

<p style="text-align: center;">Biology 142Q – Advanced Topics in Genetics and Molecular Biology Course Syllabus Fall 2012</p>
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Lecture: MWF 9:30-10:35 AM, Room 102, Pierce Hall

Laboratory: Tuesday, 1:40-4:40 PM, Room 123, Pierce Hall

Faculty Information: Dr. Nitya Jacob, Office: Room 104, Pierce Hall; Phone: 770-784-8346

Office Hours: Wednesdays, 3-4 pm or by appointment

Email: njacob@emory.edu

Required Purchases:

Textbook. *Genetics – A Conceptual Approach*. Fourth 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, 2009, 3rd 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 Blackboard (BB). It is your responsibility to note the changes.

Biology 142 – Advanced Topics in Genetics and Molecular Biology

Lecture Schedule Spring 2012

Date	Topic	Assigned Reading
W Aug 29	Introduction: The big picture	Ch. 1
F Aug 31	DNA: The Secret of Life <i>Exercise response due on BB by 9AM</i>	Ch. 1; Ch. 10
M Sep 3	LABOR DAY HOLIDAY	
T Sep 4	<i>Secret of Life response due on BB by 9AM</i>	
W Sep 5	The history of genetics and DNA	Ch. 1; Ch. 10
F Sep 7	DNA structure and technology	Ch. 10; Ch. 19: p. 513-519; 523-526
M Sep 10	DNA structure and technology	same as above
W Sep 12	Chromosomes and cell division	Ch. 2
F Sep 14	Transmission genetics - overview <i>D1S80 draft 1 due in class and on BB</i>	Ch. 3; skim Ch. 5
M Sep 17	Sex determination and sex linkage	Ch. 4
W Sep 19	Human pedigree analysis	Ch. 6: p.135-143; p. 146-154
F Sep 21	Human pedigree analysis	Ch. 6: same as above
F Sep 21	<i>Required: Writing Workshop 2:30 – 3:30 pm and 3:30 – 4:30 pm</i> <i>D1S80 draft 2 due at workshop and on BB</i>	
M Sep 24	The complexity of genetics	Ch. 5: p. 99-120
W Sep 26	The complexity of genetics	Ch. 5: same as above
Thurs Sep 27	EXAM I 8:00 - 9:30 a.m. (Chs. 1-6, 10 and 19)	
F Sep 28	Linkage and recombination	Ch. 7: p. 161-186
M Oct 1	Linkage and mapping	Ch. 7: same as above
W Oct 3	Three-point crosses	Ch. 7: same as above
F Oct 5	Genetics of bacteria and viruses <i>D1S80 complete paper due in class and on BB</i>	Ch. 8: p. 203-213; p. 216-222; 227-230
M Oct 8	Genetics of bacteria and viruses	Ch. 8: same as above
W Oct 10	Cytogenetics: chromosome structure	Ch. 11: p. 291-302
F Oct 12	Current research article discussion <i>Lab notebooks due in class</i>	Journal article – <i>summary due</i>
M Oct 15	FALL BREAK	
W Oct 17	DNA Replication	Ch. 12: p. 321-342
F Oct 19	DNA Replication and technology	Ch. 12: p.321-342; Ch. 19: 533-539

Biology 142 - Lecture Schedule Fall 2012 Continued

Date	Topic	Assigned Reading
M Oct 22	Gene expression: Transcription	Ch. 13
Tues Oct 23	EXAM II - 8:00 - 9:30 a.m. (Chs. 7, 8, 11, 12, 19)	
W Oct 24	Gene expression: RNA processing	Ch. 14
F Oct 26	Gene expression: Translation	Ch. 15
M Oct 29	Principles of gene regulation	Ch. 16: p. 431-441
W Oct 31	Lac operon regulation	Ch. 16: same as above
F Nov 2	Lac operon mutations; Trp operon <i>Materials and Methods draft due in class</i>	Ch. 16: same as above
M Nov 5	Regulation in eukaryotes	Ch. 17
W Nov 7	Regulation in eukaryotes	Ch. 17
	(Also read p. 297-298; 394-396; 385-388)	
F Nov 9	Review & catch up	
M Nov 12	Mutations I	Ch. 18
W Nov 14	Mutations II	Ch. 18; Ch. 11: 303-315
F Nov 16	Mutations III <i>Results draft due in class</i>	Ch. 18; Ch. 9 - some highlights
M Nov 19	Current article discussion	Journal article - <i>summary due</i>
T Nov 20	<i>Presentation draft due by email to Instructor by 5pm</i>	
W Nov 21	THANKSGIVING BREAK	
F Nov 23	THANKSGIVING BREAK	
M Nov 26	DNA: Curing Cancer film	
Tues Nov 27	EXAM III - 8:00 - 9:30 a.m. (Chs. 13-17, additional reading Nov 7)	
W Nov 28	Cell cycle regulation	Ch. 23
F Nov 30	Cancer and cell cycle regulation <i>Paper consultation session - optional; time TBA</i>	Ch. 23
M Dec 3	Cancer and cell cycle regulation <i>Film response due on BB by 9AM</i>	Ch. 23
W Dec 5	Stem Cells	
F Dec 7	Stem Cells <i>Lab Notebooks due in class</i>	
M Dec 10	Genetics: biology, society, and ethics <i>Final Paper due at 5 pm</i>	

***** FINAL EXAMINATION*** Friday, Dec 14, 9AM-12PM**
(Chs. 18, 11, 9, 23, stem cells, comprehensive questions)

Biology 142 – Advanced Topics in Genetics and Molecular Biology
Laboratory Schedule Fall 2012
Dr. Nitya Jacob and Dr. Amanda Pendleton

Date	Topic	Written Assignment
Sep 4/5	D1S80 VNTR Investigation I Human DNA Extraction and PCR	Introduction + Materials & Methods (<i>due in class 9/14</i>) Results + Discussion (<i>due at workshop 9/21</i>)
Sep 11/12	D1S80 VNTR Investigation II Human Genotype Analysis	Complete paper in final form (<i>due in class 10/5</i>)
Sep 18/19	Microbes and Granite Outcrops Literature Search for Research Project	Research Proposal draft (<i>due 9/19 or 9/20 at 9AM</i>) Final proposal (<i>due in class 10/1</i>)
Sep 25/26	Sample Collection – Arabia Mountain	
Oct 2/3	Observation of Collections and Sample Selection	
Oct 9/10	Bacterial DNA Extraction and PCR	Lab notebooks (<i>due in class 10/12</i>)
Oct 16/17	No lab this week – Fall Break	
Oct 23/24	Purification of PCR products, Restriction enzyme digest	
Oct 30/31	RFLP analysis of rDNA	Draft of Materials and Methods (<i>due in class 11/2</i>)
Nov 6/7	Bioinformatics and Analysis Tools Practicing Sequence Analysis	
Nov 13/14	Sequence Analysis of Outcrop Microbes	Draft of Results (<i>due 11/16</i>)
Nov 20/21	No lab this week – Thanksgiving Break	
Nov 27/28	Preparation for Research Symposium	<i>Presentation draft due</i>
Dec 4/5	Research Symposium	Lab notebooks (<i>due in class 12/7</i>) Final paper (<i>due 12/10 at 5pm</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 Blackboard site regularly for announcements and changes.

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?

-  **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 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 read or 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 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.

🌀 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 Blackboard) and the textbook. It is not advisable to make a whole new set of notes from the textbook – instead spend your time wisely by reorganizing or adding to the class notes that you already have. 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 Blackboard). 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. **Lauren Stewart** is the SI for this course. Every week, she will hold two SI sessions (timings communicated via Blackboard) 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 Blackboard 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:

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.

Discussion of Current Research Articles. There are scheduled discussion days on current research articles for this course (*see schedule*). A scientific journal article will be distributed for reading prior to each discussion day. Every student is required to read and prepare to discuss the article before class. Each student is required to write a one page summary (as directed) of the investigation conducted in the article and the main conclusions. For each discussion day, students will be expected to discuss specific aspects of the paper in class. Discussions of these articles will be evaluated on the basis of your preparedness for class, participation in the discussion, and the written summary.

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).

Applied Topics: During the course we will focus on the practical aspect of genetics and molecular biology on several occasions. Your engagement and participation is required. You are also encouraged to attend the Lyceum lectures this Fall (October 29 and December 4) - details will be announced in class.

Honor Code: All examinations and work for credit in this course come under the regulations of the Honor Code. Please follow the Honor Code in ALL aspects of this course and include your signature on your work as your pledge.

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 communicate with the instructor as much in advance as possible about medical or family emergencies or send a message through another student.

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 seek special permission from the instructor. Surfing the web, Facebook, Skype or other 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.

Distribution of Evaluation Points:

Lecture:

Lecture exams (3)	300 points
Quizzes	40 points
Class participation	10 points
Film responses	10 points
Article discussion	20 points
Final exam	170 points

Laboratory:

Human genotyping paper (labs 1&2)	30 points
Group proposal and literature review	10 points
Lab notebooks	40 points
Paper drafts	20 points
Symposium presentation	20 points
Full-length scientific paper	80 points

Total 755 points

Final grade determination: *Your final grade in the course is determined by the percentage of total points (out of 755) 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%