

Biology 240: General Genetics
The University of Tennessee, Fall 2017
4 credits: 3 hours lecture, 1 hour discussion

Course description (from the Catalog):

Classical and modern principles of heredity. Topics include meiosis and transmission genetics; molecular genetics and gene expression; population and evolutionary genetics. Discussion sections will emphasize problem-solving skills. Emphasis on development of analytical skills.

Lecture: Monday, Wednesday, Friday 9:05 – 9:55 a.m.
Walters Life Sciences M309

Instructor: Dr. Andreas Nebenführ (nebenfuehr@utk.edu)
office: Hesler Biology 240
office hours: Tuesday 11 – 12 a.m., Wednesday 2 – 3 p.m. (or by appointment)

Discussion: one 50-minute class per week in Strong Hall 237
all discussions start in the week of August 28.

Section 7: Tuesday, 2:10 – 3:00 p.m. [Kathleen King, kking62@vols.utk.edu]

Section 8: Tuesday, 3:40 – 4:30 p.m. [Kathleen King, kking62@vols.utk.edu]

Section 10: Thursday, 9:40 – 10:30 a.m. [Lindsey O’Neal, loneal5@vols.utk.edu]

Section 11: Thursday, 11:10 a.m. – 12:00 p.m. [Lindsey O’Neal, loneal5@vols.utk.edu]

Section 12: Thursday, 12:40 – 1:30 p.m. [Lindsey O’Neal, loneal5@vols.utk.edu]

If you need to change your section, please contact Dr. Brewton (rbrewton@utk.edu)

Communications:

If you can’t come to office hours, please send an email to <nebenfuehr@utk.edu> from your UTK account (spam filters may exclude other addresses) and mention “Bio240” in the subject line. For all email questions, please allow up to 24 hours for responses to your emails. Emails sent after hours or on the weekend will likely go unanswered until I am back in my office. Your patience is appreciated.

General announcements for the entire class will be made on Canvas and may also be sent out by email. Ensure that you have access to and regularly check your UTK email and Canvas so you won’t miss any announcement. Canvas can send an email when new announcements are posted, but you have to make sure that your Canvas account has this option enabled.

What you should learn in this course:

By the end of this course, you should be able to

1. Understand how the structure and properties of genetic material can form the molecular basis of heredity and explain the Mendelian pattern of inheritance.
2. Understand the mechanisms by which genes, gene-gene and gene-environment interactions can determine phenotypic traits.
3. Understand the molecular mechanisms of gene expression and their regulation in prokaryotes and eukaryotes.
4. Understand the mechanisms of gene mutation and creation of new alleles, and the key forces that affect genetic make-up of populations, select new alleles and contribute to the evolutionary process.
5. Understand the past and future contribution of genetics to our understanding of biology and the application of this knowledge to society in medicine and agriculture.

Some of the skills you will be learning include:

- Set up genetic crosses to distinguish between linked and unlinked genes.
- Understand how to use probabilities to test basic hypotheses in genetics.
- Be able to explain: restriction enzyme mapping of DNA, cloning, PCR and other molecular biology techniques.
- Use bioinformatic tools to analyze a given DNA sequence for its coding information and presence in bacteria, humans and other organisms.

These learning outcomes directly support the following Big Ideas in Biological Sciences:

- **Evolution:** Populations of organisms and their cellular components have changed over time through both selective and non-selective evolutionary processes.
- **Structure and Function:** All living systems (organisms, ecosystems, etc.) are made of structural components whose arrangement determines the function of the systems.
- **Information Flow and Storage:** Information (DNA, for example) and signals are used and exchanged within and among organisms to direct their functioning.
- **Systems:** Living systems are interconnected, and they interact and influence each other on multiple levels.

Tentative Lecture Schedule and Reading Assignments

Date	Topic	Chapters	Quiz	Discussion
23-Aug	W Mitosis, Meiosis, Life Cycles	1+2.3+2.4		<i>no disc.</i>
25-Aug	F Monohybrid Cross	3.1+3.2		
28-Aug	M Dihybrid Cross	3.3+3.4		
30-Aug	W Statistical Tests; Polygenic Inheritance	3.7+3.8+4.3	Q1	D1
01-Sep	F Multiple Alleles, Complementation	4.(4+5+6+9)		
04-Sep	M <i>Labor Day - no class</i>			
06-Sep	W One-Gene-One-Enzyme, Inborn Errors	14.5–14.7		D2

08-Sep	F	Gene Interactions; Sex-linked Inheritance	4.(6+7+11)		
11-Sep	M	Human Genetics, Pedigree Analysis	3.9+4.11		
13-Sep	W	Linkage and Recombination	5.1+5.2	Q2	D3
15-Sep	F	Genetic Maps	5.3+5.4		
18-Sep	M	Bacterial Genetics: Conjugation	6.2–6.4		
20-Sep	W	Transformation, Transduction	6.5–6.9		D4
22-Sep	F	Population Genetics: Hardy-Weinberg	25.1–25.3		
25-Sep	M	Population Genetics: Exceptions	25.4–25.8		
27-Sep	W	Evolutionary Genetics	25.9+25.10	Q3	D5
29-Sep	F	<i>Review</i>	1–6+8+25		
02-Oct	M	MIDTERM 1			
04-Oct	W	DNA Structure, DNA Replication	10.6+10.7+11.1		<i>no disc.</i>
06-Oct	F	<i>Fall Break - no lecture</i>			
09-Oct	M	DNA Replication Mechanism	11.(2+3+6+7)		
11-Oct	W	DNA Packaging	12.(1+2)	Q4	D6
13-Oct	F	Chromosome Structure, Gene Expression	12.(3-6)		
16-Oct	M	RNA and Transcription	13.8+13.9		
18-Oct	W	Transcription Initiation, Termination	13.10+13.11		D7
20-Oct	F	RNA Processing	13.12		
23-Oct	M	Translation: Code, Ribosomes, tRNA	13.(1–6)+14.1		
25-Oct	W	Translation Mechanism	14.2	Q5	D8
27-Oct	F	Operons: Negative Regulation	16.1+16.2		
30-Oct	M	Operons: Positive Regulation, Attenuation	16.(3+5+6)		
01-Nov	W	Regulation in Eukaryotes, Enhancers/Silencers	17.(1+3+4)		D9
03-Nov	F	Chromatin Regulation, Histone Modifications	17.2+17.5+7.5		
06-Nov	M	Post-Transcriptional Regulation	17.7–17.9		
08-Nov	W	<i>Review</i>	10–14+16+17	Q6	D10
10-Nov	F	MIDTERM 2			
13-Nov	M	Transposons	15.8		
15-Nov	W	Spontaneous Mutations	15.2+15.3		D11
17-Nov	F	Induced Mutations, Repair Mechanisms	15.(4+6+7)		
20-Nov	M	Homologous Recombination	11.8		
22-Nov	W	Chromosomal Aberrations	8.2–8.8		<i>no disc.</i>
24-Nov	F	<i>Thanksgiving - no lecture</i>			
27-Nov	M	Restriction Enzymes, Cloning Vectors	20.(1+2)		
29-Nov	W	PCR, Hybridization, Sequencing	20.(3+4+5)	Q7	D12
01-Dec	F	Applications of Genetic Engineering	22.(1+2+3)+ST5		
04-Dec	M	<i>Review for Final Exam</i>	8+11+15+20+22		
06-Dec	W	<i>Study Day - no lecture</i>			<i>no disc.</i>
11-Dec	M	FINAL EXAM 8:00 – 10:00			

This schedule is tentative and subject to change! Any change will be announced in class and posted on Canvas.

Important Dates:

September 1, 2017 = Last day to drop without a "W"

November 14, 2017 = Last day to drop with a "W"

December 5, 2017 = Last day for a University Withdrawal

Technology: This class does not use individual response systems ("clickers"). While in class, keep all electronic devices (especially phones of any flavor) off and out of sight. (Laptops will be discussed during the first week of class.) A calculator may come in handy, but the necessary calculations can all be carried out with a pencil on the margins of the paper.

Support for learning

Textbook: Klug et al: **Concepts of Genetics** (11th edition)
(*Note: We will not be using the online component Mastering Genetics.*)
You are automatically enrolled in the *Inclusive Access* option which gives you access to the textbook online ("e-text") for the duration of this class. If you prefer to have a hardcopy book, you can opt out of *Inclusive Access*, but you have to do this before the add/drop date (September 1) to get a reimbursement for the online text that you paid with your fees for this semester.

Online: There will be a Canvas site (<http://online.utk.edu>) associated with this class where you will find homework and quizzes for the lecture as well as all material for your discussion section. Lecture slides will not be posted online. Canvas is new to all of us, so please bear with us as we are working out the kinks in the system.

How to succeed in Genetics

This is a challenging class that covers a wide range of topics, many of which can be very abstract. Genetics often is not intuitive and may even run counter to what you might expect based on your everyday experiences. Genetics is also very concept driven, and the exam questions will often ask you to apply these concepts to a sample problem. I will try to make these concepts as clear as possible, but in the end it is up to you to understand them. Without a strong engagement on your part, you will not succeed in this class. At the same time, spending all your effort on memorizing will not get you very far as the quizzes and exams are designed to test understanding and not memorization.

This means that you should read the assigned textbook chapters *before* coming to class and *ask questions* when things are not clear. It is also self-evident that you should come to every lecture and attend every discussion session. I will use slides only sparingly and will not post Powerpoint files to Canvas. There will be a short homework question posted on Canvas after every lecture. While these give you a points towards the semester total, th

homework problems are primarily a study aid. Stay current with the material or you will be overwhelmed by the sheer mass of information when the midterm comes around. Expect to spend about 12 hours per week just on this class.

After every chapter, “suggested problems” from the book will be posted on Canvas. These problems are useful to review the concepts from that day and test whether you understand them sufficiently to *apply* them to a given question. Many students have found it helpful to work on these problems in small groups. There will be practice exams before every major exam to familiarize you with the type of questions that will appear on the midterm/final. Obviously, the exam questions will be different, but if you can answer the practice questions, you should have little problem with the actual exam. And as mentioned before: *When something is not clear, ask your instructor or TA.*

Assessment of your learning

Lecture (75% of grade, 600 points)

Midterm 1	15 %	(120 points)
Midterm 2	15 %	(120 points)
Final Exam	27.5 %	(220 points)
7 Quizzes	9 %	(15 points each, lowest two will be dropped)
Homework	8.5 %	(2 points daily, lowest three will be dropped)

Discussion (25% of grade, 200 points)

Participation	14 %	(10 points per week, lowest will be dropped)
Assignments	11 %	(8 points per week, lowest will be dropped)

Exam/Quiz/Assignment Policies:

Midterm and *Final Exams* are in-class exams and will consist of a mixture of multiple choice and short answer questions. The Midterms cover the material of lectures and discussions up to that point. The Final Exam will be comprehensive and cover the entire semester. Make-up exams will be given only under *extraordinary* circumstances and documentation will be required. Make-up exams may have a different format than the regular exam (e.g., more essay questions or no multiple choice questions) and are expected to be taken within the following week.

Quizzes will be administered every two weeks (usually Mondays) through Canvas and consist of several short answer questions covering the previous two weeks of lectures and discussions. Students will have a fixed amount of time to answer the questions and will have only a single attempt to take the quiz. Make sure you have a stable internet connection (e.g., from campus and not on the road) before you start the quiz as you will not be allowed to start over should your connection be lost! The two quizzes with the lowest score (out of seven) will be dropped. No make-up quizzes will be offered.

Daily *Homework* will be posted on Canvas and consist of a single short answer question. The individual homework problems will only be available from the end of on lecture to the beginning of the next. Each homework assignment is worth a maximum of 2 points and the three lowest assignments will be dropped.

Expectations for *Discussion Participation* and *Assignments* will be explained in detail by your TA. During the twelve discussion sessions, your TA will answer questions about lecture material, homework, and exams. In addition, specific exercises will be performed to practice the material and strengthen your understanding of Genetics. On occasion, new material may be introduced in the discussions; this additional material will also be tested in quizzes and exams. You can only get Participation and Assignment points if you attend the discussion session of that week. The lowest scoring Participation and Assignment grade will be dropped.

Final letter grades will be determined by the number of points accumulated (out of 800 possible points) accumulated as follows:

Points	Performance Level	Grade
704 – 800	Outstanding	A
680 – 703	Excellent	A-
656 – 679	Very Good	B+
616 – 655	Good	B
592 – 615	Reasonable	B-
568 – 591	Fair	C+
528 – 567	Satisfactory	C
504 – 527	Unsatisfactory	C-
480 – 503	Poor	D+
440 – 479	Very Poor	D
416 – 439	Extremely Poor	D-
0 – 415	Failure	F

Note that this table lists the *expected* grade levels with a class average of Reasonable (604 points). Should the class average *at the end of the semester* be lower than the anticipated 604 then a fixed number of points will be added for all students to bring the class average to 604.

Academic integrity:

Academic dishonesty of any sort will not be tolerated. Plagiarism includes the copying of phrases, portions of sentences or the main ideas from ANYONE (including a classmate or the textbook) on ANY work submitted for a grade (exams, assignments, quizzes, etc). Academic dishonesty also includes assisting other students on quizzes or exams.

You are expected to abide by The University of Tennessee honor statement in this class and in all of your university activities as pledged in the honor code:

“An essential feature of the University of Tennessee, Knoxville, is a commitment to maintaining an atmosphere of intellectual integrity and academic honesty. As a student of the University, I pledge that I will neither knowingly give nor receive any inappropriate assistance in academic work, thus affirming my own personal commitment to honor and integrity.”

(Undergraduate Catalog)

Depending on the offence, penalties for academic dishonesty range from a minimum of a zero for the assignment, to an F for the course, to the filing of formal academic dishonesty charges seeking dismissal from The University of Tennessee. These choices are at the discretion of the instructor, and can occur in either the lecture or the discussion portion of the class.

You should be familiar with the requisites of academic honesty and what constitutes academic dishonesty as outlined in the UT Undergraduate Catalog (<http://catalog.utk.edu/>).

Other course information

Final exams: Finals are scheduled by the University Registrar during the university final exam period. There are no conflicting times. "Students are not required to take more than two written exams on any day. The instructor(s) of the last non-departmental exam(s) on that day must reschedule the student's exam during the exam period. It is the obligation of students with such conflicts to make appropriate arrangements with the instructor at least two weeks prior to the end of classes." "All final exams must be given during the final exam period at the scheduled time."
(http://registrar.tennessee.edu/academic_calendar/finalexams.shtml)

Disability Services: If you need course adaptations or accommodations because of a documented disability, or if you have questions or concerns about disabilities or emergency information to share, please contact Disability Services: 2227 Dunford Hall; 974-6807; Email: ods@utk.edu; Website: <http://ods.utk.edu/>).

Counseling Center: <http://counselingcenter.utk.edu/>
900 Volunteer Boulevard
865 974-2196, Email: studentcounseling@utk.edu

Academic Assistance:

Tutoring: The Division of Biology does not offer tutoring services. Contact the Student Success Center and the Academic Support Unit of The Office of Minority Student Affairs for information about tutoring opportunities.

- **Student Success Center:** The comprehensive source for information, services, and resources to assist your success at UT:
<http://studentsuccess.tennessee.edu/studentsuccesscenter/>
 - 1817 Melrose Avenue, and 812 Volunteer Boulevard, 865 974-6641, Email: studentsuccess@utk.edu
- **Academic Support Unit of The Office of Minority Student Affairs** offers some tutoring services available to all students, but openings are limited and are filled quickly. The office offers other types academic assistance and support as well:
<http://omsa.utk.edu/services/>
 - 1800 Melrose Avenue, 865 974-6861, Email: omsa@utk.edu

Technical Assistance:

Canvas, clickers, or general information technology assistance:

- <http://remedy.utk.edu/contact/>
- Help Desk: 865 974 9900 (M – F, 8:00 – 5:00)
- OIT Computer Support Service Center and Walk-In Help Desk: Commons South, 2nd floor Hodges Library