Tompkins Cortland Community College

Master Course Syllabus

Course Discipline and Number: BIOL 205 **Year: 2024-2025**

Course Title: General Genetics **Credit Hours: 3**

Attendance Policy: *To maintain good grades, regular attendance in class is necessary. Absence from class is considered a serious matter and absence never excuses a student from class work. It is the responsibility of all instructors to distribute reasonable attendance policies in writing during the first week of class. Students are required to comply with the attendance policy set by each of their instructors. Students are not penalized if they are unable to attend classes or participate in exams on particular days because of religious beliefs, in accordance with Chapter 161, Section 224-a of the Education Law of the State of New York. Students who plan to be absent from classroom activity for religious reasons should discuss the absence in advance with their instructors. See college catalog for more information.*

Services for Students with Disabilities: *It is the College's policy to provide, on an individual basis, appropriate academic adjustments for students with disabilities, which may affect their ability to fully participate in program or course activities or to meet course requirements. Students with disabilities should contact the Coordinator of Access and Equity Services, to discuss their particular need for accommodations. All course materials are available in alternate formats upon request.*

Course Description

Intended for students pursuing careers in the biological or health sciences. Fundamental principles in Mendelian genetics, chromosomal function, structure, and expression are covered. Current topics including population genetics, mutation and evolution, cancer, and application of molecular genetics in the biomedical sciences are discussed. Computer access is required for bioinformatic activities. Corequisite: BIOL 206. Prerequisites: BIOL 104 or equivalent; MATH 095 or MATH 098 and RDNG 116 if required by placement testing; prior completion or concurrent enrollment in ENGL 101. 3 Cr. (3 Lec.) Fall semester.

Course Context/Audience

This course will help prepare a student for transfer to a baccalaureate level program in the natural, life, and health sciences. Upon completion of advanced studies, he/she will be qualified for a broad range of careers in the medical, biological, forensic, agricultural, etc., fields. The subject matter of the course is fundamental principles of Mendelian genetics, non-Mendelian genetics, chromosomal structure and function, and application of molecular genetics in the life sciences. Advanced studies require advanced learning skills, and this course tests the students' abilities for comprehension, analysis, and application that are developed through complex problem solving. Students' demonstrated mastery of the subject matter reflects on their capacity to succeed in a 4-year degree program.

Basic Skills/Entry Level Expectations

Writing:	WC	College level writing skills are required. See course co-requisites or pre-requisites.
Math:	M3	MATH 095 or MATH 098 if required by placement testing.
Reading:	R4	Before taking this course, students must satisfactorily complete RDNG 116 or have assessment indicating that no reading course was required.
Other:		Demonstrated ability for independent study, i.e., pursuit of extracurricular knowledge.

Course Goals

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

1. Explain the principles of Mendelian and non-Mendelian genetics.
2. Show his/her basic level of understanding of chromosomal function, structure, and expression.
3. Explain how mutations at the genetic level are related to evolution, cancer, and disease.
4. Demonstrate skills of independent study.
5. Explain how the principles of molecular genetics are applied to current problems in the social and medical sciences.

Course Objectives/Topics

Objective/Topic	% Course
Students will understand the fundamentals of genetics; principles of Mendelian and non-Mendelian genetics.	30%
Students will be able to describe the function of the chromosome, its structure and expression	20%
Students will understand how molecular genetic techniques are applied in the biomedical and life sciences.	15%
Students will understand the genetic influence on disease and cancer.	15%
Students will appreciate the significance of population genetics and evolution.	10%
Students will demonstrate independent study through completion of an outside group project.	10%

General Education Goals - Critical Thinking & Social/Global Awareness

CRITICAL THINKING OUTCOMES	HOW DOES THE COURSE ADDRESS THE OUTCOMES (Include required or recommended instructional resources, strategies, learning activities, assignments, etc., that must or could be used to address the goal/outcomes)
Students will be able to ➢ develop meaningful questions to address problems or issues. ➢ gather, interpret, and evaluate relevant sources of information. ➢ reach informed conclusions and solutions. ➢ consider analytically the viewpoints of self and others.	Students will learn the basis of heredity and how this impacts modern developments in molecular biology to detect, cure & prevent disease and explore new boundaries of science. After review of each chapter, the instructor should pose a query to the students about the concept's impact on our understanding of life and how this will be applied in the near future. Students are required to research outside resources relevant to topics in genetics. The instructor should require the students to choose a topic relevant to the field of applied genetics and develop a lecture presentation. Based on case scenarios students must delineate their thought process to defend their perspective based on fact, not emotion. At select times, the instructor should bring into discussion 'hot topic' issues (e.g. biotech, cloning, personalized medicine) and have students rationally defend their ideas. Students are exposed to the perspective of others, using the same facts to defend their ideas. The instructor should play the devil's advocate and be sure both sides of the 'issue' are represented or discussed. He/she should take to the extreme the current thinking of both sides of an issue (good and bad).
SOCIAL/GLOBAL AWARENESS OUTCOMES	**HOW DOES THE COURSE ADDRESS THE OUTCOMES** (Include required or recommended instructional resources, strategies, learning activities, assignments, etc., that must or could be used to address the goal/outcomes)

➢ Students will begin to understand how their lives are shaped by the complex world in which they live.	Rooted in genetics, students learn how man is now “God of their own domain” and with the advent of modern techniques the general layperson is “afraid of what they don’t understand.” During the review of each chapter, the instructor should discuss how important ground breaking discoveries in genetics ‘upset’ the social norm of the day and led to a greater understanding of our place in this biosphere. Based on the principles of heredity students gain an understanding of where we originated (evolved), how current molecular techniques can identify various ‘gene pools’ and the term ‘carrier’ does not always imply genetic defects. Students learn that basically all behaviors are a result of some genetic influence. During the review of principles of sexual reproduction and inheritance the instructor should have students discuss and project what a good ‘mating partner’ would possess. Where do they see the ‘human race’ in 50, 100, 1000 years out.
➢ Students will understand that their actions have social, economic and environmental consequences.	Students learn that the most significant advances in medicine are now based on genetic principles and entire industries are developing around them. The instructor should discuss the exponential growth in genetics starting with completion of the 7 yr HGP that cost $3 billion in 2000, to now having your personal genome sequenced within 3 months for $1000. From an evolutionary perspective students learn that ‘survival of the fittest’ refers to reproductive success on a long-term basis and that current recombinants are short term dead ends. During discussion on recombinant engineering and GMO’s, the instructor should bring to light that man made recombinants do not possess the genetic diversity to survive evolutionary constraints in terms of millennium.

Instructional Methods

Genetics is generally based on the fundamental principles of Mendelian genetics. The subject matter should be introduced from the perspective of inherited traits with gradual introduction of the molecular basis of inheritance. Advancements in molecular genetics as applied to the fields of biotechnology and medicine should also be expanded upon in detail.

Genetics requires a knowledge of basic facts and an understanding of how the underlying principles relate to their application. Reiteration and redundancy of fundamental principles may lead to acquired knowledge, but a strong emphasis on application of these principles toward problem solving is more appropriate. The use of case studies as a teaching tool is appropriate. Lectures should be designed to reinforce textbook material as it applies toward developing problem solving skills. Exams for each section should be designed to test for some recall of basic factual information, but the emphasis should be on testing the students' understanding of theory and the application of fundamental principles. Testing can be in the form of take home exams where the student must formulate their own unique solutions to the proposed problem. A comprehensive final exam should emphasize important fundamental principles of genetics.

To further enhance the learning experience and entice independent study, it is recommended that the instructor award credit for completion of outside class projects, either individually or as groups. Students should be encouraged to explore other venues, but they should always be required to follow a planned experimental method, to see “what would happen if” and how can it be tested.

Methods of Assessment/Evaluation

Method	**% Course Grade**
Worksheets	20%
Tests	30%
Participation	10%
Presentation	10%

Final Exam	30%

Text**(s)**
Concepts of Genetics, 9/E' Klug, Cummings, Spencer, and Palladino , Pearsall Publishing Company ISBN-10: 0321524047

Bibliography
Science published weekly by the American Association for the Advancement of Science, 1200 New York Avenue, NW, Washington, DC 20005 (www.sciencemag.org)

Nature Reviews- Genetics, Nature Publishing Group, (Macmillan Publishers Ltd), monthly periodical
Principles of Biochemistry, Lehninger, A.L., Nelson, D.L., and Cox, M.M., 3rd edition, © 1999: Worth, New York

Gene, Elsevier publishing, monthly journal

Other Learning Resources

Audiovisual
No resources specified

Electronic:
National Center for Biotechnology Information data base at http://www.ncbi.nlm.nih.gov/

BIOLINK http://www.bio-link.org/index.htm

The National Center for Case Study Teaching in Science Case Collection

http://ublib.buffalo.edu/libraries/projects/cases/ubcase.htm

Other
A course management site such as ANGEL should be used to post the course syllabus, outline, course materials and related links.