Las Positas College
3000 Campus Hill Drive
Livermore, CA 94551-7650
(925) 424-1000
(925) 443-0742 (Fax)

Course Outline for BIOL 1

INTRO TO CELL BIOLOGY

Effective: Spring 2010

I. CATALOG DESCRIPTION:
BIOL 1 — INTRO TO CELL BIOLOGY — 5.00 units

Basic principles of biology with emphasis on the experimental approach to solving modern problems in biology. Includes cell physiology, biochemistry, molecular genetics, DNA and evolution.

3.00 Units Lecture 2.00 Units Lab

Prerequisite
BIO 1B - General Zoology
with a minimum grade of C
or

BIO 1A - General Botany
with a minimum grade of C

ENG 1A - Critical Reading and Composition

Strongly Recommended
CHEM 1B - General College Chemistry II

PHYS 2A - Introduction to Physics I
and

Grading Methods:
Letter Grade

Discipline:

	MIN
Lecture Hours:	54.00
Lab Hours:	108.00
Total Hours:	162.00

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1

III. PREREQUISITE AND/OR ADVISORY SKILLS:

Before entering the course a student should be able to:

A. BIO1B
B. BIO1A
C. ENG1A

Before entering this course, it is strongly recommended that the student should be able to:

A. CHEM1B
B. PHYS2A

IV. MEASURABLE OBJECTIVES:

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

A. Explain structure and function of biologically important molecules;
B. Explain structure and function of cells and cell organelles;
C. Describe cell membrane structure, compare mechanisms of membrane transport, and discuss types of cell junctions;
D. Summarize enzyme structure and relate to function;
E. Describe the major steps of the cell cycle, mitosis and meiosis;
F. Compare and contrast aerobic and anaerobic respiration;
G. Identify cell signaling mechanisms, and explain signal transduction pathways;
H. Interpret genetic crosses, determine patterns of inheritance, explain examples of non-Mendelian inheritance, and solve genetics

problems;
I. Describe chromosome structure, explain the patterns of inheritance of sex chromosomes, and compare features of the prokaryotic and eukaryotic genomes;
J. Relate DNA structure to function, explain the gene concept and the genetic code, summarize steps of protein synthesis, compare and contrast effects of different types of mutations, and explain the molecular basis of cancer;
K. Explain and apply the major tools and techniques used in DNA technology, and discuss their practical applications;
L. Describe the molecular basis of hormone action, the action potential, muscle contraction, and antibody formation and action;
M. Summarize scientific evidence and theories of the origin of life on earth;
N. Define microevolution, explain Darwin's Theory of Natural Selection, discuss the scientific evidence for natural selection, be able to solve population genetics problems;
O. Define macroevolution and the concept of the species, explain mechanisms and scientific evidence for speciation.
P. Perform, document, explain, and interpret a variety of biochemistry, cell, and molecular techniques and experiments.

V. CONTENT:

A. Lecture
1. Biologically Important Molecules
    a. Carbohydrates
    b. Lipids
    c. Proteins
    d. Nucleic Acids
2. Cells and Organelles
    a. Structure
    b. Function
3. Cell Membranes
    a. Structure
    b. Transport across membranes
    c. Cell Junctions
4. Enzymes
    a. Structure
    b. Function
5. Cell Reproduction
    a. Cell cycle
    b. Mitosis and meiosis
6. Cellular Respiration
    a. Aerobic respiration
    b. Anaerobic respiration
7. Cell communication
    a. Cell signalling
    b. Signal transduction
8. Classical Genetics
    a. Patterns of inheritance
    b. Non-Mendelian inheritance
9. Chromosomal inheritance
    a. Chromosomal structure
    b. Sex chromosomes
    c. Genome structure
10. Molecular inheritance of Prokaryotes, Eukaryotes, and Viruses
    a. DNA structure and function
    b. Genetic code
    c. Structure of gene
    d. Protein synthesis
    e. Mutations and cancer
    f. Gene regulation
11. DNA Technology
    a. Restriction Enzymes
    b. Cloning and Vectors
    c. Hybridization
    d. PCR
    e. Sequencing
    f. Genomics
    g. Applications
12. Molecular and Cell Biology of Vertebrates
    a. Molecular basis of hormone action
    b. The action potential
    c. Muscle contraction
    d. Antibody formation and action
13. Origin of Life on Earth
    a. Scientific theories of the origin of life
14. Microevolutionary Processes
    a. Darwin and the theory of natural selection
    b. Scientific evidence for natural selection
    c. Population Genetics
15. Macroevolution
    a. Species definition
    b. Speciation and scientific evidence for speciation

B. Laboratory
1. Biologically Important Molecules
2. Cell structure
3. Cell surface receptors
4. Membrane transport
5. Enzyme kinetics
6. Cell Reproduction
7. Drosophila Genetics
8. Human Genetics
9. DNA Extraction
10. DNA Restriction and Analysis
11. Chromosome Isolation
12. Column Chromatography
13. Transformation and Cloning

14. Protein Isolation and Purification
15. Protein Gels
16. PCR Analysis
17. ELISA
18. Population Genetics

VI. METHODS OF INSTRUCTION:
A. **Discussion** -
B. **Lecture** -
C. Laboratory exercises
D. Articles from scientific literature
E. **Field Trips** -
F. **Projects** -
G. Audio-visual presentations
H. Laboratory experiments

VII. TYPICAL ASSIGNMENTS:
A. Isolate and prepare slide of Drosophila salivary gland chromosomes
B. Perform ethanol extraction of DNA from calf thymus gland and chemically test for presence of DNA.
C. Isolate human DNA, amplify Alu insertion locus using polymerase chain reaction, and determine genotype at locus.

VIII. EVALUATION:
A. **Methods**

1. Other:
   a. Quizzes, midterms, and final exam
   b. Laboratory reports, as appropriate
   c. Laboratory assignments (w/notebook checks), graded according to Discipline Standard
   d. Laboratory quizzes, graded according to Discipline Standard
   e. Laboratory practical examinations, graded according to Discipline Standard
   f. Field trip assignments, graded according to Discipline Standard
   g. Independent Research Project, graded according to Discipline Standard

B. **Frequency**

1. Quizzes, as appropriate; 3 to 4 midterms; and one final exam
2. Laboratory reports as appropriate
3. 20 – 30 Laboratory assignments (w/notebook checks) (may be bundled together)
4. 20 to 30 Laboratory quizzes
5. 3 to 4 Laboratory practical examinations
6. 2 to 4 Field trip assignments
7. 1 Independent research project per semester (e.g., Drosophila genetics)

IX. TYPICAL TEXTS:
1. Campbell, Neil A., and Jane B. Reece *Biology*. 8th ed., Benjamin Cummings, 2009.

X. OTHER MATERIALS REQUIRED OF STUDENTS: