

Biology 142Q – Advanced Topics in Genetics and Molecular Biology

Fall 2017

10A –

MWF 10:45-11:50 AM

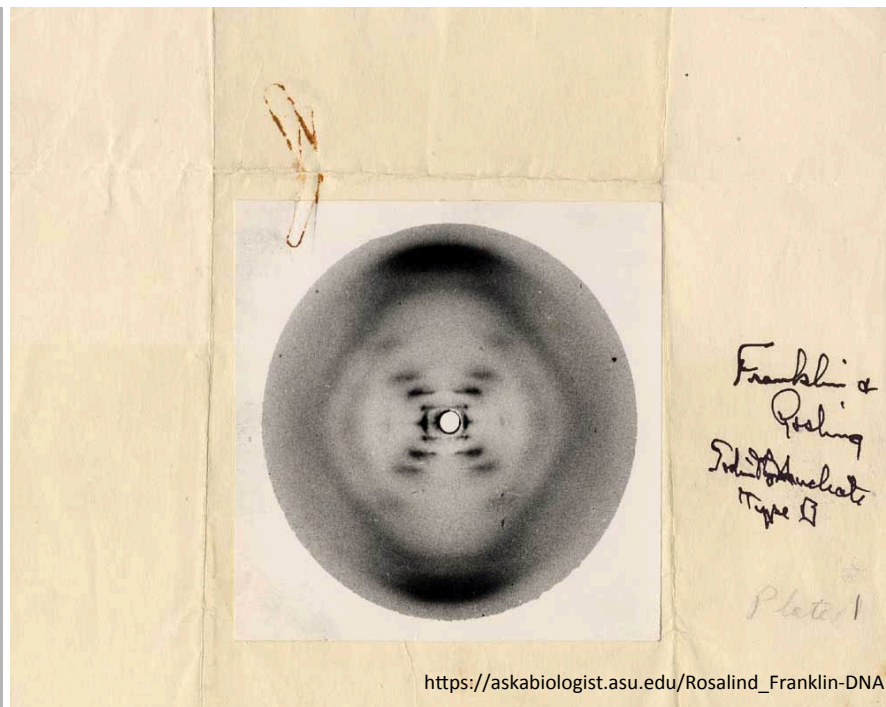
OSB 101

Lab:

Wednesday

2:30-5:30 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*. **FIFTH** 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, 4th edition, W.H. Freeman and Co. Very useful for writing assignments.

Instructor: Sarah Fankhauser

Office: OSB 302

Email: Sarah.Fankhauser@emory.edu

Office Hours: Tuesday 2-3 and by appointment

Contents:

How to be successful 2

Policies, requirements, etc 3

Grading scale and syllabus..... 4-end

Tips for Success:

Take detailed class notes

Take notes in class, draw images, and keep it organized

Review your notes often, re-draw images and diagrams

Practice the problems (without the answers in front of you!)

Actually read the textbook

Read the relevant pages before class, take notes

Do the concept questions and assigned problems from the text

Communicate, communicate, communicate

Ask questions IN class, answer questions, participate in group discussions

Email, call, telegram me! Come to my office hours, or set up a different time to meet

Attend SI!!!

Attend SI sessions; this is a time for you to work problems, ask questions and seek answers.

Your SI: Kanwal Momin (kanwal.momin@emory.edu).

Engage fully in the lab

Read each lab, complete the pre-lab assignment, and be prepared for each lab

This lab has 2 inquiry-based team investigations Communicate with your team

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.

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.

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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 2017

Date	Topic	Assigned Reading
W Aug 23	Introduction: The big picture	Ch. 1
F Aug 25	DNA: The Secret of Life	Ch. 1; Ch. 10
M Aug 28	The history of genetics and DNA <i>Film response due on Canvas by 5PM</i>	Ch. 1; Ch. 10
W Aug 30	DNA structure and technology	Ch. 10; Ch. 19: p. 535-541; 546-548; 556-560 same as above
F Sep 1	DNA structure and technology <i>Take home Quiz 1 due in class</i>	
M Sep 4	No class – Labor Day	
W Sep 6	Chromosomes and cell division <i>D1S80 draft Materials and Methods due in class and on Canvas</i>	Ch. 2
F Sep 8	Transmission genetics - overview	Ch. 3
M Sep 11	Lab 3 Part 1 <i>D1S80 draft Introduction due in class and on Canvas</i>	Complete pre-lab assignment
W Sep 13	Sex determination and sex linkage	Ch. 4
Th Sep 14	<i>Draft Group proposal due 9 am on Canvas</i>	
F Sep 15	Human pedigree analysis	Ch. 6: p. 139-147; 150-157
M Sep 18	Human pedigree analysis	Ch. 6: p.139-147; 150-157
W Sep 20	Complexity of genetics and molecular basis	Ch. 5: p. 103-117; 119-124
Th Sep 21	EXAM I 8:00 - 9:30 a.m. (Chs. 1-4, 6, 10 and 19)	
F Sep 22	Complexity of genetics and molecular basis	Ch. 5: p.103-117; 119-124
M Sep 25	<i>D1S80 draft Results Figures and Discussion Outline due in class and on Canvas</i>	
W Sep 27	Linkage and recombination	Ch. 7: p. 165-189
F Sep 29	Mapping and three-point crosses <i>Revised group research proposal due on canvas by noon</i>	Ch. 7: same as above
M Oct 2	Genetics of bacteria <i>D1S80 Final Abstract, Results and Discussion due in class and on Canvas</i>	Ch. 9: p. 241-251; 254-260
W Oct 4	DNA Replication <i>Lab notebook check 1 (Labs 1-4) due after lab</i>	Ch. 12: p. 325-347
F Oct 6	DNA Replication	Ch. 12: p. 325-347
M Oct 9	FALL BREAK	
W Oct 11	DNA Replication Review <i>Take home Quiz 2 due</i>	Ch. 12: p.325-346
F Oct 13	<i>Primary research article discussion</i>	

Biology 142 – Lecture Schedule Fall 2017 Continued

Date	Topic	Assigned Reading
M Oct 16	Gene expression: Transcription	Ch. 13
Tues Oct 17	EXAM II – 8:00 – 9:30 a.m. (Chs. 5, 7, 9, 12)	
W Oct 18	Gene expression: Transcription & RNA Processing	Ch. 13, 14
F Oct 20	Gene expression: RNA processing	Ch. 14
M Oct 23	Gene expression: Translation	Ch. 15
W Oct 25	Gene expression: Translation	Ch. 15
F Oct 27	Regulation in prokaryotes <i>Materials and Methods draft due in class</i>	Ch. 16: p. 443-458
M Oct 30	Regulation in prokaryotes	Ch. 16: same as above
W Nov 1	Eukaryotic genome organization <i>Lab notebook check 2 (Labs 5-8) due after lab</i>	Ch. 17; Ch. 11 p. 304-305
F Nov 3	Regulation in eukaryotes	Ch. 17; Ch. 14 p. 393-396; 402-405
M Nov 6	Regulation in eukaryotes <i>Take home Quiz 3 due in class</i>	Ch. 17; Ch. 14 p. 393-396; 402-405
W Nov 8	Review and problem solving	
F Nov 10	<i>Primary research article discussion</i>	
M Nov 13	Point Mutations	Ch. 18
Tues Nov 14	EXAM III - 8:00 – 9:30 a.m. (Chs. 13-17)	
W Nov 15	Large Mutations	Ch. 18; Ch. 8 – some highlights
F Nov 17	Cell cycle regulation	Ch. 23
M Nov 20	DNA: Curing Cancer film <i>Results figures and tables draft due in class</i>	
W, F Nov 22, 24	THANKSGIVING BREAK	
M Nov 27	Cancer and cell cycle regulation	Ch. 23
W Nov 29	Cancer and cell cycle regulation	Ch. 23
F Dec 1	Problem solving and applied topics <i>Film response due on canvas by 5PM</i>	
M Dec 4	Applied topics and back to the big picture <i>Final Paper and Lab notebooks due <u>December 5, 12pm (noon)</u></i>	
Tues, Dec 13 FINAL EXAMINATION 9-12 PM (Chs 18, 11, 8, and 23 + comprehensive)		

Biology 142 – Advanced Topics in Genetics and Molecular Biology
Laboratory Schedule Fall 2017
Room 317

Date	Topic	Written Assignments (see syllabus above)
Aug 30	D1S80 VNTR Investigation I Human DNA Extraction and PCR	
Sep 6	D1S80 VNTR Investigation II Human Genotype Analysis	
Sep 13	Microbes and Granite Outcrops Literature Search for Research Project <u>Note: Part 1 of this lab will be in class on Sep 11</u>	
Sep 20	Sample Collection – Arabia Mountain	
Sep 27	Identification of unique colony types and PCR	
Oct 4	Colony abundance estimations and PCR Lab notebooks <i>due in class</i> –	
Oct 11	No lab – Fall break	
Oct 18	Purification of PCR products, MspI digest	
Oct 25	RFLP analysis of rDNA	
Nov 1	Bioinformatics and Analysis Tools Practicing Sequence Analysis Lab notebooks <i>due in class</i> – 11/4	
Nov 8	Sequence Analysis of Outcrop Microbes	
Nov 15	Preparation for Research Symposium	
Nov 22	No lab this week	
Nov 29	Research Symposium <i>Lab notebooks and Final paper due in class December 5th</i>	

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 (3)	15 points
Final abstract, results, discussion	15 points
Group proposal and literature review	10 points
3 Lab notebook checks	40 points
Paper drafts	20 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%