GENERAL GENETICS
BIO 2020

Class Hours: 3.0       Credit Hours: 4.0
Laboratory Hours: 3.0   Date Revised: Fall 1999

Catalog Course Description:
Mendelian genetics, chromosomal inheritance, modified Mendelian ratios, chromosome mapping, linkage, gene and chromosomal mutations, recombination, gene expression, recombinant DNA technology, transposable elements, extranuclear genome, population genetics, and quantitative genetics. Course includes three hours of lecture and three hours of laboratory applications each week.

Entry Level Standards:
The student should have a good understanding of basic biology and chemistry. Reading and writing at the college level is expected. Basic math skills (arithmetic, determining ratios) are needed as well.

Prerequisites:
BIO 1010 and 1020 or two years of high school biology, and CHM 1010 and 1020; or consent of instructor. All remedial/developmental courses must be completed before taking this course.

Textbook(s) and Other Reference Materials Basic to the Course:

I. Week/Unit/Topic Basis:

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II. Course Objectives*:

A. Gain knowledge and appreciation of the complex, dynamic processes of storing and retrieving genetic information within the cell. III

B. Apply critical thinking skills in analyzing genetic data and determining modes of inheritance. II, V

C. Develop skills in searching current and classic historical literature sources in genetics and evaluating the information in terms of scientific validity. IV

D. Develop an appreciation of the techniques and potential of genetic engineering, as well as the responsibility for scientific integrity. II, VII

*Roman numerals after course objectives reference goals of the Natural and Behavioral Sciences department.

III. Instructional Processes*:

Students will:

1. Locate and evaluate related scientific information in the ERC and on the World Wide Web. Information Literacy Outcome, Technological literacy Outcome

2. Use related equipment and tools for making biological measurements and observations. Technological Literacy Outcome

3. Read and critique scientific writings. Communication Outcome, Personal Development Outcome

4. Use Internet course list serve to share information pertaining to the course with classmates. Communication Outcome, Technological Literacy Outcome, Information Literacy Outcome

5. Collect data, generate graphs and tables of the collected data, summarize the data, draw conclusions from the data, and apply these conclusions to related situations. Numerical Literacy Outcome

6. Develop a vocabulary that allows them to communicate more effectively with their health care providers as well as in preparing for health care professions. Transitional Strategies

7. Participate in laboratory exercises which develop teamwork, problem solving skills and data
analysis. Problem Solving and Decision Making Outcome; Active Learning Strategies

8. Utilize skills and procedures developed in the laboratory to design an implement plan to identify unknown microorganisms. Personal Development Outcome, Problem Solving and Decision Making Outcome

*Strategies and outcomes listed after instructional processes reference Pellissippi State’s goals for strengthening general education knowledge and skills, connecting coursework to experiences beyond the classroom, and encouraging students to take active and responsible roles in the educational process.

IV. Expectations for Student Performance*:

Upon successful completion of this course, the student should be able to:

1. Predict the outcome of crosses involving autosomal traits, sex-linked traits, multiple alleles, and incomplete dominance. A, B

2. Explain the connection between the chromosomal theory of inheritance and predictions of outcomes of crosses based on Mendelian genetics. A, B

3. Explain deviations in Mendelian ratios based on multiple alleles, lethal alleles, multiple genes, penetrance, expressivity and linkage. A, B

4. Compare results of genetic crosses with predicted ratios and evaluate significance of deviations using chi square analysis. B

5. Distinguish between mutations in somatic versus germ line cells and their impact on the individual and species. A

6. Predict the impact of silent, frameshift, deletion and insertion mutations within a gene. A, B

7. Compare and contrast mutations affecting chromosomal structure and number. A

8. Distinguish among various methods of genetic recombination in microorganisms: conjugation, transformation, transduction. A

9. Discuss the use of recombination in microorganisms as a tool in mapping both prokaryotic and eukaryotic genomes. A, B

10. Explain the interactions among DNA, RNA and proteins in the Central Dogma of Molecular Biology. A, C

11. Discuss the steps involved in recombinant DNA techniques: restriction enzyme digestion, gel electrophoresis, restriction mapping, cDNA libraries, DNA libraries, Southern, Northern and Western blotting, cloning, DNA sequencing, RFLP mapping, DNA fingerprinting and PCR. A, B, D

12. Compare and contrast the structure of prokaryotic and eukaryotic DNA. A

13. Identify factors involved in changing allelic frequencies in populations: natural selection, mutation, inbreeding, genetic drift, immigration. A, B

14. Calculate allelic frequencies using Hardy-Weinberg equilibrium. B

15. Discuss the role of transposable genetics elements in retroviruses, bacteria and eukaryotes. A
16. Identify sources of extrachromosomal inheritance and discuss classic examples of mitochondrial and chloroplast genes. A, C

17. Gather, organize and interpret genetic data, presenting the results in a formal laboratory report. B, C

*Letters after performance expectations reference the course objectives listed above.

V. Evaluation:

A. Testing Procedures: 50% of grade (600 points)

Five exams, each worth 100 points, will be given during the semester. If an exam is missed, there will be no make-up exam. The student will receive a 0 for a missed exam. The lowest of these exam scores will be dropped.

A final exam, consisting of 100 points over new material (not covered on previous exams) and 100 points comprehensive, will also be given.

Exams will consist of a combination of essay, short answer, problem solving, matching and multiple choice questions. Essays will be evaluated on organization as well as content. Calculators may be used in the exams.

B. Laboratory Expectations: 33% of grade (400 points)

Participation in laboratory exercises is mandatory. The laboratory grade will be determined as follows:

- Formal Lab Report on Drosophila Genetics: 100 points
- Lab Report on Cloning: 40 points
- Lab Report on Southern Blot: 40 points
- Lab Manual: 140 points
- Lab Practical: 50 points
- Technique, teamwork, effort, safety: 30 points

Total: 400 points

Lab Reports: Students will be required to submit three formal lab reports in addition to their original data sheets. It is absolutely essential that a lab log be maintained. The lab reports should include a title, introduction (in which the purpose of the experiment is explained), materials and methods, results and a discussion. Appendices must be included for data sheets and calculations. Plagiarism of others’ work will not be tolerated. ANY LAB REPORT THAT IS LATE WILL BE DOCKED 5% CREDIT PER DAY, INCLUDING WEEKENDS!!

Lab Manual: Data sheets for each laboratory exercise are to be completed in lab. ALL information is to be completed unless otherwise specified in lab. These should be completed in pen, and must be legible to receive credit. These sheets will be removed from the lab manual and turned in at the beginning of lab the week following completion of the lab.

Lab Practical: The laboratory practical will consist of questions involving analysis of data and interpretation of results. There will be a number of genetics problems on the exam, including mapping of genes and restriction site mapping. These problems will be similar to assignments completed in lab. Calculators are permitted during the laboratory practical.

C. Field Work: 16.7% of grade (200 points)

Problem sets and library reading assignments will be given throughout the semester. These will be due at the BEGINNING of class on the due date. Unless otherwise indicated, late assignments will be docked 10% per day, including the day the assignment is due. These assignments will be worth a total of 200 points.

Problem Sets: Genetics is a field which can best be understood through analysis of data and problem solving. It requires active involvement rather than passive learning. To ensure that students have a solid grasp of the concepts, problems from the book and other sources will be
assigned. Frequently assignments will be made at the end of one class and will be due at the beginning of the next class period. Students who miss a class are responsible for obtaining and completing the assignment before the next class period. Late assignments will not be accepted.

**Library Assignments:** There will be occasional reading assignments from books or journals which will be placed on reserve in the library. Students will be asked to write a summary of the article and frequently will be asked to respond to the information as well.

**Research Paper:** In addition to understanding the facts of science, students need to be exposed to the methods of science. Many discoveries in genetics have resulted from the unique personalities of the geneticists involved. Students will be asked to select their favorite geneticist and write a three page, typed, double spaced bibliographic sketch of the scientist. This paper may include, but is not limited to, information on the scientist’s family background, education, personality, accomplishments and what led the scientist to a career in genetics. A minimum of three sources must be consulted, and in text references and a bibliography must be included. Additional information on the format of the paper will be provided in class.

D. Other Evaluation Methods:

   None

E. Grading Scale:

   The final grade will be based on the accumulation of points from both lecture and lab, which will then be divided by the total number of points (1200).

   90 -100    A
   87 - 89    B+
   80 - 86    B
   77 - 79    C+
   70 - 76    C
   60 - 69    D
   Below 60   F

VI. Policies:

A. Attendance Policy:

   Pellissippi State Technical Community College expects students to attend all scheduled instructional activities. As a minimum, students in all courses must be present for at least 75 percent of their scheduled class and laboratory meetings in order to receive credit for the course.

B. Academic Dishonesty:

   Plagiarism is any form of using another person’s words or ideas without giving proper credit. Plagiarism includes, though is not limited to, the following:
   - Copying sentences from a source without putting them in quotes and citing the source.
   - Borrowing a sentence from another author and simply substituting a few synonyms or rearranging the order of the sentence.
   - Copying from another student.
   Plagiarism is a form of mental laziness and will not be tolerated. Any plagiarized assignments will receive an automatic 0 and may not be dropped or replaced by resubmitting the assignment. Second offenses will result in an automatic failure of the course.

C. Other Policies:
Late Assignments: Unless otherwise noted, late assignments will be docked 10% per day.
Use of E-mail: Consistent with PSTCC’s mission to utilize technology in the classroom, review sheets for exams, extra credit assignments and other class announcements will be sent to your school e-mail address. It is to your advantage to learn to utilize your school e-mail account. Should you have a computer and modem at home, and you wish to either forward your school mail to your home computer or access your school account from home, you may obtain instructions in the open computer lab (ERC 315). The technician at the front desk can also provide direction if you have never used your school account. If you experience continuing problems with accessing your account, please see the instructor.