ABE 454
Environmental Soil Physics
SPRING 2022

"We know more about the movement of celestial bodies than about the soil underfoot."

Leonardo Da Vinci, circa 1500

WELCOME!

Do you know that SOIL provides many benefits that humans need to survive? Soil is responsible for at least six (6) ecosystem services that make life possible on Earth. In ABE 454, we study soil's physical properties and the processes that must occur in the soil to deliver the benefits needed by humankind.

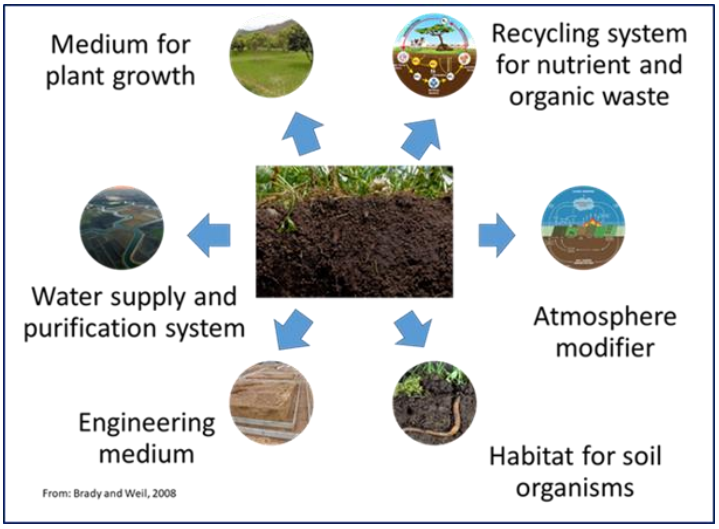

Figure 1. The benefits that we get from the soil.

Course Description:
Provides the theoretical basis for understanding and quantifying the physical, hydrological, geotechnical, and thermal properties of soil in relation to environmental processes. Topics include general soil properties as a porous medium, fluid properties, energy state, soil-water relationship, transport processes in soil, and heat flow in porous media.

Learning Objectives:
- To recognize, understand, and learn basic soil physics concepts and to apply them in solving soil and water related problems
- To enhance your overall scientific, quantitative, and analytical skills

Credit: 3 hours for undergraduate and graduate students; 3 hours for graduate students

Pre-requisite: TAM 335 or with consent of instructor

Weekly meeting schedule: 9:00 – 10:20 MW AESB TBD

Office hours: Open door policy

Course Materials:
- Class notes (Canvas)
- Textbook: Hillel, D., 1998. *Environmental Soil Physics*. Elsevier

Instructor:
I am an associate professor in the Department of Agricultural and Biological Engineering. My research area of specialty is watershed-ecosystem dynamics where I study the intricate interactions between natural and human drivers and the ecosystem to achieve a sustainable agro-production system where productivity, environmental soundness, and social relevancy are optimized.

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Tentative Schedule:

Week	Date		Topics
1	**January**	17	*M.L. King Day*
		19	Introduction
2		24	Soil properties: General
		26	Soil properties: Mass-volume relationship
3		31	Soil properties: Soil texture
	February	2	Soil properties: Soil strength
4		7	Soil properties: Soil strength
		9	Soil moisture: Fluid properties
5		14	Soil moisture: Energy state
		16	Soil moisture: Energy state
6		21	Water potential and components
		23	Water potential and components
7		28	Water potential and components
	March	2	**Midterm Examination**
8		7	Saturated flow
		9	Saturated flow
9		14	*Spring break*
		16	*Spring break*
10		21	Unsaturated Flow
		22	Unsaturated Flow
11		28	Unsaturated Flow
		30	Unsaturated Flow
12	**April**	4	Unsaturated Flow
		6	Solute/contaminant transport in soil
13		11	Solute/contaminant transport in soil
		13	Solute/contaminant transport in soil
14		18	Solute/contaminant transport in soil
		20	Soil thermal properties
15		25	Soil thermal properties
		27	Soil thermal properties
16	**May**	2	Evaporation
		4	Review
		TBD	Final Examination

Class Structure: ABE 454 is a 16-week lecture course delivered in-person with supplementary on-line component (through Canvas) for introductory videos, review quizzes, and homework submission. Discussions and problem solving will be done in class.

Class Policies:

Homework:
Homework assignments should be done neatly with the problem defined and solution clearly outlined. Final answers should have appropriate units and should be circled or underlined. The more clearly a problem is presented and solved, the more likely you will receive partial credit. Late homework will be deducted 10 points for each day of being late. Working in groups on the homework problems is encouraged, but make sure what your turn in as your work, is really your work and not a copy of another student's homework. Breach of this policy will result in a zero for all involved parties.

Quizzes:
Quizzes will be given periodically throughout the semester. Quizzes will consist of qualitative questions including definitions, concept questions, and writing expressions or equations and simple computations.

Midterm and Final Exams:
Two semester exams will be given during class time over the course of the semester, each lasting one class period and covering the material since the previous exam. The exams will each consist of qualitative and quantitative sections. The qualitative section will be closed book/closed notes, worth 15-20 points, and will consist of definitions, concept questions, and writing expressions or equations. The quantitative section will be open book/open notes, worth 80-85 points and will consist of 3-4 problems of similar nature with the assigned homework problems, class sample problems, and example in the textbooks.

**Graduate Students*
Graduate students will be required to submit a final term paper and/or will be assigned additional problems to solve in Homework and Exams.

Grading:

Homework	35%
Quizzes	25%
Midterm exam	20%
Final exam	20%
TOTAL	**100%**

Final grade should be **60%** or better to pass the course.

Additional Resources:

Academic Integrity: Academic misconduct (plagiarism, cheating, or other forms of misconduct as defined by the university) will not be tolerated in this course. Academic Misconduct is defined as any activity which tends to compromise the academic integrity of the institution or subvert the educational process. According to Article 1 of the Student Rights and Responsibilities - Part 4 (Academic Integrity and Procedure): No student shall use or attempt to use in any academic exercise materials, information, study aids, or electronic data that the student knows or should know is unauthorized. This includes copying, direct quotation without citation, paraphrasing without citation, or providing false or misleading information for the purpose of gaining an academic advantage. Please see Academic Integrity Infractions at: http://studentcode.illinois.edu/article1_part4_1-402.html for a complete outline.

Students with Disabilities: To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor as soon as possible. To insure that disability-related concerns are properly addressed from the beginning, students with disabilities who require assistance to participate in this class should contact Disability Resources and Educational Services (DRES) and see the instructor as soon as possible. If you need accommodations for any sort of disability, please speak to me after class, or make an appointment to see me, or see me during my office hours. DRES provides students with academic accommodations, access, and support services. To contact DRES you may visit 1207 S. Oak St., Champaign, call 333-4603 (V/TDD), or e-mail a message to disability@uiuc.edu. http://www.disability.illinois.edu/.

Emergency Response Recommendations: Emergency response recommendations can be found at the following website: http://police.illinois.edu/emergency/. I encourage you to review this website and the campus building floor plans website within the first 10 days of class. http://police.illinois.edu/emergency/floorplans/ .

Family Educational Rights and Privacy Act (FERPA): Any student who has suppressed their directory information pursuant to *Family Educational Rights and Privacy Act* (FERPA) should self-identify to the instructor to ensure protection of the privacy of their attendance in this course. See http://registrar.illinois.edu/ferpa for more information on FERPA.

Sexual Misconduct Policy and Reporting: The University of Illinois is committed to combating sexual misconduct. Faculty and staff members are required to report any instances of sexual misconduct to the University's Title IX and Disability Office. In turn, an individual with the Title IX and Disability Office will provide information about rights and options, including accommodations, support services, the campus disciplinary process, and law enforcement options.

A list of the designated University employees who, as counselors, confidential advisors, and medical professionals, do not have this reporting responsibility and can maintain confidentiality, can be found here: wecare.illinois.edu/resources/students/#confidential. Other information about resources and reporting is available here: wecare.illinois.edu.

Important: *Emergencies can happen anywhere and at any time, so it's important that we take a minute to prepare for a situation in which our safety could depend on our ability to react quickly. Take a moment to learn the different ways to leave this building. If there's ever a fire alarm or something like that, you'll know how to get out and you'll be able to help others get out. Next, figure out the best place to go in case of severe weather – we'll need to go to a low-level in the middle of the building, away from windows. And finally, if there's ever someone trying to hurt us, our best option is to run out of the building. If we cannot do that safely, we'll want to hide somewhere we can't be seen, and we'll have to lock or barricade the door if possible and be as quiet as we can. We will not leave that safe area until we get an Illini-Alert confirming that it's safe to do so. If we can't run or hide, we'll fight back with whatever we can get our hands-on. If you want to better prepare yourself for any of these situations, visit police.illinois.edu/safe. Remember you can sign up for emergency text messages at emergency.illinois.edu.*