TAFTCOLLEGE

Biology (BIOL) 2201 Introductory Biology - Cells (4 Units) CSU: UC
[formerly Biology 2]

Prerequisites or Co-requisites: Successful completion of Chemistry 2211with a grade of C or better; eligible for or successful completion of Math 1060 with a grade of 'C' or better

Advisories: Eligible for English 1500

Prerequisite knowledge/skills: Before entering the course, the student should be able to:

1. understand, explain, and demonstrate the logical problem-solving methods of chemistry,
2. understand pertinent examples, analogies, and special topics used to introduce and illustrate basic chemical concepts,
3. analyze the fundamentals of chemical science and thus enhance his understanding of the physical environment around him,
4. identify the way science solves problems and apply the use of the scientific method,
5. understand the basic concepts of chemistry so that he/she will be adequately prepared to continue the study of more advanced chemistry classes,
6. identify numbers as belonging to specified sets, and graph discrete and continuous sets of real numbers,
7. perform the basic arithmetic operations with positive and negative real numbers, plus raising to powers,
8. know and apply the rules of exponents and the order of operations in algebraic calculations,
9. apply the properties of addition and multiplication for real numbers and identify their use in practice,
10. solve linear equations and inequalities in one variable, and analyze and solve applications leading to such equations or inequalities,
11. solve and graph the solutions of compound inequalities or absolute value inequalities in one variable,
12. perform addition, subtraction, multiplication and division of polynomials,
13. factor simple polynomials, with special emphasis on trinomials quadratic in form, and solve related polynomial equations,
14. add, subtract, multiply and divide rational algebraic expressions, and simplify to lowest terms,
15. solve equations involving rational algebraic expressions, and analyze and solve word problems leading to such equations,
16. simplify radical expressions involving numbers and/or variables,
17. use fractional exponents,
18. perform addition, subtraction, multiplication and division of expression involving radicals and complex numbers and simplify the results, including rationalization of denominators,
19. solve equations that involve radicals,
20. solve quadratic equations in one variable, and equations quadratic in form, by factoring, completing the square, and the quadratic formula,
21. analyze and solve application problems requiring the use of quadratic equations,
22. solve and graph quadratic inequalities in one variable,

23. graph points in the rectangular coordinate system, and straight lines from ordered pairs obtained from its equation,
24. determine the slope of the line between any specified pair of points,
25. know the slope forms of the equation of a straight line, and be able to determine the equation of a particular straight line from specified input information,
26. solve and graph linear inequalities in two variables,
27. solve linear systems of equations in two or three variables algebraically, and solve those in two dimensions graphically,
28. analyze and solve application problems requiring the use of linear systems of equations in two or three variables,
29. evaluate determinants and use them to solve linear systems of equations,
30. determine whether or not a specified relation is a function,
31. for a function, compute the value of the function given the value of the independent variable, and be able to construct the inverse of simple functions in numeric or algebraic terms,
32. identify the quadratic equation representing a specific conic section, and be able to draw the graph of a conic section by analyzing its equation, or to write the equation of a specified conic section,
33. solve nonlinear systems of equation involving the intersection of two conic sections or a conic section and a straight line,
34. compute and graph specified exponential and logarithmic functions,
35. know the properties of logarithms (product, quotient, power and change of base rules) and be able to use them in practical numerical computations using a table of common logarithms or a calculator, and
36. solve simple exponential and logarithmic equations.

Hours and Unit Calculations:
48 hours lecture (96 Outside of class hours); 59 hours lab (203 Total Student Learning Hours) 4 Units

Catalog Description: This course, intended for Biology majors, will cover principles and applications of prokaryotic and eukaryotic cell structure and function, biological molecules, homeostasis, cell reproduction and its controls, molecular genetics, classical/Mendelian genetics, cell metabolism including photosynthesis and respiration, and cellular communication. The philosophy of science, methods of scientific inquiry and experimental design are foundational to the course. C-ID: BIOL 190; BIOL 135S

Type of Class/Course: Degree Credit

Text: Freeman, Scott, et al. *Biological Science.* 7th ed., Pearson, 2016.

Hofman, Angelika H. *Writing in the Biological Sciences: A Comprehensive Resource for Scientific Communication*, 3rd ed., Oxford UP, 2018.

Hofmann, A. *Writing in the Biological Sciences*. 3rd ed. New York: Oxford University Press, 2019.

Laboratory Manual:
Golling, G. *BIOL 2201 Cell Biology Lab Manual*. Version 1.2. Taft, 2019.

Course Objectives:

By the end of the course, a successful student will be able to:

1. Identify and describe biological molecules and cell structures and explain their functions

2. Compare and contrast cellular processes and interactions between prokaryotes and eukaryotes (including metabolism, reproduction, communication)
3. Apply the principles of classical and molecular genetics to solve problems in genetics or biotechnology.
4. Relate evolutionary processes to the origin and evolution of cells.
5. Explain how DNA replicates and transmits genetic information within organisms.
6. Apply the processes of scientific inquiry and experimental design to the study of biological concepts.
7. Acquire, read, evaluate, apply and cite scientific literature
8. Practice scientific writing

Means of Achieving Course Objectives:

1. Assigned reading from text and selected references
2. Lecture and demonstrations given by instructor
3. Solve basic genetics problems
4. Hands-on laboratory molecular biology techniques

Course Scope and Content Lecture:

Unit I Biology and the Tree of Life
  A. Cell Theory
  B. Theory of Evolution
  C. Tree of Life
  D. Scientific Inquiry in Biology

Unit II The Molecules of Life
  A. The Atoms and Molecules of Ancient Earth
  B. Molecular Evolution
  C. Protein Structure and Function
  D. Nucleic Acids and the RNA World
  E. An Introduction to Carbohydrates
  F. Lipids, Membranes, and the First Cells

Unit III Cell Structure and Function
  A. Structure and Function of Prokaryotic Cells
  B. Structure and Function of Eukaryotic Cells
  C. Organelle Structure and Function
  D. Cell-Cell Interactions
  E. Cellular Transport
  F. Cellular Respiration and Fermentation
  G. Photosynthesis
  H. The Cell Cycle

Unit VI Gene Structure and Expression
  A. Meiosis
  B. Mendel and the Gene
  C. DNA Synthesis
  D. How Genes Work
  E. Transcription and Translation
  F. Control of Gene Expression in Bacteria

G. Control of Gene Expression in Eukaryotes
H. Analyzing and Engineering Genes
I. Biotechnology

Course Scope and Content Laboratory:

Unit I   Basic Methods
   A. Measurements
   B. Scientific Design

Unit II   Enzymes
   A. Enzyme Kinetics
   B. Enzyme Inhibitors

Unit III   Macromolecules
   A. Nucleic Acids
   B. Carbohydrates
   C. Proteins

Unit IV   Diffusion and Osmosis
   A. Diffusion Rates
   B. Calculating Osmolarity
   C. Tonicity of Solutions

Unit V   Statistical Analysis
   A. Mean
   B. Standard Deviation
   C. Confidence Intervals
   D. Statistical Significance

Unit VI   Organelles
   A. Microscopy
   B. Simple Staining

Unit VII   Fermentation
   A. Carbohydrate Metabolism
   B. Factors Affecting Fermentation Rates

Unit VIII   Photosynthesis
   A. Light Effects
   B. O_2 and CO_2 Measurements
   C. Pigment Absorption Spectra

Unit IX   Mitosis and Meiosis
   A. Onion Root Tip Preparation
   B. Drosophila Larval Brain Preparation

Unit X   Genetics

A. Genetic Cross Problems
B. Analysis of *Drosophila melanogaster* mutants

Unit XI   Molecular Biology
A. Polymerase Chain Reaction
B. Restriction Enzyme Analysis
C. Gel Electrophoresis
D. Bacterial Transformation

All laboratory components are hands-on activities that support the learning goals of this course. Utilizing principles presented in lecture, students will perform several techniques related to the study of cellular biology.

Learning Activities Required Outside of Class:

The students in this class will spend a minimum of 6 hours per week outside of the regular class time doing the following:

1. Studying,
2. Answering questions,
3. Reading of textbook and lab manual, and
4. Completing written lecture and lab assignments.

Methods of Instruction:

1. Lectures,
2. Class discussions,
3. Multimedia presentations, and
4. Hands-on molecular biology laboratory techniques and critical analysis of results.

Methods of Evaluation:

1. Proctored, closed book/closed note unit examinations approximately every 4 weeks. The exams consist of multiple choice, matching, and essay type questions.
2. Scientific research paper
3. Weekly quizzes
4. Analysis and evaluation write-ups of laboratory exercises.

The grading is based on the mastery of the subject matter.

Laboratory Category: Extensive Laboratory

Pre delivery criteria: All of the following criteria are met by this lab.
1. Curriculum development for each lab.
2. Published schedule of individual laboratory activities.
3. Published laboratory activity objectives.
4. Published methods of evaluation.
5. Supervision of equipment maintenance, laboratory setup, and acquisition of lab materials and supplies.

During laboratory activity of the laboratory: All of the following criteria are met by this lab.

1.   Instructor is physically present in lab when students are performing lab activities.
2.   Instructor is responsible for active facilitation of laboratory learning.
3.   Instructor is responsible for active delivery of curriculum.
4.   Instructor is required for safety and mentoring of lab activities.
5.   Instructor is responsible for presentation of significant evaluation.

Post laboratory activity of the laboratory: All of the following criteria are met by this lab.

1.   Instructor is responsible for personal evaluation of significant student outcomes (lab exercises, exams, practicals, notebooks, portfolios, etc.) that become a component of the student grade that cover the majority of lab exercises performed during the course.
2.   Instructor is responsible for supervision of laboratory clean up of equipment and materials.

Supplemental Data:

TOP Code:	040100: Biology, General
SAM Priority Code:	E: Non-Occupational
Funding Agency:	Y: Not Applicable(funds not used)
Program Status:	1: Program Applicable
Noncredit Category:	Y: Not Applicable, Credit Course
Special Class Status:	N: Course is not a special class
Basic Skills Status:	N: Course is not a basic skills course
Prior to College Level:	Y: Not applicable
Cooperative Work Experience:	N: Is not part of a cooperative work experience education program
Eligible for Credit by Exam:	NO
Eligible for Pass/No Pass:	C: Pass/No Pass

Taft College General Education:	CSB2: CSU Area B2 CSB3: CSU Area B3 IG5B: IGETC Area 5B IG5C: IGETC Area 5C LNS: Local GE Natural Science
Discipline	Biological Sciences