## Texas A&M University

### Departmental Request for a Change in Course

**Undergraduate • Graduate • Professional**

- Submit original form and attachments

1. This request is submitted by the Department of Ecosystem Science and Management

2. Course prefix, number and complete title of course: RLEM 607, Physiological Plant Ecology

   **Attach a brief supporting statement for changes made to items 3a thru 3d. and 5 below.**

3. Change requested
   - a. Prerequisite(s): From: ___________________________ To: ___________________________
   - b. Withdrawal (reason): ___________________________
   - c. Cross-list with: ___________________________

   **Cross-listed courses require the signature of both department heads.**

   - d. Change in course title and description. Enter complete current course title and current course description in item 4; enter proposed course title and proposed course description in item 5.

   - e. Change in course number, contact hours (lab & lecture), and semester credit hours. Complete item 6. **Attach a course syllabus.**

4. Complete current course title and current course description:

5. Complete proposed course title and proposed course description (not to exceed 50 words):

6. a. As currently in course inventory:

<table>
<thead>
<tr>
<th>Prefix</th>
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<tr>
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   b. Change to:

<table>
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<th>Title (excluding punctuation)</th>
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   Approval recommended by: ___________________________

   **8/7/08**

   Head of Department

   Date ___________________________

   Head of Department (if cross-listed course) Date ___________________________

   Submitted to Coordinating Board by: ___________________________

   **Date________________________**

   Effective Date __________________________

   Questions regarding this form should be directed to Sandra Williams at 845-8201.

   Curricular Services – 11/07
PHYSIOLOGICAL PLANT ECOLOGY
ESSM 621
FALL 2009

COURSE INTRODUCTION

COURSE DESCRIPTION:
Investigation of physiological mechanisms influencing ecological patterns and processes, including plant acclimation and adaptation in contrasting habitats, abiotic controls on species productivity and distribution, relevant conceptual and experimental approaches, and integration across ecological scales. Each subject matter section begins with an introduction of the relevant physiological processes and develops toward an ecological synthesis of these processes at community or ecosystem scales.

LEARNING OUTCOMES:
As a result of taking this course, students will be able to accomplish the following:
- Identify the importance of major physiological processes to ecosystem function
- Describe plant-environment interactions and how they shape plant adaptation and distribution
- Independently interpret and apply physiological plant ecology from the literature
- Decompose complex ecological patterns into their component physiological processes.

INSTRUCTOR:
Dr. David D. Briske
Department of Ecosystem Science and Management
Animal Industries Building, Room 328
Telephone: 845-5581
e-mail: dbriske@tamu.edu

MEETING TIME AND LOCATION:
Monday, Wednesday and Friday, 9:10 - 10:00 am.
Animal Industries Building, Room 133.

READING ASSIGNMENTS:
Text: Plant Physiological Ecology, Lambers H., Chapin F.S. and Pons T.L. 1998 Springer-Verlag. Reading assignments within this text are referenced by section on the attached syllabus. Journal papers will also be assigned for each subject matter section. These papers are available on the course home page (WebCT-Vista).

PREREQUISITES:
RENR 205 or MEPS 313 or equivalent

EVALUATION PROCEDURES:
Exams will consist of definition and short-answer questions. Problem sets will require synthesis and application of information addressed in lectures, the text and assigned
readings to an actual or hypothetical ecological scenario. Problems sets will be made available on the course home page.

Exam I  
Exam II  
Final Exam (Comprehensive)  
Take-home Problems (3)  

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<td>November 6</td>
<td>December 11</td>
<td>As assigned</td>
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**GRADE DISTRIBUTION:**
A=90%
B=80-89%
C=70-79%
D=60-69%
F=0-59%

**MAKE-UP EXAMINATIONS AND LATE ASSIGNMENTS:**
Make-up examinations will be given provided that students present a documented University-excused absence within 1 week of the scheduled exam. An excused absence means that illness or some other problem beyond your control prevented you from taking the scheduled exams. Make-up exams must be taken within 4 weeks of the scheduled exam. Instructors are under no obligation to provide an opportunity for students to make up course work missed because of unexcused absences (see TAMU Regulations below). Assignments that are turned in late, without an excused absence, will be assessed a 10% reduction for the first week and a 25% reduction there after.

**ATTENDANCE:**
Regular class attendance is expected. Most examination questions come from the lectures and experience shows that those students who attend class consistently obtain the highest scores.

Attendance (Revised 1999)*
The University views class attendance as an individual student responsibility. Students are expected to attend class and to complete all assignments. Instructors are expected to give adequate notice of the dates on which major tests will be given and assignments will be due. Students are responsible for providing satisfactory evidence to the instructor to substantiate the reason for absence.

For any other questions or concerns, please refer to [http://student-rules.tamu.edu](http://student-rules.tamu.edu)
AMERICANS WITH DISABILITIES ACT
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities in Room B118 in Cain Hall (845-1637).

ACADEMIC INTEGRITY STATEMENT
"An Aggie does not lie, cheat, or steal or tolerate those who do."
Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the TAMU community from the requirements or the processes of the Honor System. For additional information please visit: www.tamu.edu/aggiehonor/.
PHYSIOLOGICAL PLANT ECOLOGY  
COURSE SYLLABUS  
RLEM 607

I. Introduction to Physiological Plant Ecology

A. Discipline Definition and Approach  
B. Discipline Development  

(Chapter 1)

II. Plant Processes and Environmental Interactions

A. Radiation Budgets  
1. Radiation laws and terminology  
2. Leaf spectral characteristics  
   a. reflection  
   b. absorption  
   c. transmission  
3. Leaf orientation  
   a. cosine law  
   b. display mechanisms  
4. Energy dissipation  
   a. reradiation  
   b. convection  
   c. latent heat transfer  
   d. environmental constraints  
5. Ecological implications  
   a. optimal leaf size  
   b. specific energy budgets  

B. Whole-Plant Photosynthesis  
1. Photosynthetically active radiation  
2. Radiation attenuation  
   a. canopy architecture  
   b. radiation quality  
3. Adaptation to radiation environments  
   a. heliophytes and sciophytes  
   b. physiological acclimation  
   c. canopy-level modifications  
4. Photosynthetic pathways  
   a. Calvin-Benson (C3)  
   b. Hatch- Slack (C4)  
   c. C4 subgroups  
   d. C3-C4 intermediates  
   e. Crassulacean Acid Metabolism (CAM)  
   f. pathway evolution  
5. Regulation of photosynthesis  
   a. CO2 response curve  
   b. feedback mechanisms  
   c. resource constraints  
6. Comparison of photosynthetic pathways  

(Chapter 4, p. 210-228)  

(Chapter 2A, p. 10-89)
a. CO₂ compensation point
b. light saturation point
c. light compensation point
d. photorespiration
e. temperature optima
f. water-use efficiency
g. nitrogen-use efficiency
h. ¹³C/¹²C ratio
i. photosynthetic capacity
j. quantum yield
k. productivity

7. Pathway distribution
a. patterns
b. controls

8. Response to elevated CO₂
   a. pathway comparison
   b. CO₂ acclimation
   c. ecosystem responses

9. Ecological implications

C. Relative Growth Rate
1. Plant growth
2. Basis for variation
3. Physiological mechanisms
4. Resource constraints
5. Ecological implications

(Chapter 7, p. 299-345)

D. Plant Water Relations
1. Concepts and measurements
   a. relative water content
   b. water potential
   c. instrumentation
2. Soil-plant-atmosphere continuum
   a. transpiration
   b. transport mechanisms
   c. hydraulic conductivity
   d. cavitation and xylem refilling
   e. conductivity–cavitation trade-off
3. Water absorption
   a. hydraulics of water uptake
   b. root traits and distribution
   c. hydrogen isotope ratios
   d. hydraulic lift
4. Plant water stress
   a. developmental patterns
   b. physiological consequences
   c. mechanisms of injury
5. Drought resistance
   a. tolerance mechanisms
   b. avoidance mechanisms
   c. plant strategies
6. Ecological implications

(Chapter 3, p. 154-204)
a. species replacement  
b. precipitation gradients

E. Plant-Soil Relations
   1. Nutrients in the soil  
      a. availability  
      b. distribution  
   2. Nutrient acquisition  
      a. absorption  
      b. root traits  
      c. life span  
      d. environmental constraints  
      e. mycorrhiza  
   3. Nutrient-use efficiency  
      a. retention  
      b. resorption  
   4. Adaptive strategies  
      a. root proliferation  
      b. physiological plasticity  
      c. inorganic N uptake  
      d. life history strategies

F. Scaling: Leaf to Globe
   1. Ecological scaling
   2. Leaf trait relationships
   3. Metabolic scaling

(Chapter 6, p. 239-263; 282-292)  
(Chapter 10B, p. 503-515)