SYLLABUS

TEMPERATURE STRESS PHYSIOLOGY
HORT 4133/5133
Department of Horticulture & LA
Oklahoma State University

Contact Information

Instructor: Dr. Lu Zhang
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Office Hours: Monday, Wednesday, Friday
9:00 to 10:00 a.m. Central Time
Additional times can be arranged by email as necessary

Overview of the Course

Principles of biochemistry and physiology will be used to develop an understanding of the mechanism of injury and resistance of plants to temperature stresses. The course is composed of introductory modules focusing on cellular structure, stress metabolism, and signal transduction before addressing plant responses to cold and heat stresses. The primary emphasis will be at the cellular and molecular levels.

Temperature Stress Physiology is offered online using Zoom. Canvas will be used for posting lecture slides and reading materials as well as student assignments and exam submissions.

This course will cover the following five topics: Plants, Metabolism, Signaling, Cold Stress Response, and Heat Stress Response. The instructor will give 14 base lectures to help strengthen student knowledge, and 5 lectures focusing on advanced Research Progress with the purpose to trigger student interest in research. Three expert guest speakers will be invited to give a lecture to broaden student viewpoints.

Students are required to attend each Zoom meeting or watch the recordings. 2 independent (8-10 minutes) presentations, 2 exams and 1 two-page report are required for this course.

Course Schedule

3:00 – 4:15 p.m. Central Time on Tuesday and Thursday from January 19th to April 19th
Students with schedule conflicts can watch the recordings. Students who do not attend the live meeting will be required to submit an assignment with 5 key points from the class with a total 85 words count limit.

Prerequisites:

At least one course in biochemistry or physiology, or permission from the instructor.

Course Goals:

Students will be able to apply biological, chemical and physiological principles to model how plants are damaged by temperature extremes and how they change to increase resistance. Students will also be able to apply these principles to better understand plant responses to other environmental challenges.

Course Objectives:

Upon completion of the course, student will be able to:

1. Critically evaluate technical knowledge from the scientific literature.
2. Describe how basic elements interact to bring about responses to specific environmental signals.
3. Perform academic research on topics of interest and demonstrate their understanding of this topic with a presentation.
4. Develop strategies to improve plant resistance to temperature stress.

Supplementary Texts:

Abiotic Stress. Vahdati K. and Leslie C. 2013. IntechOpen. ISBN: 978-953-51-1024-8 https://www.intechopen.com/books/abiotic-stress-plant-responses-and-applications-in-agriculture

Plant Stress Physiology (2nd Edition). 2017. Sergey Shabala. CABI, Boston MA. ISBN: 978-1780647296

Grading Policy

Attendance	20 pts
Presentation 1	15 pts
Presentation 2	15 pts
Exam 1	20 pts
Exam 2	20 pts
Report	10 pts
Total:	100 pts

Letter grades will be assigned according to the standard scale.

90-100 pts = A
80-89 pts = B
70-79 pts = C

60-69 pts = D
Below 60 pts = F

Tentative Schedule

Week	Date	Unit	Topics
1	Jan 19	I. Plants	1. Temperature Extremes
	Jan 21		2. Cell Membranes and Organelles
2	Jan 26		3. Plant Structure
	Jan 28		4. Growth and Development
3	Feb 2		5. Research Progress: Spring Freeze Damages of Pecan Bloom
	Feb 4	II. Metabolism	1. Carbohydrates
4	Feb 9		2. Guest Lecture 1
	Feb 11		3. Student Literature Review & Presentation 1
5	Feb 16		4. Respiration
	Feb 18		5. Lipid Metabolism
6	Feb 23		6. Research Progress: Temperature Stress on Phospholipid Bilayers
	Feb 25	III. Signaling	1. Signal Transduction
7	Mar 2		2. Exam 1
	Mar 4		3. Stress Response Hormone
8	Mar 9		4. Abscisic Acid Signal Transduction Pathway
	Mar 11		5. Guest Lecture 2
9	Mar 16		6. Research Progress: Fruit Calcium – Transport and Physiology
	Mar 18	IV. Cold Stress Response	1. Transcriptional Regulation
10	Mar 23		2. Student Literature Review & Presentation 2
	Mar 25		3. Cold Acclimation
11	Mar 30		4. Guest Lecture 3
	Apr 1		5. Research Progress: Cold Stress Memory
12	Apr 6	V. Heat Stress Response	1. Heat Stress Transcription Factors
	Apr 8		2. Exam 2
13	Apr 13		3. Reactive Oxygen Species (ROS) Homeostasis
	Apr 15		4. Research Progress: Heat Stress in Fruit Trees