

Biology 142Q – Advanced Topics in Genetics and Molecular Biology
Course Syllabus
Fall 2017

Lecture: 01A -MWF 1:15-2:20 PM; OSB 101

Laboratory: Tuesday, 1:40-4:40 PM, OSB 317

Faculty Information: Dr. Alexandra Tremblay, Office: Room 310 OSB

Office Hours: Tuesday, 8:30-11 AM or by appointment

Email: atremb4@emory.edu

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.

Course Objectives: Biology 142 examines how genetic and molecular **mechanisms** 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. The control of **gene expression** is an important concept covered in this course. The causes of **mutations** and resulting genetic disorders, such as **cancer**, will also be explored. You will be introduced to techniques in the **laboratory** such as DNA extraction, PCR, analysis of gene transmission, bioinformatics, and DNA sequence analysis, which are major technological advances in the field of genetics. The laboratory is designed as a **research setting** including a semester-long project using molecular biology to examine biodiversity in the environment. **Practical applications** of genetics in the areas of two major human concerns - medicine and agriculture –will be discussed throughout the course. 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.

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 2016

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* ^{optional}
F Sep 1	DNA structure and technology <i>Take home Quiz 1 due in class</i>	same as above
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 (except conditional and binomial expansion)
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 <i>Draft Group proposal due 9 am on Canvas</i>	Ch. 4
F Sep 15	Human pedigree analysis	Ch. 6: p. 139-147; 150-157* ^{optional}
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 and Discussion due at workshop 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 Results and Discussion due in class and on Canvas</i>	Ch. 9: p. 241-251; 254-260
T Oct 3	<i>Lab notebooks due after lab (1-4)</i>	
W Oct 4	DNA Replication	Ch. 12: p. 325-346
F Oct 6	DNA Replication	Ch. 12: p. 325-346
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 2016 Continued

Date	Topic	Assigned Reading
M Oct 16	Gene expression: Transcription	Ch. 13
Tues Oct 18	EXAM II – 8:00 – 9:30 a.m. (Chs. 5, 7, 9, 12)	
W Oct 19	Gene expression: Transcription & RNA Processing	Ch. 13, 14
F Oct 21	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
T Oct 31	<i>Lab notebooks due after lab (5-8)</i>	
W Nov 1	Eukaryotic genome organization	Ch. 11 p. 302-305
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>	
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	18Ch. 18; Ch. 8 – some highlights
F Nov 17	Cell cycle regulation	Ch. 23
M Nov 20	DNA: Curing Cancer film <i>Results draft due in class (figs and tbls)</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> (9-10)</i>	

FINAL EXAMINATION Thurs, Dec 7th 2-5 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 29	D1S80 VNTR Investigation I Human DNA Extraction and PCR	
Sep 5	D1S80 VNTR Investigation II Human Genotype Analysis	
Sep 12	Microbes and Granite Outcrops Literature Search for Research Project <u>Note: Part 1 of this lab will be in class on Sep 13</u>	
Sep 19	Sample Collection – Arabia Mountain Lab notebooks <i>due in class</i> –	
Sep 26	Identification of unique colony types and PCR	
Oct 3	Colony abundance estimations and PCR Lab notebooks <i>due in class</i> –	
Oct 10	No lab – Fall break	
Oct 17	Purification of PCR products, MspI digest	
Oct 24	RFLP analysis of rDNA	
Oct 31	Bioinformatics and Analysis Tools Practicing Sequence Analysis Lab notebooks <i>due in class</i> – 11/4	
Nov 7	Sequence Analysis of Outcrop Microbes	
Nov 14	Preparation for Research Symposium	
Nov 21	No lab this week	
Nov 28	Research Symposium <i>Lab notebooks and Final paper due in class December 5th</i>	

GUIDE TO BIOLOGY 142

Information in this syllabus is critical to your success and may be subject to change according to my discretion, so please record any changes made during the semester. Please check the Canvas site regularly for announcements, changes, documents, and submissions.

Ways of Inquiry (INQ): Biology 142 is designated as a “Ways of Inquiry” or INQ course. In INQ courses, students “understand and question the way knowledge is sought by actively learning and practicing the discipline’s approaches to inquiry” (INQ Vision Statement). In other words, 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.

TIPS FOR SUCCESS: *Biology 142 is a rigorous and demanding course. Being successful in this course relies on your learning and study strategies both in and out of the classroom throughout the semester. To be the best in this class, READ the following tips carefully and regularly PRACTICE ALL of these suggestions.*

⊗ What are the best strategies for **learning** and retaining information in this course? The below information comes from the most successful students:

- ☞ **Take detailed class notes!!** Your time in the classroom and laboratory is THE most important time you will spend in learning for this course. Taking detailed notes, organizing your notes by concepts or topics, drawing images (and re-drawing images), and identifying the examples are ways in which your notes will be most useful for later study. The class time often does not involve just a “lecture” by the instructor. You will learn best if you write details of what the instructor conveys, and if you also take notes during discussions, problem solving, or when other students raise points in the classroom. In the laboratory – write good notes about procedures and concepts to understand the process, which will later help you in communication.
- ☞ **Complete the assigned reading!** There is an assigned chapter or pages from a chapter for every topic covered in this course. You must make every attempt to at least take note of the key topics and images in the assigned chapter BEFORE you come to class. Also answer the “Concept Checks” questions. After class, you can read the chapter again in detail.
- ☞ **Review Biology 141 information!** You are now learning about advanced topics in the field and using your knowledge from Biology 141 (or prior course) is VERY critical for your learning in this course. For every topic that we cover in 142, you must make it a point to review your 141 notes or textbook to re-learn the foundational information. Truly mastering the information in 142 and to work independently requires building further upon the knowledge that you already have about the subject. I will expect you to make those connections in the classroom as part of your learning process.
- ☞ **Ask questions and make contributions!** Students who ask questions and also contribute their understanding in and out of the class everyday are the ones who are most successful in this course. To be able to contribute in class, you MUST be following the above three tips on a regular basis. I will

give you opportunities to be a regular participant and you must use these for learning. If you find yourself asking and answering questions in class every day or every week – it is a good indication that you are on the right path to success in this course.

- ☞ **Communicate with Me!** I work very hard to make sure I'm accessible to students. Even if you can't make my office hours, send me an email and we will find the time to meet. You're more than welcome to simply drop in my office as well. You should come and talk to me on a regular basis; you don't need to wait until you're struggling. If you are struggling, then absolutely come and talk with me and we'll work together to figure out a plan for success.

🌀 What are the best strategies for **studying** in this course?

- ☞ **Study on a daily and weekly basis!** The night BEFORE every class, review the class notes from the previous class period and at least study the key concepts. Review the connections to Biology 141 information. Every weekend, you should actually study the information from your class notes and link them with the explanations in the textbook. Study details and processes using visuals from the Powerpoints (posted on Canvas) and the textbook. Many of the exam questions come out of the material discussed in the classroom.
- ☞ **Study all handouts and additional resources!** BEFORE every class, review any handouts given to you in the previous class period and be able to explain their significance. Use the same handouts to study every weekend while conducting the above tip. Many of the exam questions come out of these resources.
- ☞ **Practice all problems and complete all worksheets daily and weekly!** Problem solving and critical analysis is ESSENTIAL to learning in the field of genetics. Every day or every weekend at the least, you MUST complete all problems and worksheets given in class that week. Solve all textbook problems given in the "Assigned Problems From Textbook" handout (also available on Canvas). Each test will have a set of application problems. Students who solve these problems and worksheets at the last minute do not perform at the highest level in this course.
- ☞ **Attend SI sessions!** This course has a Supplemental Instruction (SI) leader. **Christina Hong** is the SI for this course. Every week, she will hold two SI sessions (timings communicated via Canvas/Facebook) to review key concepts and to engage you in problem-solving. Being in SI twice a week is very valuable for you and it helps you achieve some parts of the three tips listed above.

🌀 What do the **exams** cover in this course and what are the best strategies to prepare for these tests?

A large part of your success in learning and studying for this course will be measured by your performance on three term examinations and one final examination. **Format** - Each exam will have a combination of multiple choice, short answer and short essay questions, including application problems. **Coverage** - Exams will primarily focus on ALL material covered in the classroom and including information from relevant assigned textbook readings and practice problems (*see above tips for learning and studying*). The final examination will cover the last topics in detail and will include comprehensive information. **Preparation** – to best prepare for tests, follow ALL strategies listed above!

What are the best strategies for being successful in the laboratory?

The laboratory is a very **CRITICAL** component of this course and your success in the laboratory significantly impacts your overall performance in this course. **Pre-laboratory preparation** - A custom laboratory manual is available for the course. Weekly laboratory exercises and instructions for assignments are included in this manual. The Canvas site contains additional resources for the laboratory. You are expected to read each exercise thoroughly, complete the pre-laboratory assignment, and be fully prepared for each lab. You must also read ALL instructions for assignments carefully. **Format** - The laboratory portion of Biology 142 resembles a research lab setting, where students are expected to learn how to be independent (with some guidance) in thinking critically, troubleshooting problems and learning how to clearly document observations and analysis. A molecular study of microbes is a main component of this laboratory. Samples will be collected from rock outcrops and brought back to the laboratory for genetic analysis. Students will work in research teams, develop an independent project question, and will be expected to communicate results in the form of an oral presentation and a full-length scientific paper. **Evaluation** - Your performance in lab will be evaluated based on your written assignments (see syllabus schedule), lab notebook, group work, project paper, and group presentation.

OTHER IMPORTANT ASPECTS OF THIS COURSE:

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 schedule*). 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: Biology 142 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.

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.

Distribution of Evaluation Points:

Lecture:

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

Laboratory:

Human genotyping drafts (3)	15 points
Final Results, Discussion, & Abstract	20 points
Group proposal and literature review	10 points
Lab notebooks	40 points
Paper drafts	20 point
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%