

BIO 2.1 Course Outline as of Fall 2024**CATALOG INFORMATION**

Dept and Nbr: BIO 2.1 Title: FUND BIO: CELL
 Full Title: Fundamentals of Biology (Cell and Molecular)
 Last Reviewed: 8/14/2023

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	5.00	Lecture Scheduled	3.00	17.5	Lecture Scheduled	52.50
Minimum	5.00	Lab Scheduled	6.00	8	Lab Scheduled	105.00
		Contact DHR	0		Contact DHR	0
		Contact Total	9.00		Contact Total	157.50
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 105.00

Total Student Learning Hours: 262.50

Title 5 Category: AA Degree Applicable

Grading: Grade Only

Repeatability: 00 - Two Repeats if Grade was D, F, NC, or NP

Also Listed As:

Formerly: BIO 3

Catalog Description:

Students will study the following topics: cell structure and function, origin, evolution and diversity of cells, biochemistry, metabolism, Mendelian and molecular genetics, cell regulation, cell differentiation, and evolutionary development. This course is intended for students majoring in biological sciences, pre-medical, or related pre-professional programs.

Prerequisites/Corequisites:

Course Completion of CHEM 3A AND CHEM 3AL; OR CHEM 1A; OR CHEM 4A; AND
 Course Completion of BIO 10; AND ENGL 1A OR EMLS 10 (formerly ESL 10)

Recommended Preparation:**Limits on Enrollment:****Schedule of Classes Information:**

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(Grade Only)

Prerequisites/Corequisites: Course Completion of CHEM 3A AND CHEM 3AL; OR CHEM 1A; OR CHEM 4A; AND Course Completion of BIO 10; AND ENGL 1A OR EMLS 10 (formerly ESL 10)

Recommended:

Limits on Enrollment:

Transfer Credit: CSU;UC.

Repeatability: Two Repeats if Grade was D, F, NC, or NP

ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

AS Degree:	Area		Effective:	Inactive:
	C	Natural Sciences	Fall 1981	

CSU GE:	Transfer Area		Effective:	Inactive:
	B2	Life Science	Fall 1981	
	B3	Laboratory Activity		

IGETC:	Transfer Area		Effective:	Inactive:
	5B	Biological Sciences	Fall 1981	
	5C	Fulfills Lab Requirement		

CSU Transfer:	Transferable	Effective:	Fall 1981	Inactive:
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UC Transfer:	Transferable	Effective:	Fall 1981	Inactive:
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CID:

CID Descriptor:BIOL 190 Cell and Molecular Biology

SRJC Equivalent Course(s): BIO2.1

Certificate/Major Applicable:

Both Certificate and Major Applicable

COURSE CONTENT

Student Learning Outcomes:

At the conclusion of this course, the student should be able to:

1. Apply the scientific method to develop hypotheses and use lab skills to investigate these hypotheses by measuring biological phenomena and analyzing the resulting data. Generate lab reports in formal scientific paper format.
2. Demonstrate proficiency in a variety of standard laboratory techniques and equipment, which are used for the study of cells, DNA, and proteins.
3. Explain and provide supporting evidence for the major concepts of cell biology, and be able to integrate these concepts using an evolutionary perspective.

Objectives:

At the conclusion of this course, the student should be able to:

1. Use the scientific method to develop and test hypotheses.
2. Explain current hypotheses on the diversity, origins, and evolution of cellular life.
3. Differentiate the structure and function of prokaryotic and eukaryotic cells.
4. Relate the properties of biochemical macromolecules to the structure and function of cell membranes and organelles.
5. Compare and contrast the mechanisms of cell respiration and photosynthesis.

6. Describe the transmission of genetic information and how it relates to principles of evolution.
7. Explain the molecular flow of information from DNA to RNA to protein.
8. Explain cell regulation based both on control of gene expression and on signal reception and transduction.
9. Explain current biotechnologies, including CRISPR cas9 gene editing, and their uses.
10. Use the microscope proficiently and perform a variety of standard laboratory techniques used for the study of cells, DNA, and proteins.
11. Analyze and present student-generated data using formal scientific paper format.

Topics and Scope:

I. Introduction to Biology

- A. Characteristics of life
- B. Biological levels of organization
- C. Disciplines of biology
- D. Scientific method
- E. Evolution and biological thought
- F. Cell theory and origins of cells

II. The Chemistry of Life

- A. Atoms and molecules
- B. Water and carbon
- C. Biochemistry
- D. Chemical reactions

III. Cell Structure and Function

- A. Evolution, classification, and diversity of cells
- B. Compare and contrast Archaea, Bacteria, and Eukarya
- C. Cytoskeleton and organelles
- D. Cell membranes and transport
- E. Bioenergetics and enzymes
- F. Signal transduction pathways

IV. Energy Flow in Cells

- A. Cell respiration reactions
- B. Photosynthesis reactions

V. Information Flow in Cells

- A. Cell reproduction: mitosis and meiosis
- B. Inheritance: genes and chromosomes
- C. Structure, replication, mutation, and repair of DNA
- D. Gene expression: transcription, RNA processing, and translation
- E. Genetic regulation: epigenetics, and transcriptional and post-transcriptional regulation
- F. Cell Cycle

VI. Cell Differentiation and Evolutionary Development

VII. Biotechnology

VIII. Laboratory Exercises

- A. Molecular model building
- B. Microscopy and cell structure, diversity, and adaptation
- C. Statistical analysis of data
- D. Enzyme activity
- E. Ames and toxicity tests
- F. Bacterial transformation
- G. Recombinant DNA technology
- H. Gel electrophoresis of DNA
- I. Polymerase chain reaction

J. Student-designed original experiments

Assignment:

Lecture-Related Assignments:

1. Weekly reading in text (30-60 pages per week)
2. Formal assessment (that include objective and essay questions):
 - A. Exams (3-4)
 - B. Cumulative final exam

Lab-Related Assignments:

1. Formal assessment:
 - A. Quizzes (4-15)
 - B. Lab practical examination (microscope and/or micropipettor use)
2. Lab reports and homework, such as:
 - A. Calculation,
 - B. Graphing,
 - C. Data analysis,
 - D. Explanation of ideas
3. Original group research projects presented as a scientific paper and research poster, may include:
 - A. Calculation
 - B. Graphing
 - C. Data analysis
 - D. Explanation of ideas

Methods of Evaluation/Basis of Grade:

Writing: Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

Group research paper and poster; lecture formal assessment

Writing
15 - 30%

Problem Solving: Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Lab reports and homework

Problem solving
0 - 20%

Skill Demonstrations: All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

Lab formal assessment

Skill Demonstrations
0 - 4%

Exams: All forms of formal testing, other than skill performance exams.

Exams and quizzes

Exams
60 - 70%

Other: Includes any assessment tools that do not logically fit into the above categories.

Group presentation; student participation

Other Category
0 - 10%

Representative Textbooks and Materials:

Campbell Biology. 12th ed. Urry, Lisa, Cain, Michael, Wasserman, Steven, Minorsky, Peter and Orr, Rebecca. Pearson. 2021.

Essential Cell Biology. 6th ed. Alberts, Bruce, Johnson, Alexander, Hopkin, Karen, Morgan, David, Roberts, Keith, Walter, Peter and Heald, Rebecca. W.W. Norton & Company, Inc. 2023.

Instructor prepared lab manual