

<p style="text-align: center;"><b>Biology 142 – Advanced Topics in Genetics and Molecular Biology</b> <b>Course Syllabus</b> <b>Spring 2010</b></p>
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*Email:* Learnlink or [njacob@emory.edu](mailto:njacob@emory.edu)

**Lecture:** MWF 9:30-10:25AM, Room 102, Pierce Hall

**Laboratory:** Tuesday 2:30-5:30PM, Room 125, Pierce Hall

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**Required:**

Text: *Genetics – A Conceptual Approach*. Third Edition. By Benjamin A. Pierce. 2008. W. H. Freeman and Company – for lecture and lab topics.

Lab Book: Laboratory research notebook. This notebook should be purchased from the Oxford College bookstore. No substitutes accepted.

Lab Binder: A 3-ring binder is required for weekly laboratory handouts. Laboratory handouts must be downloaded and printed from the Blackboard site each week ([classes.emory.edu](http://classes.emory.edu); use OPUS login and ID)

**Highly Recommended:**

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

Writing in Biology: *A Student Handbook for Writing in Biology*, Karen Knisely, 2009, 3<sup>rd</sup> 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 analysis, recombinant DNA technology, analysis of gene transmission, bioinformatics and mutation analysis, which are major technological advances in the field of genetics. The laboratory is designed as a research setting including a field study 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 in the laboratory and the classroom. An emphasis will be placed on recognizing social, ethical and environmental impacts of current advances in genetic research. Critical thinking and scientific communication skills will be developed throughout the semester in laboratory and lecture.

**NOTE:** This syllabus, particularly the schedule, is subject to change. You will be notified of any changes in the classroom and the Learnlink conference. It is your responsibility to keep track of the changes and to check Learnlink and Blackboard.

**Biology 142 – Advanced Topics in Genetics and Molecular Biology**  
**Lecture Schedule Spring 2010**

Date	Topic	Assigned Reading
W, Jan 13	Why study genetics?	Ch. 1
F, Jan 15	DNA: The Secret of Life	Ch. 1; Ch. 10
M, Jan 18	<i>Martin Luther King Day – no class</i>	
W, Jan 20	The history of genetics and DNA	Ch. 1; Ch. 10
F, Jan 22	DNA structure and technology	Ch. 10; Ch. 19: p. 503-509; 513-516
M, Jan 25	DNA structure and technology	same as above
W, Jan 27	Chromosomes and cell division	Ch. 2
F, Jan 29	Transmission genetics - overview	Ch. 3; Ch. 5 (skim)
M, Feb 1	Sex determination and sex linkage	Ch. 4
W, Feb 3	Human pedigree analysis	Ch. 6: p.134-142
F, Feb 5	Human pedigree analysis	Ch. 6: p. 146-152
M, Feb 8	The complexity of genetics	Ch. 5: p. 99-119
W, Feb 10	The complexity of genetics	Ch. 5: p. 99-119
F, Feb 12	Linkage and recombination	Ch. 7: p. 160-185
M, Feb 15	Linkage and mapping	Ch. 7: p. 160-185
<b>Tues, Feb 16</b>	<b>EXAM I 8:00 - 9:30 a.m. (Chs. 1-6, 10 and 19)</b>	
W, Feb 17	Genetics of bacteria and viruses	Ch. 8: p. 200-210 p. 215-219; 228-230
F, Feb 19	Genetics of bacteria and viruses	
M, Feb 22	Current research article discussion	<i>Journal article – summary due</i>
W, Feb 24	Cytogenetics: chromosome structure	Ch. 11: p. 285-309
F, Feb 26	Cytogenetics: chromosome variations	Ch. 9
<i>Last day to submit first news article for class participation (by email)</i>		
M, Mar 1	DNA Replication	Ch. 12: p. 315-335
W, Mar 3	DNA Replication and sequencing	Ch. 12: p.315-335; Ch. 19: 525-529
F, Mar 5	Review of gene expression	

## Biology 142 – Lecture Schedule Fall 2010 Continued

Date	Topic	Assigned Reading
M, Mar 8 – F, Mar 12	<b>***Spring Break***</b>	
M, Mar 15 <b>Tues, Mar 16</b>	Gene expression: Transcription <b>EXAM II – 8:00 – 9:30 a.m. (Chs. 7-9; 11, 12, 19)</b>	Ch. 13
W, Mar 17 F, Mar 19	Gene expression: RNA processing Gene expression: Translation	Ch. 14: p. 368-385 Ch. 15
M, Mar 22 W, Mar 24 F, Mar 26	Principles of gene regulation Lac operon regulation Lac operon mutations; Trp operon	Ch. 16: p. 425-435 Ch. 16: p. 436-445 Ch. 16: p. 436-445
M, Mar 29 W, Mar 31	Regulation in eukaryotes Regulation in eukaryotes	Ch. 17 Ch. 17
F, Apr 2	Review and catch up	(Also review p. 292; 386-388; 378-380)
M, Apr 5 W, Apr 7 F, Apr 9	Current article discussion Application: Stem Cells Application: Stem Cells	<i>Journal article – summary due</i>
M, Apr 12 <b>Tues, Apr 13</b> W, Apr 14 F, Apr 16	Mutations: overview, base substitutions <b>EXAM III - 8:00 – 9:30 a.m. (Chs. 13-17)</b> Mutations: insertions/deletions, etc Mutations: repair mechanisms	Ch. 18 Ch. 18 Ch. 18
M, Apr 19	DNA: Curing Cancer film	
W, Apr 21 F, Apr 23	<i>Last day to submit second news article for class participation (by email)</i> Cancer and cell cycle regulation Cancer and cell cycle regulation	Ch. 23 Ch. 23
M, Apr 26	Genetics: biology, society, and ethics	
<b>*** FINAL EXAMINATION*** 9A Section: Tuesday, May 4, 2010</b>		

**Biology 142 – Advanced Topics in Genetics and Molecular Biology**  
**Laboratory Schedule Spring 2010**  
**Dr. Nitya Jacob and Dr. Amanda Pendleton**

<u>Date</u>	<u>Topic</u>	<u>Assignment</u>
Jan 19, 20	Molecular Biology Techniques I Human DNA Extraction and PCR	<i>Introduction + Materials and Methods draft</i> <b>Due in class Fri, Jan 29</b>
26, 27	Molecular Biology Techniques II Human Genotype Analysis	<i>Final Paper – all sections</i> <b>due in class Fri, Feb 12</b>
Feb 2, 3	Microbes and Granite Outcrops Literature Search for Research Project	<i>Research Proposal and literature review due by 5pm next day (email)</i>
9, 10	Field Trip to Rock Outcrops Sample Collection	
16, 17	Observation of Collections and Sample Selection	
23, 24	Bacterial DNA Extraction and PCR	
Mar 2, 3	Purification of PCR products, Restriction enzyme digest	<i>Lab notebooks</i> <b>due in class Fri, Mar 5</b>
9, 10	<b>**Spring Break**</b>	
16, 17	RFLP analysis of rDNA	
23, 24	Bioinformatics and Analysis Tools Exercise in Sequence Analysis	<i>Draft of Materials and Methods</i> <b>due in class Mon, Mar 22</b>
30, 31	Sequence Analysis of Outcrop Microbes	<i>Draft of Results</i> <b>due in class Fri, Apr 2</b>
Apr 6, 7	Preparation for Research Symposium	
13, 14	Research paper consultation	
20, 21	Research Symposium	<b>Lab notebooks due in lab</b> <b>Final paper due Mon, Apr 26</b>

## GUIDE TO BIOLOGY 142

Please read this syllabus carefully and please be sure to clarify any doubts. This handout is your map to Biology 142! Please pay full attention to the information contained in this syllabus. Information in this syllabus is subject to change according to my discretion, so please pay attention to any changes made during the semester. Please check the class conference and Blackboard site regularly for announcements and changes.

### Expectations/ Tips for Success:

- \* **Class notes are most important!** Please work on taking good notes in class – this will be the most important information in the course. Some examples discussed in class may not be found in the text. Many of the exam questions come out of the material discussed in the classroom.
- \* **Be a regular participant.** It is important to be an active participant in course work and discussion. This includes completing “homework” problem assignments outside of class. There is a participation grade but more importantly, your active engagement is critical to your learning.
- \* **Read and use your textbook regularly.** Please read the chapter assignments BEFORE you come to class or lab. The textbook reading gives you a preview of the subject matter. Bring your textbook to class. After each class, review your lecture notes along with the textbook. Answer all of the “Concept Checks” questions associated with your reading assignment in the textbook to practice your knowledge. If a particular topic is in your reading but was not part of your lecture notes, you must still know the main points.
- \* **Practice all assigned problems and review worksheets.** Problem solving and critical analysis is very essential to learning in the field of genetics. You **MUST** review all problems and worksheets given in class on a regular basis to succeed in this class. In addition, solve all of the “Comprehensive Questions” listed in the textbook for the assigned reading. You will be expected to solve all textbook problems given in the “Assigned Problems From Textbook” handout. A copy of this list is also available on Blackboard.
- \* **Avoid becoming overwhelmed.** This is an intense and rigorous course. You are expected to be competent in the knowledge, skills, and comprehension from Biology 141. To avoid becoming overwhelmed be well organized (plan for deadlines and test preparation ahead of time), attentive, keep up with the material, attend SI sessions, and practice problems several times. Work consistently in small doses!

**Supplemental Instruction.** Sara Radmard is the SI for this course. There will be two SI sessions per week. Check the class conference for timings.

**Evaluation:** Your performance in the course is evaluated through quizzes, examinations, writing assignments, and class participation. The distribution of evaluation points is on page 8.

**Quizzes** - There will be several unannounced quizzes during the course of the semester. The quizzes will test some important concepts you may have covered in your reading or should know from prior knowledge.

**Examinations:** The lecture exams will be a combination of multiple choice, short answer and short essay questions, including application problems. Exams will focus on material covered in the classroom, related assigned textbook readings, and assigned problems. The final examination will cover the last portion of the material and will include comprehensive information.

**Discussion of Current Research Articles.** There are scheduled discussion days on current research articles for this course. 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.

**Laboratory.** There is no published lab manual for this course. Handouts describing each lab exercise will be available a week in advance on the Blackboard site specifically designed for the course. The Blackboard site contains other resources for lecture and laboratory as well. Please keep these handouts in a 3-ring binder so that they are easily available for lab. You are expected to read each exercise thoroughly and be fully prepared for each lab. The laboratory portion of Biology 142 resembles a research lab setting, where students are expected to think critically on their own, troubleshoot problems and learn to clearly document observations and analysis. A field study on local granite rock outcrops is a main component of this laboratory. Samples will be collected from these outcrops and brought back to the laboratory for genetic analysis. Students will work in research teams, develop an independent question about these organisms and their environment, and will be expected to communicate results in the form of an oral presentation and a full-length scientific paper. Your performance in lab will be evaluated based on your lab written assignments, lab notebook, project paper, and presentation.

**Class Participation.** Biology 142 is an interactive course. There is a participation requirement for a total of 20 points. Ten of these points are assigned for your overall engagement in the classroom throughout the semester (asking and answering questions in class, problem solving abilities, level of preparation). The remaining 10 points are awarded for your engagement outside of class. Submit two news articles pertinent to topics covered in class by email to the instructor to receive these points. Articles should be received by the deadlines listed in the lecture schedule (February 26 and April 19).

**Application Topics and Film Discussions:** During the course we will focus on the practical aspect of genetics and molecular biology on several occasions. Your engagement and participation is required.

**Special Guest:** We have a special guest in our course this semester, Ms. Jennifer Johnston, HHMI Curriculum Fellow and graduate student in Pharmacology at Emory University who will help you learn some applied topics in genetics.

**Honor Code:** All examinations and work for credit in this course come under the regulations of the Honor Code. Please follow the Honor Code 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. Any questions about absences should be asked immediately.

**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 and using calculators on phones is also prohibited.

**Evaluation Points:**

**Lecture:**

Lecture exams (3)	300 points
Quizzes	50 points
Class participation	20 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	30 points
Paper drafts	20 points
Symposium presentation	20 points
Full length scientific paper	80 points

**Total**                      **760 points**

**Final grade determination**

*(Plus and minus grades are given)*

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