

SCI-933: Botany: Understanding the Plant World (Great Courses Series)

Independent Study Online Course Syllabus

Instructors: Andrew Herrick, PhD Bill Cockerham, EdD	Number of Graduate Semester Units: 3 units
Phone: (602) 751-2528 (Andy) (559) 825-7443 (Bill)	Target Audience: 6 th - 14 th grade teachers
Emails: andy.herrick@yahoo.com billac@gmail.com	Course Access: ce-connect.fresno.edu

Course Description

In this course, we invite you into the uniquely satisfying world of plants, and the joy of celebrating and learning from the secrets of living nature. With almost 400,000 known species and thousands more identified every year, the variety of plant life is almost overwhelming—from the microscopic to the largest organism on Earth. During your journey, you will explore the astonishing adaptations that allow plants to live in an enormous variety of ecosystems, from deserts and the ocean floor to thousands of feet above sea level and on every continent. You will understand why there are no fewer than three kinds of photosynthesis, how the process separates plants from animals, and why many plants rely on symbiosis with bacteria and fungi in conjunction with photosynthetic processes.

See Plants in New Ways

Recent scientific research from botany has offered astonishing revelations about the diurnal sleeping and waking cycles of trees. And DNA analysis proves fungi are actually more closely related to humans than to plants. These and many other discoveries illuminate the ways taxonomic identification of plants has changed with the advent of DNA sequencing and other cutting-edge scientific breakthroughs, allowing for a greater understanding of the world around us. This course includes video lectures that address shared features of plants, how they resemble and yet differ from humans, and why there are few truly universal rules that govern all plants in exactly the same way. Later lectures reveal how natural selection has allowed plants to adapt to the widest possible range of environments all around the globe. These adaptations have led to plant adaptations so surprising that they almost seem to have sprung directly from science fiction.

A Passionate Adventure with Plants

This course will introduce and discuss fascinating questions botanists are still working to answer. We know plants can sense and respond to their environments, but can they remember their experiences? We know plants communicate to others in their vicinity via

chemical signals, but is it also possible some plants have evolved an ability to detect sound waves? We know certain plants respond to touch, but can they be conditioned to “learn” when it is unnecessary to respond? And perhaps the most basic of questions: what exactly is a species? Now that scientists have access to genetic techniques such as DNA fingerprinting, it is relatively easy to find different alleles for different genes. But how many different alleles does it take to identify a new species? It’s an ongoing and exciting debate in the ever-changing world of botany. Learn to see the world around you afresh as you read the stories of plant life for yourself that transforms science into an adventure. Assignments address the National Board for Professional Teaching Standards (NBPTS) for Science.

Note: Course guidebook is included with the cost of the course.

Content Disclaimer

The views expressed in some of the lectures and materials used in this course do not necessarily align with the theological views of Fresno Pacific University. As a faith-based institution we believe in the literal interpretation of the Bible. However, we also recognize that evolution is a scientific theory that is supported by scientific evidence. We believe that it is important for our students to be exposed to a variety of viewpoints on this topic, so that they can make personal decisions about their own beliefs.

Required Texts and Course Materials

Course Guidebook: Kleier, C. (2017). Plant Science: An Introduction to Botany. The Teaching Company.

Online Resources: Relevant online resources that support the course content and encourage further investigation will be available throughout the course assignments. Active hyperlinks are utilized throughout the course and will link to the appropriate information when clicked. These include videos, podcasts, worksheets, online activities, journal articles and other resources.

Moodle: Moodle is a web-based learning management system used to support flexible teaching and learning in both face-to-face and distance courses (e-learning).
<https://moodle.org> // <https://moodle.org/demo> // <https://docs.moodle.org>

Course Dates

Self-paced; students may enroll at any time and take up to one year, from the date of registration, to complete assignments. Students may complete assignments in no less than three weeks for a 3-unit course (one week per unit).

National Standards Addressed in This Course

National Board for Professional Teaching Standards (NBPTS)
(<http://www.nbpts.org/standards-five-core-propositions/>)

First published in 1989 and updated in 2016, *What Teachers Should Know and Be Able to Do* articulates the National Board’s Five Core Propositions for teaching. The Five Core Propositions - comparable to medicine’s Hippocratic Oath — set forth the profession’s vision for accomplished teaching. Together, the propositions form the basis of all National Board Standards and the

foundation for National Board Certification. Course assignments have been designed so students can demonstrate excellence against these professional teaching standards whenever possible.

- Proposition 1: Teachers are committed to students and their learning
- Proposition 2: Teachers know the subject they teach and how to teach those subjects to students
- Proposition 3: Teachers are responsible for managing and monitoring student learning
- Proposition 4: Teachers think systematically about their practice and learn from experience
- Proposition 5: Teachers are members of learning communities

NBPTS Science Standards (SS-HS)

<http://www.nbpts.org/wp-content/uploads/EAYA-SCIENCE.pdf>

The National Board for Professional Teaching Standards (NBPTS) has organized the standards for accomplished teachers of science subjects into the following nine standards. The standards have been ordered to facilitate understanding, not to assign priorities. They each describe an important facet of accomplished teaching; they often occur concurrently because of the seamless quality of accomplished practice. These standards serve as the basis for National Board Certification in science.

NBPTS Science Standards

- **Standard I:** Understanding Students: Accomplished science teachers continuously seek to understand their students, and they use this knowledge to enhance student learning.
- **Standard II:** Knowledge of Science: Accomplished science teachers have comprehensive understandings of the nature of science, inquiry, and natural phenomena.
- **Standard III:** Curriculum and Instruction: Accomplished science teachers thoughtfully and deliberately implement a standards-based curriculum using a variety of high-quality instructional strategies and resources to enhance student learning.
- **Standard IV:** Assessment: Accomplished science teachers purposefully assess their students in order to set learning goals, differentiate instruction, and encourage student learning.
- **Standard V:** Learning Environment: Accomplished science teachers create and maintain a safe and engaging learning environment to promote and support science learning for all students.
- **Standard VI:** Family and Community Partnerships: Accomplished science teachers establish productive interactions and successful partnerships with families and communities to enhance student learning.
- **Standard VII:** Advancing Professionalism: Accomplished science teachers advance their professionalism by pursuing leadership roles, collaborating with colleagues, and undertaking high-quality professional learning opportunities.
- **Standard VIII:** Diversity, Fairness, Equity and Ethics: Accomplished science teachers understand and value diversity, and they engage all students in high-quality science learning through fair, equitable, and ethical teaching practices.
- **Standard IX:** Reflection: Accomplished science teachers continually reflect on their teaching practice in order to maximize their own professional growth and improve the quality of their students' learning experiences

Common Core State Standards (CCSS) (www.corestandards.org)

The Common Core State Standards provide a consistent, clear understanding of what students are expected to learn, so teachers and parents know what they need to do to help them. The standards are designed to be robust and relevant to the real world, reflecting the knowledge and skills that our young people need for success in college and careers. With American students fully prepared for the future, our communities will be best positioned to compete successfully in the global economy.

Continuing Education Student Learning Outcomes (CE-SLO)

CE-SLO 1	Demonstrate proficient written communication by articulating a clear focus, synthesizing arguments, and utilizing standard formats in order to inform and persuade others, and present information applicable to targeted use.
CE-SLO 2	Demonstrate comprehension of content-specific knowledge and the ability to apply it in theoretical, personal, professional, or societal contexts.
CE-SLO 3	Reflect on their personal and professional growth and provide evidence of how such reflection is utilized to manage personal and professional improvement.
CE-SLO 4	Apply critical thinking competencies by generating probing questions, recognizing underlying assumptions, interpreting and evaluating relevant information, and applying their understandings to the professional setting.
CE-SLO 5	Reflect on values that inspire high standards of professional and ethical behavior as they pursue excellence in applying new learning to their chosen field.
CE-SLO 6	Identify information needed in order to fully understand a topic or task, organize that information, identify the best sources of information for a given enquiry, locate and critically evaluate sources, and accurately and effectively share that information.

Course Student Learning Outcomes (C-SLO)

Student Learning Outcomes for This Course By the end of this course student will be able to:		National Standards Addressed*	CE-SLO Addressed**
C-SLO 1	Demonstrate an understanding of the importance of plants for sustaining life on Earth.	Science Standards II, III, IV	CE 1, 2, 6
C-SLO 2	Explain the diversity of plant adaptations that allow them to thrive in different ecosystems.	Science Standards II, III, IV	CE 1, 2, 3
C-SLO 3	Understand the process of photosynthesis and its significance in differentiating plants from animals.	Science Standards II, III, IV	CE 1, 3, 6
C-SLO 4	Explore recent scientific discoveries in botany, such as the diurnal sleeping patterns of trees and the relationship between fungi and humans.	Science Standards II, III, IV	CE 2, 4, 6
C-SLO 5	Recognize and discuss how plants act as ecosystem engineers and protect their territories.	Science Standards II, III, IV	CE 1, 2, 6
C-SLO 6	Investigate the mechanisms by which plants obtain nutrients, including carnivorous plants and poison-injecting hairs.	Science Standards II, III, IV	CE 2, 4, 5
C-SLO 7	Identify shared features between plants and humans while recognizing their fundamental differences.	Science Standards II, III, IV	CE 1, 2, 5

C-SLO 8	Investigate the impact of natural selection on plant adaptations across different environments.	Science Standards II, III, IV	CE 1, 2, 5
C-SLO 9	Explore fascinating reproductive methods employed by plants, including both sexual and asexual reproduction.	Science Standards II, III, IV	CE 1, 3, 4

* Please refer to the section on **National Standards Addressed in This Course**

** Please refer to the section on **Continuing Education Student Learning Outcomes**

Topics, Assignments, and Activities

The participant's grade will be determined by the number and quality of modules they choose to complete. Outlined below are the module requirements for each type of unit and grade options.

If working towards the "A letter grade" option:

- Eight modules - Complete all 8 content modules.
- Complete the Knowledge Check OR Reflective Forum per module.
- Complete one (1) of the Applied Assignments per module.
- All coursework with must receive "A-grade" quality or better.

If working towards the "B letter grade" option:

- Six modules - Complete 6 of the 8 content modules (any 6 of your choice).
- Complete the Knowledge Check OR Reflective Forum per module.
- Complete one (1) of the Applied Assignments per module.
- All coursework with must receive "B-grade" quality or better.

Module Title	Module Assignments and Activities	Points Possible
Welcome Module	<ul style="list-style-type: none"> • Welcome Video • Course Syllabus • Introduce Yourself Forum 	
Module 1 – Introduction and First Plants	<ul style="list-style-type: none"> • Watch Videos 1, 2, 3 • Read Guidebook Lectures 1, 2, 3 • 1.1 Knowledge Check: Introduction and First Plants • 1.2 Reflective Forum: Introduction and First Plants • 1.3 Application: Presentation, Lesson Plan, or Choice 	Pass Pass Pass
Module 2 – Plant Anatomy	<ul style="list-style-type: none"> • Watch Videos 4, 5, 6 • Read Guidebook Lectures 4, 5, 6 • 2.1 Knowledge Check: Plant Anatomy • 2.2 Reflective Forum: Plant Anatomy • 2.3 Application: Presentation, Lesson Plan, or Choice 	Pass Pass Pass
Module 3 – Plant Chemistry	<ul style="list-style-type: none"> • Watch Videos 7, 8, 9 • Read Guidebook Lectures 7, 8, 9 • 3.1 Knowledge Check: Plant Chemistry • 3.2 Reflective Forum: Plant Chemistry • 3.3 Application: Presentation, Lesson Plan, or Choice 	Pass Pass Pass
Module 4 – Seeds and Flowers	<ul style="list-style-type: none"> • Watch Videos 10, 11, 12 • Read Guidebook Lectures 10, 11, 12 • 4.1 Knowledge Check: Seeds and Flowers • 4.2 Reflective Forum: Seeds and Flowers • 4.3 Application: Presentation, Lesson Plan, or Choice 	Pass Pass Pass

Module Title	Module Assignments and Activities	Points Possible
Module 5 – Fruit and Dissemination	<ul style="list-style-type: none"> • Watch Videos 13, 14, 15 • Read Guidebook Lectures 13, 14, 15 • 5.1 Knowledge Check: Fruit and Dissemination • 5.2 Reflective Forum: Fruit and Dissemination • 5.3 Application: Presentation, Lesson Plan, or Choice 	Pass Pass Pass
Module 6 – Plants, Water, and Society	<ul style="list-style-type: none"> • Watch Videos 16, 17, 18 • Read Guidebook Lectures 16, 17, 18 • 6.1 Knowledge Check: Plants, Water, and Society • 6.2 Reflective Forum: Plants, Water, and Society • 6.3 Application: Presentation, Lesson Plan, or Choice 	Pass Pass Pass
Module 7 – Plants, Rainfall and Temperature	<ul style="list-style-type: none"> • Watch Videos 19, 20, 21 • Read Guidebook Lectures 19, 20, 21 • 7.1 Knowledge Check: Plants, Rainfall, and Temperature • 7.2 Reflective Forum: Plants, Rainfall, and Temperature • 7.3 Application: Presentation, Lesson Plan, or Choice 	Pass Pass Pass
Module 8 – Funny Plants and Bad Plants	<ul style="list-style-type: none"> • Watch Videos 22, 23, 24 • Read Guidebook Lectures 22, 23, 24 • 8.1 Knowledge Check: Funny Plants and Bad Plants • 8.2 Reflective Forum: Funny Plants and Bad Plants • 8.3 Application: Presentation, Lesson Plan, or Choice 	Pass Pass Pass
Course Wrap-up – Grading and Evaluation	<ul style="list-style-type: none"> • Final Reflection Forum • Course Evaluation • Course Completion Checklist • Grade Request / Transcript Request 	

Grading Policies, Rubrics, and Requirements for Assignments

Grading Policies

- Assignments will be graded per criteria presented in the course rubrics.
- A = 90-100% and B = 80-89%, (anything below 80% will not receive credit.)
- The discernment between an A or a B letter grade is at the discretion of the instructor based on the quality of work submitted (see course rubrics).
- Coursework falling below a B grade will be returned with further instructions.
- All assignments must be completed to receive a grade and are expected to reflect the quality that teacher-training institutions require of professional educators. If completed assignments do not meet this standard, students will be notified with further instructions from the instructor.

Grading Rubrics

Grade	Percent	Description	Rubric
A	90-100%	Excellent	Meets all course / assignment requirements with significant evidence of subject mastery and demonstration of excellent graduate level professional development scholarship.
B	80-89%	Very Good	Adequately meets criteria for all course/assignment requirements - demonstrates subject competency with very good graduate level professional development scholarship.

NC	Below 80%	Unacceptable	Does not meet the minimum criteria for all course/assignment requirements and demonstrated little, if any, evidence of acceptable graduate level professional development scholarship.
----	-----------	--------------	--

Writing Requirements

- **Superior:** Writing is clear, succinct, and reflects graduate level expectations. Clearly addresses all parts of the writing task. Maintains a consistent point of view and organizational structure. Includes relevant facts, details, and explanations.
- **Standard:** Writing is acceptable with very few mistakes in grammar and spelling. Addresses most parts of the writing task. Maintains a mostly consistent point of view and organizational structure. Includes mostly relevant facts, details, and explanations.
- **Sub-standard:** Writing contains noticeable mistakes in grammar and spelling. Does not address all parts of the writing task. Lacks a consistent point of view and organizational structure. May include marginally relevant facts, details, and explanations.

Lesson Plan Requirements

- **Superior:** Instructional goals and objectives clearly stated. Instructional strategies appropriate for learning outcome(s). Method for assessing student learning and evaluating instruction is clearly delineated and authentic. All materials necessary for student and teacher to complete lesson clearly listed.
- **Standard:** Instructional goals and objectives are stated but are not easy to understand. Some instructional strategies are appropriate for learning outcome(s). Method for assessing student learning and evaluating instruction is present. Most materials necessary for student and teacher to complete lesson are listed.
- **Sub-standard:** Instructional goals and objectives are not stated. Learners cannot tell what is expected of them. Instructional strategies are missing or strategies used are inappropriate. Method for assessing student learning and evaluating instruction is missing. Materials necessary for student and teacher to complete lesson are missing.

Instructor/Student Contact Information

Throughout the course participants will be communicating with the instructor and their classmates on a regular basis using asynchronous posting forums. Students are provided with instructor contact information in the event they want to make email or phone contact. In addition, students are encouraged to email or phone the instructor at any time. Students will also receive feedback on the required assignments as they are submitted.

Forums

Participation is an important expectation of this course and all online courses. Online forums promote reflection and analysis while allowing students to appreciate and evaluate positions that others express. Forum postings are open to be viewed by all students in the course, so do not post sensitive or personal information about your students. While students may not be engaging with the same students throughout this course, they will be expected to offer comments, questions, and replies to the forum questions whenever possible. The faculty role in the forums is that of an observer and facilitator.

Coursework Hours

Based on the Carnegie Unit standard, a unit of graduate credit measures academic credit based on the number of hours the student is engaged in learning. This includes all time spent on the course:

reading the textbook, watching videos, listening to audio lessons, researching topics, writing papers, creating projects, developing lesson plans, posting to discussion boards, etc. Coursework offered for FPU Continuing Education graduate credit adheres to 45 hours per semester unit for the 900-level courses. Therefore, a student will spend approximately 135 hours on a typical 3-unit course.

Services for Students with Disabilities

Students with disabilities are eligible for reasonable accommodations in their academic work in all classes. In order to receive assistance, the student with a disability must provide the Academic Support Center with documentation, which describes the specific disability. The documentation must be from a qualified professional in the area of the disability (i.e. psychologist, physician or educational diagnostician). Students with disabilities should contact the Academic Support Center to discuss academic and other needs as soon as they are diagnosed with a disability. Once documentation is on file, arrangements for reasonable accommodations can be made. For more information and for downloadable forms, please go to <https://www.fresno.edu/students/academic-support/services-students-disabilities>.

Plagiarism and Academic Honesty

All people participating in the educational process at Fresno Pacific University are expected to pursue honesty and integrity in all aspects of their academic work. Academic dishonesty, including plagiarism, will be handled per the procedures set forth in the Fresno Pacific University Catalogue and Handbook - <https://handbook.fresno.edu/graduate/academic-policies>

Technology Requirements

To successfully complete the course requirements, course participants will need Internet access, can send and receive email, know how to manage simple files in a word processing program, and have a basic understanding of the Internet. Please remember that the instructor is not able to offer technical support. If you need technical support, please contact your Internet Service Provider.

Moodle: This course will be delivered totally online at <https://ce-connect.fresno.edu>. Moodle is a learning management system that provides students access to online resources, documents, assignments, knowledge checks, forums, etc. Moodle is easy to learn and has a friendly user interface. There are also some student tutorials on the Center for Online Learning website at Fresno Pacific University - <https://col.fresno.edu/student>.

Moodle Login and Passwords: Students will need to have internet access to log onto <https://ce-connect.fresno.edu>. The username and password for Moodle access will be sent to you by the university using the email address you submitted at the time of registration. The instructor will then contact you with a welcome communication. If you need help with your username and password recovery, please contact the Continuing Education office at (800) 372-5505 or (559) 453-2000 during regular office hours - Mon-Fri 8:00 am to 5:00 pm (pacific) or email them at prof.dev@fresno.edu.

Getting Help with Moodle: If you need help with Moodle, please contact the Center for Online Learning (COL), by telephone or the website. Help by phone (559) 453-3460 is available Mon-Fri 8:00 am to 5:00 pm (pacific) or by filling out a "Request Services" form at <https://col.fresno.edu/contact/request-services>. If asked, please identify that you are with the "School = Continuing Education".

Final Course Grade and Transcripts

When all work for the course has been completed, students will need to logon to the Continuing Education website (<https://ce.fresno.edu/my-account>) and “Request Final Grade”. Once the instructor receives the requests and submits the grade online, students may log back in to view their Final Grade Report or order transcripts online. Please allow at least two weeks for the final grade to be posted. For more information, see the Continuing Education Policies and Procedures at <https://ce.fresno.edu/ce-policies-and-procedures>.

University Policies and Procedures

Students are responsible for becoming familiar with the information presented in the Academic Catalog and for knowing and observing all policies and procedures related to their participation in the university community. A summary of university policies may be found on the university website at <https://www.fresno.edu/students/registrars-office/academic-catalogs>.

Fresno Pacific University Student Learning Outcomes (FPU-SLO)

FPU-SLO 1	Student Learning Outcomes Oral Communication: Students will <i>exhibit</i> clear, engaging, and confident oral communication – in both individual and group settings – and will critically <i>evaluate</i> content and delivery components.
FPU-SLO 2	Written Communication: Students will <i>demonstrate</i> proficient written communication by <i>articulating</i> a clear focus, <i>synthesizing</i> arguments, and utilizing standard formats in order to <i>inform</i> and <i>persuade</i> others.
FPU-SLO 3	Content Knowledge: Students will <i>demonstrate</i> comprehension of content-specific knowledge and the ability to apply it in theoretical, personal, professional, or societal contexts.
FPU-SLO 4	Reflection: Students will <i>reflect</i> on their personal and professional growth and <i>provide evidence</i> of how such reflection is utilized to manage personal and vocational improvement.
FPU-SLO 5	Critical Thinking: Students will <i>apply</i> critical thinking competencies by <i>generating</i> probing questions, <i>recognizing</i> underlying assumptions, <i>interpreting</i> and <i>evaluating</i> relevant information, and <i>applying</i> their understandings to new situations.
FPU-SLO 6	Moral Reasoning: Students will <i>identify</i> and <i>apply</i> moral reasoning and ethical decision-making skills, and <i>articulate</i> the norms and principles underlying a Christian worldview.
FPU-SLO 7	Service: Students will <i>demonstrate</i> service and reconciliation as a way of leadership.
FPU-SLO 8	Cultural and Global Perspective: Students will <i>identify</i> personal, cultural, and global perspectives and will employ these perspectives to <i>evaluate</i> complex systems.
FPU-SLO 9	Quantitative Reasoning: Students will accurately <i>compute</i> calculations and symbolic operations and <i>explain</i> their use in a field of study.
FPU-SLO 10	Information Literacy: Students will <i>identify</i> information needed in order to fully understand a topic or task, <i>explain</i> how that information is organized, <i>identify</i> the best sources of information for a given enquiry, <i>locate</i> and critically <i>evaluate</i> sources, and accurately and effectively <i>share</i> that information.