

INTRODUCTORY SOIL PHYSICS (SOCR470)

Fall, 2018

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Office Hours: MW: 3-4, Th: 9-10, or when office door is open.

SUMMARY OUTLINE

Preliminary development- Excel skills for formulas and graphing

2 weeks I. Overview of Soil - Properties of the three-phase system
Reading: Jury and Horton: Chapter 1; Chapter 2, p. 37-48.

0.5 week II. Soil Water Content
A) direct measurement
B) indirect measurement- Neutron attenuation, TDR, emerging methods
Reading: Jury and Horton: Chapter 2, p. 48-52.

*Problem Set #1

2.5 weeks III. Soil Water Retention
A) energy state of water in soil - components of soil water potential
B) analysis of soil-water systems at equilibrium
C) water content - matric potential relationship
Reading: Jury and Horton: Chapter 2, p. 52-73.

*Problem Set #2

First Exam (Approximate timing)

4.5 weeks IV. Soil Water Movement
A) Darcy's Law - saturated and unsaturated flow
Reading: Jury and Horton: Chapter 3, p.74-101.

*Problem Set #3

B) Transient water flow - Richard's Equation and example applications for 1-D and 2-D water flow .
Reading: Jury and Horton: Chapter 3, p.101-117; Chapter 4, p.118-124 and p.147-158.
C) infiltration models (some classic approaches)
Reading: Jury and Horton: Chapter 4, p.124-147.

*Problem Set #4

Second Exam (Approximate timing)

3.5 weeks V. Heat and Gas Transport in Soils
A) governing equations for heat conduction, gas diffusion and advection
B) continuous and periodic inputs
C) field examples- reactive gas transport (e.g. methane dynamics)
Reading: Jury and Horton: Chapter 5, p.176-200; Chapter 6.

*Problem Set #5

2 weeks VI. Solute Transport
A) overview of solute transport models
B) a closer look at reactive chemical transport
C) field studies
Reading: Jury and Horton: Chapter 7, p.225-246.

Third Exam & Final Exam (cumulative)

*Approximate timing of Problem Sets

Required Text: Jury and Horton "Soil Physics", 6th Edition (2004)
(ISBN-10: 047105965X)

Expectations

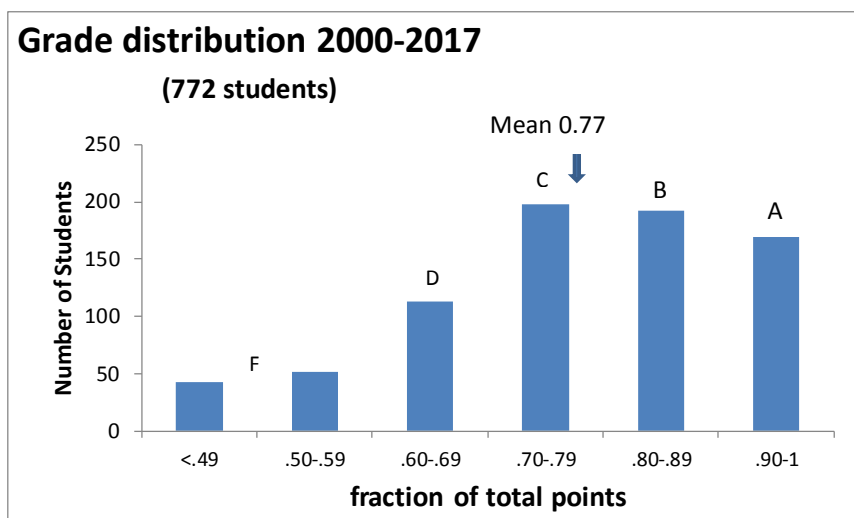
Course Objective: You will learn the fundamentals of water flow, gas flow, and heat movement in soils with emphasis on physical properties mediating these processes. You will leave this course with a strong blend of theory and problem solving skills.

Assignments: 5 or 6 problem sets, typically due about 10 days after handed out. **Late assignments will be penalized 20% per day.** Problem sets account for 60% of course points.

Reading: The required text ("Soil Physics" by Jury and Horton) provides discussions of many of the concepts covered in lecture. Specific chapters related to the lecture material are listed on the course outline. The text contains many example problems with solutions.

Exams: 3 exams at 1 hour each and a cumulative final. Exams account for 40% of course points. *A file of exam questions comprising a minimum of 90% the exam points will be provided. Questions involving calculations will be altered.*

Grading:	<u>% of total points</u>	<u>Grade</u>
	≥90	A
	80-89	B
	70-79	C
	60-69	D
	60-69	D
	<60	F



Getting help!

1. Office Hours: MW: 3-4, Th: 9-10, or when office door is open.
2. To make appointment, 491-6314 or email greg.butters@colostate.edu.
3. **Visit the separate lab course (SOCR471). The beginning of the lab session is devoted to problem set Q& A. We meet in W001 in the Plant Sci. Bldg., Th (2pm) and Fri (1 pm).**

Additional helpful references/reading:

- Warrick (2002). "Soil Physics Companion"
Hillel (2004). "Intro. to Environmental Soil Physics"
Hillel (1980). "Fundamentals of Soil Physics"
Taylor and Ashcroft (1972). "Physical Edaphology".