HOS6932: ROOT AND RHIZOSPHERE ECOLOGY

Fall 2018

Credits: 3

Course Description: The aim of this course is to provide a complete view of the rhizosphere and its unique functioning that implies numerous, strong and complex interactions between plant roots, soil constituents and microorganisms. Furthermore, the course not only aims at addressing current knowledge and achievements but also at outlining the future challenges that stand in front of rhizosphere sciences. Topics incorporate how roots and the rhizosphere respond to different environments including multiple interactions between soils, plant roots, microbes, mycorrhizas, and fauna, soil heterogeneity, biogeochemical cycles, abiotic stresses, and emerging contaminants.

Course prerequisites: BOT 2010 or BSC 2010

Knowledge prerequisites: This is an advanced course which examines the interactions between plant root apparatus and the environment. To be successful, students should have a general knowledge of biology, botany, microbiology, and soil chemistry.

Course objectives:

1) To provide a review of recent research literature on root and rhizosphere biology and ecology.
2) To develop an understanding of unique biochemical processes in roots and in the rhizosphere.
3) To promote integration of different disciplines such as plant physiology, biochemistry, natural product chemistry, molecular biology, genomics and chemical ecology to study roots and rhizosphere processes.
4) To raise awareness about environmental concerns (e.g., interaction between plant roots and heavy metals, engineered nanoparticles, BTEX, etc.).

Student Learning Outcomes – After successful completion of this course, students will be able to:

1) Understand the role of plant roots in the global context of soil development and atmosphere composition.
2) Classified and recognized root derived products.
3) Compare different Root System Architectures.
4) Describe root response to biotic and abiotic stresses.
5) Explain key root-rhizosphere interactions, from beneficial microorganisms to detrimental nematodes.
6) Recommend modern research techniques for field and lab studies on plant roots.

Lectures

Online course: Each week there is a block of content available with specific due dates.
Instructor: Dr. Lorenzo Rossi
Webpage: Canvas course link
Contact Information:
- Instructor: Dr. Lorenzo Rossi
- Email: use the Canvas e-mail (the most efficient) or l.rossi@ufl.edu.
- Phone: 772-577-7341.
- Office hours: online conferencing via skype every Friday 11am-12pm (or by request).
Recommended textbooks

Evaluation of learning

<table>
<thead>
<tr>
<th>Assignment</th>
<th>% of grade</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quiz/Discussion</td>
<td>70</td>
<td>1500</td>
</tr>
<tr>
<td>First Exam</td>
<td>10</td>
<td>250</td>
</tr>
<tr>
<td>Mid-Term Exam</td>
<td>10</td>
<td>250</td>
</tr>
<tr>
<td>Final Exam</td>
<td>10</td>
<td>250</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>2250</td>
</tr>
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Assignment breakdown  Points x Number of assignment = Total Points

<table>
<thead>
<tr>
<th>Exams</th>
<th>Content covered</th>
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</thead>
<tbody>
<tr>
<td>Quiz</td>
<td>50 X 15 = 750</td>
</tr>
<tr>
<td>Discussion</td>
<td>50 X 15 = 750</td>
</tr>
<tr>
<td>Total</td>
<td>1500</td>
</tr>
</tbody>
</table>

Exams
- First Exam: Modules 1-5
- Mid-Term Exam: Modules 6-10
- Final Exam: Modules 11-15

UF Grading Policy: [https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx](https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx)

Course organization

The module material of a given week will be made available the Friday of the week before. A first batch the assignments will be due on the Tuesday and the rest on the Friday of a given module week.

Module 0: Introduction to the course
Module 1: Definition of the rhizosphere and origin of roots
Module 2: Root structure, functions and modifications
Module 3: Regulation of root growth
Module 4: Classification and function of root derived products
Module 5: Root exudates and mineral nutrition
Module 6: Root system architecture and nutrient acquisition
Module 7: Legume-Rhizobia symbiosis
Module 8: Mycorrhizal fungi and nutrient acquisition
Module 9: Plant growth promoting rhizobacteria
Module 10: Drought and salt stress
Module 11: Heath and flooding stress
Module 12: Trace metals and emerging contaminants stress
Module 13: Stresses caused by pathogens
Module 14: Modern research techniques for field experiments
Module 15: Modern research techniques for laboratory experiments
**Course schedule**

8/22/2018  Week 1 – Module 0 – Introduction to canvas and distance education
8/24/2018  Week 1 – Module 0 – Introduction to the course, quiz #0 and discussion #0
8/27/2018  Week 2 – Module 1 – Definition of the Rhizosphere/1
8/29/2018  Week 2 – Module 1 – Definition of the Rhizosphere/1
8/31/2018  Week 2 – Module 1 – Quiz #1, Discussion #1

**9/3/2018  Labor Day**

9/5/2018  Week 3 – Module 2 – Root structure and development
9/7/2018  Week 3 – Module 2 – Quiz #2, Discussion #2
9/10/2018  Week 4 – Module 3 – Regulation of root growth/1
9/12/2018  Week 4 – Module 3 – Regulation of root growth/2
9/14/2018  Week 4 – Module 3 – Quiz #3, Discussion #3
9/17/2018  Week 5 – Module 4 – Classification and function of root derived products/1
9/19/2018  Week 5 – Module 4 – Classification and function of root derived products/2
9/21/2018  Week 5 – Module 4 – Quiz #4, Discussion #4
9/24/2018  Week 6 – Module 5 – Root exudates and mineral nutrition
9/26/2018  Week 6 – Module 5 – Quiz #5, Discussion #5

**9/28/2018  First Exam (Modules 1-5)**

10/1/2018  Week 7 – Module 6 – Root system architecture and nutrient acquisition/1
10/3/2018  Week 7 – Module 6 – Root system architecture and nutrient acquisition/2
10/5/2018  Week 7 – Module 6 – Quiz #6, Discussion #6
10/8/2018  Week 8 – Module 7 – Legume-Rhizobia symbiosis/1
10/10/2018  Week 8 – Module 7 – Legume-Rhizobia symbiosis/2
10/12/2018  Week 8 – Module 7 – Quiz #7, Discussion #7
10/15/2018  Week 9 – Module 8 – Mycorrhizal fungi and nutrient acquisition/1
10/17/2018  Week 9 – Module 8 – Mycorrhizal fungi and nutrient acquisition/2
10/19/2018  Week 9 – Module 8 – Quiz #8, Discussion #8
10/22/2018  Week 10 – Module 9 – Plant growth promoting rhizobacteria/1
10/24/2018  Week 10 – Module 9 – Plant growth promoting rhizobacteria/2
10/26/2018  Week 10 – Module 9 – Quiz #9, Discussion #9
10/29/2018  Week 11 – Module 10 – Drought and salt stress
10/31/2018  Week 11 – Module 10 – Quiz #10, Discussion #10

**11/2/2018  Homecoming – Go Gators!**

11/5/2018  Mid-Term Exam (Modules 6-10)
11/7/2018  Week 12 – Module 11 – Heath and flooding stress
11/9/2018  Week 12 – Module 11 – Quiz #11, Discussion #11

**11/12/2018  Veterans Day**

11/14/2018  Week 13 – Module 12 – Metals and emerging contaminants stresses
11/16/2018  Week 13 – Module 12 – Quiz #12, Discussion #12
11/19/2018  Week 14 – Module 13 – Stresses caused by pathogens

**11/21/2018  Holiday break**

**11/23/2018  Happy Thanksgiving!**

11/26/2018  Week 15 – Module 13 – Quiz #13, Online discussion #13
11/28/2018  Week 15 – Module 14 – Modern research techniques for field experiments
11/30/2018  Week 15 – Module 14 – Quiz #14, Discussion #14
12/3/2018  Week 16 – Module 15 – Modern research techniques for laboratory experiments
12/5/2018  Week 16 – Module 15 – Quiz #15, Discussion #15

**12/10/2018  Final Exam (Modules 11-15)**
University of Florida Policies

Accommodations for students with disabilities: Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, www.dso.ufl.edu/drc/) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Class attendance and make-up work: Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx.

Online course evaluation process: Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results/.