College of San Mateo
Official Course Outline

1. **COURSE ID:** BIOL 110 **TITLE:** General Principles of Biology
   Units: 4.0 units **Hours/Semester:** 48.0-54.0 Lecture hours; 48.0-54.0 Lab hours; and 96.0-108.0 Homework hours
   Method of Grading: Letter Grade Only
   Recommended Preparation:
   Eligibility for ENGL 100, or Eligibility for ENGL 105

2. **COURSE DESIGNATION:**
   Degree Credit
   Transfer credit: CSU; UC
   AA/AS Degree Requirements:
   CSM - GENERAL EDUCATION REQUIREMENTS: E5a. Natural Science
   CSU GE:
   CSU GE Area B: SCIENTIFIC INQUIRY AND QUANTITATIVE REASONING: B2 - Life Science
   CSU GE Area B: SCIENTIFIC INQUIRY AND QUANTITATIVE REASONING: B3 - Laboratory Activity
   IGETC:
   IGETC Area 5: PHYSICAL AND BIOLOGICAL SCIENCES: B: Biological Science
   IGETC Area 5: PHYSICAL AND BIOLOGICAL SCIENCES: C: Science Laboratory

3. **COURSE DESCRIPTIONS:**
   Catalog Description:
   Study of the principles of the biological sciences, including methods of scientific inquiry and experimental design. The course includes the origin and evolution of life, cellular makeup of living things, cellular metabolism including photosynthesis and respiration, genetics, ecology, life cycles, and natural history. One or more field trips may be required. Extra supplies may be required. A materials fee in the amount shown in the Schedule of Classes is payable upon registration.

4. **STUDENT LEARNING OUTCOME(S) (SLO'S):**
   Upon successful completion of this course, a student will meet the following outcomes:
   1. Explain the principles of evolution that underlie all of biology.
   2. Describe relationships and dynamics in ecosystems.
   3. Relate molecular structure and function in cells and organisms.
   4. Describe the diversity of organisms.
   5. Follow instructions, work cooperatively using appropriate laboratory skills and the scientific method to investigate biological phenomena, evaluate current issues and solve both quantitative and conceptual problems in Biology.

5. **SPECIFIC INSTRUCTIONAL OBJECTIVES:**
   Upon successful completion of this course, a student will be able to:
   1. Explain the principles of evolution that underlie all of biology.
   2. Describe relationships and dynamics in ecosystems.
   3. Relate molecular structure and function in cells and organisms.
   4. Describe the diversity of organisms.
   5. Follow instructions, work cooperatively using appropriate laboratory skills and the scientific method to investigate biological phenomena, evaluate current issues and solve both quantitative and conceptual problems in Biology.

6. **COURSE CONTENT:**
   Lecture Content:
   1. Scientific method (1 lecture + numerous examples over semester)
   2. Characteristics of Life (1 lecture)
   3. Evolution-terms, fundamental concepts, examples (2-3 weeks + part of all topics)
      A. Landmarks in history of evolutionary theory; evidence for evolution
      B. Principle of Natural Selection
      C. Adaptations, populations, species, sympatric & allopatric speciation

D. Microevolution, macroevolution processes, mechanisms, importance of variation
E. Origin of Life: earth's history, chemical evolution, levels of organization
F. Prokaryotic and eukaryotic domains, kingdoms, evolutionary relationships; endosymbiont hypothesis of eukaryote evolution; evolution of multicellular organisms

4. Ecology-terms, fundamental concepts, examples (1-2 weeks)
   A. Community, abiotic, biotic environment, niche, producer, consumer, trophic levels
   B. Energy flow, mass cycles, food webs & pyramids
   C. Species interactions, coevolution
5. Chemistry (2-3 weeks + lab)
   A. Atomic and molecular structure
   B. Water chemistry, importance to living systems
   C. Molecules of cells; interactions with water, organic substances, basic structure and characteristics of carbohydrates, lipids, proteins, nucleic acids
   D. Proteins: diverse functions, information content/specificity
   E. Energy conversions: metabolic pathways, role of enzymes in cell metabolism
   F. Photosynthesis, Cellular respiration
6. Molecular Biology (2-3 weeks)
   A. DNA structure, replication
   B. RNA, genetic code
   C. Protein synthesis
   D. Mutation
7. Mendelian inheritance and population genetics: terms, fundamental concepts, examples (1 week + lab)
8. Cells (2 weeks + lab)
   A. General characteristics, prokaryotic structure, eukaryotic organelles
   B. Membrane structure and function; transport
   C. Cell division and organismal reproduction: asexual and sexual reproduction, mitosis, meiosis, haploid, diploid cells
9. Survey of domains and kingdoms (6 weeks)
   A. Metabolic diversity, roles in ecosystems, interactions with humans, of prokaryotes (Bacteria & Archaea), Eukarya: Protista, Fungi, Plants, Animals
   B. Advantages, problems of aquatic and terrestrial living for algae/plants, animals
   C. Plants: trends in evolution, characteristics of four major groups, seeds, flowers, fruits
   D. Animals: trends in evolution, characteristics of major phyla; Vertebrates trends in evolution, characteristics of classes

Lab Content:

Course content-laboratory topics (15-17 per semester)

1. Observation: Scientific Method
2. Use of the Microscope; Metric Units; Cells and tissues
3. Mitosis and Meiosis
4. Osmosis and Diffusion
5. Biochemistry, Nutrition
6. Metabolism: Enzymes, Fermentation, Respiration, Photosynthesis
7. Bacterial Plating
8. Survey of Protista
9. Survey of Fungi
10. Survey of Animals
11. Survey of Plants
12. Bay Area Ecosystems and Sustainability: field trips
13. Predator Prey Model for Variation, Selection and Population Dynamics
14. Mendelian, Human and Population Genetics
15. Animal Development
16. Techniques: Pipetting
17. Techniques: Sizing DNA Fragments by Gel Electrophoresis
18. Ecological Energetics: Owl Pellets
19. Models of Information Flow & Mutation

7. **REPRESENTATIVE METHODS OF INSTRUCTION:**

Typical methods of instruction may include:

A. Lecture

B. Lab
C. Activity
D. Discussion
E. Experiments
F. Field Trips
G. Guest Speakers
H. Observation and Demonstration
I. Service Learning
J. Other (Specify): I) Lecture: Introduce general features, organize and explain concepts, define terms, and provide examples and illustrations of all topics. 2) Discussion in lecture or laboratory: supervise group discussions that apply concepts to problem-solving, propose expected results from investigations of chemical and biological properties of molecules, model systems, and organisms; propose explanations of observations; analyze results and draw conclusions from demonstrations and experiments. 3) Laboratory work: Group and individual work to investigate chemical and biological properties of molecules, model systems, and organisms; observe, record, analyze results of demonstrations and experiments; observe, record and analyze effects of variables on metabolic processes such as enzyme activity, photosynthesis, respiration; produce models and diagrams illustrating biological processes including cell division, molecular structure.

8. **REPRESENTATIVE ASSIGNMENTS**

Representative assignments in this course may include, but are not limited to the following:

Writing Assignments:

1. Laboratory assignments clearly record results of each exercise: observations, summary and interpretation of results. Assignments evaluate how well results compare to expectations, relate experiments and results to principles studied in lecture.
2. Homework assignments related to textbook readings and supplemental to textbook readings. Some of the assignments may include answering review questions, short essays, or a report on a current issue in biology.
3. Term paper that includes a library search of appropriate valid scientific sources, and proper citation of sources.
4. Report based on a field trip.
5. Report based on a service learning activity.
6. Metacognitive (reading) logs based on short articles or textbook chapters.
7. Reflective journals.
8. Oral or poster presentations related to a selected class topic.

Reading Assignments:

1. Instructions for class assignments, quizzes, tests, lab instructions and questions, and other class assignments.
2. Reading assignments for each of the textbook chapters.
3. Reading selected papers from the library journal database.

Other Outside Assignments:

1. Review of biology videos housed in the library database collection.
2. Review of appropriate documentaries from the Nature or Nova PBS or other appropriate website.
3. Independent on- and off-campus field trips.
4. Online assignments and assessments in selected publisher websites.

9. **REPRESENTATIVE METHODS OF EVALUATION**

Representative methods of evaluation may include:

A. Class Participation
B. Class Work
C. Exams/Tests
D. Field Trips
E. Group Projects
F. Homework
G. Lab Activities
H. Oral Presentation
I. Papers
J. Portfolios
K. Projects
L. Quizzes

M. Research Projects
N. Simulation
O. Written examination
P. Midterm and Final exams, Lab Assignments, online homework, and student papers or projects assess students' success; in addition an online exit quiz in Canvas assesses SLO success.

10. **REPRESENTATIVE TEXT(S):**
Possible textbooks include:
A. Samantha Fowler, Rebecca Roush, James Wise. *Concepts of Biology*, 1st ed. OpenStax, 2020
B. Phelan, Jay. *What is Life? A Guide to Biology, with Physiology*, 4th ed. Macmillan, 2018
C. Hoefnagels, Marielle. *Biology the Essentials*, 3rd ed. McGraw-Hill, 2019
D. Simon, Reece, Dickey. *CAMPBELL ESSENTIAL BIOLOGY*, 6th ed. Benjamin/Cummings, 2019

Origination Date: August 2020
Curriculum Committee Approval Date: October 2020
Effective Term: Fall 2021
Course Originator: Paul Hankamp