Syllabus - SOIL 6583
Soil Physics Theory

Spring 2020

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Course webpage: http://soilphysics.okstate.edu/teaching/soil-6583

Course meeting time and location: 2:30-3:20 p.m., MWF, Room 401 Agricultural Hall

Office hours: You are welcome to stop by my office any time the door is open. I can usually make time to talk with you. You may also call or e-mail to schedule an appointment.

Course description: This course equips students with the theoretical understanding and modeling skills required to analyze and predict mass and energy transport in the soil-plant-atmosphere continuum. Students will learn to apply analytical and numerical models for diverse transport phenomena including water, heat, solute, and gas transport through soil. Applications in hydrology, agronomy, and environmental science will be emphasized.

Prerequisites: SOIL 4683 "Soil, Water, and Weather" or similar course and MATH 2233 "Differential Equations" or similar course.

Textbook: Jury, W.A. and R. Horton. 2004. Soil Physics. Sixth ed. John Wiley & Sons, Inc., Hoboken, New Jersey.

Course objectives: Students should develop and demonstrate the ability to —

1. **Understand** physical theories used to describe water, mass, and energy flow in the soil-plant-atmosphere continuum.

2. **Apply** existing models to analyze key mass and energy transport processes in real-world situations.

3. **Develop** new modeling tools or approaches to effectively predict soil physical properties or processes relevant to their area of research.

Methods: Students' knowledge and skill will be developed through assigned readings, homework, exams, lectures, and a semester project.

Performance evaluation: Student performance will be evaluated using homework assignments, a mid-term exam, a final exam, and a modeling project. The maximum points that can be earned for each activity are listed below. To earn an overall grade of "A" for the course requires 450 points, a "B" requires 400 points, and so on.

	Possible points
Homework	150
Modeling project	150
Mid-term exam	100
Final exam	100

Important dates:

First draft of project proposal due	January 22
Mid-term exam	assigned March 4, due March 11 (approximate dates)
First draft of project paper due	April 10
Project presentations	May 1
Final exam	assigned May 4 due May 8

Modeling Project:

Each student will propose a soil physics modeling project suited to their research interests. The project must answer a specific, well-defined research question and must focus primarily on modeling water, solute, heat, or gas movement in soil. Plant or microbial processes may be included in the modeling project depending on the topic. Students may use an established soil physics model such as “Hydrus” or may develop a model of their own using Matlab, python, or other programming language. Modeling can be in 1-, 2-, or 3-D; can be for any relevant spatial scale; and can be transient or steady-state. The project must be described in **a one-page proposal**, a **research paper** (maximum 5 single-spaced pages with tables and figures embedded, not including reference list) and a **15 minute oral presentation**. Projects will be evaluated competitively, with the top project receiving 150 points and the other projects scored relative to the top project.