

Instructor: Dr. William H. Jackson
Office: SBDG 111B **Office hours:** By appointment
Telephone: 641-3601 **Email:** Billj@aiken.sc.edu
Lecture: TTh, 10:50-12:05 PM **Text:** **Principles of Genetics, 7th Edition** by R. Tamarin
Laboratory: See Laboratory Syllabus
Supplies: Scantron Sheets and Laboratory notebook (USCA Bookstore) **Information:** <http://www.usca.edu/biogeno/faculty/Jackson/Jackson.html>
Credit: Four (4) Semester Hours

Course Description: Fundamental Genetics is a four credit hour course for biology majors that covers the principles of transmission, molecular, and population genetics. Topics covered will include Mendelian genetics, quantitative inheritance, linkage, recombination, the biochemical aspects of gene function and regulation, and developmental and population genetics.

Course Objectives: This course will introduce the student to the underlying principles of genetics. It is divided into transmission and molecular genetics. On completion of this course students will be expected to

1. Demonstrate an understanding of transmission genetics;
2. Demonstrate an understanding of molecular genetics;
3. Demonstrate an ability to write and discuss applications of genetic concepts
4. Solve genetics problems using appropriate mathematical techniques in conjunction with data collected in the genetics laboratory;

Attendance Policy: Students are expected to adhere to the University attendance policy as stated in the Student Handbook. In this regard, the instructor may impose a penalty for absences in excess of 25% of regularly scheduled class meetings by assigning an "F" in the course. Absences, *neither excused nor unexcused*, absolve the student from meeting class assignments. Because of their nature, laboratory exercises cannot be made up – students should make every effort to attend all laboratory sessions.

Disability Statement: If you have a physical, psychological, and/or learning disability which might affect your performance in this class, please contact the Office of Disability Services, 126A B&E, (803) 641-3609, as soon as possible. The Disability Services Office will determine appropriate accommodations based on medical documentation.

Methods of Presentation and Evaluation: Information will be presented through lectures, class discussions, and laboratory exercises using appropriate visual aids and laboratory equipment.

A laboratory grade will make up 25% of the final grade for the course (see below). Each laboratory exercise will require a written report based on the format of a scientific paper (visit <http://www.usca.edu/biogeno/researchguide/writing.html> for more information). Each student will be required to maintain a laboratory notebook into which all records of laboratory activities will be kept. The laboratory notebook should be bound and contain grid paper. It is not recommended that the laboratory book be the type with duplicate sheets. Laboratory grades will be based on laboratory quizzes, the maintenance of individual laboratory notebooks, and written reports of each laboratory exercise. Some laboratory sessions may be combined with lecture sessions.

| Description | Percentage | Comments |
|----------------|------------|---|
| Midterm Exam | 30% | Comprehensive exam covering the first half of the semester |
| Final Exam | 30% | Comprehensive exam covering the second half of the semester |
| Weekly Quizzes | 15% | Quizzes will generally be given on Tuesdays of each week and will cover the material of the previous week |
| Laboratory | 25% | See Laboratory Syllabus supplement for grading information |

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You will be expected to endorse the USCA HONOR PLEDGE on every assignment: 'On my honor as a University of South Carolina Aiken student, I have neither given nor received any unauthorized aid on this assignment/examination. To the best of my knowledge, I am not in violation of academic honesty'

TENTATIVE LECTURE SCHEDULE

| Date | Week | Topic/Comments | Chapter |
|--------|------|---|---------|
| Jan 9 | 1 | Introduction; Mendel's Principles | 2 |
| Jan 14 | 2 | Quiz 1 ; Mendelian Principles | 2 |
| Jan 16 | | Mendelian Principles | 2 |
| Jan 21 | 3 | Quiz 2 ; Mendelian Principles | 2 |
| Jan 23 | | Mitosis and Meiosis | 3 |
| Jan 28 | 4 | Quiz 3 ; Mitosis and Meiosis | 3 |
| Jan 30 | | Probability and Statistics | 4 |
| Feb 4 | 5 | Quiz 4 ; Probability and Statistics | 4 |
| Feb 6 | | Sex Determination, Sex Linkage, and Pedigree Analysis | 5 |
| Feb 11 | 6 | Quiz 5 ; Sex Determination, Sex Linkage, and Pedigree Analysis | 5 |
| Feb 13 | | Linkage and Mapping in Eukaryotes | 6 |
| Feb 18 | 7 | Quiz 6 ; Linkage and Mapping in Eukaryotes | 6 |
| Feb 20 | | Linkage and Mapping in Eukaryotes | 6 |
| Feb 25 | 8 | Linkage and Mapping in Eukaryotes | 6 |
| Feb 27 | | Midterm Examination | |
| Mar 4 | 9 | Chemistry of the Gene | 9 |
| Mar 6 | | Chemistry of the Gene | 9 |
| Mar 11 | | Spring Break – No Classes | |
| Mar 13 | | | |
| Mar 18 | 10 | Quiz 7 ; Chemistry of the Gene | 9 |
| Mar 20 | | Chemistry of the Gene | 9 |
| Mar 25 | 11 | Quiz 8 ; Chemistry of the Gene | 9 |
| Mar 27 | | Chemistry of the Gene | 9 |
| Apr 1 | 12 | Chemistry of the Gene | 9 |
| Apr 3 | | Chemistry of the Gene | 9 |
| Apr 8 | 13 | Quiz 9 ; Gene Expression: Transcription | 10 |
| Apr 10 | | No Classes | |
| Apr 15 | 14 | Gene Expression: Transcription | 10 |
| Apr 17 | | Gene Expression: Transcription | 10 |
| Apr 22 | 15 | Quiz 10 ; Gene Expression: Translation | 11 |
| Apr 24 | | Gene Expression: Translation | 11 |
| May 1 | | Final Exam at 11:00 AM in SBDG 200 | |

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FUNDAMENTAL GENETICS LABORATORY SYLLABUS

- Text:** Principles of Genetics, 7th Edition by R. Tamarin
- Laboratory Manual:** Contemporary Genetics Laboratory Manual by R. Scott
- Additional Materials:** Quad-ruled laboratory notebook; Scientific calculator; Diskette
- Required Reading:** Drosophila Life Cycle | Fly Care | Anesthetizing Flies | Lab Report Guidelines
<http://www.usca.edu/biogeo/faculty/Jackson/Jackson.html>
- Laboratory:** T, 8:00 – 10:40 AM in SBDG 108 and 110

LABORATORY SCHEDULE

| Date | Meeting | Exercise | Chapter |
|--------|---------|---|--------------|
| Jan 14 | 1 | Introduction to <i>Drosophila melanogaster</i> , Random segregation | 3 |
| Jan 21 | 2 | Mitosis and Meiosis | 4 |
| Jan 28 | 3 | Independent Assortment | 3 |
| Feb 4 | 4 | Sex-linked Inheritance | 3 |
| Feb 11 | 5 | Linkage and Crossing Over | 3 |
| Feb 18 | 6 | Genetics crosses – wrap up | 6 |
| Feb 25 | 7 | Midterm Problem Set | |
| Mar 4 | 8 | Genetic crosses – wrap up | |
| Mar 11 | 9 | No classes – Spring Break | |
| Mar 18 | 10 | Bioinformatics | Handout |
| Mar 25 | 11 | Bioinformatics | Handout |
| Apr 1 | 12 | Bioinformatics | Handout |
| Apr 8 | 13 | Cloning project | 13 (Tamarin) |
| Apr 15 | 14 | Cloning project | 13 (Tamarin) |
| Apr 22 | 15 | Cloning project | Handout |

General Information: The laboratory component of ABIO 350 is not separate from the lecture sessions. The student is expected to synthesize the material covered in lecture, laboratory, and the text. The student is expected to meet every laboratory session, as it is impossible to recreate the laboratory setup after the scheduled meeting time. In general, each laboratory meeting will be divided into two sessions. The first session, lasting up to one hour, will be used to answer and solve homework problems in genetics. The second session will be used to carry out the assigned laboratory exercise. The Fundamental Genetics Laboratory has been created to introduce the student to genetics using living organisms (*Drosophila melanogaster*, *Escherichia coli*). Several laboratory exercises involve genetic crosses between mutant strains of *D. melanogaster*. These crosses will require several days to complete. Because these and later studies involve living systems, the student must be prepared to work on the project when the need arises. While the majority of the work can be done during normal laboratory meeting times, this is not always the case.

Recording Data: One of the most critical requirements for any scientist is careful record keeping. In order to intelligently analyze and report your data, the student should keep careful records of the crosses made

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and the results obtained from each cross. All information concerning laboratory experiments must be kept in a laboratory notebook. For crosses between strains of *D. melanogaster*, records should be made of the phenotypes, genotypes, sex, number of progeny, and any other pertinent information that is relevant to your experiment. Before a cross is attempted, the experimental design should be recorded so that the student knows the traits to be scored. Remember: once progeny are counted and discarded, they cannot be retrieved for "double-checking". Be sure to get it right the first time! Because individual crosses may take several weeks to complete, there will be times when you will be counting progeny from several crosses. Only after the cross is completed will the results be analyzed. Organize the data efficiently. If the results do not make sense or are confused with the results from another cross, it will be impossible to go back and determine where the mistakes were made.

House Keeping: Neither the laboratory assistant, nor I have the time or the inclination to clean up after you. At the end of each laboratory session, you must clean up your work area. Wipe down the work area with a damp paper towel. If a microscope was used make sure that it is put away. Do not leave fly vials open!

Laboratory Partners: Laboratory partners will be assigned during the first laboratory meeting. It is essential that each student develop the skills required for working well with others. Each group will complete assigned laboratory exercises, collect and analyze data, and submit a written report of results.

Collaboration with Other Groups: While each student will work with their laboratory partner to complete the assigned projects. Groups are also encouraged to discuss experiments with other classmates (groups), however, each laboratory group is expected to record their own data. While some of the projects may use pooled data from all laboratory groups, the actual generation of written reports is expected to result from data obtained by the student and laboratory partner, and not in collaboration with anyone else.

Attendance: In order for the student to successfully complete laboratory assignments, attendance is mandatory at every session. In addition, information covered during laboratory sessions is fair game for lecture exams.

Grading: The laboratory component of ABIO 350 is worth 25% of the final course grade, and will be based on written results of your work. Generally speaking, laboratory reports will be due 4-6 weeks after beginning a *Drosophila* cross. Molecular biology reports will be due the week following the completion of the project. Ninety-percent of your laboratory grade will be determined as a percentage of total points earned. An additional 10% of your laboratory grade will be obtained from turning in a properly maintained laboratory notebook.

| Project | Points | Project Start Date | Project Due |
|---------------------------|------------|--------------------|-------------|
| Random Segregation | 40 | 1.14.03 | 2.18.03 |
| Mitosis and Meiosis | N/A | 1.21.03 | N/A |
| Independent Assortment | 40 | 1.28.03 | 3.4.03 |
| Sex-linked Inheritance | 40 | 2.4.03 | 3.18.03 |
| Linkage and Crossing Over | 40 | 2.11.03 | 3.25.03 |
| Bioinformatics | 40 | 3.18.03 | 4.8.03 |
| Cloning | 40 | 4.8.03 | 4.25.03 |
| TOTAL POINTS | 240 | | |