BIO 2.1 Course Outline as of Fall 2021

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:
Cell structure and function, origin, evolution and diversity of cells, biochemistry, metabolism, Mendelian genetics, molecular genetics, cell regulation, cell differentiation and evolutionary development. Intended for students majoring in biological sciences, pre-medical or related pre-professional programs. (Formerly BIO 1.3, BIO 3)

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 ESL 10)

Recommended Preparation:

Limits on Enrollment:

Schedule of Classes Information:
Description: Cell structure and function, origin, evolution and diversity of cells, biochemistry, metabolism, Mendelian genetics, molecular genetics, cell regulation, cell differentiation and evolutionary development. Intended for students majoring in biological sciences, pre-medical or related pre-professional programs. (Formerly BIO 1.3, BIO 3) (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 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:
UC Transfer:	Transferable	Effective:	Fall 1981	Inactive:

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 (without assistance or instruction) 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 through sexual and asexual reproduction and the inheritance of traits via Mendelian genetics.
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 how cells become differentiated during the processes of embryogenesis and development, and how the mechanisms of cellular differentiation contribute to evolutionary change.
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. Archaea vs Bacteria vs 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. Mendelian genetics
      1. Monohybrid crosses
      2. Dihybrid crosses
      3. Probability theory
      4. Sex-linkage, epistasis, multi-gene traits and pleiotropy
      5. Chi-squared analysis of genetic data
   D. Structure, replication, mutation and repair of DNA
   E. Transcription, RNA processing and translation
   F. Genetic regulation: epigenetics, transcriptional and post-transcriptional regulation
   G. Cell Cycle
VI. Cell Differentiation and Evolutionary Development
   A. Embryonic development
   B. Stem cells
   C. Generation of biological diversity
VII. Laboratory Exercises
   A. Molecular model building

B. Microscopy, cell structure, diversity and adaptation
C. Statistical analysis of data: chi square and probability theory
D. Enzyme activity
E. Drosophila monohybrid and dihybrid crosses
F. Chromatography of Drosophila eye color pigments
G. Bacterial transformation
H. Recombinant DNA technology
I. Gel electrophoresis of DNA
J. Polymerase chain reaction
K. Performance of student-designed original experiments

Assignment:

Lecture-Related Assignments:
1. Weekly reading in text, 30-60 pages per week
2. Original group research project, written as a scientific paper and presented. May include calculation, graphing and data analysis as well as explanation of ideas
3. Formal assessment: 3-4 midterm exams, including objective and essay questions, 1 lab practical examination, and 5-15 quizzes

Lab-Related Assignments:
1. Lab reports: may include calculation, graphing, data analysis, and 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.

Research paper and poster	Writing 15 - 30%

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

Lab reports and problem sets	Problem solving 0 - 20%

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

None	Skill Demonstrations 0 - 0%

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

Multiple choice, completion, essay questions, lab exams, quizzes	Exams 60 - 70%

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

Group presentation and student participation	Other Category 0 - 10%

Representative Textbooks and Materials:
Campbell Biology. 10th Ed. Reece, Jane and Urry, Lisa and Cain, Michael. Pearson. 2014
Essential Cell Biology. 4th Ed. Alberts, Bruce and Bray, Dennis and Hopkin, Karen. Garland Science. 2014
Instructor prepared lab manual