

LeTourneau University

BIOL 3404-01

General Genetics and Laboratory

Course Syllabus

Objective: To understand the fundamental processes of inheritance. The relationships among phenotypic and genotypic variation will be studied from both the molecular and Mendelian perspectives. Students should gain a clear understanding of the impact the cell cycle and chromosome structure have on Mendelian ratios and extranuclear inheritance. Topics include: traditional Mendelian relationships, extra-chromosomal inheritance, quantitative genetics, gene mapping, mutations, DNA structure, organization, and function, and genomics. Laboratory investigations will include both Mendelian and molecular aspects including *Drosophila* experiments, DNA isolation and restriction, PCR, and bacterial transformation. All will be examined from a Christian Theistic worldview.

Christian Leadership Distinctives:

- **Discovering Purpose** - Students will expand their understanding of the genetic basis of some aspects of who they have been designed to be as well as understanding the limitations of a naturalistic worldview. Assignments and exams will help the student evaluate their fit with the challenges of learning the biological sciences.
- **Grounding Values** - Students will examine historical and contemporary bioethical issues as related to genetics. In some cases they should see that greater knowledge of the science does not resolve moral dilemmas and ultimately the answer lies in our values and beliefs. As appropriate and related to genetics, the instructor will integrate Christian faith and Biblical Truth to relevant moral dilemmas in the biological sciences.
- **Broadening Knowledge** - The students will be challenged to master the knowledge objectives of this course from a Christian worldview. The general scope of the course is standard, major's level, general genetics starting with a molecular understanding of inheritance and cellular control followed by a typical Mendelian understanding of the inheritance of traits. Laboratory exercises and experiments are designed to expand and solidify concepts and skills as related to genetics.
- **Deepening Skills** - The student will learn additional skills for isolating and purifying DNA, manipulating and visualizing DNA fragments, testing for traits, creating genetics crosses, and analyzing the results of crosses including statistical comparisons.
- **Collaborative Service** - Students will experience limited collaboration in the laboratory portion of this course and no service-learning.

Instructor: Dr. Andree Elliott, Assistant Professor of Biology
Office: Glaske O145
Telephone: 903-233-3952; email: AndreeElliott@letu.edu

Office Hours: MWF 9:15-10:15, T 10:15-11:00, OR by appointment.

Periods: Lecture, MWF 8:15 to 9:10 a.m. Location: Glaske C101
Lab, R 3:00 to 5:20 p.m. Location: Glaske S103

Required Texts: *iGenetics: A Molecular Approach 2nd Ed.* Peter J. Russell
Benjamin Cummings, 2006
ISBN 0-8053-4713-5

Genetics Laboratory Investigations, 13th Ed.
T.R. Mertens and R.L. Hammersmith
Prentice Hall, Upper Saddle River, 2007
ISBN 0-13-174252-3

How to succeed in this course:

- *Ask questions when you do not understand and when you want to go deeper.*
- *Do all of the reading for lecture and lab.*
- *Work more than the assigned homework problems.*
- *Review the notes.*
- *Memorize key figures and processes so you can teach them to someone else.*
- *Continue the lab assignments until you get meaningful results.*
- *Read recent articles of relevant to genetics in Science or Nature.*

Policies:

Attendance is to your advantage and is required. You must attend at least 75% of the class periods to complete this course. Failure to attend will result in a failing grade regardless of performance on assignments. Quizzes covering the assigned lecture/textbook questions/problems will be given at the *beginning of each lab session*. The quiz questions will be similar to homework questions/problems but not identical. *Reading the assigned material before lecture will greatly increase your learning*, since *all the details* of each chapter will not necessarily be covered in lecture; the important material (main topics) of each chapter will be emphasized in lecture and sometimes supplemented with additional materials. You will, however, be responsible for the main topics *and* details. Check your reading assignments. Laboratory exercises cannot be made up directly following a scheduled lab, because lab materials are time-sensitive. You must prepare ahead of time to complete lab work, if an excused absence is anticipated. In other words, if you have a scheduled event that qualifies as an excused absence, you may attend a scheduled alternate lab session AFTER receiving permission from the instructor, which will be granted, provided ample notice is given. Please do not assume you can just “show up” for the alternate lab meeting time; the number of students attending the alternate lab time must be known in advance. The date and time for this alternate lab session will be scheduled and announced during the course of the semester. Information and criteria regarding the Bradford-Hill paper, which is to be written on a classic Genetics journal article, may be found in Blackboard under Course Documents. A sign-up sheet is posted on the board in the Genetics lab. A copy of the sign-up sheet may also be viewed on Blackboard under Course Documents. The articles are located as a collection in the book Classic Papers in Genetics edited by James A. Peters, which will be kept on reserve in the LeTourneau University library. **This assignment is due at the beginning of class on Friday, October 27, 2006.**

Grading: Your grade will be based on the number of points earned from Exams, Quizzes, Homework assignments, a written review of a published classical Genetics paper, and the Drosophila Breeding Report. Homework assignments will be posted on Blackboard. These will be graded and returned each week. Correct answers for homework will also be posted on Blackboard after the due date. Once the correct answers are posted for a given assignment, the assignment may not be turned in for credit. The Final Exam will be comprehensive. Exams will be a combination of multiple choice, short answer, and critical thinking problems similar to homework problems. Each exam will include extra credit questions from the same material. Quizzes will cover the previous week’s lecture material and may include questions from the previous week’s lab material, as well.

4 Unit Exams = 400 pts
Comprehensive Final Exam = 150 pts
Quizzes (10 points each) = 120 pts
Homework (10 points each) = 150 pts
Drosophila Breeding Report = 100 pts
Classical Paper Report (Bradford-Hill paper) = 80 pts

A = 90-100%; B = 80-89%; C = 70-79%; D = 60-69%; F = below 60%

Academic Honesty: Each student is expected to strive for personal excellence in academic achievement. Academic Honesty will be defined as stated in the Student Handbook. In this course cheating on ANY assignment will result in zero points for that assignment and a notice sent to your Academic Advisor. A second violation of the Academic Honesty policy will result in immediate failure of this course and a letter sent to Student Affairs and to your Academic Advisor.

Drosophila Breeding Report: Each student will create a written report that includes all original data, null and alternate hypotheses for both monohybrid and dihybrid crosses, Chi-Square analysis, and specific conclusions based on the statistical analyses. This written report is an individual effort entirely. You may consult with the instructor for help. You must submit both a printed and electronic copy of this report.

Laboratory Safety: You are expected to follow the safety guidelines that will be explained at the first lab meeting. This includes close-toed shoes, modest clothing that protects your torso and legs, and personal safety eye-ware. If you desire a lab coat, you may purchase one through a uniform store or online. Failure to follow safety guidelines will result in dismissal from the lab session to correct the issue. Students having issues with safety compliance may be referred to Student Affairs for disciplinary action.

Self-Identification: Students enrolled in an institution of higher education are required to self-identify if they would like to request academic support services and/or facility adjustments on the basis of a disability. LeTourneau University encourages a student with a disability to self-identify after admission and to provide required documentation to the Director of Student Success. Students needing facility adjustments must notify the Director of Student Success at 903-233-4460.

LeTourneau University
BIOL 3404
Fall 2006 Lecture Schedule

| Date | Day | Topic of the Day | Reading Assignment |
|----------------|------------|--|--|
| 30-Aug | W | Syllabus, Expectations, and Historical Review | Supplemental Notes |
| 1-Sep | F | Historical Review (continued) and Introduction | Ch 1 |
| 4-Sep | M | DNA: The Genetic Material | Ch 2 |
| 6-Sep | W | DNA: The Genetic Material | Ch 2 |
| 8-Sep | F | DNA Replication | Ch 3 |
| 11-Sep | M | DNA Replication | Ch 3 |
| 13-Sep | W | Gene Function | Ch 4 |
| 15-Sep | F | Gene Expression: Transcription | Ch 5 |
| 18-Sep | M | Gene Expression: Transcription | Ch 5 |
| 20-Sep | W | Gene Expression: Transcription | Ch 5 |
| 22-Sep | F | Gene Expression: Translation | Ch 6 |
| 25-Sep | M | Exam #1 | Ch 1-5 |
| 27-Sep | W | Gene Expression: Translation | Ch 6 |
| 29-Sep | F | DNA Mutation and Repair, and Transposable Elements | Ch 7 |
| 2-Oct | M | DNA Mutation and Repair, and Transposable Elements | Ch 7 |
| 4-Oct | W | DNA Mutation and Repair, and Transposable Elements | Ch 7 |
| 6-Oct | F | Recombinant DNA Technology | Ch 8 |
| 9-Oct | M | Recombinant DNA Technology | Ch 8 |
| 11-Oct | W | Applications of Recombinant DNA Technology & Genomics (Overview) | Ch 9-10 |
| 13-Oct | F | Mendelian Genetics | Supplemental Notes |
| 16-Oct | M | Exam #2 and Issue of Take-Home Exam (grades averaged together for one score) | Ch 6-8 (in class) Ch 9-10 (take-home) |
| 18-Oct | W | Mendelian Genetics | Ch 11 |
| 20-Oct | F | Mendelian Genetics | Ch 11 |
| 23-Oct | M | Mid-Semester Break – No Classes | |
| 25-Oct | W | Chromosomal Basis of Inheritance | Ch 12 |
| 27-Oct | F | Review Paper due! Chromosomal Basis of Inheritance | Ch 12 |
| 30-Oct | M | Take-Home Exam Due (beginning of class) / Chromosomal Basis of Inheritance (continued) | Ch 12 |
| 1-Nov | W | Extensions of Mendelian Genetic Principles | Ch 13 |
| 3-Nov | F | Extensions of Mendelian Genetic Principles | Ch 13 |
| 6-Nov | M | Extensions of Mendelian Genetic Principles | Ch 13 |
| 8-Nov | W | Quantitative Genetics | Ch 14 |
| 10-Nov | F | Exam #3 | Ch 11-13 |
| 13-Nov | M | Quantitative Genetics | Ch 14 |
| 15-Nov | W | Quantitative Genetics | Ch 14 |
| 17-Nov | F | Gene Mapping in Eukaryotes | Ch 15 |
| 20-Nov | M | Gene Mapping in Eukaryotes | Ch 15 |
| 22-Nov | W | Gene Mapping in Eukaryotes | Ch 15 |
| 24-Nov | F | Thanksgiving Holiday – No Classes | |
| 27-Nov | M | Variations in Chromosome Structure and Number | Ch 17 |
| 29-Nov | W | Variations in Chromosome Structure and Number | Ch 17 |
| * 1-Dec | F | Non-Mendelian Genetics | Ch 23 |
| 4-Dec | M | Exam #4 | Ch 14-17, 23 |
| 6-Dec | W | Regulation of Gene Expression in Bacteria | Ch 19 |
| 8-Dec | F | Regulation of Gene Expression in Bacteria | Ch 19 |
| 14-Dec | R | Final Exam (7:30 – 9:30 a.m.) | Comprehensive |

* Friday, December 1 is the last day to drop with a “W”

BIOL 3404
Genetics Lab Schedule
Fall 2006

| Date | Lab Title | Lab Manual Investigation |
|---------------|--|---------------------------------|
| 7-Sep | DNA Isolation | Lab 14 |
| 14-Sep | Introduction to <i>Drosophila melanogaster</i> | Two Handouts |
| 21-Sep | DNA Restriction – Start | Lab 15 |
| 28-Sep | DNA Restriction – Finish | Lab 15 |
| 5-Oct | Giant Chromosome Staining | Handout |
| 12-Oct | Mitosis | Lab 4 |
| 19-Oct | Meiosis | Lab 5 |
| 26-Oct | Monohybrid Crosses | Lab 1 |
| 2-Nov | Dihybrid Crosses | Lab 1 |
| 9-Nov | Principles of Probability | Lab 2 |
| 16-Nov | The Chi-Square Test | Lab 3 |
| 23-Nov | Thanksgiving Holiday – No Lab | |
| 30-Nov | <i>Sordaria</i> Linkage and Crossing Over | Lab 12 |
| 7-Dec | Completion of Fly Project | N/A |
| 14-Dec | Finals Week – No Lab | |

NOTE: A quiz will be given at the beginning of each lab session; therefore, you must be on time to lab! The quiz will consist of 10 multiple choice questions and cover both lecture and lab content from the previous week.

NOTE: Not all lab sessions will consume the entire scheduled lab time. These shorter labs sessions were scheduled specifically to accommodate the students' need to work on the fly project, which requires working independently throughout the entire semester. Please use your lab time efficiently!