

Plant Physiology

11:776:382 (4 credits)

Spring Semester (even years)

Tuesday, Friday (lecture) 10:55 AM – 12:15 PM 138B Foran Hall

Wednesday (laboratory) 3:55 – 6:55 PM 194 Foran Hall

CONTACT INFORMATION

Instructor: Dr. Bingru Huang
Office Location: 301B Foran Hall, 59 Dudley Rd., New Brunswick, NJ 08901
Phone: 848-932-6390
E-mail: huang@aesop.rutgers.edu
Office Hours: by arrangement

COURSE DESCRIPTION

This course is designed to provide students with comprehensive exposure to the subject of plant physiology. The laboratory exercises provide hands-on experiences with experiments and training in instrumental skills. Topics include: water relations, photosynthesis, inorganic nutrition, metabolism of organic materials, and plant growth regulation, with emphasis on environmental factors in the physiology of plants.

COURSE WEBSITE, RESOURCES AND MATERIALS

- Course website: Sakai
- Required textbook: Introduction to Plant Physiology, 3rd. William G. Hopkins (on reserve at Chang Library)
- Other references:
Plant Physiology, 2nd. L. Taitz and E. Zeiger
Plant Physiology, 4th. F. Salisbury and Cleon W. Ross

PREREQUISITES

01:119:115-116-117 General Biology OR equivalent AND 11:776:242 Plant Science. Recommended: Organic Chemistry

COURSE LEARNING GOALS

(Link to Plant Biology Undergraduate Program Goals: <http://plantbiology.rutgers.edu/undergrad/plantbiology/>)

By the end of this course, the student will be able to:

1. Comprehend the fundamental concepts of plant physiology (addresses program goal 1)
2. Describe the physiological mechanisms of plant growth, function, and development (addresses program goals 1 and 3)
3. Recognize and describe how plants respond to their environment (addresses program goal 2)

ASSIGNMENTS/RESPONSIBILITIES AND ASSESSMENT

Grading

- Lecture:
 - First exam 15%
 - Second exam 20%

- Third exam 30%
- Laboratory:
 - Reports and presentations 30%
- Attendance and class participation 5%
- Scale: 90-100 = A; 80-89 = B; 70-79 = C; 60-69 = D

Lab reports and presentations: Laboratory work is done in small groups. To foster learning and interaction among students, each group will design an experiment to conduct based on techniques learned in the course.

Learning goals assessment: Specific questions on exams and participation in class will be used to assess student knowledge of course learning goals, including demonstrated mastery of fundamental terms and mechanisms in plant physiology. In graded laboratory exercises, students will communicate their understanding of techniques used in the discipline (course learning goals 2 and 3). The percentage score on these assessments will determine the level of mastery: >90% outstanding; 80-89% good; 70-79% satisfactory; <69% unsatisfactory.

PARTICIPATION GRADE AND ABSENCE POLICY

Attendance is mandatory and will be recorded. There will be no make-up for missed exams or labs. Students unable to attend may contact the instructor via e-mail prior to the missed class or may use the University absence reporting website (<https://sims.rutgers.edu/ssra/>) to indicate the date and reason for the absence. An e-mail is automatically sent to the instructor.

COURSE TOPICS

Lecture schedule

Lecture	Topics	Chapter
Introduction		
1	Course overview: the organization of plants and plant cells	1
Part I: Water and mineral nutrients		
2	Water in plant cells	10
3	Water relations of the whole plant	11
4	Essential nutrients	12
5	Nutrient uptake	13
Exam I		
Part II: Photosynthesis and Respiration		
6	Photosynthesis: light and pigments	3
7, 8	Photosynthesis: light reaction	4
9, 10	Photosynthesis: carbon assimilation	5
11	Photosynthesis: carbon allocation	6
12, 13	Respiration	7
Spring recess		
Exam II		
Part III: Regulation of plant growth and development		
14	Cellular basis of growth and development	14
	Plant hormones	15, 16
15	Auxin	
16	Gibberellins	
17	Cytokinins	
18	Abscisic acid and ethylene	
19	Photomorphogenesis: responding to light	17
20	Plant movements	18
21	Photoperiodism	19
22	Temperature control	20

Lecture	Topics	Chapter
Part IV: Stress physiology and biotechnology		
23, 24	Plant response to environmental stresses	21
25	Biotechnology	22
Exam III (final exam: to be determined)		

Laboratory schedule

Schedule	Laboratory	Topic	Procedures
Week 1	No laboratory		
Week 2	No laboratory		
Week 3	1	Water Relations	Time domain reflectometry Relative water content Osmotic adjustment Transpiration rate
Week 4	2	Nutrition	Deficiency symptoms Nitrate-nitrogen concentration
Week 5	3 (Part 1)	Photosynthesis	Photochemical efficiency Stomatal characteristics Leaf area meter
Week 6	4 (Part 2)	Photosynthesis	Chlorophyll content Light meter Net photosynthetic rate
Week 7	5	Respiration	Net respiration rates Temperature and respiration Starch quantification
Week 8	No laboratory Spring recess		
Week 9	6	Plant Growth Regulators	Effects of gibberellic acid on germination and growth
Week 10	7	Plant Growth Regulators	Lab 6 (cont.) Effects of auxin on rooting
Week 11	8	Light Response	Quantification Intensity/duration Direction
Week 12	No laboratory		
Week 13	9	Abiotic Stress	Drought Salinity Flooding
Week 14	No laboratory	Wrap up	

FINAL EXAM/PAPER DATE AND TIME

The Online Final exam Schedule: <http://finalexams.rutgers.edu/>

ACCOMODATIONS FOR STUDENTS WITH DISABILITIES

Please follow the procedures outlined at <https://ods.rutgers.edu/students/registration-form>. Full policies and procedures are at <https://ods.rutgers.edu/>

ACADEMIC INTEGRITY

The university's policy on Academic Integrity is available at <http://academicintegrity.rutgers.edu/academic-integrity-policy/>

The principles of academic integrity require that a student:

- Properly acknowledge and cite all use of the ideas, results, or words of others.
- Properly acknowledge all contributors to a given piece of work.
- Make sure that all work submitted as his or her own in a course or other academic activity is produced without the aid of impermissible materials or impermissible collaboration.
- Obtain all data or results by ethical means and report them accurately without suppressing any results inconsistent with his or her interpretation or conclusions.
- Treat all other students in an ethical manner, respecting their integrity and right to pursue their educational goals without interference. This requires that a student neither facilitate academic dishonesty by others nor obstruct their academic progress.
- Uphold the canons of the ethical or professional code of the profession for which he or she is preparing.

Adherence to these principles is necessary in order to ensure that:

- Everyone is given proper credit for his or her ideas, words, results, and other scholarly accomplishments.
- All student work is fairly evaluated and no student has an inappropriate advantage over others.
- The academic and ethical development of all students is fostered.
- The reputation of the University for integrity in its teaching, research, and scholarship is maintained and enhanced.

Failure to uphold these principles of academic integrity threatens both the reputation of the University and the value of the degrees awarded to its students. Every member of the University community therefore bears a responsibility for ensuring that the highest standards of academic integrity are upheld.

STUDENT WELLNESS SERVICES

Just In Case Web App <http://codu.co/cee05e>

Access helpful mental health information and resources for yourself or a friend in a mental health crisis on your smartphone or tablet and easily contact CAPS or RUPD.

Counseling, ADAP & Psychiatric Services (CAPS)

(848) 932-7884 / 17 Senior Street, New Brunswick, NJ 08901/ www.rhscaps.rutgers.edu/

CAPS is a University mental health support service that includes counseling, alcohol and other drug assistance, and psychiatric services staffed by a team of professional within Rutgers Health services to support students' efforts to succeed at Rutgers University. CAPS offers a variety of services that include: individual therapy, group therapy and workshops, crisis intervention, referral to specialists in the community and consultation and collaboration with campus partners.

Violence Prevention & Victim Assistance (VPVA)

(848) 932-1181 / 3 Bartlett Street, New Brunswick, NJ 08901 / www.vpva.rutgers.edu/

The Office for Violence Prevention and Victim Assistance provides confidential crisis intervention, counseling and advocacy for victims of sexual and relationship violence and stalking to students, staff and faculty. To reach staff during office hours when the university is open or to reach an advocate after hours, call 848-932-1181.

Disability Services

(848) 445-6800 / Lucy Stone Hall, Suite A145, Livingston Campus, 54 Joyce Kilmer Avenue, Piscataway, NJ 08854 / <https://ods.rutgers.edu/>

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at

the campus where you are officially enrolled, participate in an intake interview, and provide documentation: <https://ods.rutgers.edu/students/documentation-guidelines>. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form on the ODS web site at: <https://ods.rutgers.edu/students/registration-form>.

Scarlet Listeners

(732) 247-5555 / <http://www.scarletlisteners.com/>

Free and confidential peer counseling and referral hotline, providing a comforting and supportive safe space.