

Syllabus for
BIO 311—Genetics Laboratory
1.0 Credit Hour
Spring 2002

I. COURSE DESCRIPTION

An opportunity to make crosses using *Drosophila* and other organisms, analyze data, and form conclusions. Other experiments demonstrate and complement the information being taught in the lecture portion.

Corequisite: BIO 311 Lecture.

Lab Fee: \$25

II. COURSE GOALS

A. It is a well-established fact that the speed and ease with which learning occurs is directly proportional to the number of human senses (sight, sound, touch, taste, and smell) employed in the process. In the biology laboratory, students handle and manipulate equipment, chemicals, and living organisms. They see, hear, touch, smell, and sometimes even taste what they are doing.

B. The laboratory experience is therefore a vitally important aspect in any biology course, including Genetics. The laboratory experience in this course will be utilized to enhance and supplement the learning that takes place in the classroom of BIO 311.

III. COURSE OBJECTIVES

As a result of successfully completing this course, the student will be able to do the following:

- A. Manipulate *Drosophila melanogaster* (the fruit fly) as a genetic research organism.
- B. Demonstrate classic Mendelian laws governing monohybrid and dihybrid inheritance.
- C. Discuss probability principles and their relationship to genetics.
- D. Use the Chi-square Test to determine whether experimentally obtained data constitutes a good fit to, or a satisfactory approximation of, a theoretical, expected ratio.
- E. Explain the use and role of fungi, bacteria, and viruses (bacteriophages) in genetic research.
- F. Demonstrate gene linkage and recombinations via crossing-over.
- G. Utilize the Hardy-Weinberg Equation for solving population genetic problems.
- H. Conduct a sex chromatin (Barr Bodies) check on human cells.
- V. Discuss current, practical problems in genetics; i.e., plant and animal breeding programs,

- genetic engineering problems, etc.
- J. Collect, analyze, and interpret experimental data upon which to draw sound scientific conclusions in a scientifically written paper.
- K. Identify literature in the field of genetics.
- L. Determine the grandparent genotypes when given F₂ generation fruit flies from which to determine phenotypic data.

IV. TEXTBOOKS

Required Textbooks

- A. Merten, T.R. and Hammersmith, R.L. 2001. Genetics Laboratory Investigations. 12th edition. New Jersey: Prentice Hall.
- B. Other Required Materials
Lab notebook – bound with guidelines

V. POLICIES AND PROCEDURES

- A. University Policies and Procedures
 1. Attendance at each class or laboratory is mandatory at Oral Roberts University.
 2. Double cuts will be assessed for absences immediately preceding or following holidays.
 3. Excessive absences can reduce a student's grade or deny credit for the course.
 4. Students taking a late exam because of an unauthorized absence will be charged a late exam fee.
 5. Students and faculty at Oral Roberts University adhere to all laws addressing the ethical use of others' materials, whether it is in the form of print, video, multimedia, or computer software.
 6. Final exams cannot be given before their scheduled times. Students need to check the final exam schedule before planning return flights or other events at the end of the semester.
- B. Course Policies and Procedures
 1. Evaluation Procedures
 - a. All exercises require individualized effort in conducting the experiments, analyzing and interpreting the data. Plagiarism and falsifying data are two temptations to be avoided concerning these exercises. **Any evidence of plagiarism or cheating on lab work will automatically earn an F grade for the semester.**
 - b. In order to differentiate between those students who really understand the principles studied from those who do not understand and those who had the right answers for lab manual checkoff, but not a good comprehension, two exams will be given--a mid-term and a final lab practical. These exams will be constructed in such a way that the student who uses his or her own brain power to do his or her own work will be able to do better than someone who did less than his or her best.
 - c. Reports submitted past established due-date deadlines will be penalized

10% per day including weekend days regardless of evaluation.

2. Grading

Notebook	1 x 100	= 100
Lab reports	2 x 25	= 50
Quizzes	10 x 20	= 200
<u>Final</u>	<u>1 x 150</u>	<u>= 150</u>
Total		500

Letter Grade	Meaning	Percent
A	Excellent	90 – 100
B	Above Average (Good)	80 – 89
C	Average	70 – 79
D	Below Average (Poor)	60 – 69
F	Inadequate Knowledge, Failing	Below 60

VI. COURSE CALENDAR

<u>WEEK</u>	<u>TOPIC</u>	<u>EXERCISE</u>
1	<i>Drosophila</i> and Maize Experiments in Genetics: Monohybrid Crosses	1
2	<i>Drosophila</i> and Maize Experiments in Genetics: Dihybrid Crosses	2
3	Principles of Probability	3
4	The Sex Check: A Study of Sex Chromatin in Human Cells	10
5	Linkage and Crossing Over	12
6	Open-Ended Experiments Using <i>Drosophila</i> : Locating a Mutant Gene in its Chromosome	14
7	The Genetic Material: Isolation of DNA	15
8	Restriction Endonuclease Digestion and Gel Electrophoresis of DNA	16
9	Amplification of DNA Polymorphisms by Polymerase Chain Reaction (PCR) and DNA Fingerprinting	17
10	Transformation of <i>E. coli</i>	18
11	Gene Recombination in Phage	22
12	Population Genetics: The Hardy-Weinberg Principle	24
13	Applied Human Genetics	26

VII. ASSESSMENT SUMMARY

Mrs. Sarah Myer
Name of Instructor

Biology 311
Course No.

Genetics Laboratory
Title of Course

Biology
Name of Department

MISSION

The lifestyle at ORU is rooted in the word "Wholeness." ORU seeks to educate the whole person, with balanced emphasis placed on the development of mind, spirit, and body.

GENERAL OUTCOMES

1. Spiritual Development
2. Physical Development
3. Communication
4. Analysis
5. Problem Solving
6. Valuing in Decision Making
7. Social Interaction
8. Global Perspectives
9. Effective Citizenship
10. Aesthetic Responsiveness

MAJOR OUTCOMES

Analysis/Problem Solving

Be proficient in biology by acquisition of a broad-based knowledge in biology and by the development of scientific skills.

Be equipped to do independent investigation, analysis, and evaluation of a scientific nature.

Communication

Be able to effectively communicate science in written and oral format.

Global Perspective/Spiritual Development

Be able to develop a scientific worldview consistent with biblical truth.

COURSE GOALS

Demonstrate a practical knowledge and understanding of heredity principles.

Be able to apply the knowledge and understanding gained through this course to the student's other courses in his or her major area of study.

ASSESSMENT OF COURSE GOALS

STIMULI

Examinations

Case studies/problem solving

CRITERIA

As stated elsewhere in the syllabus.