

**BIOLOGY 142 (INQ, WR) – ADVANCED TOPICS IN GENETICS AND MOLECULAR BIOLOGY**  
**COURSE SYLLABUS, DR. AMANDA PENDLETON**  
**SPRING 2013**

**Faculty Information:** Pierce 105, (770) 784 - 4506, arpendl@emory.edu

**Office hours:** M 2:30 - 4:30 PM & T 10 - 11 AM; or feel free to make an appointment for another time

**Course Meeting Times:**      Lecture - M, W, F      12:00 - 1:05      Pierce Hall Room 101  
    Lab -      W      1:40 - 4:40      Pierce Hall Room 125

**Required Texts:**

- (1) **Text:** *Genetics - A Conceptual Approach*. Fourth Edition. By Benjamin A. Pierce. 2012. W. H. Freeman and Company - for lecture and lab topics.
- (2) **Laboratory research notebook:** This notebook should be purchased from the Oxford College bookstore. No substitutes accepted.
- (3) **Lab Manual:** The custom laboratory manual for this course will be available for purchase in the laboratory.

**Highly Recommended:**

- (1) *Solving Problems: Solutions and Problem-Solving Manual to accompany Genetics - A Conceptual Approach*. Third Edition.
- (2) *A Student Handbook for Writing in Biology*, Karen Knisely, 2008, 3<sup>rd</sup> edition, W.H. Freeman and Co. This is a great resource for writing, and is also on reserve in the library.

**Course Objectives:** The purpose of this course is to give you, the student, a firm foundation in the underlying themes of genetics and molecular biology, so that you can answer the following **essential questions**:

- \* What patterns are seen when traits pass from generation to generation?
- \* What are the cellular and molecular mechanisms that underlie inheritance patterns?
- \* What are the molecular properties of genes, gene expression, and mutation that contribute to phenotype?
- \* What principles and techniques do biologists use to study genetics and communicate their findings?

In addition, 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.

Finally, this course (both lecture and laboratory portions) is designed as a "Ways of Inquiry" or INQ course. Therefore, this course will teach you to "think, work, and communicate like a scientist" through "actively learning and practicing the discipline's approaches to inquiry" (INQ Vision Statement). Throughout the course, you will have many opportunities to engage in biological inquiry by asking questions, designing experiments, reading and writing critically, and working independently to seek knowledge. My hope is that upon grasping the fundamental themes of genetics and molecular biology in this course, and using them to ask questions and solve problems, you will be well prepared, both in knowledge and in thinking abilities, to delve deeper, into more specialized areas of biology.

**BIOLOGY 142Q; LECTURE SCHEDULE SPRING 2013**

Date	Topic	Assigned Reading
W Jan 16	Introduction: The big picture	Ch. 1
F Jan 18	DNA: The Secret of Life <i>L&amp;O response due on Blackboard by 9 AM</i>	Ch. 1; Ch. 10
M Jan 21	<i>MLK day, no classes</i>	
T Jan 22	<i>Secret of Life response due on Blackboard by 9 AM</i>	
W Jan 23	The history of genetics and DNA	Ch. 1; Ch. 10
F Jan 25	DNA structure and technology	Ch. 10; Ch. 19: p. 513-519; 523-526

**BIOLOGY 142Q; LECTURE SCHEDULE SPRING 2013**

Date	Topic	Assigned Reading
M Jan 28	DNA structure and technology	same as above
W Jan 30	Chromosomes and cell division	Ch. 2
F Feb 1	Transmission genetics - overview <i>D1580 Intro and M&amp;M drafts due on Blackboard by classtime</i>	Ch. 3; Ch. 5 (skim)
M Feb 4	Sex determination and sex linkage	Ch. 4
W Feb 6	Human pedigree analysis	Ch. 6: p.135-143
F Feb 8	Human pedigree analysis	Ch. 6: p. 146-154
F Feb 8	<i>Required: Writing Workshop 2:30 - 3:30 pm and 3:30 - 4:30 pm</i> <i>D1580 Results and Discussion drafts due at workshop and on Blackboard</i>	
M Feb 11	The complexity of genetics	Ch. 5: p. 99-120
W Feb 13	The complexity of genetics	Ch. 5: p. 99-120
Thurs Feb 14	<b>EXAM I 8:00 - 9:30 a.m. (Chs. 1-4, 6, 10 and 19)</b>	
F Feb 15	Linkage and recombination	Ch. 7: p. 161-186
M Feb 18	Linkage and mapping	Ch. 7: p. 161-186
W Feb 20	Three-point crosses	Ch. 7: p. 161-186
F Feb 22	Genetics of bacteria and viruses <i>D1580 final paper due on Blackboard by classtime</i>	Ch. 8: p. 203-213; 216-222; 227-230
M Feb 25	Genetics of bacteria and viruses	same as above
M Feb 25	<b><i>Oxford Studies lecture: Jessica Wyndham, science &amp; human rights</i></b> <b><i>7:30 PM, Williams Hall</i></b>	
W Feb 27	Cytogenetics: chromosome structure	Ch. 11: p. 291-302
F Mar 1	Current research article discussion	<i>Journal article - summary due</i>
M Mar 4	DNA Replication	Ch. 12: p. 321-342
W Mar 6	DNA Replication and technology	Ch. 12: p.321-342; Ch. 19: 534-539
F Mar 8	Gene expression: Transcription <i>Lab notebooks due in class</i>	Ch. 13
M Mar 11 - F, Mar 15	<b>***Spring Break, no classes***</b>	
M Mar 18	Review & catch up	
Tues Mar 19	<b>EXAM II - 8:00 - 9:30 a.m. (Chs. 5, 7-8; 11, 12)</b>	
W Mar 20	Gene expression: RNA processing	Ch. 14
F Mar 22	Gene expression: Translation	Ch. 15
M Mar 25	Principles of gene regulation	Ch. 16: p. 431-441
W Mar 27	Lac operon regulation	Ch. 16: p. 441-451
F Mar 29	Lac operon mutations; Trp operon <i>Materials &amp; Methods draft due on Blackboard by classtime</i>	Ch. 16: p. 441-451
M Apr 1	Regulation in eukaryotes	Ch. 17
W Apr 3	Regulation in eukaryotes	Ch. 17; Review p. 298; 394-6; 385-8
F Apr 5	Mutations I <i>Results draft due on Blackboard by classtime; Tables/figures due in class</i>	Ch. 18
M Apr 8	Mutations II	Ch. 18; Ch. 11: 303-315
W Apr 10	Current article discussion	<i>Journal article - summary due</i>
F Apr 12	Mutations III	Ch. 18; Ch. 9

**BIOLOGY 142Q; LECTURE SCHEDULE SPRING 2013**

Date	Topic	Assigned Reading
M Apr 15	DNA: Curing Cancer film	
Tues Apr 16	EXAM III - 8:00 - 9:30 a.m. (Chs. 13-17)	
W Apr 17	Cell cycle regulation	Ch. 23
Th Apr 18	Cancer film response due on Blackboard by 9 AM	
F Apr 19	Cancer and cell cycle regulation	Ch. 23
M Apr 22	Cancer and cell cycle regulation	Ch. 23
W Apr 24	Application: Stem Cells	
F Apr 26	Application: Stem Cells	
M Apr 29	Genetics: biology, society, and ethics Lab notebooks due in class Final paper due on Blackboard by 5 PM; Tables/figures due to me by 5 PM	

**FINAL EXAMINATION: Tuesday, May 7; 2:00 pm - 5:00 pm**

**BIOLOGY 142Q, LABORATORY SCHEDULE, SPRING 2013**

Date	Topic	Assignment
Jan 22	D1S80 VNTR Investigation I Human DNA Extraction and PCR	Introduction + Materials & Methods Drafts: due in class 2/1
29	D1S80 VNTR Investigation II Human Genotype Analysis	Results + Discussion Drafts: due in class 2/8 Complete final paper: due in class 2/22
Feb 5	Microbes and Granite Outcrops Literature Search for Research	Research Proposal draft: due 2/6, 9 am Final proposal with literature review: due in class 2/18
12	Field Trip to Rock Outcrops: Sample Collection	
19	Observation of Collections and Sample Selection	
26	Bacterial DNA Extraction and PCR	
Mar 5	Purification of PCR products, RFLP	Lab notebooks: due in class 3/8
12	**Spring break, no lab**	
19	RFLP analysis of rDNA	
26	Bioinformatics and Analysis Tools Exercise in Sequence Analysis	Draft of Materials and Methods: due in class 3/29
Apr 2	Sequence Analysis of Microbes	Draft of Results: due in class 4/5
9	Preparation for Symposium	
16	Research paper consultations	
23	Research Symposium	Lab notebooks: due in class 4/26 Final paper: due in class 4/29

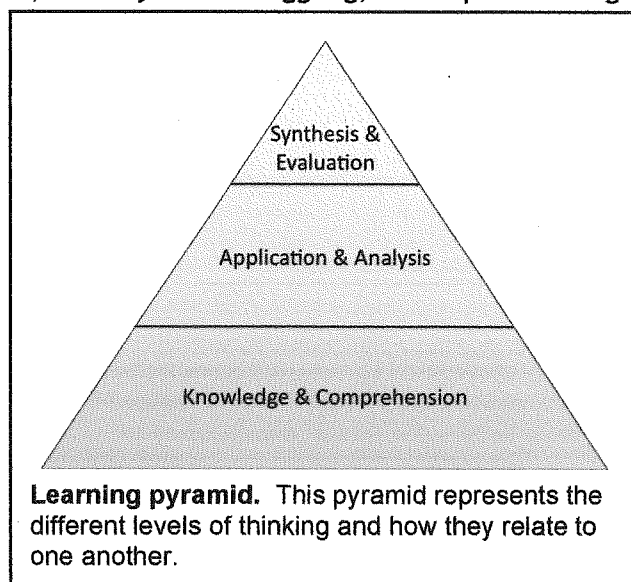
**The instructor reserves the right to make changes to this syllabus as necessary.**

## EXPECTATIONS, EVALUATION AND TIPS FOR SUCCESS IN BIOLOGY 142

Welcome to Biology 142! The information in this handout and accompanying materials should be read and followed by all students in Advanced Topics in Genetics and Molecular Biology. Please do not hesitate to ask for clarification. Biology 142 is designed for students who **plan to major in biology or neuroscience and behavioral biology, attend professional school in a health related field, or have a strong background in biology** and have chosen biology to fulfill their distribution requirements.

**Tips for Success:** Biology 142 is an *intensive course* that requires *time and commitment* and assumes competency in all Biology 141 material. To perform well in this course, you must manage your time appropriately and have a proper study plan, beginning from the *first day* of class. The best overall approach is to work consistently, in small doses. The following are some additional tips that will help you succeed:

- **Be prepared for class every day.** The readings should be done before class. The best overall reading approach is to read before class (or at least browse) assignments at first for an overview, jotting down questions or areas of confusion. Then, answer all of the 'Concept Checks' questions associated with your reading assignment in the textbook to practice your knowledge. Bring your textbook to class and annotate the figures. Finally, read a second time after class (the same day as class is best), using a different color of highlighter and paying careful attention to topics discussed during class. This second reading is critical because it will help you to connect class discussions to the textbook assignments.
- **Take good notes.** During class, we will discuss the most significant concepts from your readings. At times, I will present examples that may not be given in your textbook. You are responsible for all of this information. Good note-taking will help you to remember which concepts were most important and why. Additionally, the act of note-taking is itself a learning exercise that helps you to stay actively engaged in the topic and better remember class discussions.
- **Ask questions.** Biology 142 is a collaborative course. Therefore, if you don't understand something discussed in class, ask questions in class, ask questions of your peers, form productive study groups, or arrange to meet with me. I welcome your questions, and if you're struggling, it's important to get help early. Additionally, by asking questions, you take charge of your own learning.
- **Build a foundation of knowledge, but aim high in your thinking** (adapted from [www.cas.lsu.edu](http://www.cas.lsu.edu)). While studying, keep in mind that you will need to do more than simply learn facts; you will need to think. We will use a learning pyramid as a guide for our thinking this semester:
  - **Level 1 = Knowledge & Comprehension:** Memorizing and understanding information, restating in your own words, paraphrasing, or summarizing.
  - **Level 2 = Application & Analysis:** Identifying parts, patterns, and connections in new information and comparing, contrasting, or arranging these parts and patterns in a logical order or in categories. Using information to solve new problems; transferring abstract or theoretical ideas to a practical, new situation.
  - **Level 3 = Synthesis & Evaluation:** Evaluating the relative effectiveness, value, or worth of a set of different solutions, ideas, or results. Predicting consequences. Taking a position on an issue



and defending that position. Combining information to form a unique product that requires creativity and originality.

Notice how each level of the pyramid builds on the foundation that precedes it. We must learn the lower levels before we can effectively perform at higher levels. In general, students who earn lower grades have not gone past the 'Knowledge & Comprehension' level. Students who earn higher grades generally know the course material well enough to perform higher level thinking tasks.

- **Review, review, review and practice.** Any biology course these days will have a lot of information. So, mastering the course material at the 'Knowledge & Comprehension' level first is key. To do this, I suggest that you study the diagrams in your text and lecture handouts; practice writing out and linking concepts *by memory*; prepare your own tables and diagrams as a study aid; create lists of questions that help you remember the material, and then practice answering those questions *by memory*. You should do at least one or two of these activities (in addition to your reading) each day. To move up to the higher learning levels, complete all worksheets and problems given during class, complete all textbook problems given in the 'Assigned Problems from Textbook' handout (available on Blackboard), and attend SI sessions (where you will be given additional practice with higher-level thinking tasks).
- **Supplemental Instruction (SI)** is provided for all students in Biology 142. Your Biology 142 SI leader is Robert Bruner. Two SI sessions each week. Check the course Blackboard site for more information.

#### Evaluation Criteria:

- **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 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 (see syllabus). 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.** 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 and be fully prepared for each lab. You must also read **ALL** instructions for assignments carefully. 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. 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).

- **Application Topics and Film Discussions:** During the course we will focus on the practical aspects 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.

#### Evaluation Points:

##### Lecture:

Lecture exams (3)	300 points
Quizzes	40 points
Class participation	10 points
Film responses	15 points
Article discussion	20 points
Final exam	170 points

**Total**

##### 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

**755 points**

#### Final grade determination: *(Plus and minus grades are given)*

90 - 100% = A

80 - 89% = B

70 - 79% = C

60 - 69% = D

<60 = F

#### Class Policies:

1. **Attendance:** See the attached sheet for the attendance policy. Unexcused absences in lecture, lab, examinations or a failure to follow the procedures outlined in that handout will 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.
2. **Exams:** A student should place all book bags, purses, and other belongings at the front of the room while sitting for any type of exam or graded assignment. Cell phones should be turned off and should be placed in bags or on a bench at the front of the room. (Desktops should be clear except for the materials needed and authorized for testing). Students should feel free to ask for clarification about any question during the exams
3. **Late work:** My due dates are fixed, unless you provide documentation of a serious life event.
4. **Missed exams:** In general, missed exams may not be made up (see the attached sheet for the absence policy) except for serious reasons (such as death or illness) with proper documentation. However, if you already know you have a conflict, please inform me by Jan. 21, and I will determine if make-up arrangements will be possible.
5. **Electronic devices:** Please turn off all cell phones and other electronic devices prior to entering the classroom. Photography and using calculators on phones is also prohibited. If you would like to take notes on your personal laptop in class you must seek special permission from the instructor. Use of laptops for surfing the web, Facebook, Skype, or other networking/chat during class is not appropriate or respectful classroom behavior.
6. **Academic dishonesty:** Honesty and ethical behaviors are imperatives in any career. Therefore, academic dishonesty will not be tolerated. Regulations of the Honor Code apply to all work in this course, including lecture and lab examinations and assignments. Please pledge all of your work with your signature to indicate that you have followed the rules of the Honor Code. Please also 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 Blackboard. Anyone caught violating Honor Code policies will be reported to the Honor Council, as detailed in the Honor Code. If you have any questions about what constitutes your own work, definitely ask!

7. **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.
8. **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.

## **ABSENCE POLICY – Biology Department**

All students are expected to attend all lecture and laboratory sessions. However, emergencies may arise which will necessitate absences from class. Students are allowed 4 cuts in lecture and **NO CUTS** in lab. Students may only miss lab without penalty in cases of illness, family emergency or a school sponsored event **which is cleared with the professor in advance.** Students are responsible for all material which is covered in laboratory and lecture. When possible, students will be allowed to "make-up" laboratory material missed due to an excused absence; however, because of the nature of laboratory material, actual "make-up" of missed activities is usually impossible.

### **PENALTIES**

Students who exceed the 4 cut limit in lecture for whatever reasons of have an unacceptable absence from laboratory will have their FINAL grade reduced 5 points per absence. **Students who miss 2 labs without acceptable reasons will fail the course (see below).**

### **LECTURE ABSENCES:**

**THERE ARE NO EXCUSED ABSENCES FOR LECTURE.** Each student may be absent four times without penalty. These four cuts may be used for any reason: Illness, studying, travel, family emergency, etc. However, ANY additional cuts will result in grade reduction. **USE YOUR CUTS JUDICIOUSLY**, e.g., for sick leave only.

### **ACCEPTABLE LABORATORY ABSENCES**

Although no discretionary absences, i.e., "cuts", are allowed regarding laboratory, on rare occasions, illness, family emergencies, or certain school sponsored events may make it necessary for a student to miss a laboratory session. The instructor **MUST** be notified prior to the day of the absence in all but the most extreme emergencies.

**In all cases, the final decision regarding whether or not an absence is acceptable will be made by the instructor.**

**AN UNACCEPTABLE ABSENCE FROM LABORATORY RESULTS IN A FIVE POINT REDUCTION IN THE FINAL GRADE. TWO UNACCEPTABLE LABORATORY ABSENCES RESULT IN FAILURE OF THE COURSE.**

### **MISSED TESTS**

Ordinarily, tests cannot be made up, however, this is up to the instructor. If a student misses a test, and the absence is acceptable the missed test will not count either for or against the student. If the absence is not excused the grade will be a zero. Students are cautioned that any excuse for missing an exam will come under severe scrutiny by the instructor. **THE INSTRUCTOR MUST BE NOTIFIED PRIOR TO THE TIME OF THE EXAM, AND THE INSTRUCTOR MAKES THE FINAL DECISION REGARDING WHETHER OR NOT AN ABSENCE IS ACCEPTABLE.**

Laboratory tests which are missed for a reason that is excused **MUST** be made up. **The instructor must be notified prior to the time of the test.**

### **RELIGIOUS HOLIDAYS:**

Students must notify the instructor one week in advance if they intend to be absent for a religious holiday.

### **TARDINESS**

Being late to class is rude and distracting. Continued tardiness by any student will result in the assignment or absences and ultimately a reduction in the student's grade. **Three tardies equal an absence.** The tardy student is responsible for notifying the instructor that she/he entered the classroom late and, therefore was not absent. The instructor reserves the option of excluding a person from further classroom or laboratory participation if the student is continuously tardy.

**Falsification of information regarding absences from class or laboratory will be considered as a breach of academic integrity.**



## CLASSROOM AND LABORATORY GUIDELINES

### Department of Biology

1. Eating and drinking are not allowed in either classrooms or laboratories. Therefore, do not bring food items and beverages to class or laboratory. The use of tobacco in any form is forbidden in Pierce Hall.
2. Students are expected to wear appropriate attire in classrooms and laboratories. Students must wear closed toed shoes in the laboratory.
3. Students should thoroughly wash their hands before leaving the laboratory.
4. Students must be safety conscious at all times but especially in the laboratories. Special procedures will be reviewed during laboratory sessions as needed.
5. All students are requested to help with housekeeping in the classroom and laboratory.
6. Materials may not be taken out of the laboratories. This includes microscopes, microscopic slides, demonstration notes and materials, charts, and all other items which are to be found in the laboratory.
7. Students may not photograph laboratory materials.
8. Violation of any regulation notes in Sections 6 and 7 above will be treated as a breach of academic integrity. Therefore, such violations will be immediately reported to the Honor Council.

# STUDENT INFORMATION SHEET

NAME: \_\_\_\_\_ (Print) \_\_\_\_\_ [Freshman or Sophomore] SEMESTER: \_\_\_\_\_  
(circle one)

NAME: \_\_\_\_\_ (Signature) \_\_\_\_\_ COURSE: \_\_\_\_\_

PHONE NUMBERS: Dorm: \_\_\_\_\_ Cell: \_\_\_\_\_

CAMPUS ADDRESS: \_\_\_\_\_

HOME ADDRESS: \_\_\_\_\_

HIGH SCHOOL: \_\_\_\_\_

TENTATIVE MAJOR/INTERESTS: \_\_\_\_\_

ACADEMIC ADVISOR: \_\_\_\_\_

PREVIOUS SCIENCE COURSES: HIGH SCHOOL: \_\_\_\_\_

\_\_\_\_\_

COLLEGE: \_\_\_\_\_

\_\_\_\_\_

List any health information that might be important for participation in the laboratory and on field trips. (For example: pregnancy, allergies, handicaps) \_\_\_\_\_

\_\_\_\_\_

This information will be kept confidential if requested.