BIOL 6350

Advanced Physiological Plant Ecology

Spring 2025

1 Course Description

Students in this course will learn the fundamentals of plant physiology through an ecological lens. The course will focus on plant responses to environmental conditions across multiple spatial and temporal scales. The course will cover plant, water, carbon, and nutrient relations in natural and managed systems across multiple ecological scales. Students will be evaluated on their ability to discuss and disseminate ecophysiological topics.

1.1 Class Time and Location

Tuesdays and Thursdays 9:30-10:50

Biology Building (BIOL) Room 102-103.

1.2 Instructor

Dr. Nick Smith

Experimental Sciences Building II (ESBII) Room 402D

806-834-7363

nick.smith@ttu.edu

1.3 Office Hours

Tuesdays 14:00-14:50

1.4 Recommended Texts

Plant Physiological Ecology (2nd Edition; 2008) by Lambers, Chapin, and Pons

The book can be accessed from Springer here: https://www.springer.com/us/book/9780387783406. Click on "Access this title on SpringerLink." It can also be accessed through the TTU library.

Plant Physiology and Development (6th Edition) by Taiz, Ziegler, Moller, and Murphy

2 Mode of Instruction

All instruction will be done face-to-face unless the university directs classes be taught online.

3 Course Materials

All course materials, including lecture slides, readings, activities, and code will be posted to a GitHub repository for the course. The primary repository address is https://github.com/SmithEcophysLab/biol43506350_spring2025.

4 Learning Objective

This course will broadly focus on understanding the role that plant physiological processes play in driving ecological responses across multiple scales from the individual to the globe. Class activities will be based on discussion and dissemination of ideas, including classic and recent scientific literature. Topics will be flexible and modified to match student interests where possible.

5 Attendance Policy

Attendance is strongly recommended. Much of the graded content will be completed in class and students will not be permitted to complete this material out-

side of class. See course assessments below for details. Makeups will not be granted.

6 Course Assessment

6.1 *Participation and Engagement*

Being an active and engaged participant in the class will benefit your understanding of material as well as your peers'. Examples include asking questions, providing feedback, and facilitating discussion. Participation and engagement of each student will be monitored during each class period.

6.2 *Mini-quizzes*

Short "quizzes" will be given in class each week (typically on Thursdays). These quizzes will be used to stimulate discussion and to assess how well prior concepts were understood by the class.

6.3 *Classical literature feedback*

Each week students will be required to read a "classic" article on the current weeks' topic and produce a short summary as well as two questions that arose during their reading of the article. Students are encouraged to bring up these questions during the Tuesday class discussions.

6.4 *Recent literature article lead*

Each student will be required to lead one Thursday discussion on recent literature. This will involve introducing the article and leading a jigsaw-style discussion related to the article. Students must read some of the cited literature integral to the study in order to answer relevant questions brought forth during the discussion. The article will be chosen by Dr. Smith, unless a different arrangement is made. Discussion leads will be done in groups of 1-3 students.

6.5 *Recent literature article feedback*

Students not leading the current week's discussion will be required to produce a summary and develop two questions based on each week's article.

6.6 *Literature Review*

The primary semester project will be to produce a literature review on a topic of the student's choice. Broadly, the review should address a question or problem related to plant ecophysiology and review the current state of knowledge on the topic. The review should be forward thinking, in that it forms the basis for understanding plant physiological processes moving forward. The review should be novel in that it should not be similar to previously published review papers.

Students will first develop a written proposal for their literature review and present their idea to the class. The class and instructors will provide feedback. Students will then produce and present their review to the class at the end of the semester.

This project will be done individually. Students are encouraged to receive help and guidance from the instructors as well as the class at large.

The literature review will be assessed for completeness, breadth, originality, and presentation. Students must have their project OKed by the instructor after the proposal and prior to beginning the final project.

The grading of this review will differ from that for the undergraduate section. Specifically, for full points on the breadth and originality portion (20% of written grade), the question addressed must be completely novel and not something that has been reviewed in the published literature. The review should produce novel findings, questions, and hypotheses. For full points on the scientific rigor portion (30% of written grade), the content of the review should be of suitable quality for partial inclusion in the introduction of a manuscript or proposal or be submittable for publication on its own. For full points on the oral presentation portion (5% of total oral grade), the presentation should be of suitable quality that it could be presented at a national conference in the field of plant science (Botanical Society of America) and/or ecology (Ecological Society of America).

7 Grading

Participation and Engagement: 15%

Mini-quizzes: 10%

Classical literature feedback: 5%

Recent literature lead: 15%

Recent literature feedback: 5%

Review idea proposal: 10%

Review idea feedback: 5%

Final review presentation: 10%

Final review: 25%

Grades will be made available on Blackboard. All grades posted at the end of the course will be final. Please contact Dr. Smith if you feel your grade has been calculated incorrectly.

8 Grading Scale

A: $\geq$ 90%

B: 80 – 90%

C: 70 – 80%

D: 60 – 70%

F: $\leq$ 59.9%

9 Missing In-class Activities

Students will be required to be in class to receive in-class activity points. Please contact Dr. Smith if you plan to miss class for a university function *prior to class*. If class is missed due to an illness, please let Dr. Smith know as soon as possible. Documentation will need to be provided in order to be able to make up any missed work.

10 Special Considerations

Texas Tech Policies Concerning Academic Honesty, Special Accommodations for Students with Disabilities, Student Absences for Observance of Religious Holy Days, Accommodations for Pregnant Students, and other policies may be found at this link: `https://www.depts.ttu.edu/tlpdc/RequiredSyllabusStatements.php`.

10.1 AI Use

The use of generative AI tools (such as ChatGPT) is strictly prohibited in this course for any purpose. Information gathered from AI cannot be used even with appropriate citation. Submission of AI-generated content (i.e., information, text, or images) as your own work is a violation of academic integrity and may result in referral to the Office of Student Conduct. Please contact your instructor if you have questions regarding this course policy.

11 Plagiarism Statement

Texas Tech University expects students to "understand the principles of academic integrity and abide by them in all class and/or course work at the University" (OP 34.12.5). Plagiarism is a form of academic misconduct that involves (1) the representation of words, ideas, illustrations, structure, computer code, other expression, or media of another as one's own and/or failing to properly cite direct, paraphrased, or summarized materials; or (2) self-plagiarism, which involves the submission of the same academic work more than once without the prior permission of the instructor and/or failure to correctly cite previous work written by the same student. Please review Section B of the TTU Student Handbook for more information related to other forms of academic misconduct, and contact your instructor if you have questions about plagiarism or other academic concerns in your courses. To learn more about the importance of academic integrity and practical tips for avoiding plagiarism, explore the resources provided by the TTU Library and the School of Law.

Schedule of Topics by Week; pages refer to pages in Lambers book

13/01/23 - Introductions, semester planning, and goals

20/01/23 – Physiology's role in ecology (pp. 1-8)

27/01/23 – Key physiological processes: photosynthesis, respiration, transpiration, translocation (pp. 11-203)

03/02/23 – Light (pp. 26-47, 237-238)

10/02/23 – Temperature (pp. 60-63, 127-129, 239-244)

17/02/23 – Water (53-57, 163-217)

24/02/23 – CO2 (pp. 87-90)

03/03/23 – Nutrients (pp. 58-59, 225-310)

10/03/23 – **Literature review proposal presentations**

17/03/23 – NO CLASS

24/03/23 – Growth and allocation (pp. 321-367), Life cycles, ontogeny, and phenology (pp. 375-398)

31/03/23 – Competition (pp. 505-518)

07/04/23 – Scaling (pp. 555-569)

14/04/23 – **Literature review presentations**

21/04/23 – **Literature review presentations**

28/04/23 – NO CLASS

05/05/23 – NO CLASS

General Weekly Schedule

Generally, each Tuesday will consist of a lecture by Dr. Smith followed by a discussion of a classical literature article. Students will turn in their classical literature feedback at the end of Tuesday's lecture. Thursdays will generally begin

with an in-class mini-quiz and discussion. This will be followed by a discussion of a recent literature article and (time permitting) an in-class activity.