

Principles of Botany Biology 131 Syllabus

Department: Biology

Course Description: Four semester hours, three hours lecture per week, two hours lab per week. Introduction to the fundamental principles of botany and the plant sciences. Topics include the study of plant form, function and reproduction, and an overview of plant diversity including bryophytes, ferns, and seed plants. Required lab fee.

Text and Materials: *Biology of Plants* (8th Edition), Raven, Evert, Eichorn

Prerequisites: TSI complete in English and Math.

Core Objectives:

1. **Critical Thinking:** to include creative thinking, innovation, inquiry and analysis, evaluation and synthesis of information.
2. **Communication Skills:** to include effective development, interpretation and expression of ideas through written, oral, and visual communication.
3. **Empirical and Quantitative Skills:** to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions.
4. **Teamwork:** to include the ability to consider different points of view and to work effectively with others to support a shared purpose or goal.

Program Learning Outcomes:

1. The student will demonstrate a good knowledge base in biological concepts.
2. The student will clearly articulate scientific information in oral form.
3. The student will clearly articulate scientific information in written form.
4. The student will be able to carry out, and analyze experiments to answer biological questions.
5. Students will demonstrate teamwork skills to coordinate diverse multidisciplinary teams to solve challenges.
6. Students will demonstrate preparation for future career and educational goals.

Student Learning Outcomes:

1. Students will learn the basic principles of plant cells and tissues; plant organs; plant physiology; plant reproduction and diversity; and plant ecology. (PLO 1)
2. Students will examine plants using observational tools, scientific techniques, and empirical analysis. (PLO 4; COs 1, 3)
3. Students will perform experiments, gather data, test hypotheses, and draw conclusions based on data. (PLO 4; COs 1, 3)
4. Students will communicate results of data they have collected in teams by preparing a written poster conforming to a typical scientific format including data tables and graphs of results. (PLOs 3, 5; COs 2, 4)

Course Requirements: Students must enroll in both lecture and lab and final grades will reflect both components. The lecture portion of the grade is based on student performance on examinations. Lab grades include both a daily quiz and assessment of in-lab assignments. During the final weeks of lab (weeks 12-15) students will work together in teams to complete a Plant Ecology Poster of data gathered during the week 12 ecology lab. This project will be used to assess all Core Objectives. As part of the project students will be required to identify the research question, propose hypotheses for testing, and evaluate hypothesis support (Critical Thinking); gather and analyze data (Critical Thinking; Empirical and Quantitative Skills); and prepare a poster of their results including both written and visual communication elements (Communication Skills). Students will be required to submit an analysis of their teamwork process as part of the final project (Teamwork Skills). Poster will be evaluated using a common rubric.

Grading Policy: Final grades reflect both lecture and lab scores and will be computed using the following formula:

$$75\% \text{ Lecture Score} + 25\% \text{ Lab Score} = \text{Final Grade}$$

Final grades will be converted to letter grades as follows: 90+%= A; 80-89%= B; 70-79%= C; 60-69%= D; below 60%= F.

Acceptable Student Behavior

Classroom behavior should not interfere with the instructor's ability to conduct the class or the ability of other students to learn from the instructional program (see the Student Conduct Code, policy D-34.1). Unacceptable or disruptive behavior will not be tolerated. Students who disrupt the learning environment may be asked to leave class and may be subject to judicial, academic or other penalties. This prohibition applies to all instructional forums, including electronic, classroom, labs, discussion groups, field trips, etc. The instructor shall have full discretion over what behavior is appropriate/inappropriate in the classroom. Students who do not attend class regularly or who perform poorly on class projects/exams may be referred to the Early Alert Program. This program provides students with recommendations for resources or other assistance that is available to help SFA students succeed.

Academic Integrity (University Policy A-9.1 Statement):

Academic dishonesty includes both cheating and plagiarism. Cheating includes but is not limited to (1) using or attempting to use unauthorized materials to aid in achieving a better grade on a component of a class; (2) the falsification or invention of any information, including citations, on an assigned exercise; and/or (3) helping or attempting to help another in an act of cheating or plagiarism. Plagiarism is presenting the words or ideas of another person as if they were your own. Examples of plagiarism are (1) submitting an assignment as if it were one's own work when, in fact, it is at least partly the work of another; (2) submitting a work that has been purchased or otherwise obtained from an Internet source or another source; and (3) incorporating the words or ideas of an author into one's paper without giving the author due credit.

Please read the complete policy at http://www.sfasu.edu/policies/academic_integrity.asp

Withheld Grades (University Policy A-54):

Ordinarily, at the discretion of the instructor of record and with the approval of the academic chair/director, a grade of WH will be assigned only if the student cannot complete the course work because of unavoidable circumstances. Students must complete the work within one calendar year from the end of the semester in which they receive a WH, or the grade automatically becomes an F. If students register for the same course in future terms the WH will automatically become an F and will be counted as a repeated course for the purpose of computing the grade point average.

Disabilities Statement:

To obtain disability related accommodations, alternate formats and/or auxiliary aids, students with disabilities must contact the Office of Disability Services (ODS), Human Services Building, and Room 325, 468-3004 / 468-1004 (TDD) as early as possible in the semester. Once verified, ODS will notify the course instructor and outline the accommodation and/or auxiliary aids to be provided. Failure to request services in a timely manner may delay your accommodations. For additional information, go to <http://www.sfasu.edu/disabilityservices/>.

Topical Outline

Week	Lecture	Lab Topic	CO	Activity
1	Plant Cells <i>CO 1 Instruction: Scientific Method as a Critical Thinking Process Critical Reading</i>			
2	Plant Tissues	Microscopy <i>CO 1 Instruction: Lab Manual Introduction on Critical Thinking Skills; CO 3- In lab instruction on proper microscope use</i>	3	Using microscope to make observations
3	Plant Growth	Plant Cells and Simple Tissues	1	Hypothesis ID & Testing
			3	Microscope observation Histochemical Staining
4	Roots and Stems	Complex Tissues and Tissue Systems	3	Microscope observation Histochemical Staining
5	Leaves, Flowers, & Fruits	Plant Organs <i>CO 3: Lab Manual how to calculate Surface area and volume</i>	1	Compare/Contrast Identify/Interpret
			3	Microscope Observation Geometric Analysis
6	Photosynthesis I- Light reactions	Fruits and Flowers	1	Taxonomic keys as organizational tool
			3	Taxonomic keys as observational tool
7	Photosynthesis II- Calvin Cycle	Wood <i>CO 3 Instruction: Lab Manual on making measurements</i>	1	Scientific Method & Hypothesis ID & Testing Compare/Contrast
			3	Making measurements and gathering data Mathematical Analysis Microscope Observations
8	Nutrition and Transport	Photosynthesis		
9	Reproduction and Diversity	Genetics and Meiosis	3	Probability calculations Scientific Procedure: DNA Extraction
10	Bryophytes	Plant Reproduction	1	Identify and Interpret
			3	Microscope Observations
11	Lycophytes and Ferns	Plant Diversity	1	Compare/Contrast Identify and Interpret Creating a taxonomic key
			4	Creating Consensus
12	Gymnosperms	Ecology- Data collection <i>CO 4 Instruction: Lab Manual Critical Reading on efficient Teamwork</i>	1	Scientific Method and Hypothesis ID & Testing
			3	Ecological observation Gather data
			4	Work in teams
13	Angiosperms	Ecology- Data analysis <i>CO 2- Instruction: Lab Manual Critical Reading on Effective Scientific Writing; How to create tables and figures and how to incorporate them within a poster; CO 3- How to analyze the data using Excel;</i>	1	Scientific Method and Hypothesis Testing
			2	Prepare poster including written and visual material
			3	Mathematic data analysis
			4	Work in teams
14	Ecology	Mycology		
15	Varies by Instructor		1 2 3 4	Submit Plant Ecology Posters

Examples of Core Objective Activities

Core Objective 1- Critical Thinking Skills

- Using the scientific method including identification and evaluation of hypotheses based on collected data. A critical reading on the scientific method and hypothesis testing will be included for instructional purposes. Students will perform activities related to this scientific method and hypothesis testing in five separate labs.
- Compare/Contrast- students will be asked to compare and contrast information in three separate labs. We will provide a critical reading on critical thinking skills including the compare/contrast technique in the laboratory manual introduction.
- Identify/Interpret- Botany is a highly visual discipline requiring students to both identify structures and to be able to interpret those features in terms of organization and function. These activities help students to synthesize complex information from several sources. The identify and interpret skill will be detailed in the critical thinking reading.
- Taxonomic keys are a way of organizing complex data in a logical fashion designed to facilitate identification of plant materials. Instructors will explain how to use taxonomic keys in lab and assist as students implement their use during the fruit and flower lab. As a critical thinking tool taxonomic keys allow Botanists to synthesize and organize complex patterns of variation in a meaningful and logical fashion. Students will have the opportunity to create keys in the Plant Diversity lab.

Core Objective 2- Communication

- Students will prepare a PowerPoint-based poster of scientific findings that includes both written text and visual elements. Instructors will provide a written text detailing proper formatting of a scientific poster as this is distinctly different from the Essay Format learned in English courses. The reading will also discuss the importance of using technical scientific vocabulary, maintaining a scientific tone, and incorporating visual photos, graphs, and tables.

Core Objective 3- Empirical and Quantitative Skills

- Microscope Observation- Many important Botanical structures are too small to be observed by the naked eye. During the first lab students will be taught how to use the microscope effectively as a tool for making observations. Microscope observation activities will be incorporated in five other labs.
- Histochemical staining- Many microscopic Botanical features are clear under the microscope. Histochemical staining can render these structures visible/observable (CO 3) after they incorporate the dye. Because many dyes are chemical specific, histochemical staining can also be used as critical thinking activity to allow students to identify and interpret the nature of the stained substances. Histochemical staining will be used in two labs.
- Mathematical Analysis (including geometric analysis)- mathematical skills will be incorporated in four labs. Students will be required to make measurements, perform calculations, and interpret these calculations. These skills will include using geometry to analyze shape.

- Taxonomic Keys- in addition to critical thinking, taxonomic keys are a standard tool used by scientists to enable them to identify specimens. Keys guide the user to focus on relevant details and to make pertinent observations in order to assist in identification.

Core Objective 4- Teamwork

- Students will work in teams throughout the semester. However, they will formally work together in during the Ecology Lab Project. Students will be provided a critical reading as part of this project instructing them as to the nature of effective teamwork. They will be provided to then analyze the quality of their teamwork experience as part of their project, and thus independently of their grade.
- During the Plant Diversity Lab students will work together as teams on the project, but will be required to come to consensus and submit a single response for the group.