**Principles of Plant Physiology LAB (PLS 361)**

**LOCATION:** MARLEY 212

**CREDIT UNITS:** 1

**TIME:** Spring 2018; Wednesday; 2:00PM - 4:50 PM

**INSTRUCTORS:** Dr. Ravishankar Palanivelu  
School of Plant Sciences  
University of Arizona, Tucson, AZ 85721  
Office: Marley 441E  
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**TA:** Wen Chen (wenchen@email.arizona.edu)

**TEXT BOOK:** Laboratory manual prepared by:

“*The Plant Detective's Manual: a research-led approach for teaching plant science*”  
Gonzalo M. Estavillo, Ulrike Mathesius, Michael Djordjevic and Adrienne B. Nicotra  
The Australian National University  
Canberra ACT 0200, Australia

Additional Notes by:  
Dr. Ravishankar Palanivelu  
School of Plant Sciences  
University of Arizona, Tucson, AZ 85721

**D2L SITE:** http://www.d2l.arizona.edu/

**COURSE DESCRIPTION:** Whether you will work with plants as a physiologist, pathologist, ecologist, agronomist, horticulturalist, or molecular biologist, you will need to know how a plant is constructed, how it grows, and how it functions. Depending on the need and your interests, you may work at the subcellular, cellular, tissue, organ, or whole plant level. As a result, it is important to have a hands-on experience and understanding of plant growth and development.

In this laboratory course, we will start with reviewing basic information about plant growth and development. We will provide an unknown *Arabidopsis thaliana* mutant (to you) and use it to go though lab exercises and techniques that reinforce the basic concepts of plant growth and development. The course will also involve exercises that not only teach the structural aspects but also discuss the functions of a plant cell, tissue, and organ.

**COURSE OBJECTIVES AND EXPECTED LEARNING OUTCOMES:**

(i) Provide an understanding as to how to investigate plant growth and development
(ii) Demonstrate the complexity and orderliness of the organization found in higher plants

(iii) Learn how to investigate and understand abiotic interactions between plant and its environment

TOPICS: Please see at the end of this document a list of exercises and topics to be covered in this course.

GRADING:

<table>
<thead>
<tr>
<th>Lab activity</th>
<th>Points</th>
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<tbody>
<tr>
<td>Pre-lab submissions (12)</td>
<td>60 points (5 points each for 12 activities, starting 1/24/17)</td>
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<tr>
<td>Participation points (14)</td>
<td>70 points (5 points each for attendance, activities, and presentations in each class, starting 1/17/17 &amp; ending 4/25/17)</td>
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<tr>
<td>Poster or written report</td>
<td>70 points (5/2/17)</td>
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<tr>
<td>Total</td>
<td>200 points</td>
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<tr>
<td>Grade</td>
<td>Will be determined as a % of course total points</td>
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COURSE METHODOLOGY: A hard copy of the lab manual will be provided, at not cost to the student; introductory lectures will be provided as powerpoint files; in classroom aids (Elmo and chalk board) will be used; microscopy and lab protocols will be used by students after training by the Instructors.

GRADE DISTRIBUTION: Letter grade. Your final grade will be based on a percentage scale (i.e., 90-100% = A, 80-89% = B; 70-79% = C; 60-69% = D; 59% or below = E).

TEACHING FORMAT: Lab exercises coupled with a brief introductory lecture.

INCOMPLETE POLICY: An incomplete grade will not be given unless there is a prior written agreement between the instructor and the student. The agreement should clearly outline the work to be done and a timetable for completion.

COURSE WITHDRAWAL POLICY: Students must execute withdrawal procedures according to the University of Arizona General Catalog. If a student misses two or more consecutive classes, he/she is subject to ‘administrative drop’ unless alternative arrangements have been made between the instructor and the student.

ATTENDANCE Students are expected to attend every class and remain for the entire class period. If you are absent in a lab, you do not get the participation points. Excessive absences may result in an administrative drop of the student from the class. All holidays or special events observed by organized religions will be honored for those students who show affiliation with that particular religion. Absences pre-approved by the UA Dean of Students (or Dean designee) will be honored.

CLASSROOM BEHAVIOR: While in class, you are expected to conduct yourself in a manner conducive to learning and one that does not interfere with other students’ or the
instructor’s concentration or attention. It is expected that you learn to think critically as demonstrated by evaluating course information from multiple perspectives, drawing reasonable conclusions, and defending these conclusions rationally. Please be familiar with the The Arizona Board of Regents’ Student Code of Conduct http://web.arizona.edu/~policy/threatening.pdf

Questions and discussion are encouraged. However, each student is encouraged to help create an environment during class that promotes learning, dignity, and mutual respect for everyone. Deviations from these requirements could result in disciplinary action under the Student Code of Conduct, http://deanofstudents.arizona.edu/codeofacademicintegrity.

Please turn off your cell phone before the lab begins and refrain from surfing the internet or tending to other matters not related to this lab course.

The Arizona Board of Regents’ Student Code of Conduct, ABOR Policy 5-308, prohibits threats of physical harm to any member of the University community, including to one’s self. See: http://policy.web.arizona.edu/~policy/threaten.shtml.

SPECIAL NEEDS AND ACCOMMODATIONS STATEMENT: Students who need special accommodation or services should contact the Disability Resources Center, 1224 East Lowell Street, Tucson, AZ 85721, (520) 621-3268, FAX (520) 621-9423, email: uadrc@email.arizona.edu, and website URL: http://drc.arizona.edu/. You must register and request that the DRC send us an official notification of your accommodation needs as soon as possible. Please plan to meet with us by appointment or during office hours to discuss accommodations and how course requirements and activities may impact your ability to fully participate. The needs for accommodations must be documented by the appropriate office.

STUDENT CODE OF ACADEMIC INTEGRITY: Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See: http://deanofstudents.arizona.edu/codeofacademicintegrity

CONFIDENTIALITY OF STUDENT RECORDS: Student records will remain confidential in accordance with FERPA http://www.registrar.arizona.edu/ferpa/default.htm

COPYRIGHT: The Australian National University holds copyright for the manual used in this class. The instructors hold copyright to all lectures and original course materials provided in this course. This includes notes taken by students that substantially reflect the lecture content. Copyrighted material is available for personal use by students and may be shared among students; however lecture notes may not be distributed or reproduced for a commercial purpose without the express written consent of the instructors. Selling your lecture notes online or in any other way is a violation of copyright and of the Code of Academic Integrity.

SUBJECT TO CHANGE STATEMENT: Information contained in the course syllabus may be subject to change with advance notice, as deemed appropriate by the instructors.
Jan. 10  Introduction
Jan. 17  Lecture; overview/review of plant growth & development
        Review of lab, plant, and statistical procedures
        planting and plating wt/mut seeds for next few week activities
Jan. 24  Lab 1: Seed germination and root growth (activity #2 in the lab manual);
        Confocal training 1
Jan. 31  Lab 2: Microscopy analyses of leaves and roots (activity # 10 in
        lab manual); confocal training 2
        planting wt/mut seeds for confocal microscopy on Feb. 14 (2 groups)
Feb. 07  Lab 3: Observing plant phenotype (activity #1 in lab manual)
        planting wt/mut seeds for confocal microscopy on Feb. 21 (3 groups)
Feb. 14  Lab 4: Root cell anatomy analysis – Confocal microscopy
        planting seeds in soil for activities 6 & 7 on Mar. 21 and Mar. 28
Feb. 21  Lab 4: Root cell anatomy analysis – Confocal microscopy continued
Feb. 28  Lab 5: Extraction and quantification of photosynthetic pigments
        (activity # 3 in lab manual)
        planting seeds in soil for activity 8 on Apr. 04
Mar.  14 Lab 6: Qualitative analyses of photosynthetic pigments by TLC;
        activity # 4 in lab manual)
Mar.  21 Lab 7: Quantification of anthocyanins (activity #6 in lab manual)
Mar.  28 Lab 8: Stomata and the effect of the hormone ABA; measuring
        stomatal conductance using porometer; (activities # 8, 11 in lab
        manual)
Apr.  04 Lab 9: Drought response (activity #9 in lab manual)
Apr.  11 Lab 10: DNA isolation and genotyping (PCR) (activity not found in
        the manual)
Apr.  18 Lab 11: gel analysis, gel extraction, (activity not found in the
        manual)
Apr.  25 Lab 12: Sequence analysis; genotyping (tetrad analysis); (activity
        not found in the manual)
May.  02 Poster presentations or written report submission