I. Catalog Description
A course in principles of biology, with special emphasis given to molecular and cellular biology. Topics include the chemical basis of life, prokaryotic and eukaryotic cells, structure and function, cell metabolism, cellular communication, classical genetics, molecular genetics, and biotechnology. This course is designed to meet the core requirements for biology and related majors. (This course is the recommended preparation for Bio 4, Biol 20, and Biol 25.) This course has been approved for hybrid (online/traditional) delivery.

Prerequisite(s): Math 60 - Intermediate Algebra or the equivalent placement through the assessment process. Chemistry 1A

Prerequisite Skills Required:
Before entering this course, the student should be able to:
1. Develop a systematic logical approach to solving a variety of problems
2. Integrate mathematical computational and algebraic skills to solve and graph a variety of linear, exponential and logarithmic equations.
3. Demonstrate a basic understanding of atomic and simple molecular structure.

Transfers to both UC/CSU
CSU GE Area: B2
IGETC GE Area: 5A
C-ID BIOL 190
51 Hours Lecture, 51 Hours Lab
Scheduled: Fall, Spring

II. Coding Information
Repeatability: Not Repeatable, Take 1 Time
Grading Option: Graded or Pass/No Pass
Credit Type: Credit - Degree Applicable
TOP Code: 040100

III. Course Objectives
A. Course Student Learning Outcomes
Upon completion of this course the student will be able to:
1. Apply the scientific method by stating a question; researching the topic; determining appropriate tests; performing tests; collecting, analyzing, and presenting data; and finally proposing new questions about the topic.
2. Given a specific organic molecule, analyze the relationship between structure and the various functions within living cells.
3. Relate the structures and functions of various cellular organelles to the metabolic activities of a single selected prokaryotic or eukaryotic cell.
4. Analyze a single trait from both a classical and molecular genetics approach.
5. Correctly perform biological laboratory skills and display habits of good laboratory practices.
B. Course Objectives
Upon completion of this course the student will be able to:
1. List and describe the areas covered by: biology, cytology, anatomy, physiology, microbiology, genetics, and evolution, population biology.
2. List and describe the levels of organization (atomic-molecular through ecosystem and the biosphere).
3. List and discuss characteristics of living organisms.
4. Write a paragraph describing scientific method.
5. Describe atomic structure and diagram specified atoms from the given atomic number and weight.
6. List, define, and illustrate kinds of chemical bonds.
7. Describe the unusual properties of water.
8. Define acid, base, and discuss the meaning of pH.
9. Describe the basic structure and function of carbohydrates, lipids, proteins, and nucleic acids in living cells.
10. Describe the factors affecting the rate of chemical reactions.
11. Define and give examples of enzymes and the substrates upon which they act.
12. Differentiate the several ways that substances move across cell membranes.
13. State the cell theory in its contemporary form.
14. Describe the structure and function of primary organelles found in prokaryotic and eukaryotic cells.
15.
16. Describe the mechanisms of hormonal regulation of cellular activity.
17. Diagram photosynthesis including energy relationships and matter into and out of system.
18. Discuss the significance of photosynthesis to life on earth.
19. Describe fermentation and aerobic cellular respiration including energy relationships and matter into and out of each of the pathways.
20. Name the stages and describe the significant events in the processes of cell division (mitosis and cytokinesis) and reduction division (meiosis and cytokinesis).
21. Write a paragraph to explain Mendel's laws of: dominance, segregation, and independent assortment.
22. Cross"Drosophila"of varying traits in the lab and analyze the results.
23. Solve genetics problems dealing with monohybrid, dihybrid, sex-linked and multiple allelic crosses.
24. Describe DNA replication and building of a functional product from the DNA information.
25. Describe mechanisms of gene regulation.
26. Describe the lytic and lysogenic cycles of multiplication in viruses.
27. Describe recent advances in recombinant DNA technology.
28. Discuss sources of variation: mutation, recombination, sexual reproduction, etc.

IV. Course Content
The following topics may be included; however, the order of presentation, relative emphasis and the depth of treatment will depend on the preferences on the instructor.
A. Introduction to Biology
   1. Characteristics of Living Things
2. Levels of Organization
3. Science and Scientists and Scientific Inquiry
4. Evolution
   a. Origin of Life
   b. Molecular Evolution
   c. Cellular Evolution
B. Biochemistry
   1. Organic Molecules (carbohydrates, lipids, proteins, nucleic acids)
C. Cell Structure
   1. Membranes and Transport
   2. Organelles - structure and function
   3. Prokaryotic versus Eukaryotic Cell structure and function
D. Cellular communication
E. Bioenergetics
   1. Laws of Thermodynamics
   2. Central Role of ATP
F. Chemical Reactions
G. Enzymes (structure and function)
H. Enzymatic Pathways and Regulation
I. Photosynthesis
   1. Cyclic Photosynthesis
   2. Non-cyclic Photosynthesis
   3. Role in Cycling Elements
J. Metabolism
   1. Anaerobic Pathways
   2. Aerobic Cellular Respiration
K. Cellular Reproduction
   1. Asexual reproduction
   2. Sexual reproduction
L. Hereditary Principles
   1. Mendelian Genetics
   2. Golden Age of Classical Genetics
   3. Human Genetics
M. Molecular Genetics
   1. Nucleic Acids
   2. Protein Synthesis
   3. Gene Regulation
   4. Human Genome Research
N. Genetic Variation in Nature
   1. Sexual Reproduction
   2. Mutations
   3. Recombination
O. Recombinant DNA Technology
   1. Viral Multiplication
   2. History of Recombinant Technology
   3. Modern Techniques in Genetic Engineering
   4. Ethical Issues
Laboratory Content
A. Scientific Inquiry and Experimental Design
B. Introduction to Laboratory Equipment and Procedures
V. Assignments

A. Appropriate Readings
   Reading assignments which will be used to enhance the learning process may include, but are not limited to:
   1. Standard college level lecture and laboratory texts
   2. Scientific journals such as Scientific American and Science
   3. Electronic and other archival research on a variety of topics in biology
   4. Newspaper articles relevant to current topics in biology

B. Writing Assignments
   In order to successfully complete the course, students must demonstrate understanding of course content through writing assignment which may include, but are not limited to:
   1. Essay answers to questions on mixed format examinations
   2. Detailed scientific report on an experimental monohybrid genetic cross conducted by the student in the laboratory.
   3. Written analysis of weekly laboratory exercises in biology.

C. Expected Outside Assignments
   Examples of outside assignments may include, but are not limited to:
   1. Performance and analysis of an independent experiment in the field of classical genetics.
   3. Reading and writing assignments as specified in the course syllabus.
   4. Library and Learning Center: electronic and other archival research on a variety of topics in the field of biology.
   5. Read and summarize newspaper articles relevant to current topics in biology.

D. Specific Assignments that Demonstrate Critical Thinking
   This course presents many examples of the utilization of critical thinking by scientists for the advancement of scientific knowledge. Examples of assignments that demonstrate critical thinking may include, but are not limited to:
   1. Review of periodicals and newspapers
   2. Analysis and synthesis of information presented in the text and during lecture
   3. Analysis of an experiment in classical genetics
   4. Solution of a series of genetics problems
VI. Methods of Evaluation
The first day of class the instructor will provide each student with a written course syllabus indicating the evaluation procedures to be used.

Traditional Classroom Instruction
The formulation of a student grade will be based upon:
A. Performance on mixed-format including essay questions asking students to critically analyze topics discussed in class. Sample essay questions:
   1. Discuss the unique nature of the water molecule and its role in living systems.
   2. Interpret the significant factors provided by non-cyclic photosynthesis as they relate to the survival of living organisms (including ourselves) on this planet.
   3. Compare and contrast the metabolic processes utilized in the production of ATP in prokaryotic and eukaryotic cells.
   4. In humans sickle-cell anemia is caused by a recessive autosomal allele and color blindness is caused by a recessive sex-linked allele. Identify the possible offspring of a couple both heterozygous for sickle-cell anemia and both with normal vision, although the father of each was color-blind.
B. Performance on independent study laboratory exercise in genetics
C. Performance on laboratory exercises and write-ups of those exercises

Hybrid Delivery
A combination of traditional classroom and online evaluations will be used, such as (1) Traditional Classroom: objective examinations and essay examinations and (2) Online delivery: online quizzes, essay forum postings, chat rooms and email communications.

VII. Methods of Delivery
Check those delivery methods for which, this course has been separately approved by the Curriculum/Academic Standards Committee.

- Traditional Classroom Delivery
- Correspondence Delivery
- Interactive Television Delivery
- Online Delivery

Traditional Classroom Instruction
Methods of instruction may include, but are not limited to:
1. Lecture and computer assisted presentations
2. Computer generated tutorials
3. Laboratory
4. Discussion and problem solving performed in and outside class
5. Homework and extended projects
6. Collaborative projects

Hybrid Delivery
A combination of traditional classroom and online instruction will be utilized. Every week, one 150 minutes class period dedicated to laboratory will be taught face-to-face by the instructor and the other 150 minutes will be instructed online through the technology platform adopted by the District, currently Moodle. Traditional class instruction will consist of laboratories, examinations, and group presentations. Online delivery will
consist of participation in forum-based discussions and posts, web links, email communications, lecture posts, and online lectures.

VIII. Representative Texts and Supplies
Standard college level texts will be required.
Required text: In-house, Principles of Molecular & Cellular Biology Lab Workbook.

IV. Discipline/s Assignment
Biological Sciences

X. Course Status
Current Status: Active
Original Approval Date: 1/16/1990
Revised By: Susan G. Mouck
Curriculum/Academic Standards Committee Revision Date: 05/06/2014