TAFT COLLEGE
West Kern Community College District

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Biology (BIOL) 2203 General Botany (4 Units) CSU:UC
[formerly Botany 1 and Botany 1L]

Prerequisite: Eligibility for Mathematics 1500 or higher

Advisory: Completion of Biology 2201 and eligibility for English 1500 strongly recommended

Prerequisite knowledge/skills: Before entering the course, the student should be able to:

1. identify numbers as belonging to specified sets, and graph discrete and continuous sets of real numbers,
2. perform the basic arithmetic operations with positive and negative real numbers, plus raising to powers,
3. know and apply the rules of exponents and the order of operations in algebraic calculations,
4. apply the properties of addition and multiplication for real numbers and identify their use in practice,
5. solve linear equations and inequalities in one variable, and analyze and solve applications leading to such equations or inequalities,
6. solve and graph the solutions of compound inequalities or absolute value inequalities in one variable,
7. perform addition, subtraction, multiplication and division of polynomials,
8. factor simple polynomials, with special emphasis on trinomials quadratic in form, and solve related polynomial equations,
9. add, subtract, multiply and divide rational algebraic expressions, and simplify to lowest terms,
10. solve equations involving rational algebraic expressions, and analyze and solve word problems leading to such equations,
11. simplify radical expressions involving numbers and/or variables,
12. use fractional exponents,
13. perform addition, subtraction, multiplication and division of expression involving radicals and complex numbers and simplify the results, including rationalization of denominators,
14. solve equations that involve radicals,
15. solve quadratic equations in one variable, and equations quadratic in form, by factoring, completing the square, and the quadratic formula,
16. analyze and solve application problems requiring the use of quadratic equations,
17. solve and graph quadratic inequalities in one variable,
18. graph points in the rectangular coordinate system, and straight lines from ordered pairs obtained from its equation,
19. determine the slope of the line between any specified pair of points,
20. know the slope forms of the equation of a straight line, and be able to determine the equation of a particular straight line from specified input information,
21. solve and graph linear inequalities in two variables,
22. solve linear systems of equations in two or three variables algebraically, and solve those in two dimensions graphically,
23. analyze and solve application problems requiring the use of linear systems of equations in two or three variables,

24. evaluate determinants and use them to solve linear systems of equations,
25. determine whether or not a specified relation is a function,
26. for a function, compute the value of the function given the value of the independent variable, and be able to construct the inverse of simple functions in numeric or algebraic terms,
27. identify the quadratic equation representing a specific conic section, and be able to draw the graph of a conic section by analyzing its equation, or to write the equation of a specified conic section,
28. solve nonlinear systems of equation involving the intersection of two conic sections or a conic section and a straight line,
29. compute and graph specified exponential and logarithmic functions,
30. know the properties of logarithms (product, quotient, power and change of base rules) and be able to use them in practical numerical computations using a table of common logarithms or a calculator, and
31. solve simple exponential and logarithmic equations.

Total Hours: 48 hours lecture; 59 hours lab (107 total hours)

Catalog Description: This course is intended for majors and covers comparative diversity, structure, and function of plant, fungal, and protistan phyla. Topics include development, morphology and physiology, taxonomy and systematics. Principles of population and community ecology and ecosystem interactions are emphasized. Students who intend to transfer to a UC should take BIOL 2202 after BIOL 2201. C-ID: BIOL 155; BIOL 135S

Type of Class/Course: Degree Credit

Text: Stern, Kingsley R. *Introductory Plant Biology*. 13th ed. New York: McGraw, 2013. Print.

Additional Required Materials: Course Syllabus, Course Outline and Objectives
Laboratory Handouts

Course Objectives:

By the end of the course, a successful student will be able to

1. Recognize characteristics of plants, fungi, and photosynthetic protistans, and their phylogenetic relationships,
2. Construct and interpret phylogenies,
3. Describe and contrast life cycles within and among major plant, fungal, and photosynthetic protistan taxa,
4. Describe the structural organization of major plant, fungal, and photosynthetic protistan taxa,
5. Identify and describe plant structures and relate them to their functions, including transpiration, photosynthetic pathways, and energy and nutrient acquisition,
6. Describe how organisms are organized into and interact within and among populations and communities,
7. Describe the processes that occur within ecosystems including flow of energy, and the role of nutrient cycling in maintaining ecosystem integrity,
8. Provide evidence for evolution in plants and photosynthetic protistans,
9. Acquire, use and cite of scientific literature for scientific writing,

10. Apply scientific methodology and reasoning through active experimentation and experiences, and
11. Demonstrate critical thinking and scientific reasoning skills.

Course Scope and Content (Lecture):

Unit I Introduction

A. Relationship of Humans to their Environment
B. Botany as a Science
C. Diversification of Plant Study
D. Attributes of Living Things

Unit II Ecology

A. Plants and the Environment (Populations, Communities, Ecosystems)
B. Biological Interactions among Populations
C. Community Structure and Succession
D. Factors affecting Ecosystem Diversity
E. Interspecific Interactions (Population & Community)
F. Nutrient Cycling and Ecosystem Integrity
G. Conservation and Human Interactions

Unit III Plant Cells and Tissues

A. Cell Structure and Communication
B. Cellular Components
C. Plant Systems Structure
D. Cellular Reproduction
E. Plant Tissues

Unit IV Stems

A. Stem Structure and Function
B. Stem Growth and Development
C. Monocot vs. Dicot Stems
D. Specialized Stems
E. Wood and Its Uses

Unit V Roots

A. Root Development
B. Root Structure and Function
C. Monocot vs. Dicot Roots
D. Specialized Roots
E. Mycorrhizae
F. Soil Structure and Chemistry

Unit VI Leaves

A. Leaf Structure and Function
B. External Leaf Morphology
C. Leaf Classification
D. Internal Leaf Structure
E. Leaf Abscission
F. The Change of Leaf Colors
G. Specialized Leaves
H. Ecological Relevance of Leaves

Unit VII Plant Transport Systems

A. Molecular Movement
B. Water and Mineral Absorption
C. Water Movement and Transpiration
D. Mineral and Sugar Transport
~~E.~~ Regulation of Transpiration

Unit VIII Photosynthesis and Respiration

A. Process of Photosynthesis
B. The Importance of Photosynthesis
C. Light Energy and Absorption
D. Comparison Between C3, C4 and CAM Photosynthesis
E. Conditions Affecting the Rate of Photosynthesis
F. Process of Cellular Respiration
G. Anaerobic Respiration
H. Factors Affecting the Rate of Respiration
I. Comparison of Photosynthesis and Respiration

Unit IX Plant Reproduction

A. Sexual Reproduction in Plants
B. Structure and Function of Flowers
C. Modified Flowers
D. Pollination
E. Pollination Vectors
F. Flower Recognition, Energetics, and Pollination Ecology
G. Gamete Production
H. Seed Structure and Function
I. Seed and Fruit Development
J. Seed and Fruit Dispersal

Unit X Growth and Development

A. Germination
B. Anatomy of a Seedling
C. Plant Development
D. Environmental Factors and Plant Development

E. Plant Hormones

Unit XI Survey of Kingdoms – Archaea, Protista, Fungi, and Plantae

A. Study of Morphology, Physiology, Taxonomy, Ecology, Life Cycles, and Economic Importance of the Major Plant Phyla and Classes
1. Kingdom Archaea
a. Phylum Archaebacteria – primitive bacteria (methane, salt and sulfolobus bacteria
2. Kingdom Bacteria – true bacteria
a. Phylum ~~Bacteriophyta~~ Eubacteria – true bacteria
1) Class Eubacteriae – unpigmented, purple, and green sulfur bacteria
2) Class Cyanobacteriae – blue-green bacteria ~~(formerly blue-green algae)~~
3. Kingdom Protista
a. Phylum Chlorophyta – green algae
b. Phylum Chromophyta – brown, golden brown, and yellow-green algae~~, and diatoms~~
c. Phylum Rhodophyta – red algae
d. Phylum Euglenophyta – euglenoids
e. Phylum Dinophyta ~~(Pyrophyta)~~ – dinoflaellates
f. Phylum Myxomycota – plasmodial slime molds
g. Phylum Dictyosteliomycota – cellular slime molds
h. Phylum Oomycota – water mold, potato blight
4. Kingdom Fungi
a. Phylum Chytridiomycota – chytrids
b. Phylum Zygomycota – coenocytic fungi or zygote fungi
~~c.~~ Phylum Ascomycota – sac fungi ~~(lichens)~~
d. Phylum Basidiomycota – club fungi
e. Phylum Deuteromycota – imperfect fungi
~~5.~~ Kingdom Plantae ~~(Metaphyta)~~
a. Phylum Hepaticophyta – liverworts
b. Phylum Anthocerotophyta – hornworts
c. Phylum Bryophyta – mosses
d. Phylum Psilotophyta – whisk ferns
e. Phylum Lycophyta – club mosses
f. Phylum Equisetophyta – horsetails
g. Phylum Polypodiophyta ~~(Pterophyta)~~ – ferns
h. Phylum Pinophyta ~~(Coniferophyta)~~ – conifers
i. Phylum Ginkophyta – Ginkgo
j. Phylum Cycadophyta – cycads
k. Phylum Gnetophyta – (Gnetum, Ephedra, Welwitschia)
l. Phylum Magnoliophyta ~~(Anthocphyta)~~ – flowering plants
1) Class Magnoliopsida – dicots
2) Class Liliopsida – monocots

B. The Importance of Plants

Course Scope and Content (Laboratory):

Unit I The Microscope
- A. Microscope Anatomy
- B. Using the Microscope

Unit II The Scientific Method and Metric Measurements
- A. Application of the Scientific Method
- B. Metric Units of Measurement
- C. Metric Conversions

Unit III Introduction to Plant Classification and Identification
- A. Binomial Nomenclature
- B. Classification of Major Groups
- C. Phylogenetic Relationships
- D. Dichotomous Keys
- E. Interpretation and Construction of Cladogram

Unit IV Collecting and Pressing Plants
- A. Collect Plant specimens from the Field Using Proper Technique
- B. Identify Unknown Plant Specimens
- C. Prepare Quality Herbarium Specimens
- D. Importance of Herbaria in Plant Biology Research
- E. Field Trip- North vs. South Facing Slopes

Unit V Mitosis – Cell Division
- A. Cell Cycle
- B. Stages of Mitosis
- C. Influence on Evolution

Unit VI Stems
- A. External Anatomy of a Woody Twig
- B. Anatomy of Herbaceous Dicot Stem
- C. Anatomy of Woody Dicot Stem
- D. Anatomy of Monocot Stems

Unit VII Leaves
- A. Leaf Anatomy
- B. Leaf Arrangement
- C. Specialized Leaves

Unit VIII Roots
- A. Importance and Development of Root Hairs
- B. Dicot vs. Monocot Roots
- C. Formation of Lateral Roots

Unit IX Flowers, Fruits, and Seeds
- A. Anatomy of the Flower
- B. Classification of Fruits
- C. Seed Anatomy

Unit X Plant Metabolism
- A. Factors Influencing Photosynthetic Rates
- B. Factors Influencing Cell Respiration Rates

Unit XI Plant Growth, Development and Regulation
- A. Role of Plant Hormones
- B. Meiosis
- C. Alternation of Generations

Unit XII Plant Groups and Identification
- A. Classification of Organisms in Domains and Kingdoms
- B. Comparison Between Photosynthetic Bacteria, Green Algae and Plants
- C. Life Cycle of a Fungus
- D. Life Cycle of a Bryophyte
- E. Life Cycle of a Typical Fern
- F. Life Cycle of a Pine Tree
- G. Life Cycle of a Flowering Plant

Unit XIII Local Plant Identification
- A. Taxonomy
- B. Application of Dichotomous Keys

Unit XIV Field Trip –Botanical Garden
- A. Recognize Characteristics of Plants
- B. Observe Evolutionary Relationships

Learning Activities Required Outside of Class

The students in this class will spend a minimum of 9 hours per week outside of the regular class time doing the following:

1. Studying
2. Answering questions
3. Skill practice
4. Completing required reading
5. Problem solving activity and exercise
6. Written work

Methods of Instruction:

1. Assigned readings from the text and selected references
2. Lecture and demonstration by instructor using models, charts, multimedia, and preserved specimens
3. Class discussion
4. Audiovisual presentations
5. Field trips

6. Hands-on laboratory techniques and critical analysis of results
7. Focus Questions

Methods of Evaluation:

1. Substantial writing assignments, including:
   a. essay exam
   b. digital photo essay and slideshow
2. Computational or non-computational problem-solving demonstrations, including:
   a. exams
   b. homework problems
3. Other examinations, including:
   a. multiple choice
   b. matching items
   c. true/false items
   d. fill in
   e. essay
   f. demonstration of laboratory techniques
   g. identification of laboratory specimens
4. Plant collection project

Laboratory Category: Extensive Laboratory

Pre delivery criteria: All of the following criteria are met by this lab:

1. Curriculum development for each lab
2. Published schedule of individual laboratory activities
3. Published laboratory activity objectives
4. Published methods of evaluation
5. Supervision of equipment maintenance, laboratory setup, and acquisition of lab materials and supplies

During laboratory activity of the laboratory: All of the following criteria are met by this lab:

1. Instructor is physically present in lab when students are performing lab activities.
2. Instructor is responsible for active facilitation of laboratory learning.
3. Instructor is responsible for active delivery of curriculum.
4. Instructor is required for safety and mentoring of lab activities.
5. Instructor is responsible for presentation of significant evaluation.

Post laboratory activity of the laboratory: All of the following criteria are met by this lab:

1. Instructor is responsible for personal evaluation of significant student outcomes, (lab exercises, exams, practical's, notebooks, plant collections), that become a component for the student grade that cover the majority of lab exercises performed during the course.
2. Instructor is responsible for supervision of laboratory; clean up of equipment, and materials.

Supplemental Data:

TOP Code:	040200: Botany, General
SAM Priority Code:	E: Non-Occupational
Funding Agency:	Y: Not Applicable(funds not used)
Program Status:	1: Program Applicable
Noncredit Category:	Y: Not Applicable, Credit Course
Special Class Status:	N: Course is not a special class
Basic Skills Status:	N: Course is not a basic skills course
Prior to College Level:	Y: Not applicable
Cooperative Work Experience:	N: Is not part of a cooperative work experience education program
Eligible for Credit by Exam:	E: Credit By Exam
Eligible for Pass/No Pass:	C: Pass/No Pass
Taft College General Education:	CSB2: CSU Area B2 CSB3: CSU Area B3 IG5B: IGETC Area 5B IG5C: IGETC Area 5C LNS: Local GE Natural Science