Syllabus -- SOIL 5583

Soil Physics Measurement Techniques

Spring 2019

Instructor: Tyson Ochsner
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Course meeting time and location*: 1:30-3:20 p.m., M; 2:30-3:20 p.m., W & F
Room 401 Agricultural Hall

**Meeting times and locations may vary week-to-week to accommodate course objectives.*

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.

Teaching Assistant: Sumon Datta, sdatta@okstate.edu, Room 209 Agricultural Hall

Course description: This course provides hands-on training in field and laboratory techniques for the analysis of soil physical properties and processes. Students will develop skills applicable to soil science, agronomy, hydrology, ecology, and environmental science. Students will receive hands-on training in:

- Selecting appropriate measurement techniques and sampling plans
- Measuring soil physical properties in lab and field settings
- Using sensors and data acquisition systems
- Processing and analyzing data using Matlab
- Writing research manuscripts

Prerequisites: SOIL 4683 Soil, Water, and Weather or approved substituted

Textbook: Dane, J.H., and G.C. Topp, (eds.) 2002. Methods of Soil Analysis: Part 4-Physical Methods, Vol. No. 5, pp. 1-1692. Soil Science Society of America, Inc., Madison, Wisconsin.

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

1. **Plan** a soil physics related research project or training exercise.
2. **Perform** the laboratory, field, and data processing tasks required in the project or exercise. This includes training and supervising the other participants.
3. **Present** the results of the research project or training exercise in written form with excellence.

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Performance evaluation: Student performance will be evaluated based on their demonstrated ability to plan, perform, and present soil physics research within the context of the training exercises and the research project. To earn an overall grade of "A" for the course requires 450 points, a "B" requires 400 points, and so on.

Table 1. Grading system

Possible points	
Training exercises – participation	100
Training exercises – reports	100
Research project – participation	100
Research project – products	100
Final exam – oral, May 6, 2:00 p.m.	100

Training exercises: We will complete six or seven training exercises to gain hands on experience with soil physics measurement techniques. Some of the exercises will require laboratory work outside of normal class hours. Each student will submit a one page report summarizing and reflecting on each training exercise. Potential topics for the training exercises include:

1. K_{sat} measurement – tank method
2. Water retention – sand box, Tempe cell, pressure plate
3. Soil thermal properties – heat pulse
4. Particle size distribution – hydrometer
5. Solute transport properties – breakthrough curve
6. Soil water content sensing – dielectric sensors
7. Bulk density and water content – hand sampling
8. Bulk density and water content – Giddings probe sampling
9. Mobile soil moisture sensing – Cosmic-ray neutron rover
10. Hydraulic conductivity – minidisk infiltrometers
11. Visual evaluation of soil structure
12. Soil water content and temperature sensor installation and datalogger programming

Research project: We will plan and complete one class research project designed to help us increase our knowledge and skills relevant to research methods in soil physics and related disciplines. The research project will also provide opportunities for students to learn some measurement techniques that were not covered in the training exercises. Primary field and laboratory data collection activities for the research project are planned for March 11 – April 5. After April 5, the remainder of the semester will be devoted to data analysis in Matlab, creating tables and figures, and writing and revising a scientific manuscript. This will be a collaborative effort with everyone working together, helping and learning from each other.