BIOL 6350

Plant Physiological Ecology

Spring 2021

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 101 or synchronous online via Zoom (see Mode of Instruction section below).

1.2 Instructor

Dr. Nick Smith

Biology Building (BIOL) Room 215

806-834-7363

nick.smith@ttu.edu

Meetings by appointment

1.3 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 given in a synchronously. The course will be taught in a hybrid mode. Students will have the option to either attend class in person (BIOL 101) or online via Zoom. In-person and online attendees will be expected to partipate fully in the class (see expectations and grading below). All students, regardless of how they attend, will be evaluated similarly. Students wanting to attend online will need to download Zoom to their personal computer (`https://zoom.us/`). Students will need to have access to a webcam and microphone for Zoom delivery. The Zoom meeting ID and password will be emailed to the class by Dr. Smith.

3 Contingency Statement

If Texas Tech University campus operations are required to change because of health concerns related to the COVID-19 pandemic, it is possible that this course will move to a fully online delivery format. Should that be necessary, students will need to have access to a webcam and microphone for remote delivery of the class. Additionally, students will need to have access to Zoom software.

4 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/ecophys_sp2021`.

5 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.

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

7 Course Assessment

7.1 *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.

7.2 *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.

7.3 *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.

7.4 *Recent literature article lead*

Each student will be required to lead one Thursday discussion on recent literature. This will involve presenting the article and leading a 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 chose by Dr. Smith, unless a different arrangement is made. Discussion leads will be done in groups of 2-3 students.

7.5 *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.

7.6 *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.

8 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.

9 Grading Scale

A: $\geq$ 90%

B: 80 – 90%

C: 70 – 80%

D: 60 – 70%

F: $\leq$ 59.9%

10 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 (see COVID illness based absence policy below).

10.1 Illness Based Absence Policy

If at any time during this semester you feel ill, in the interest of your own health and safety as well as the health and safety of your instructors and classmates, you are encouraged not to attend face-to-face class meetings or events. Please review the steps outlined below that you should follow to ensure your absence for illness will be excused. These steps also apply to not participating in synchronous online class meetings if you feel too ill to do so and missing specified assignment due dates in asynchronous online classes because of illness. If you are ill and think the symptoms might be COVID-19-related:

- Call Student Health Services at 806.743.2848 or your health care provider. After hours and on weekends contact TTU COVID-19 Helpline at [TBA].
- Self-report as soon as possible using the Dean of Students COVID-19 webpage. This website has specific directions about how to upload documentation from a medical provider and what will happen if your illness renders you unable to participate in classes for more than one week.
- If your illness is determined to be COVID-19-related, all remaining documentation and communication will be handled through the Office of the Dean of Students, including notification of your instructors of the period of time you may be absent from and may return to classes.
- If your illness is determined not to be COVID-19-related, please follow steps below.

If you are ill and can attribute your symptoms to something other than COVID-19:

- If your illness renders you unable to attend face-to-face classes, participate in synchronous online classes, or miss specified assignment due dates in asynchronous online classes, you are encouraged to visit with either Student Health Services at 806.743.2848 or your health care provider. Note that Student Health Services and your own and other health care providers may arrange virtual visits.
- During the health provider visit, request a "return to school" note;
- E-mail the instructor a picture of that note;
- Return to class by the next class period after the date indicated on your note.

11 TTU COVID-19 Policy Reminders

The Texas Tech University System has implemented a mandatory Facial Covering Policy to ensure a safe and healthy classroom experience. Current research on the COVID-19 virus suggests that there is a significant reduction in the potential for transmission of the virus from person to person by wearing a mask/facial covering that covers the nose and mouth areas. Because of the potential for transmission of the virus, and to be consistent with the University's requirement, students in this class are to wear a mask/facial covering before, during, and after class. Observing safe distancing practices within the classroom by spacing out and wearing a mask/facial covering will greatly improve our odds of having a safe and healthy in-person class experience. Any student choosing not to wear a mask/facial covering during class will be directed to leave the class and will be responsible to make up any missed class content or work.

COVID-19-related links:

- Student Affair COVID-19 (`https://www.depts.ttu.edu/studentaffairs/SACOVID19.php`)
- Student COVID-19 Protocol (`https://www.depts.ttu.edu/communications/emergency/coronavirus/provostdocs/Student_COVID-19_Flowchart_07-21-20.pdf`)
- TTU Commitment (`https://www.ttu.edu/commitment/`)

12 Special Considerations

12.1 Disabling Condition

Any student who, because of a disability, may require special arrangements in order to Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact Dr. Smith as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services. Please note instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office at 335 West Hall or 806-742-2405.

12.2 Religious Holy Days

"Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence. A student who is excused may not be penalized for the absence; however, the instructor may respond appropriately if the student fails to complete the assignment satisfactorily.

13 Academic Integrity

As stated in the Texas Tech University catalog, “The attempt of any students to present as their own work that they have not honestly performed is regarded by the faculty and administration as a serious offense and renders the offenses liable to serious consequences, possibly suspension.” This statement applies to cheating in whatever manner, including plagiarism.

14 TTU Resources for Discrimination, Harassment, and Sexual Violence

Texas Tech University is committed to providing and strengthening an educational, working, and living environment where students, faculty, staff, and visitors are free from gender and/or sex discrimination of any kind. Sexual assault, discrimination, harassment, and other Title IX violations are not tolerated by the University. Report any incidents to the Office for Student Rights and Resolution, (806)-742-SAFE (7233) or file a report online at `titleix.ttu.edu/students`.

Faculty and staff members at TTU are committed to connecting you to resources on campus. Some of these available resources are:

- TTU Student Counseling Center, 806-742-3674, `https://www.depts.ttu.edu/scc`. Provides confidential support on campus.
- TTU 24-hour Crisis Helpline, 806-742-5555. Assists students who are experiencing a mental health or interpersonal violence crisis. If you call the helpline, you will speak with a mental health counselor.
- Voice of Hope Lubbock Rape Crisis Center, 806-763-7273, `https://voiceofhopelubbock.org`. 24-hour hotline that provides support for survivors of sexual violence.
- The Risk, Intervention, Safety and Education (RISE) Office, 806-742-2110, `https://www.depts.ttu.edu/rise/`. Provides a range of resources and support options focused on prevention education and student wellness.
- Texas Tech Police Department, 806-742-3931, `http://www.depts.ttu.edu/ttpd/`. To report criminal activity that occurs on or near Texas Tech campus.

15 LGBTQIA

I identify as an ally to the lesbian, gay, bisexual, transgender, queer, intersex, and asexual (LGBTQIA) community, and I am available to listen and support you in an affirming manner. I can assist in connecting you with resources on campus to address problems you may face pertaining to sexual orientation and/or gender identity that could interfere with your success at Texas Tech. Please note that additional resources are available through the Office of LGBTQIA within the

Center for Campus Life, Student Union Building Room 201, www.lgbtqia.ttu.edu, 806.742.5433.

16 Online Classroom Civility

Texas Tech University is a community of faculty, students, and staff sharing an expectation of cooperation, professionalism, respect and civility in all forms of university communication and business. This expectation applies to all interactions in a classroom setting where an exchange of ideas and creative thinking should be encouraged and where intellectual growth and development are fostered. As we consider ways in which we maintain a productive and cooperative online environment, many of the same standards from a face-to-face instruction transfer to the online setting. In this way, at the instructor's discretion, disruptive behavior may result in disciplinary referrals pursuant to the Texas Tech University Code of Student Conduct. Students are expected to maintain online behaviors that are conducive to learning.

Examples of behavior that may be considered disruptive include:

- Disrupting the flow of a class session(s) by making off-topic comments.
- Enabling or participating in online classroom hijacking ("Zoombombing") by participating in online classroom streams without being enrolled in the course or by sharing streaming classroom links with parties not enrolled in the course.
- Spamming, hacking, or using TTU or Blackboard platforms for commercial purposes.
- Cyberbullying or online harassment.
- Habitually interfering with or stopping instructional delivery

17 Creating Livable Futures

This class is part of a campus-wide initiative called Creating Livable Futures, which is sponsored in part by the Texas Tech Center for Global Communication. As such, one of our objectives is to prepare you to communicate, in a fully interdisciplinary and global way, the challenges posed by pressing issues

that speak to our collective wellbeing and sustainability. You will be asked to translate and communicate the work of leading thinkers on sustainability, and to expand discussing those materials through research experience and experiential learning. These objectives will be met through discussion leads and the review paper.

Your progress in communicating about global issues will be evaluated according to the Center for Global Communication rubric, so you will be invited to participate in one or more Creating Livable Futures activities outside of class that will complement class content. Planned Creating Livable Futures activities include participating in and attending speaker events and conferences, edit-a-thons, blogging and publication opportunities, student organizations, a book club, and even small scholarship opportunities for research.

You'll be informed of relevant opportunities and activities as they arise over the course of the semester.

Schedule of Topics by Week

Note: Lambers, Chapin III, and Pons (2008) pages in parentheses

18/01/21 – Introductions, semester planning, and goals

25/01/21 – Physiology's role in ecology (pp. 1-8)

01/02/21 – Key physiological processes: photosynthesis, respiration, transpiration, translocation (pp. 11-203)

08/02/21 – Light (pp. 26-47, 237-238)

15/02/21 – Temperature (pp. 60-63, 127-129, 239-244)

22/02/21 – Water (53-57, 163-217)

01/03/21 – CO2 (pp. 87-90)

08/03/21 – Nutrients (pp. 58-59, 225-310)

15/03/21 – Growth and allocation (pp. 321-367)

22/03/21 – **Literature review proposal presentations**

29/03/21 – Life cycles, ontogeny, and phenology (pp. 375-398)

05/04/21 – Competition (pp. 505-527)

12/04/21 – Symbioses (pp. 522-524)

19/04/21 – Scaling from cells to canopies to ecosystems to the globe (pp. 247-253, 555-569)

26/04/21 – **Literature review presentations**

03/05/21 – **Literature review presentations**

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.