

Course Syllabus
Soil Properties & Ecology
BIOL 4395/5301 CRN: 14177/12728
GEOL 4335/5315 CRN: 16751/15326

Instructors:

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By appointment

Scheduled Class Time and Room:

Tuesdays and Thursdays 1:30-2:50 p.m., Geology302

Course Objectives: This course centers on the overlap of soil science and geology. Our goal is to explain the fundamental principles in soil sciences, introduce the concept of critical zone, where water, rock, biology, and atmosphere interact as a system, understand: (1) how the interactions of landform, topography, climate, and biota result in patterns of soil development and the distribution of soils that we observe within the landscape; (2) how physical, chemical and biological properties of soils affect water and nutrient availability to plants; (3) how major groups that make up soil biodiversity make up the soil food web; (4) how nutrients are cycled within terrestrial ecosystems; and (5) what are the typical types of soils in the El Paso region and how these soils are influenced by climate and human activities. This course will also provide training on routine analyses of soil quality.

Required Text: None. Reading materials will be provided on BB.

Topical Outline:

- 1) Soil properties
- 2) Soil ecology
- 3) Soil biogeochemistry
- 4) Soil development
- 5) Applications

Grading: Course grades will be based on the following assignments for a total of 100 points. Graduate students will have expanded requirements for the project and be held to higher standards. The letter grade is on the following scale: A: 90-100; B: 80-89; C: 70-79; D: 60-69; F: Less than 60.

• **Quizzes: 24 points.** 3 points each with a total of 10 quizzes, and lowest 2 scores are dropped. Quizzes will be on material we have covered and/or material from the book. *No make-up quizzes will be given.*

• **Problem sets: 36 points.** Four problem sets will be distributed as shown on the schedule below, 9 points each, and the grading structure will be contained within each problem set.

• **Annotated bibliography: 30 points.** You will select a topic and read peer-reviewed papers (5 for UG, 10 for MS and 15 for PhD students) relevant to the topic that you select, and write annotated bibliography entries for each one. Each annotated bibliography entry will consist of a description of the key findings of the paper *based on a description of a key figure from the paper*. Crucially, the short description should demonstrate that you have read the paper thoroughly. You must select one figure from the paper and explain what it shows and how it illustrates a key finding in the paper. You will also write up to (not exceeding) 500 words on what you learned about your topic from reading these papers. Additionally, if you are a graduate student, you will describe how the paper may be relevant to your research. Examples of this approach will be demonstrated in class. Use MS Word format for submissions.

- Topic is due on **Sept 19** via blackboard;
- Check point is on **Oct 17**: The assignment must be partially done to a level of 1, 3 and 5 papers for UG, MS and PhD students;
- Further paper selections or draft material can be verified by **November 14**. A complete bibliography with or without the annotations can be submitted any time before this date;
- Final assignment is due on **December 5**.

• **Two drawings: 10 Points.** Each student will make two colorful drawings. The drawing papers should be at least 17” by 22” in size, landscape or portrait. The first one highlights the global soil challenges of your choice and targets high-school students as your audience. Be as comprehensive as you can, to include drivers, consequences, locations, and maybe solutions or strategies for remediation. The second drawing will be used for education and outreach purpose for third grade students at elementary schools. The content of the second one is up to you, and it could deliver one specific soil knowledge, fun facts, or it could bring awareness of soils’ importance as resources. Topics relevant to our region are strongly encouraged. Be creative! Limit the use of text on the drawings. If you have to include words, use large fonts and artistic forms. Hand in your drawings by **December 5**.

• **Optional field trip attendance:** November 9th (Jornada, Las Cruces, NM, 8am to 3pm) and November 16th (Ivey farm at Tornillo, TX; 8am to 2pm). Details are to be determined and extra credits might be offered.

Academic dishonesty: Academic Dishonesty will not be tolerated. It includes, but is not limited to, cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts. If you have any questions regarding the university policy on scholastic dishonesty please contact the Dean of Students.

Attendance: If you miss a class, it is your responsibility to obtain any class notes or pertinent information from a fellow student. Regular attendance will be necessary for success in this class.

Drop date: The College of Science aligns with UTEP’s posted drop date of **November 1** for the Fall 2024 semester. We will not approve any student- or faculty-initiated drop requests for a course after that date, except under circumstances of complete withdrawal of all courses due to medical or non-medical reasons.

Disability Statement: If a student has or suspects he/she has a disability and needs an accommodation, he/she should contact the Disabled Student Services Office (DSSO) at 747-5148

or at dss@utep.edu or go to Room 106 Union East Building. The student is responsible for presenting to the instructor any DSS accommodation letters and instructions.

Schedule of Topics and Assignment Due Dates

Note that this schedule is tentative and subject to change

Date	Topic	Unit	Assignments
8/27	Introduction	Introduction	
8/29	State factors and campus soil	Introduction	
9/3	Color, texture, horizons	Properties	Quiz 1
9/5	Temperature, density, porosity	Properties	Problem set 1
9/10	Water properties and soil hydrology	Properties	
9/12	Plant and soil water potential	Properties	Problem set due
9/17	Clay minerals	Properties	<i>Bibliography topic due</i>
9/19	Cation Exchangeable Capacity	Properties	Quiz 2
9/24	Aggregates and Organic matter	Ecology	
9/26	Microbial ecology	Ecology	Quiz 3
10/1	Soil diversity and food webs	Ecology	Problem set 2
10/3	pH, salinity, sodicity	Properties	
10/8	pH, salinity, sodicity	Properties	Problem set due
10/10	Gas transport in soils	Properties	Quiz 4
10/15	Fungi	Ecology	
10/17	Bacteria and Eukaryotes	Ecology	Quiz 5
10/22	Plant-soil interactions	Ecology	<i>Bibliography check point 1</i>
10/24	Decomposition and SOM formation	Ecology	Quiz 6
10/29	Organic carbon cycle	Biogeochemistry	Problem set 3
10/31	Soils and the periodic table	Biogeochemistry	
11/5	Abiotic and geologic carbon cycle	Biogeochemistry	Problem set due
11/7	Nitrogen cycle	Biogeochemistry	Quiz 7
11/12	Phosphorus cycle	Biogeochemistry	
11/14	Soil orders and classification	Soil development	Quiz 8
11/19	Weathering	Soil development	<i>Bibliography check point 2</i>
11/21	Weathering	Soil development	Quiz 9
11/26	Critical zone science	Applications	Problem set 4
11/28	THANKSGIVING		
12/3	Drylands	Applications	Problem set due
12/5	Conclusion	Applications	Quiz 10; <i>Bibliography & Drawings due</i>