San Bernardino Valley College
Curriculum Approved: SP01

I. COURSE DESCRIPTION:

A. Division: Science
Department: Biology
Course ID: BIOL 202
Course Title: Organismal Biology and Ecology
Units: 4
Lecture: 3 hours
Laboratory: 3 hours
Prerequisite: BIOL 201.

B. Catalog Description:

An introduction to ecological and organismal aspects of biology intended for the pre-professional or biology major or others interested in an in-depth study of biology. The course requires participation in and completion of a field project and participation in several weekend field trips.

Schedule Course Description:

An introduction to ecological and organismal aspects of biology intended for the pre-professional or biology major or others interested in an in-depth study of biology. The course requires participation in and completion of a field project and participation in several weekend field trips.

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

III. EXPECTED OUTCOMES FOR STUDENTS:

Upon completion of this course, students should be able to:

A. Apply current evidence supporting evolutionary theory to the phenomenon of biological diversity.
B. Predict outcomes based on variables in population genetics.
C. Identify major evolutionary themes in the animal and plant kingdoms.
D. Distinguish between macroevolutionary and microevolutionary processes.
E. Recognize and explain patterns of population growth, population interactions, and life history common to living species.
F. Explain the fundamental role of natural selection and evolution in organismal and ecological areas of biology.
G. Identify the structures and explain the function of, major components of vertebrate animal anatomy.
H. Compare and contrast the structure and function of major components of vascular plant anatomy.
I. Create flow diagrams outlining patters of energy and matter acquisition and allocation in an ecosystem.
J. discuss variables affecting population growth and interactions.
K. Research and execute an experimental or observational field project.
L. Analyze and report on the results of a field project in the form of a scientific paper.
M. Interpret results from application of an ecological mathematical model.

IV. CONTENT:

Lecture:

A. Evolutionary Theory
   1. Role of Genetically Variable Populations
   2. Impact of Selective Forces on Populations
   3. Overview of Organismal Diversity

B. Population Genetics
   1. Processes Influencing Evolutionary Change within a Population
   2. Genetic Basis of Evolutionary Processes
   3. Adaptive Evolution

C. Patterns of Speciation and Macroevolution
   1. What is a Biological Species?
   2. Prerequisites for Speciation
   3. Speciation Processes

D. Phylogeny and Macroevolution
   1. Processes at Work in Producing the Fossil Record
   2. The Basis and Notion of Geologic Time
   3. Evolutionary Trends
   4. Mechanisms of Macroevolution
   5. Introduction to Phylogenetic Analysis

E. Plants
   1. Major Trends in Plant Evolution
   2. General Structure and Function of Vascular Plants
   3. Aspects of Plant Reproduction

F. Vertebrate Animals
   1. Major Trends in Vertebrate Evolution
   2. General Structure and Function of Vertebrates
   3. Organ System Structure and Function

G. Ecology
   1. Introduction to Ecology
   2. Relation of Ecology to Evolution
   3. Introduction to Ecological Mathematical Models

H. Effects of Abiotic Factors
   1. Types of Abiotic Factors - Global, Local, Microclimate
   2. Temporal and Spatial Variation of Abiotic Factors

I. Resource Acquisition and Allocation Patterns
   1. Modes of Energy Gain
   2. Energy Allocation and Impact on Reproduction
   3. Energy Acquisition in Animals and Plants : Evolutionary Tactics

J. Population Demography
   1. Life Tables and Reproductive Tables
   2. Age Distributions
   3. Evolutionary Reproductive Tactics

K. Population Growth
   1. Factors influencing Population Growth
   2. Mathematical Representations of Population Growth
   3. Interpretation of Population Growth Models

L. Population Interactions
   1. Diversity of Population Interactions
   2. Mathematical Models of Population Interactions

Laboratory Content:

A. Comparative Anatomy Among the Major Vertebrae Phyla
   1. Tissues
   2. Bones
   3. Organ systems
B. Ecological Field Project
   1. Experimental design
   2. Sampling and data collection techniques
   3. Statistical analysis and interpretation of results

V. METHODS OF INSTRUCTION:

A. Interactive lecture, augmented by demonstration materials and audio visual media presentations.
B. Use of the computer for simulation exercises and data analysis using statistical techniques.
C. Preparation of written scientific reports.
D. Reading assignments in the textbook and from scientific literature.
E. Microscopic examination of biologically important tissues and cells.
F. Dissection of preserved plant and animal specimens.
G. Field trips.

VI. TYPICAL ASSINGMENTS:

A. Perform a comparative identification of various vertebrate skeletal structures.
B. Design and conduct a field experimental; prepare a written report that includes a clear description of methodology, results of statistical analysis, interpretation of those results compared to the working hypothesis, and a discussion of uncontrolled variables.

VII. EVALUATION:

A. Methods of Evaluation
   1. Short answer and essay exams
      a. Example: The latitudinal distribution of ectothermic organisms is more limited than that of endothermic organisms. Explain why.
      b. Example: The distinct evolutionary paths followed by animals are strongly influenced by their mode of gathering energy. Describe one consequence of how heterotrophy may have influenced the evolution of animals.
      c. Example: An ecologist studying desert plants performed the following plants and numerous small annual wildflowers. She found the same wild flower species in similar numbers in both plots. Then she enclosed one of the plots to keep out kangaroo rats, the most common herbivore in the area. After two years, four out of five species of wildflowers were no longer present in the fenced plot, but the remaining one species of wildflower had increased its population dramatically. The unfenced control plot had not changed significantly. Provide a likely explanation for what happened in terms of changes in types of population interactions.
   2. Lab practical exams
      a. Example: Name the labeled anatomical structures on the provided specimen.
      b. Example: Identify homologous anatomical structures on two or more vertebrate specimens.
   3. Lab reports
      a. Example: Compare the methods of interpretation used in different types of vegetation analysis.

b. Example: Write field notes describing ecological or behavioral patterns observed at various field locations. Provide an expanded discussion and interpretation of these observed patterns.

4. Semester field project:
The purpose of the Semester Project in BIOL 202 is to introduce the fundamental aspects of planning, carrying out, and reporting on an experimental or observational field project. The projects are scheduled during the 9th to 15th week. Students must prepare both a written and an oral report to be submitted during the 16th week.

B. Frequency of Evaluation
1. Four or five short answer and essay exams.
2. Weekly lab reports.
3. One or two lab practical exams.
4. One semester project.

VIII. TYPICAL TEXTS:

A. Campbell, N.A., Reese, J.B., Mitchell, L.G. Biology, 5th ed. Benjamin/Cummings – Addison – Wesley Longman Publishing Co., 1999.
B. Ambrose, III, H.W., Ambrose, K. P. A Handbook of Biological Investigation, 4th ed. Hunter Textbooks, 1987.
C. Pianka, E.R. Evolutionary Ecology, 5th ed. Harper & Row Publishers, 1994.
D. Wischnitzer, S. Atlas and Dissection Guide for Comparative Anatomy, 5th ed. W.H. Freeman & Co., 1994.

IX. OTHER SUPPLIES REQUIRED OF STUDENTS:

A. Dissection tools, such as scalpel and scissors
B. Surgical gloves