Texas A&M University
Departmental Request for a New Course
Undergraduate • Graduate • Professional
• Submit original form and attach a course syllabus.

1. This request is submitted by the Department of Horticultural Sciences.

2. Course prefix, number and complete title of course: HORT 618 Root Biology

3. Course description (not to exceed 50 words): Basic concepts and current topics in root-soil ecology; managed and natural ecosystems including grasslands, cropping systems and forests; role of roots in the rhizosphere, the effects of soil, nutrient and water stress and climate change in C and N cycling and carbon sequestration; participate in discussions; critique recent literature.

4. Prerequisite(s): Approval of instructor

Cross-listed with: MEPS 618

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

5. Is this a variable credit course? ☐ Yes ☒ No If yes, from ________ to ________

6. Is this a repeatable course? ☐ Yes ☒ No If yes, this course may be taken ________ times.

Will this course be repeated within the same semester? ☐ Yes ☐ No

7. Has this course been taught as a 489/689? ☒ Yes ☐ No If yes, how many times? 1

Indicate the number of students enrolled for each academic period it was taught. 08s=8

8. This course will be:
   a. required for students enrolled in the following degree program(s) (e.g., B.A. in history)

   b. an elective for students enrolled in the following degree program(s) (e.g., M.S., Ph.D. in geography)

   MS, MAg, PhD HORT  MS, PhD MEPS

9. If other departments are teaching or are responsible for related subject matter, the course must be coordinated with these departments. Attach approval letters.

10. Prefix Course # Title (excluding punctuation)
    HORT 618 Root Biology

    Lect. Lab SCH CIP and Fund Code Admin. Unit Acad. Year FICF Code
    0 3 0 0 0 0 3 2 6 0 3 0 7 0 0 2 1 5 2 0 0 9 1 1 0 0 0 3 6 3 2

    Approval recommended by: Head of Department Date

    Head of Department (if cross-listed course) Date

    Submitted to Coordinating Board by: Associate Director, Curricular Services Date

    Chair, College Review Committee Date

    Dean of College Date

    Dean of College Date

    Effective Date

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu.
Texas A&M University
Departmental Request for a New Course
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4. Prerequisite(s): An undergraduate class in plant biology, plant ecology or soils is highly recommended

Cross-listed with: MEPS 618

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MS, MAg, PhD HORT MS, PhD MEPS

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10. Prefix Course # Title (excluding punctuation)
    HORT 618 ROOT BIOLOGY
    
    Lect. Lab SCH CIP and Fund Code
    0 3 0 0 0 3 2 6 0 3 9 7 0 0 0 2 1 5 2 0 0 9 - 10 0 0 3 6 3 2
    Admin. Unit Acad. Year VICE Code
    11-11-08
    Ch. College Review Committee
    Date
    Dean of College
    Date
    Submitted to Coordinating Board by:
    Date
    Effective Date

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra-williams@tamu.edu.
Curricular Services – 10/08
Syllabus HORT 618 Root Biology – 3 credits

Prerequisites
Approval of instructor

Instructor

Dr. Astrid Volder
Office: 405 Horticulture/Forest Science Building (HFSB)
Phone: 845-9277
Email: a-volder@tamu.edu

Office hours

I will set aside time for open office hours after class. However, please feel free to send me email anytime with questions, comments, or to arrange a meeting in person. I will typically reply to email the same day.

Web-based course materials

A companion website for the course is located in WebCT. As a registered student, you will have access to the website through the internet. The website is an essential course tool.
1. Use the following URL to access Web CT Vista:
   https://elearning.tamu.edu/
2. Click on the “TAMU(netID)” link and login using your official TAMU logon id and password.
3. Complete your discussion assignments and find lecture outlines etc. online.

Course objectives

Upon completion of this course you will be able to:

- Explain what role roots and root turnover play in soil C and N cycling
- Create a conceptual diagram of the most important processes related to roots, the rhizosphere, and the cycling of water and nutrients through the rhizosphere
- Explain how root growth is affected by soil conditions
- Describe how root and whole plant processes are interrelated
- Connect soil and root processes to ecosystem functioning
- Discuss root and rhizosphere responses to environmental stressors, including climate change.

COURSE DESCRIPTION AND FORMAT

HORT 618 Root Biology is a 3-credit lecture course. We will explore basic concepts and current topics in root-soil ecology through assigned readings, classroom discussion, lectures and slide shows. We will cover both managed and natural ecosystems, from grasslands to cropping systems to forests. We will discuss the role of roots in the rhizosphere, the effects of soil, nutrient and water stress and climate change, and the role of roots in C and N cycling and carbon sequestration. Students are expected to actively participate in the discussions, and find, present and critique recent literature in the field of root-soil ecology.
Required reading
You will read the assigned material before each class period and participate in discussions, lectures, and activities. To excel in this course, attendance at all class sessions is mandatory. The lectures and in class activities will usually focus on the same topics, but may address either the specific reading or completely different materials, depending on the comprehensiveness or importance of the reading, its difficulty, and the total information that needs to be covered. Therefore, do not assume that materials in the readings will be covered in class. In addition to the assignments, supplemental readings may be assigned for some topics. These readings will be posted on the course website.

Discussion questions and comments
For each discussion class period (see schedule) you will prepare one question or comment about the assigned papers. These daily questions or comments should be brief and should be posted online on WebCT Vista (or handed in at the start of class only if computer problems arise). We will address the questions in class discussions as time permits at the beginning of the class session. The objectives of these required "daily questions" are:

- to help you in studying the course material and enhance your classroom experience
- to provide practice at critical thinking and evaluation
- to provide a gauge and feedback on your level of understanding
- to help move classroom focus to issues you find interesting and important

In addition, I will attempt to post replies online to your questions. Please visit the discussion post area often to read the posted discussion questions and participate in the discussions.

What types of questions?
A good question or comment indicates some depth of thought. A question could be something that is not clear to you (e.g., "Why are some plants more sensitive to temperature changes than other plants?"), or that seems to contradict something else we’ve read or covered in lecture (e.g., "how can we reconcile these results with those of Joe Greene who found the opposite results using turfgrass?"). Other comments could for instance, indicate what you think is an important policy implication or linkage to other aspects of root biology, public perception, etc. A good question or comment indicates depth of thought and evidence of critical thinking. The questions are due three hours prior to the beginning of each class period, but you are encouraged to submit the question early for better discussion. Late submissions will not be accepted. The questions are graded for accuracy (make sure you read the assigned papers carefully), relevancy (do they relate to the paper?), depth of thought (have you thought about possible answers?), and your active participation in the online discussion of the questions. For example, asking for a definition you could look up in the background literature will not earn as many points as an in-depth question discussing whether the daily mean or daily maximum temperature is more important for plant stress responses. Responding to questions posed by other people will earn you points as well. Your ten highest scoring questions will be counted for credit (20 points per question, maximum 200 points).

Presentations
You will present several times (depending on the number of students enrolled) throughout the course, depending on the amount of available time slots. Each student is expected to find two original, peer-reviewed, research papers that fit the topic of the day and present the findings of these papers to the class for discussion. It must be clear from the presentation what the hypotheses in the papers were, how the experiments were designed, what the major results were and how these results fit with the topic of the day. You will need to search for additional
background information beyond the two papers presented and you should use this information to help your audience (which has not read the papers) understand the framework for the research. You will have to critically evaluate the work presented in the papers and will take the lead in discussing the papers. Please contact me at least one week in advance to make sure that the papers you have chosen are of appropriate length and fit the topic. More information will be given in class and a grading guide will be posted on WebCT. The total points for the presentations is 60, 20 points per presentation (3 total presentations). These presentations will be peer-reviewed and graded, which will account for fifty percent of the points!!

**Evaluation and final grade**

<table>
<thead>
<tr>
<th>Course Component</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active class participation</td>
<td>20</td>
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<tr>
<td>10 Questions submitted</td>
<td>20</td>
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<tr>
<td>Mid-term</td>
<td>50</td>
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<tr>
<td>Presentations (total)</td>
<td>60</td>
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<tr>
<td>Final exam</td>
<td>80</td>
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<tr>
<td><strong>Total</strong></td>
<td>230</td>
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</tbody>
</table>

Point totals and course letter grades*

<table>
<thead>
<tr>
<th>Points</th>
<th>Course letter grade</th>
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</thead>
<tbody>
<tr>
<td>≥ 207</td>
<td>A</td>
</tr>
<tr>
<td>≥ 184</td>
<td>B</td>
</tr>
<tr>
<td>≥ 161</td>
<td>C</td>
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<tr>
<td>≥ 138</td>
<td>D</td>
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<tr>
<td>&lt; 138</td>
<td>F</td>
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</tbody>
</table>

*I reserve the right to lower the point totals for the letter grade categories.

**Make-up exams.** Students will be allowed the opportunity to make up any quiz, exam or other graded activities in accordance with University policy. University policy on make-up work and absences can be found on the website student-rules.tamu.edu/.

**Late assignments.** No late assignments will be accepted. Credit on late assignments will only be granted for authorized, properly documented, university excused absences.

**AGGIE honor code:**
"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/](http://www.tamu.edu/aggiehonor/)

**Americans with Disabilities Act (ADA) Policy Statement**
The following ADA Policy Statement (part of the Policy on Individual Disabling Conditions) was submitted to the University Curriculum Committee by the Department of Student Life. The policy statement was forwarded to the Faculty Senate for information.
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 Cain Hall or call: 845-1637.

HORT 618 Topics Root Biology
Class Schedule

<table>
<thead>
<tr>
<th>Week (week of)</th>
<th>Topic</th>
<th>Lecture or Activity</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
<td>1. Introduction to roots and soil</td>
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<tr>
<td></td>
<td></td>
<td>2. Root systems: structure and development</td>
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<tr>
<td>2</td>
<td>Presentation 1</td>
<td>MLK Holiday</td>
<td>1</td>
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<tr>
<td>3</td>
<td>Soil environment</td>
<td>3. Soils from a plant perspective - challenges</td>
<td>2</td>
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<td></td>
<td>Presentation 2</td>
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<td>4</td>
<td>Methods</td>
<td>4. Trials and tribulations of observing roots in their natural environment</td>
<td>3</td>
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<td></td>
<td>Presentation 3</td>
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<tr>
<td>5</td>
<td>Presentation 4</td>
<td>5. Global root growth patterns</td>
<td>4</td>
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<td>6</td>
<td>Rhizosphere</td>
<td>6. From symbionts to herbivores and pathogens</td>
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<td></td>
<td>Presentation 5</td>
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<tr>
<td>7</td>
<td>Presentation 6</td>
<td>7. Soil processes and soil respiration</td>
<td>6</td>
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<tr>
<td>8</td>
<td>Resource acquisition</td>
<td>8. Foraging for resources (1); water and nutrient uptake</td>
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<td>MID-TERM EXAM</td>
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<td>SPRING BREAK</td>
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<td>9</td>
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<td>9. Foraging for resources (2); responses to temporal and spatial pulses</td>
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<td>Presentation 7</td>
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<td>10</td>
<td>Root responses to stress and competition</td>
<td>10. Root responses to stress; drought and flooding; soil compaction and other stresses</td>
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<td></td>
<td>Presentation 8</td>
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<td>11</td>
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<td>11. Belowground competition, strategies to avoid, tolerate and win the race.</td>
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<td>Presentation 9</td>
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<tr>
<td>12</td>
<td>Nitrogen and carbon cycling</td>
<td>12. Root traits, plant functional types and biomass allocation. To invest in roots, or not?</td>
<td>11</td>
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<td></td>
<td>Presentation 10</td>
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<tr>
<td>13</td>
<td>13 Nitrogen and carbon cycling pathways</td>
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<td></td>
<td>and processes. The role of root turnover</td>
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<td>Presentation 11</td>
<td>14</td>
<td>12</td>
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<td>14</td>
<td>14. Root responses to climate change. Implications for carbon sequestration</td>
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<tr>
<td>Presentation 12</td>
<td>15</td>
<td>13</td>
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<tr>
<td>15</td>
<td>Recap and summary</td>
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<tr>
<td>16</td>
<td>Final exam due</td>
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</tbody>
</table>

1 Lecture order may vary from the schedule described above.
2 Readings and discussion question postings are to be completed prior to lecture on the date shown. Additional brief supplemental readings may also be assigned for some topics.