BIO 319 GENETICS
Spring 2018
MWF, 9:00-9:50
Knox 104

Description This class provides students with a thorough grounding in the fundamentals of classical, molecular, and population genetics. Specific topics are listed in the schedule below.

Prerequisites BIO 201 (Cell Biology) and BIO 205 (Biochemistry)

Textbook *Genetics Analysis & Principles, 6th edition* by Brooker, ISBN 978-1259616020.
A copy of the textbook is on two-hour reserve in the Lockwood library.

Instructors

Dr. Laura Rusche (Course Director)
Cooke 653
lrusche@buffalo.edu
Office hours: Thursday 1:30-2:30 or by appointment

Dr. Michael Yu
Cooke 355
mcyu@buffalo.edu
Office hours: Tuesday 11:00-12:00 or by appointment

Teaching Assistants

Chase Ely
Cooke 221
Office hours: Tue, 9:30-10:30

Anthony Graber
Cooke 221
Office hours: Mon, 10:00-11:00

Katherine Gutierrez
Cooke 221
Office hours: Wed, 10:00-11:00

Andre Ho
Cooke 221
Office hours: Fri, 4:00-5:00

Leah Novo
Cooke 221
Office hours: Thur, 10:00-11:00

Attendance Students are responsible for all material presented during the lectures, regardless of whether they are present.

Participation During each class, students will use the iClicker in-class response system to answer several questions. Doing so will be worth seven points per unit. For participation credit, students must answer at least 50% of the questions in each class. One class per unit may be missed with no penalty. After that, one point will be deducted for each missed class. Late submissions are not accepted. No excused absences or makeup assignments will be offered.

Homework Five problem sets will be assigned during the course of the semester. Each problem set will be worth 13 points. Nine points will be awarded for completion of the assignment, and four points will be awarded for obtaining the correct answers for two problems selected by the instructors. No partial credit will be awarded on the graded problems. Homework should be submitted in class or in Cooke 109. Homework must be submitted by 5:00 pm on the due date. Late homework will be accepted up to 24 hours after the due date and

will receive half-credit.

Review sessions For each unit, there will be two recitation sessions led by the TAs and one review session led by the professors, as outlined in the course schedule. Attendance is optional.

Exams There will be four exams during the semester and one exam during finals week, for a total of five exams. Each exam will be worth 100 points. The fifth exam will *not* be cumulative. **Students must take the final exam at the scheduled time.**

Students arriving late to an exam will **not** be allowed extra time to finish. Once one student has finished and left the room, no other students will be allowed to begin the exam.

If a student is too ill to take an exam, s/he must notify one of the professors by email or phone within 24 hours of the exam time. A written medical excuse must be presented if the student wishes to make up the exam. The excuse will be checked, so be sure to give the medical examiner permission to talk to us and write his/her phone number on the excuse.

Calculators Only numeric calculators will be allowed in exams.

Cell phones Cell phones cannot be out during exams. No exceptions.

Re-grading Exams Simple issues regarding scoring of exams, such as addition errors, will be handled on an individual basis. Questions regarding interpretations of answers must be submitted **in writing** within one week of the return of graded exams. **We will regrade the entire exam**, not just the question at issue.

Grading Policy A total of 600 points will be possible for the course.

Exams	500 points
Homework	65 points
Participation	35 points

In general, grade assignments will follow the **Undergraduate Grading Policy** as defined by the Vice Provost for Undergraduate Education. Plus and minus grades will be given. Scores of 90-100% are guaranteed to be in the A range, 80-89% in the B range, etc. However, if the mean score is less than 75%, the cutoffs for each grade will be lowered accordingly. At least 55% (330 points out of 600) is required to pass the class (D letter grade).

April 20 is the last day a student may resign from a course and receive an R grade.

Incomplete grades can only be given in cases where a student is unable to complete the course due to severe unforeseen problems. **The student must be receiving a passing grade** in the class at the time the Incomplete is issued. The student will be given up to 12 months to complete **only that portion of the work that was not completed**. An I grade does not allow you to "start over" next year.

UB's policy on receiving an I grade: https://catalog.buffalo.edu/policies/explanation.html

Academic Integrity Students are welcome to work together while studying for the exams and completing homework. However, there are limits to your collaborations. **Academic dishonesty of any kind, including cheating on exams in any fashion, will result in an F.**

UB's academic integrity policy: https://catalog.buffalo.edu/policies/integrity.html

Accessibility

We do our best to accommodate students who have a diagnosed disability that makes it difficult to carry out the course work as outlined. If you have a concern, please contact the Accessibility Resources Office. Please present the documentation from Accessibility Resources to one of the instructors within the first two weeks of the course so that we can make necessary arrangements.

Information on accessibility resources at UB:
http://www.buffalo.edu/studentlife/who-we-are/departments/accessibility.html

Unit 1 Central Dogma of Molecular Genetics

1.	Heredity & genetic variation (1, 9.1-9.6)	Jan 29	LR
2.	Transcription overview (12.1, 12.2)	Jan 31	LR
3.	Transcription in bacteria (12.2)	Feb 2	LR
4.	Transcription in eukaryotes (12.3, 12.5)	Feb 5	LR
5.	RNA processing (12.4)	Feb 7	MCY
	Recitation covering lectures 1-4, 5:00, Talbert 115	*Feb 7*	*TAs*
6.	Translation overview (13.2, 13.4, 13.5)	Feb 9	LR
7.	Translation mechanism (13.3, 13.6)	Feb 12	LR
8.	Viral genetics (18.1-2, 18.4)	Feb 14	MCY
	Recitation covering lectures 5-8, 5:00, Talbert 115	*Feb 14*	*TAs*
	HOMEWORK DUE 5:00	***Feb 14***	
	Review session with professors during class time	*Feb 16*	*LR/MCY*
	EXAM 1, 7:15 – 8:15 pm, NSC 225	***Feb 16***	

Unit 2 Heredity and Variation at the Molecular Level

9.	Heredity: DNA replication (11.1-11.3)	Feb 19	MCY
10.	Heredity: DNA replication (11.4, 11.5)	Feb 21	MCY
11.	Variation: Mutations (19.1-19.4)	Feb 23	MCY
12.	Variation: Mutations (19.1-19.4)	Feb 26	MCY
13.	DNA repair (19.5)	Feb 28	MCY
	Recitation covering lectures 9-12, 5:00, Talbert 115	*Feb 28*	*TAs*
14.	Recombination at molecular level (20)	Mar 2	MCY
15.	Recombination at molecular level (20)	Mar 5	MCY
16.	Variation in chromosome structure (8, 10.3)	Mar 7	MCY
	Recitation covering lectures 13-16, 5:00, Talbert 115	*Mar 7*	*TAs*
	HOMEWORK DUE 5:00	***Mar 7***	
	Review session with professors during class time	*Mar 9*	*MCY*
	EXAM 2, 7:15 – 8:15 pm, NSC 225	***Mar 9***	

Unit 3 Heredity and Variation at the Organismal Level

17.	Heredity: Meiosis & the chromosome theory of inheritance (3)	Mar 12	MCY
18.	Mendel's law of segregation (2.1-2.2)	Mar 14	MCY
19.	Mendel's law of independent assortment (2.3, 2.5)	Mar 16	MCY
20.	Variation: Dominant and recessive alleles (4.1-4.4, 4.7-4.8)	Mar 26	MCY
21.	Gene interactions and multigenic traits (4.9, 28.1, 28.3)	Mar 28	LR
	Recitation covering lectures 17-20, 5:00, Talbert 115	*Mar 28*	*TAs*
22.	Inheritance patterns influenced by sex (2.4, 3.6, 4.5, 5.1, 5.4, 25.1)	Mar 30	LR
23.	Genetic linkage and recombination (6.1-6.2)	Apr 2	LR
24.	Genetic mapping and complex traits (6.3, 23.3, 25.2)	Apr 4	LR
	Recitation covering lectures 21-24, 5:00, Talbert 115	*Apr4*	*TAs*
	HOMEWORK DUE 5:00	***Apr 4***	
	Review session with professors during class time	*Apr 6*	*LR/MCY*
	EXAM 3, 7:15 – 8:15 pm, NSC 225	***Apr 6***	

Unit 4 Heredity and Variation at the Cellular Level

25. Variation: Gene expression in bacteria (14.1, 14.2)	Apr 9	LR
26. Variation: Gene expression in bacteria (14.3, 14.5)	Apr 11	LR
27. Variation: Transcriptional regulation in eukaryotes (10.5, 15.1, 15.2)	Apr 13	LR
28. Small RNAs in gene regulation and genome editing (17.1-3, 17.5-6)	Apr 16	MCY
29. Small RNAs in gene regulation and genome editing (17.1-3, 17.5-6)	Apr 18	MCY
Recitation covering lectures 25-28, 5:00, Talbert 115	*Apr 18*	*TAs*
30. Heredity: Epigenetic control of gene expression (15.3, 16.1-16.4)	Apr 20	LR
31. Heredity: Epigenetic inheritance patterns (5.2, 5.3)	Apr 23	LR
32. Cancer genetics (25.5, 16.5)	Apr 25	MCY
Recitation covering lectures 29-32, 5:00, Talbert 115	*Apr 25*	*TAs*
HOMEWORK DUE 5:00	***Apr 25***	
Review session with professors during class time	*Apr 27*	*LR/MCY*
EXAM 4, 7:15 – 8:15 pm, NSC 225	***Apr 27***	

Unit 5 Heredity and Variation at the Population Level

33. Heredity: Population genetics (27.1-27.3)	Apr 30	LR
34. Variation: Population genetics (27.4-27.7)	May 2	LR
35. Molecular evolution of genes and genomes (29.3, 24.3)	May 4	LR
Recitation covering lectures 33-35, 5:00, Talbert 115	*May 4*	*TAs*
36. Human genetic diversity (25.2-3, 25.6)	May 7	LR
37. Sequencing and assembling genomes (23.4-6, 10.4)	May 9	MCY
38. Biotechnology and genetic engineering (22)	May 11	MCY
Recitation covering lectures 36-38, 5:00, Talbert 115	*May 11*	*TAs*
HOMEWORK DUE 5:00	***May 14***	
Review session, 3:30-4:30, NSC 216	*May 15*	*LR/MCY*
EXAM 5, 9:00-10:00 am, Norton 112	***May 16***	

Department of Biological Sciences Learning Outcomes and Assessment Grid for BIO 319

0 - not covered

1 - moderately covered

2 - extensively covered

Number	Program Learning Outcome	Depth	Specific Outcome Objectives	Assessment Instrument	Defined Success Level
1	Students will develop a broad background in the biological sciences and achieve an understanding and appreciation of basic biological concepts and principles. They will become proficient in five broad areas of biology: evolutionary biology, cell biology, physiology, biochemistry, and genetics.	2	Students will become proficient with basic concepts in genetics.	Homework and Exams	At least 70% of class earns 65% of available points
2	Students will acquire laboratory and field skills necessary to answer biological questions and an ability to understand and employ scientific methodologies. They will be able to understand how to obtain, critically evaluate, and communicate experimental results	0			
3	Students will gain understanding of how to integrate knowledge across biological sub disciplines and to synthesize examples, facts, or hypotheses from more than one level of organization into a coherent whole. They will also obtain the ability to integrate the physical sciences (chemistry, physics, and mathematics) with biology.	2	Students will understand how the integration of classical, molecular, and population genetic analyses leads to a more complete understanding of complex biological processes. Students will learn to integrate genetic concepts at the molecular, cellular, organismal, and population levels.	Homework and Exams	At least 70% of class earns 65% of available points
4	Students will develop effective quantitative reasoning skills and be able to operate as a scientist to formulate and test appropriate biological hypotheses. They will be engaged both independently and collaboratively in the scientific process and learn to critically evaluate the veracity and value of published information.	1	Students will develop quantitative reasoning skills in evaluating, interpreting, and predicting the outcomes of genetic crosses and allele frequencies in populations.	Exams 2,5	At least 70% of class earns 65% of available points

5	Students will be able to retrieve information from multiple sources, to analyze this information and communicate it precisely in both written and oral forms.	1	Students will practice communicating the concepts presented in this course in short answer and short essay exam questions and homework assignments.	Homework and Exams	At least 70% of the class earns 65% of available points.
6	Students will develop an interest in lifelong learning and be able to evaluate and advance knowledge in biology. Students will be exposed to current problems in biology, as well as develop an appreciation for the nature of living organisms, the mechanisms of life function, the different levels of biological organization and the interactions among organisms and their environments.	1	Students will learn about genetic technologies and their impact on everyday life.	Homework and Exam 5	At least 70% of the class earns 65% of available points.
7	Students will learn to appropriately place biological knowledge into an ethical context, appreciate the importance of ethical conduct in science and demonstrate knowledge of contemporary social and ethical issues related to biology and the professional responsibilities of a biologist.	1	Students will learn about and discuss genetic technologies and their potential benefits and dangers.	Homework and Exam 5	At least 70% of the class earns 65% of available points.
8	Students will complete a more advanced level of study in areas of their choice to obtain a deeper coverage of at least one of the five broad areas.	0			