College of San Mateo
Course Outline

☐ New Course
☐ Update/No change
☐ Course Revision (Minor)
☐ Course Revision (Major)

Date: 4/11/02

Department: Biology **Number:** 110

Course Title: General principles of Biology **Units:** 4

Hours/Week: **Lecture:** 3 **Lab:** 3 **By Arrangement:**

Length of Course

☒ Semester-long
☐ Short course (Number of weeks___)
☐ Open entry/Open exit

Grading

☒ Letter
☐ Credit/No Credit
☐ Grade Option (letter or Credit/No Credit)

1. **Prerequisite** (Attach Enrollment Limitation Validation Form.)

None

2. **Corequisite** (Attach Enrollment Limitation Validation Form.)

None

3. **Recommended Preparation** (Attach Enrollment Validation Form.)

Eligibility for ENGL 800

4. **Catalog Description** (Include prerequisites/corequisites/recommended preparation.)

Three lecture and three lab hours plus one hour by arrangement per week. Recommended preparation: eligibility for ENGL 800. Study of the principles of the biological sciences. Includes origin and evolution of life, cellular nature of living things, genetics, ecology, life cycles, and natural history. One or more field trips may be required. Extra supplies may be required. (CSU/UC) (CAN BIOL 2) (BIOL 110, 210, 220=CAN BIOL SEQ A).

5. **Class Schedule Description** (Include prerequisites/corequisites/recommended preparation.)

Lecture/lab study of major principles of biology; one or more field trips may be required. Extra supplies may be required. Plus one hour by arrangement per week. Recommended Preparation: eligibility for ENGL 800. (CSU/UC) (CAN BIOL 2) (BIOL 110, 210, 220=CAN BIOL SEQ A)

6. **Student Learning Outcomes** (Identify 1-6 expected learner outcomes using active verbs.)

Upon successful completion of the course, the student will be able to:

7. Course Objectives (Identify specific teaching objectives detailing course content and activities. *For some courses, the course objectives will be the same as the student learning outcomes. If this is the case, please simply indicate this in this section).*

1) Recognize and name: characreristics of living things; landmarks in the history of evolution, evolutionary relationships between different types of organisms, stages mitosis and meiosis, types of Monera/Bactetia,Protista, Fungi, and their roles in ecosystems, atomic and molecular structures, evidence that genetic materia1 is DNA. (2-6, 8, 9)

2) Describe: interactions between Bacteria, Protista, Fungi and other organisms, success of Arthropods, chemistry of water and its importance to living systems, the eukaryotic cell cycle. (4, 5, 8, 9)

3) Recognize and Distinguish: classification of organisms into domains and kingdoms, major animal phyla body plans and evolutionary trends, life cycle of plants, dominant and recessive traits and variations in dominance, characteristics and functions of molecules that make up cells. (5, 7, 9)

4) Define and compare: terms used to discuss evolution, species, ecology, species interactions and coevolution, causes of speciation, haploid and diploid states. (3, 4, 8)

5) Identify components, describe major concepts/functions, and analyze examples of: evolution by natural selection, earth's history and landmarks in origin of life, prokaryotic and eukaryotic cells and organelles, biological membranes, vascular system of plants, seeds, flowers and fruits, DNA structure and replication, protein synthesis. (3, 5, 6, 8, 9)

6) Explain: energy conversions and the role of enzymes in cellular metabolism; different types of evidence for, and the importance of different scientific fields in studying evolution; basis for, and role of variation in evolution; sexual and asexual reproduction and the role of cell division in both processes; endosymbiont hypothesis of eukaryote evolution. (3, 5, 8)

7) Distinguish and compare processes of: energy flow and mass cycling in ecosystems, advantages and problems of aquatic and terrestrial life for plants and animals, four major plant groups and evolutionary trends, classes of vertebrates and evolutionary trends, photosynthesis and aerobic respiration, structure and function of DNA and RNA, types and consequences of mutation. (4-6,9)

8) Apply rules to solve problems illustrating: use of the genetic code, Mendelian genetics. (6, 7)

9) Demonstrate basic laboratory skills for objective investigation of biological phenomena: use of light microscope, tools for metric measurement of length and volume, accurate observation and recording of results, cooperative group preparation, results and analysis of simple exercises using the scientific process.(Laboratory topics)

10)Recognize: scientific approach to investigating phenomena; unifying theme of evolution in biology, importance of science in society's decisions. (1, 3,4)

11)Communicate explanations of biological phenomena in writing. (All lecture and lab topics)

8. **Course Content** (Brief but complete topical outline of the course that includes major subject areas [1-2 pages]. Should reflect all course objectives listed above. In addition, you may attach a sample course syllabus with a timeline.)

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,fumdamental 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,Cellularrespiration.
6) Molecular Biology (2-3 weeks).
   a) DNA structure, replication.
   b) RNA, genetic code.
   c) Protein synthesis.
   d) Mutation.
7) Mendelian inheritance- 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 traditional five kingdoms and three domains (6 weeks)
   a) Metabolic diversity, roles in ecosystems, interactions with humans, of Monera (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.

9. **Representative Instructional Methods** (Describe instructor-initiated teaching strategies that will assist students in meeting course objectives. Include examples of out-of-class assignments, required reading and writing assignments, and methods for teaching critical thinking skills.)

1) 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 observation; analyze results and draw conclusions from demonstrations and experiments.

3) Hour by arrangement: Independent or group study to review and discuss lecture and text presentations, apply learning to study questions,CD-rom interactive study activities.

4) 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.

10. Representative Methods of Evaluation (Describe measurement of student progress toward course objectives. Courses with required writing component and/or problem-solving emphasis must reflect critical thinking component. If skills class, then applied skills.)

1) Midterm and Final exams assess student's ability to communicate the following in writing: recognize and name topics in objective 1, describe topics in objective 2, recognize and distinguish topics in objective 3, define and compare topics in objective 4, identify steps and describe major functions in objective 5, explain topics in objective 6, distinguish and compare processes in objective 7, demonstrate and explain topics in objective 8.

2) Laboratory assignments assess student's methods, careful recording of observations, results, clear evaluation of conclusions; objectives 9, 10, 11.

3) Oral and/or poster presentations reveal students' ability to identify and evaluate main concepts of selected topics, as in objective 10.

11. Representative Text Materials (With few exceptions, texts need to be current. Include publication dates.)

Text:

Campbell, Mitchell, Reece, BIOLOGY, CONCEPTS & CONNECTIONS, Fourth Edition Benjamin/ Cummings, 2002
Starr, BASIC CONCEPTS IN BIOLOGY, Fourth Edition, Brooks/Cole-Thomson, 2003

Lab Manual:
Diamond, BIOLOGY 110 LABORATORY MANUAL, Fifth Edition, College of San Mateo, 2000
Morgan, Carter, INVESTIGATING BIOLOGY, Fourth Edition, Benjamin/Cummings, 2002

Prepared by: _____
(Signature)

Email address:

Submission Date: _____

Biology 110

Assignments

1. Reading in textbook to restate lecture and laboratory concepts, illustrate key points of lecture, define terms, and provide examples.
2. 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.
3. Independent research into selected topics, resulting in poster or oral presentations demonstrating identification and evaluation of main concepts of topic.

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

1) Observation.
2) Microscope I: Use of the Microscope; Metric Units; Fresh preparations; Cells and Tissues.
3) Mitosis and Meiosis.
4) Osmosis and Diffusion.
5) Simple Biochemical Tests for Organic Molecules.
6) Enzyme Activity.
7) Bacterial Plating.
8) Survey of the Animal Kingdom.
9) Survey of the Plant Kingdom.
10) Bay Area Biomes - Coyote Point Museum.
11) Predator prey Model for Variation and Selection.
12) Biological Optima and Population Growth.
13) Mendelian and Human Genetics.
14) Animal Development.
15) Techniques: Macro and Micro Pipetting.
16) Sizing DNA Fragments by Gel Electrophoresis.
17) Ecological Energetics: Owl Pellets.
18) Fermentation.
19) Photosynthesis.
20) Acid Rain.