

Physiology and Ecology of Crops AGR 4512

**Department of Agronomy
University of Florida**

Course Description:

Physiological, ecological, and environmental responses that impact growth, development and yield formation of cultivated crops

Course Objective:

To provide students with an understanding and appreciation of the fundamental processes (at the cellular, leaf, whole-plant, and crop canopy levels) that are ultimately integrated to produce crop biomass and grain yield

Credit Hours:

3 hours

Prerequisite:

PLS 3004C (Principles of Plant Science), or equivalent

Class Schedule:

The class meets period 5 (11:45 am - 12:35 pm) on Monday, Wednesday, and Friday in Spring semesters.

Classroom:

All classes are scheduled for G001 McCarty Hall D.

Class Attendance and Participation:

Attendance is expected and in-class and on-line participation will comprise 10% of the final class grade. Attendance will be recorded on random dates throughout the semester.

Instructor:

Jerry M. Bennett (biographical profile: <http://agronomy.ifas.ufl.edu/jerry-m-bennett/profile/>)
Agronomy Department
3105G McCarty Hall D
Phone: 352-294-1591
email: jmbt@ufl.edu

Office Hours:

Students are encouraged to make an appointment, as necessary, with the instructor to clear any doubts about how the course is conducted or about the subject matter, as necessary. Fourth period (10:40-11:30, right before class) on Monday, Wednesday, or Friday is the best time to meet with the instructor. I will also be happy to meet at other times if an appointment is made. To schedule an appointment, please contact the instructor by phone (352-294-1951) or email (jmbt@ufl.edu).

The instructor reads email daily and will be happy to conduct general communications via email.

Technology Requirements:

Access to and on-going use of a computer is required for all students to successfully complete their UF degree programs. Competency in the basic use of a computer is expected for students in this course. Class participation will require consistent access to the Internet. You are strongly encouraged to have reliable Internet access at home, but the University also has student computer labs available to students who wish to use them. The complete official UF policy on the student computer requirement is found at: <http://training.helpdesk.ufl.edu/computing.shtml>.

Learning Management System (Course Platform) – Sakai:

Learning resources and assignments for this course will be delivered in **E-Learning Sakai**, the centrally-supported course management system at UF. For a tutorial regarding E-Learning Sakai functionality, go to https://lss.at.ufl.edu/sakai-training/student_index.shtml.

Students enrolled in the course should login to Sakai on the first day of the course at: <http://lss.at.ufl.edu>. You will use your Gatorlink name and password to login to Sakai.

All Powerpoint presentations that support the lectures will be posted within the “Lessons” section of Sakai, as well as additional readings on the lecture topics. Assignments will be provided in the “Assignments” section of Sakai. Threads of discussion on assigned topics and readings will be posted to the “Discussion” section of Sakai and all students will be expected to contribute to the discussions. Course announcements, general course information and all course communications will also be delivered within Sakai.

UF Computing Help Desk:

The UF Computing Help Desk is available by phone or email at 352-392-HELP (4357) and helpdesk@ufl.edu. The hours of operation are Monday-Thursday: 7:30 am to 10:00 pm; Friday: 7:30 am to 5:00 pm; and weekends 12:00 pm to 6:00 pm.

Texts:

No textbook is required for this course, but the following are some excellent references:

- Boote, K. J., J. M. Bennett, T. R. Sinclair, and G. M. Paulsen (eds.). 1994. *Physiology and Determination of Crop Yield*. American Soc. of Agronomy, Crop Sci. Soc. of America, Soil Sci. Soc. of America. 601 pp.
- Evans, L. T. (ed.). 1975. *Crop Physiology*. Cambridge University Press. 374 pp.
- Fageria, N. K., V. C. Baligar, and R. B. Clark. 2006. *Physiology of Crop Production*. New York: Food Products Press. 345 pp.
- Fitter, Alastair H. and Robert K. M. Hay. *Environmental Physiology of Plants* (Third Edition). 2002. Academic Press. 367 pp.
- Gardner, Franklin P., R. Brent Pearce, and Roger L. Mitchell. 1985. *Physiology of Crop Plants*. Iowa State University Press. 327 pp.
- Hay, Robert K. M. and John Porter. 2006. *The Physiology of Crop Yield* (Second Edition). Blackwell Publishing. 314 pp.
- Hay, Robert K. M. and Andrew J. Walker. 1989. *An Introduction to the Physiology of Crop Yield*. Longman Scientific & Technical and John Wiley & Sons. 292 pp.
- Kramer, Paul J. and John S. Boyer. 1995. *Water Relations of Plants and Soils*. Academic Press. 495 pp.
- Lambers, Hans, F. Stuart Chapin III, and Thijs L. Pons. 2008. *Plant Physiological Ecology*. Springer. 604 pp. (available as an e-book through UF Libraries).
- Larcher, Walter. 1995. *Physiological Plant Ecology* (Third Edition). Springer. 2006 pp.
- Pessaraki, Mohammad. 2002. *Handbook of Plant and Crop Physiology* (Second Edition). Marcel Dekker, Inc. 973 pp.
- Prasad, M. N. V. (ed.). 1996. *Plant Ecophysiology*. John Wiley & Sons. 542 pp.
- Sinclair, T. R. and F. P. Gardner. 1998. *Principles of Ecology in Plant Production*. CAB International. 189 pp.
- Sinclair, T. R. and A. Weiss. 2010. *Principles of Ecology in Plant Production*. 2nd Edition. CAB International. 186 pp.
- Smith, D. L. and C. Hamel (eds.). 1999. *Crop Yield Physiology and Processes*. Springer. 504 pp.
- Taiz, Lincoln and Eduardo Zeiger. 2006. *Plant Physiology* (Fourth Edition). Sinauer Associates, Inc., Publishers. 764 pp.

Assignments and Grades:

- Three exams = 65%
- Final, comprehensive examination = 25%
- In-Class and On-line Participation = 10%

Final course grades will be on a percentage basis:

A =	93-100	C =	73-76
A- =	90-92	C- =	70-72
B+ =	87-89	D+ =	67-69
B =	83-86	D =	63-66
B- =	80-82	D- =	60-62
C+ =	77-79	E =	<60
		I =	Incomplete

Grade point equivalencies for grades are found at:

<https://catalog.ufl.edu/ugrad/current/Pages/home.aspx>

Classroom Etiquette and Demeanor:

Students are expected to arrive for class on time since lectures will begin promptly at the beginning of the period. Cell phones must be turned off during class.

Absences and Make-up Work:

Requirements for class attendance and make-up exams, assignments and other work are consistent with university policies that can be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

Academic Honesty, Software Use, Campus Helping Resources, Services for Students with Disabilities:

Academic Honesty

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: *“We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.”* You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: *“On my honor, I have neither given nor received unauthorized aid in doing this assignment.”*

It is assumed that you will complete all work independently in each course unless the

instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>

Software Use

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Campus Helping Resources

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- *University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575, <http://www.counseling.ufl.edu/cwc/>*

Counseling Services
 Groups and Workshops
 Outreach and Consultation
 Self-Help Library
 Training Programs
 Community Provider Database

- *Career Resource Center, First Floor JWRU, 392-1601, <http://www.crc.ufl.edu/>*

Resources for Students with Disabilities:

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation. 0001 Reid Hall, 352-392-8565, www.dso.ufl.edu/drc/

Student Complaints on Distance Learning:

Each online distance learning program has a process for, and will make every attempt to resolve, student complaints within its academic and administrative departments at the program level. See <http://distance.ufl.edu/student-complaints> for more details.

Course Outline

Human Population, Food Production and Security

Radiant Energy

- Properties
- Atmospheric Effects
- Seasonal Differences
- Leaf Absorption

Photosynthesis and Respiration

- Light Reactions of Photosynthesis
- Dark Reactions of Photosynthesis (C_3 , C_4 , and CAM)
- Photorespiration
- Respiration
- Carbon Exchange of Individual Leaves

Development of Leaf Area and Light Interception by Crop Canopies

Carbon Exchange by Crop Canopies

Assimilate Transport and Partitioning

Crop Development, Ontology, and Yield Formation

Root Systems

Mineral Nutrients

Biological Nitrogen Fixation

Water Relations

- Properties
- Soil Water
- Transpiration and Flow
- Uptake
- Measures of Plant Water Status
- Effects on Physiology and Yield
- Water use Efficiency

Environmental Limits to Crop Yields

Global Climate Change

Bioenergy Crops