

## **Syllabus – HOS 6345 – Environmental Physiology – Fall, even years**

Section 7732; 4 credits, 2318 Fifield Hall; MWF 4<sup>th</sup> period

There are two components to this course. The first is a series of lectures devoted to the most current, interesting, and relevant advances in plant responses to the environment. These are explored from the molecular-genetic to whole-plant levels. The second is a grant proposal authored by each student in a physiological area of their choice. The purpose is to thoroughly review relevant current literature, identify the most important, unanswered questions, and identify a feasible, innovative research plan for advancing understanding of the area. Students are also exposed to peer-review and competitive granting systems by writing anonymous reviews of one another's work and by serving on one of two, mutually-exclusive grant panels for anonymous evaluation of proposals.

**Prerequisite:** At least one semester of a previous physiology course.

**Sitting In:** Students are welcome to sit in if they have taken the course previously. Faculty, postdoctoral associates, or visiting scientists are also welcome to attend.

### **Reading:**

Most important-- Required reading will center on the reviews and primary literature identified by each student during the *in-depth review of advances in their own area*. Please see handout with additional information on "References and how to find the most current, relevant research in your area"

Current literature will serve as the basis for lectures rather than a text.

Highly recommended -- The following small book on concise, direct English. It can greatly aid scientific writing style and is an excellent reference on English grammar.

Strunk W Jr, and EB White (1979) *The Elements of Style*. Allyn and Bacon Pub. Boston. 92 pp.

### **Grading:**

**The lecture** portion of the course (300 pts) is divided into three units. Each is followed by a one-hour, in-class, closed-book exam based on material presented in lecture (see Course Schedule).

**The proposal** portion of the course (250 pts) is also divided into three sections. These are the Literature Review, Experimental Plan, and Full Proposal (including revisions and other components of a complete proposal).

**The peer-review** portion of the course (50 pts) is based on two written reviews of colleagues' proposals and oral participation in the panel review process.

**Other aspects** of the course (50 pts) include attendance, participation, and weekly written assignments involved in proposal development.

**Accommodations for students with disabilities:** Students requesting classroom accommodation should register with the Dean of Students Office. This office will provide documentation to the student who can then bring this necessary material to the instructor when requesting accommodation.

**Academic Honesty:** As a result of completing the registration form at the University of Florida, every student has signed the following statement: "I understand that the University of Florida expects its students to be honest in all their academic work. I agree to adhere to this commitment to academic honesty and understand that my failure to

comply with this commitment may result in disciplinary action up to and including *expulsion from the University.*”

\*\* **For the present course**, particular attention is drawn to the definition of plagiarism (see handout on Academic Honesty).

**UF Counseling Services** available on campus include the following:

- 1) University Counseling Center, 301 Peabody Hall, 392-1575, personal and career counseling
- 2) Student Mental Health, Student Health Care Center, 392-1171, personal counseling
- 3) Sexual Assault Recovery Services (SARS), Student Health Care Center, 392-1161
- 4) Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.

**Instructor for HOS 6345:**

Dr. Karen E. Koch, Professor

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**Research interests of KE Koch:** Carbohydrate metabolism and gene expression

Plants respond markedly to sugars, not only as substrates, but also as signals to an array of plant processes. Genes can be up- or down-regulated in response to carbohydrates. Overall, the process of feast-and-famine adjustment by plants provides a mechanism for altering the balance between resource acquisition (source tissues) and resource utilization (sink tissues). This framework can link molecular-level responses to adaptive alterations in C/N balance at the whole-plant level.

Genes for sucrose metabolism occupy a pivotal position in this process, since their action is critical to both sugar utilization and sugar sensing. Our research centers on expression of these genes and their impact on early fruit and seed development, root physiology, and cell wall biosynthesis (primarily in maize and *Arabidopsis*). Each of these processes can be strikingly influenced by sucrose metabolism, not only as the first step in C-use by importing cells, but also as a central point of interface between sugar and other sensing systems.

Recent developments in the area of transposon mutagenesis have also opened tremendous opportunities for developing and utilizing “knock-out” plants that lack function for a single gene. These plants provide ideal experimental material for identifying the biological function of individual genes (hence the relevance to “functional genomics”). Either the knock-out, the gene, or the knowledge of how to use them can have important economic consequences. As part of a national project in functional genomics, our lab is developing a resource for identifying and analyzing knock-out mutants in maize, beginning with selected target genes and progressing to the mutant plant (“reverse genetics”). Emphasis is being directed to genes hypothesized to affect cell wall biosynthesis, associated sugar conversions, and kernel development. In this way, we hope to contribute to improving human food and fiber supplies. The latter includes biomass use for renewable fuels and bio-polymers

**Please see separate attachment for schedule of 2014 topics**

**Environmental Physiology of Plants (HOS 6345)**  
**Fall Semester, 2014 Karen E. Koch**

**\*\*TENTATIVE\*\***

<b>Timing</b>	<b>Topics: tentative schedule (From molecular to field levels)</b>	<b>Student Input: tentative due dates (Lit review with rationale + proposal)</b>
<b>I. Light:</b>		
Aug. 25 (M)	Organizational	
Aug. 27 (W)	Light physics and environments	List 3 key reviews + 7 other refs.
Aug. 29 (F)	Light reactions and light stress	Resumé in grant format
Sept. 1 (M)	Labor Day (no UF classes)	
Sept. 3 (W)	C- and N-assimilation, partitioning	List 20 refs + why 5 are favorites
Sept. 5 (F)	C- partitioning, C-sensing (guest lecture)	
Sept. 8 (M)	C/N partitioning, C/N sensing	Project Summary (1st draft)
Sept. 10 (W)	Phytochrome	List 40 refs + why 5 new favorites
Sept. 12 (F)	Photomorphogenesis	
Sept. 15 (M)	Photomorphogenesis	Project Rationale (1st draft)
Sept. 17 (W)	Photoperiod	
Sept. 19 (F)	Light and sugar signals (guest lecture)	
Sept. 22 (M)	Signal transduction	<b>Literature Review + 50 refs (5PM)</b>
<b>II. Temperature and Atmosphere</b>		
Sept. 24 (W)	Freezing	
Sept. 26 (F)	Exam I (Light)	<b>Exam I (Light)</b>
Sept. 29 (M)	Chilling injury	
Oct. 1 (W)	Chilling and dormancy	
Oct. 3 (F)	Seed and bud dormancy, release	Outline of Experimental Objectives
Oct. 6 (M)	Dormancy and plant growth regulators	
Oct. 8 (W)	Heat stress, diurnal thermal effects, lipids	
Oct. 10 (F)	Atmosphere: Rising CO <sub>2</sub> , other	Project Summary and Rationale due
Oct. 13 (M)	Ethylene	
Oct. 15 (W)	CA storage, low oxygen, ethanol, ethylene	
Oct. 17 (F)	Homecoming (no UF classes)	
Oct. 20 (M)	Flooding stress, low oxygen, ethanol, ethylene	<b>Experimental Plan due (5PM)</b>
Oct. 22 (W)	To be announced	
Oct. 24 (F)	Exam II: Temperature and Atmosphere	<b>Exam II (Temperature &amp; Atmosphere)</b>
<b>III. Water and Minerals</b>		
Oct. 27 (M)	Biophysics of water relations	
Oct. 29 (W)	Water in xylem and phloem, stomata	Administrative, budget, resume
Oct. 31 (F)	Drought stress (Happy Halloween!)	Halloween, be scary
Nov. 3 (M)	Drought stress	
Nov. 5 (W)	Salt stress and osmotic adjustment	
Nov. 7 (F)	Nitrogen	<b>Proposal due (5PM)</b>
Nov. 10 (M)	Nitrogen + balance	(get extra work done!)
Nov. 11 (T)	Veterans Day (no UF classes)	
Nov. 12 (W)	Soil pH	
Nov. 14 (F)	Non-N nutrients (guest lecture)	<b>First proposal review due</b>
Nov. 17 (M)	Non-N nutrients	
Nov. 19 (W)	Mycorrhizae	
Nov. 21 (F)	Exam III (water and minerals)	<b>Exam III (water and minerals)</b>
Nov. 24 (M)	open	(work on second proposal review)
Nov. 25 (T)	open	<b>Second proposal review due</b>
Nov. 26 (W)	Thanksgiving! (no UF classes)	
Nov. 28 (F)	Thanksgiving! (no UF classes)	
Dec. 1 (M)	Panel meetings	<b>Panel meetings (essential attendance)</b>
Dec. 3 (W)	Panel meetings	<b>Panel meetings (essential attendance)</b>