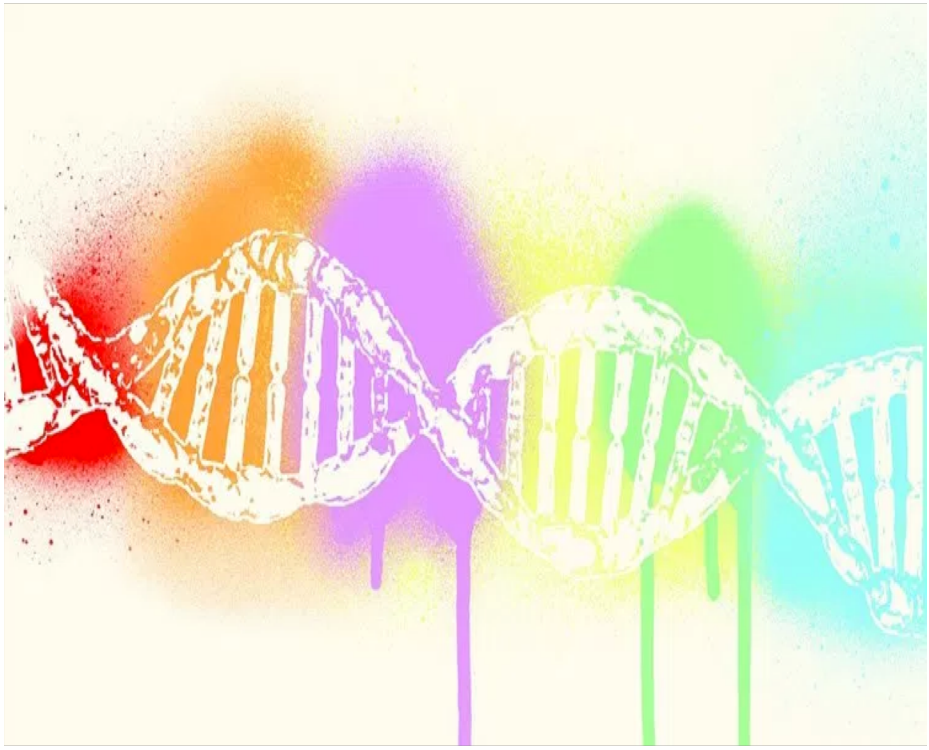
# Biology 142Q – Advanced Topics in Genetics and Molecular Biology

Spring 2019

**10–**
MWF 10-10:50 AM
OSB 101

Lab:
Monday
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**: Fridays 12-2pm or 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:** Kenny Chian

### 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 **Turnitin 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 <u>your responsibility</u> to note the changes.*

**Biology 142 – Advanced Topics in Genetics and Molecular Biology**
**Lecture Schedule Spring 2019**

| Date | | Topic | Assigned Reading (BEFORE CLASS) |
|---|---|---|---|
| W | January 16 | Introduction: The big picture | Ch. 1 |
| F | Jan 18 | DNA: The Secret of Life | Ch. 10 |
| M | Jan 21 | MLK Day | |
| W | Jan 23 | The history of genetics and DNA | Ch. 10 |
| | | *Film response due on canvas by 5PM Wednesday January 23rd* | |
| F | Jan 25 | DNA structure | Ch. 10 |
| | | *Take home Quiz 1 due in class* | |
| M | Jan 28 | DNA technology | Ch. 19: p. 559-571; 582-586 |
| W | Jan 30 | DNA technology | Ch. 19: p. 559-571; 582-586 |
| F | Feb 1 | Chromosomes and cell division | Ch. 2 |
| M | Feb 4 | Lab 3 Part 1 | Complete pre-lab assignment |
| | | *D1S80 Materials and Methods due on Canvas by start of lab (2:00pm)* | |
| | | *Draft Group proposal due on Canvas by Tuesday February 5th 5pm (24 hours after lab)* | |
| W | Feb 6 | Transmission genetics - overview | Ch. 3: p.47-58; 60-74 |
| F | Feb 8 | Sex determination and sex linkage | Ch. 4 |
| M | Feb 11 | *D1S80 draft Results Figures, table(s) and Discussion Outline due in class and on Canvas* | |
| W | Feb 13 | Human pedigree analysis | Ch. 6: p.145-154 |
| F | Feb 15 | Human pedigree analysis | Ch. 6: p.145-154 |
| M | Feb 18 | Complexity of genetics and molecular basis | Ch. 5: p.109-123 |
| **Tues** | **Feb 19** | **EXAM I 8:00 - 9:30 a.m. (Chs. 1-4, 6, 10 and 19)** | |
| W | Feb 20 | Complexity of genetics and molecular basis | Ch. 5: p.109-123 |
| | | *Revised group research proposal due on canvas by 5pm* | |
| F | Feb 22 | Linkage and recombination | Ch. 7: p.173-185; 187-189 |
| M | Feb 25 | Linkage mapping | Ch. 7: p.173-185; 187-189 |
| | | *Optional: revised results figures and table(s) due on Canvas-5pm* | |
| W | Feb 27 | Genetics of bacteria | Ch. 9: p. 251-262; 264-267 |
| F | March 1 | *Primary research article discussion* | |
| | | *Lab notebook check 1 (Labs 1-4) due in class* | |
| M | Mar 4 | DNA Replication | Ch.11: p.319-322; Ch. 12: p. 339-360 |
| | | *D1S80 Final - Title page, Abstract, Results and Discussion due on Canvas- 5pm* | |
| W | Mar 6 | DNA Replication | Ch. 12: p. 339-360 |
| | | *Take home Quiz 2 due in class* | |
| F | Mar 8 | DNA Replication Review | Ch. 12: p.339-360 |

**March 11-15: Spring Break ☺**

**Biology 142 – Lecture Schedule Spring 2018 Continued**

| Date | | Topic | Assigned Reading (BEFORE CLASS) |
|---|---|---|---|
| M | Mar 18 | Transcription Introduction | Ch. 13: p.373-384; 386-389 |
| W | Mar 20 | Gene expression: Transcription | Ch. 13: p.373-384; 386-389 |
| **Thurs** | **Mar 21** | **EXAM II – 8:00 – 9:30 a.m. (Chs. 5, 7, 9, 12)** | |
| F | Mar 22 | Gene expression: Transcription & RNA Processing | Ch. 14: p.399-409; 414-418 |
| M | Mar 25 | Gene expression: RNA processing | Ch. 14: p.399-409; 414-418 |
| W | Mar 27 | Gene expression: Translation | Ch. 15: p.429-449 |
| F | Mar 29 | Gene expression: Translation | Ch. 15: p.429-449 |
| | | *Research paper outline due on Canvas- 5pm* | |
| M | April 1 | Principles of gene regulation | Ch. 16: p. 461-476 |
| W | Apr 3 | Regulation in prokaryotes | Ch. 16: p. 461-476 |
| F | Apr 5 | Eukaryotic genome organization | Ch. 11 p. 311-318; Ch. 17: p. 491-502 |
| | | *Materials and Methods draft due on Canvas-5pm* | |
| M | Apr 8 | *Primary research article discussion* | |
| W | Apr 10 | Regulation in eukaryotes | Ch. 17: p. 491-502 |
| | | *Take home Quiz 3 due in class* | |
| F | Apr 12 | Regulation in eukaryotes | Ch. 14 p. 409-411; 418-420; Ch.17: p. 504-506 |
| | | *Lab notebook check 2 (Labs 5-8) due in class* | |
| M | Apr 15 | Point Mutations | Ch. 18: p.515-521; 526-532 |
| | | *Results figures and tables draft due on Canvas-5pm* | |
| W | Apr 17 | Large Mutations | Ch. 18: p.534-544 |
| **Thurs** | **Apr 18** | **EXAM III - 8:00 – 9:30 a.m. (Chs. 13-17)** | |
| F | Apr 19 | DNA: Curing Cancer film | |
| M | Apr 22 | Cell cycle regulation | Ch. 23: p.691-702 |
| W | Apr 24 | Cancer and cell cycle regulation | Ch. 23: p.691-702 |
| F | Apr 26 | Cancer and cell cycle regulation | Ch. 23: 705-706; 708-710 |
| | | *Film response due on canvas-5PM* | |
| M | Apr 29 | Back to the big picture | |

*Final Paper due **on Canvas Monday April 29th by midnight***
*Lab notebooks (Labs 9-11) due Tuesday April 30th by noon*

**FINAL EXAM: Monday May 6th 9am-12pm**

**Biology 142 – Advanced Topics in Genetics and Molecular Biology**
**Laboratory Schedule Spring 2019**
*Room 317*

| Date | Topic | |
|---|---|---|
| Jan 18 | D1S80 VNTR Investigation I<br>Human DNA Extraction and PCR | ** Lab is on Friday due to MLK |
| January 21 | NO LAB | |
| Jan 28 | D1S80 VNTR Investigation II<br>Human Genotype Analysis | |
| Feb 4 | Microbes and Granite Outcrops<br>Literature Search for Research Project | |

Note: Part 1 of this lab will be in class on Monday February 4th

| | |
|---|---|
| Feb 11 | Sample Collection – Arabia Mountain |
| Feb 18 | Identification of unique colony types and PCR<br>Colony abundance estimations (open lab Oct 4-19 ) |
| Feb 25 | Antibiotic plate preparation and secondary PCR<br>Colony abundance estimations (open lab Oct 4-19) |
| Mar 4 | Purification of PCR products, antibiotic resistance measurement |

**Spring Break March 11-15**

| | |
|---|---|
| Mar 18 | MspI digest and Bioinformatics Part I |
| Mar 25 | RFLP analysis and Bioinformatics Part II |
| Apr 1 | Sequence Analysis of Outcrop Microbes |
| Apr 8 | Preparation for Research Symposium |
| Apr 15 | Preparation for Research Symposium |
| Apr 22 | Research Symposium |

**Distribution of Evaluation Points:**

| Lecture: | | Laboratory: | |
|---|---|---|---|
| Lecture exams (3) | 300 points | Human genotyping drafts (2) | 10 points |
| 3 Quizzes | 30 points | Final abstract, results, discussion | 20 points |
| Class participation | 10 points | Group proposal and literature review | 10 points |
| 2 Film responses | 10 points | 3 Lab notebook checks | 40 points |
| 2 Article discussions | 20 points | Paper outline and drafts | 25 points |
| | | Symposium presentation | 25 points |
| Final exam | 170 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%