-Oct | F | | Inheritance | Transmission Genetics Activity | AMC | 3.1-3.3 |
| 7-Oct | M | 6 | Inheritance | Linkage | KH | 3.4, 7.1-7.2 |
| 9-Oct | W | | Inheritance | Gene interactions | AMC | 5.1; 5.2 (Intro, Gene interactions… & Gene interaction w/ epistasis); 5.5 (Intro & Environ. effects…) |
| 11-Oct | F | | Inheritance | **Quiz 2** & Chromosome Mutations I | KH | 8.1, 8.3 |
| 14-Oct | M | 7 | Inheritance | Chromosome Mutations II | KH | 8.4 |
| 16-Oct | W | | Inheritance | Chromosome Mutations III | KH | 8.2 |
| 18-Oct | F | | Inheritance | Extranuclear Inheritance | KH | 5.3; 11.4 |
| 21-Oct | M | 8 | Inheritance | Sexual life cycles & sex determination | KH | 4.1 |
| 23-Oct | W | | Inheritance | Sex determination | TBA | 4.1, 4.3 (dosage compensation) |
| 25-Oct | F | | | **EXAM 2** | | |
| 28-Oct | M | 9 | Genes to populations | Population genetics I | KH | 25.1-25.2 |
| 30-Oct | W | | Genes to populations | Population Genetics II | KH | 25.3-25.4 |

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| 1-Nov | F | | Genes to populations | Quantitative Genetics I | KH | 24.1-24.2 |
| 4-Nov | M | 10 | Genes to populations | Quantitative Genetics II | KH | 24.3-24.4 |
| 6-Nov | W | | Genes to populations | Quantitative Genetics III | KH | 24.4 |
| 8-Nov | F | | Genes to populations | **Quiz 3** & Evolutionary Genetics | KH | 26.1; 26.2; 26.5 |
| 11-Nov | M | 11 | Genes to populations | Transposons | KH | 18.4 |
| 13-Nov | W | | Genes to populations | Retrotransposons & Viruses | KH | 9.4 |
| 15-Nov | F | | Genes to populations | Genomics I | AMC | 20.1 (Intro, Seq entire genome, Human Genome, Single-Nucleotide Polymorphisms, Copy Number Variants, Bioinformatics); 20.2 |
| 18-Nov | M | 12 | Genes to populations | Genomics II | AMC | |
| 20-Nov | W | | | **EXAM 3** | | |
| 22-Nov | F | | Future of genetics | Epigenetics I | AMC | 21.1; 21.2; 21.3 (Paramutation) |
| 25-Nov | M | | *Fall break* | *No class* | | |
| 27-Nov | W | | *Fall break* | *No class* | | |
| 29-Nov | F | | *Fall break* | *No class* | | |
| 2-Dec | M | 13 | Future of genetics | Epigenetics II | AMC | 21.3 (Behavioral Epigenetics – Epigenetic effects in monozygotic twins); 21.4 |
| 4-Dec | W | | Future of genetics | Biotechnology I | KH | 19.1; 19.2; 19.3 (Intro, Gene Cloning section thru “other cloning vectors) |
| 6-Dec | F | | Future of genetics | Biotechnology II | AMC | 19.3 (Genetic engineering plants…); 19.6 (Silencing genes with RNAi & Using RNAi…); 17.5 |
| 9-Dec | M | 14 | Future of genetics | Biotechnology III | KH & AMC | 14.5, 19 intro and 19.2 (only "CRISPR-Cas Genome editing") |
| 11-Dec | W | | | **Final exam review session** | | **Final exam is cumulative** |