

Biology 142Q – Advanced Topics in Genetics and Molecular Biology

Fall 2018

11–
MWF 11-11:50 AM
OSB 101

Lab:
Wednesday
2-5 PM,
OSB 317



Course Description and Objectives:

We will examine the genetic and molecular **mechanisms** that influence multiple aspects of biological life. Physical and chemical **properties** of genes, transmission mechanisms, and **processes** by which genes are manifested as physical characteristics in a **whole organism** will be covered in detail. How genes are **expressed** (turned on), the causes and effects of **mutations**, will also be explored.

The laboratory is designed as a **research setting** including a semester-long project using molecular biology to examine biodiversity in the environment. An emphasis will be placed on recognizing **social, ethical, and environmental impacts** of current advances in genetic research. **Critical thinking** and **scientific communication skills**, including writing and oral presentation, will be developed throughout the semester.

Required Purchases:

Textbook. *Genetics – A Conceptual Approach*. **SIXTH** Edition. By Benjamin A. Pierce. 2012. W. H. Freeman and Company.

Laboratory Research Notebook. This notebook must be purchased from the Oxford College bookstore. No substitutes will be accepted.

Laboratory Manual. The custom laboratory manual for this course will be available for purchase in the laboratory.

Highly Recommended:

Solving Problems: *Solutions and Problem-Solving Manual to accompany Genetics – A Conceptual Approach*. Fourth Edition.

Writing in Biology: *A Student Handbook for Writing in Biology*, Karen Knisely, 2013, 5th edition, W.H. Freeman and Co. Very useful for writing assignments.

Instructor: Sarah Fankhauser

Office: OSB 302

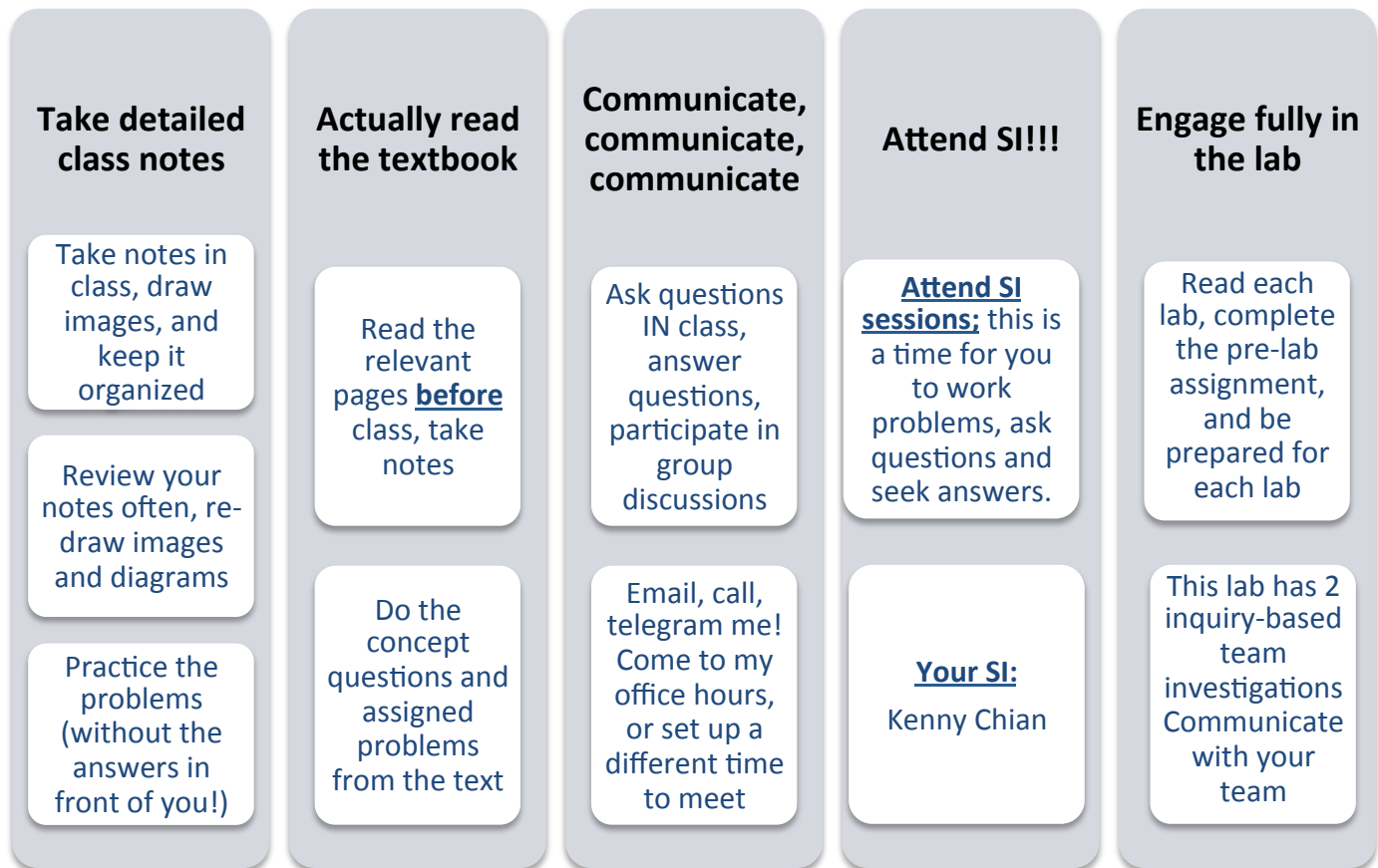
Email: Sarah.Fankhauser@emory.edu

Office Hours: Mondays 3-4:30 or by appointment

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Tips for Success:



How to study (yes you need a diagram for this)

Study all handouts and additional class resources...on a daily and weekly basis. YOU CANNOT wait until the week before the exam!

Review your 141 material and the textbook; connect the material back to your notes and lectures. If there is a discrepancy then come talk to me or email me.

Make visuals, diagrams, pictures, flow charts and tables of the content. This will help connections emerge and help you identify areas or content that you still have questions about.

Practice all problems, worksheets and questions. Come see me to look at and discuss the answers. Do this daily and weekly, not right before the exam!

What Ways of Inquiry really means:

You will learn about genetics in this course not just by learning information simply "given" to you. You will learn about the subject by practicing methods that led to the discovery of that knowledge in the first place - by asking questions, designing experiments, reading and writing critically, working independently, making connections, and thinking beyond the confines of the discipline.

Policies, requirements, etc...

Honor Code: All examinations and all work for credit in this course come under the regulations of the Honor Code. Your signature on your work attests to your upholding the Honor Code. Please read the information on **plagiarism** on the Library web page and always ask if you have any questions about assignments. Note that writing assignments will be submitted to **SafeAssign on Canvas**. Please follow the Honor Code in ALL aspects of this course and include your signature on your work as your pledge.

Quizzes: There will be several quizzes either in-class or take-home during the course of the semester. The quizzes will test some important concepts you may have covered in your preparation for class or from your prior knowledge.

Exam Protocols: Do not come to any exam with notecards in your pockets or on your person. All cell phones are to be turned off and either in your bag in the front of the room or on the instructor's bench. Do not write notes or study material, or anything that could be construed as these, on your body. Check for such notations and remove before the exam time. These are considered to be a breach of the Honor Code.

Primary Research Articles: There are scheduled discussion days on current primary research articles for this course (*see syllabus*). A scientific journal article will be distributed for reading prior to each discussion day. Each student is required to read the paper and participate in a critical evaluation of the paper.

Class Participation: This is an interactive course. Points are assigned for participation. These points are assigned based on your overall engagement in the classroom throughout the semester (asking and answering questions in class, problem solving abilities, level of preparation, displaying your interest by contributing news articles in genetics).

Absences: The policy on absences is provided in a separate handout. Unexcused absences, tardiness, or a failure to follow the procedures outlined in that handout can result in a reduction in your grade. It is your responsibility to clearly communicate with the instructor as much in advance as possible about medical or family emergencies.

Cell Phones: The use of cell phones is strictly prohibited in the classroom and the laboratory. Please turn off your phone before you come to class and leave your phone at the front during exams.

Photography with camera phones is only permitted to gather evidence for your research project.

Personal Computer or Tablet: If you would like to take notes on your personal laptop or tablet in class you must first seek special permission from the instructor. Surfing the web, Facebook, Skype or other multitasking/networking/chat during class is completely unacceptable and will not be tolerated.

Accommodations: In order to receive consideration for reasonable accommodations, please contact the OAS and complete the registration process. If you have a registered accommodation, please immediately coordinate a meeting with me to discuss a protocol to implement accommodations that will (or may) be needed over the course of the semester. This meeting should occur as early in the term as possible. Contact Megan Bohinc in OAS for more information at (770) 784-4690 or oas_oxford@emory.edu

Inclusivity: Oxford College of Emory University's ideals of inclusivity require that we foster an environment where people of diverse backgrounds, identities, abilities, and ideologies are affirmed, respected, and seen as a source of strength; where we strive to learn together, and ultimately thrive communally. If we at all fail to support these ideals, then we encourage discussion towards improvement, and we hope that this statement affirms your right to seek those discussions via dialogue with faculty, staff, your peers, and the use of the "Speak Up!" system when needed.

College-Wide Assessment: Student work submitted as part of this course may be reviewed by Oxford College and Emory College faculty and staff for the purposes of improving instruction and enhancing Emory education.

NOTE: This syllabus, particularly the schedule, is subject to change. You will be notified of any changes in the classroom and/or via Canvas. It is your responsibility to note the changes.

Biology 142 – Advanced Topics in Genetics and Molecular Biology
Lecture Schedule Fall 2018

Date		Topic	Assigned Reading (BEFORE CLASS)
W	Aug 29	Introduction: The big picture	Ch. 1
F	Aug 31	DNA: The Secret of Life	Ch. 10
M	Sept 3	Labor Day	
W	Sept 5	The history of genetics and DNA	Ch. 10
		<i>Film response due on canvas by 5PM Wednesday Sept 5th</i>	
F	Sept 7	DNA structure	Ch. 10
		<i>Take home Quiz 1 due in class</i>	
M	Sept 10	DNA technology	Ch. 19: p. 559-571; 582-586
W	Sept 12	Chromosomes and cell division	Ch. 2
F	Sept 14	Transmission genetics - overview	Ch. 3: p.47-58; 60-74
		<i>D1S80 Materials and Methods due on Canvas</i>	
M	Sept 17	Lab 3 Part 1	Complete pre-lab assignment
W	Sept 19	Sex determination and sex linkage	Ch. 4
F	Sept 21	Human pedigree analysis	Ch. 6: p. 145-154
		<i>Draft Group proposal due on Canvas by 5pm</i>	
M	Sept 24	Human pedigree analysis	Ch. 6: p.145-154
Tues	Sept 25	EXAM I 8:00 - 9:30 a.m. (Chs. 1-4, 6, 10 and 19)	
W	Sept 26	Complexity of genetics and molecular basis	Ch. 5: p.109-123
F	Sept 28	Complexity of genetics and molecular basis	Ch. 5: p.109-123
M	Oct 1	<i>D1S80 draft Results Figures, table(s) and Discussion Outline due in class and on Canvas</i>	
W	Oct 3	Linkage and recombination	Ch. 7: p.173-185; 187-189
		<i>Revised group research proposal due on canvas by 5pm</i>	
F	Oct 5	Linkage mapping	Ch. 7: p.173-185; 187-189
		<i>Optional: revised results figures and table(s) due on Canvas</i>	
M	Oct 8	Fall Break	
W	Oct 10	Primary research article discussion	
F	Oct 12	Genetics of bacteria	Ch. 9: p. 251-262; 264-267
		<i>Lab notebook check 1 (Labs 1-4) due in class</i>	
M	Oct 15	DNA Replication	Ch.11: p.319-322; Ch. 12: p. 339-360
		<i>D1S80 Final - Title page, Abstract, Results and Discussion due on Canvas</i>	
W	Oct 17	DNA Replication	Ch. 12: p. 339-360
		<i>Take home Quiz 2 due in class</i>	
F	Oct 19	DNA Replication Review	Ch. 12: p.339-360

Biology 142 – Lecture Schedule Fall 2018 Continued

Date	Topic	Assigned Reading (BEFORE CLASS)
M Oct 22	Transcription Introduction	Ch. 13: p.373-384; 386-389
Tues Oct 23	EXAM II – 8:00 – 9:30 a.m. (Chs. 5, 7, 9, 12)	
W Oct 24	Gene expression: Transcription	Ch. 13: p.373-384; 386-389
F Oct 26	Gene expression: Transcription & RNA Processing	Ch. 14: p.399-409; 414-418
M Oct 29	Gene expression: RNA processing	Ch. 14: p.399-409; 414-418
W Oct 31	Gene expression: Translation	Ch. 15: p.429-449
F Nov 2	Gene expression: Translation	Ch. 15: p.429-449
	<i>Research paper outline due on Canvas</i>	
M Nov 5	Principles of gene regulation	Ch. 16: p. 461-476
W Nov 7	Regulation in prokaryotes	Ch. 16: p. 461-476
	<i>Materials and Methods draft due on Canvas</i>	
F Nov 9	Eukaryotic genome organization	Ch. 11 p. 311-318; Ch. 17: p. 491-502
M Nov 12	<i>Primary research article discussion</i>	
W Nov 14	Regulation in eukaryotes	Ch. 17: p. 491-502
	<i>Take home Quiz 3 due in class</i>	
F Nov 16	Regulation in eukaryotes	Ch. 14 p. 409-411; 418-420; Ch.17: p. 504-506
	<i>Lab notebook check 2 (Labs 5-8) due on Canvas</i>	
M Nov 19	Point Mutations	Ch. 18: p.515-521; 526-532
Tues Nov 20	EXAM III - 8:00 – 9:30 a.m. (Chs. 13-17)	
W, F Nov 22, 24:	THANKSGIVING BREAK	
M Nov 26	Large Mutations	Ch. 18: p.534-544
W Nov 28	Cell cycle regulation	Ch. 23: p.691-702
F Nov 30	DNA: Curing Cancer film	
	<i>Results figures and tables draft due on Canvas</i>	
M Dec 3	Cancer and cell cycle regulation	Ch. 23: p.691-702
W Dec 5	Cancer and cell cycle regulation	Ch. 23: 705-706; 708-710
F Dec 7	Problem solving and applied topics	
	<i>Film response due on canvas by 5PM</i>	
M Dec 10	Back to the big picture	

Final Paper due on Canvas Monday December 10th by midnight

Lab notebooks (Labs 9-11) due Tuesday December 11th by noon

FINAL EXAM: December 18th 2-5pm

Biology 142 – Advanced Topics in Genetics and Molecular Biology
Laboratory Schedule Fall 2018
Room 317

Date	Topic
Sept 5	D1S80 VNTR Investigation I Human DNA Extraction and PCR
Sept 12	D1S80 VNTR Investigation II Human Genotype Analysis
Sept 19	Microbes and Granite Outcrops Literature Search for Research Project
<u>Note: Part 1 of this lab will be in class on Sept 17</u>	
Sept 26	Sample Collection – Arabia Mountain
Oct 3	Identification of unique colony types and PCR Colony abundance estimations (open lab Oct 4-19)
OCTOBER 8-9: Fall Break	
Oct 17	Antibiotic plate preparation and secondary PCR Colony abundance estimations (open lab Oct 4-19)
Oct 24	Purification of PCR products, antibiotic resistance measurement
Oct 31	MspI digest and Bioinformatics Part I
Nov 7	RFLP analysis and Bioinformatics Part II
Nov 14	Sequence Analysis of Outcrop Microbes
Nov 21	No lab this week
Nov 28	Preparation for Research Symposium
Dec 5	Research Symposium

Distribution of Evaluation Points:

Lecture:

Lecture exams (3)	300 points
3 Quizzes	30 points
Class participation	10 points
2 Film responses	10 points
2 Article discussions	20 points
Final exam	170 points

Laboratory:

Human genotyping drafts (2)	10 points
Final abstract, results, discussion	20 points
Group proposal and literature review	10 points
3 Lab notebook checks	40 points
Paper outline and drafts	25 points
Symposium presentation	25 points
Full-length scientific paper	100 points

Final grade determination: *Your final grade in the course is determined by the percentage of total points that you earn at the end of the course.*

(Plus and minus grades are given on the final grade)

A: 90 - 100%; B: 80 – 89%; C: 70 – 79%; D: 60 – 69%; F <60%