

## **Soil properties, morphology and formation (Spring 2017)**

GEOL 4335 (CRN27695)/5315 (CRN27696)

10:30-11:50 Monday and Wednesday

Instructor: Dr. Lixin Jin; 221A Geology Building; 747-5559; [ljin2@utep.edu](mailto:ljin2@utep.edu)

Office hours: M/W 9:30-10:20; or by appointment

**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 nutrients are cycled within terrestrial ecosystems; and (4) what are the typical types of soils in the El Paso regions and how these soils are influenced by climate and human activities. This course will also provide training on routine analyses of soil quality.

**Prerequisites:** Students are expected to have a background in geology, chemistry and biology. In particular, a working knowledge of chemical equilibria, ionic solution chemistry, pH, and oxidation-reduction reactions, different types of minerals and rocks and their reactivity, is highly recommended. Students without such background should consult with the instructor before enrolling.

### **Textbooks:**

Brady, N.C., and R.R. Weil. 2002. *The Nature and Properties of Soils*, 13th Edition. Collier MacMillan Publishers, N.Y. (Fundamental levels)

Daniel Strawn, Hinrich Bohn, and George O'Connor. 2015. *Soil Chemistry*, fourth Edition, Wiley Blackwell. (Intermediate levels)

Randall Schaetzl, and Sharon Anderson. 2005. *Soils: Genesis and Geomorphology*, Cambridge. (Advanced levels)

**Grades:** Course grades are distributed as follows

Four exams (15% each); Presentation (8%); homework and quiz (25%); Participation (7%)

A: >90%, B: 80-90%, C: 70-80%, D: 60-70%, F: <60%

Exams II through IV are not cumulative. Exams cannot be made-up without prior notice to the instructor.

The UTEP drop deadline is March 30, 2017.

**Disability Statement:** "If you have or suspect a disability and need an accommodation, contact Disabled Student Services (DSSO) at 747-5148 or at [dss@utep.edu](mailto:dss@utep.edu) or visit us in Room 106 Union East Building."

## Lecture Schedule\*

Date	Subject
Jan 18: W1	Introduction to Soil Science
	<b>I. Soil Physical Properties</b>
Jan 23: W2	A. Soil Texture, Structure and Color
Jan 25: W2	B. Master soil Horizons, Bulk Density, and Pore Space
Jan 30: W3	C. Soil Water
Feb 1: W3	D. Soil Atmosphere and Temperature
	<b>(EXAM I)</b>
	<b>II. Soil Chemical Properties</b>
Feb 6: W4	A. Structure and Function of Clay Minerals
Feb 8: W4	B. Soil Organic Matter
Feb 13: W5	C. Cation Exchangeable Reactions, Base Saturation
Feb 15: W5	D. Soil pH, Acidify, and Buffer Capacity
Feb 20: W6	E. Soil salinity, sodicity, and alkalinity
Feb 24: W6	F. Soil Analysis (student presentation)
	<b>(EXAM II)</b>
	<b>III. Soil Development</b>
Feb 27: W7	A. Parent Material
Mar 1: W7	B. Weathering
Mar 6: W8	C. Climate and Biota
Mar 8: W8	D. Topography and Time
Mar 13: W9	<b>No Class (spring break)</b>
Mar 15: W9	<b>No Class (Spring break)</b>
Mar 20: W10	E. Assessing Weathering Intensity
Mar 22: W10	F. Soil Genesis: Mass balance, strain
Mar 29: W11	<b>(EXAM III)</b>
	<b>IV: Landscape Evolution</b>
Apr 3: W12	A. Critical Zone Science
Apr 5: W12	B. Surface Morphometry
Apr 10: W13	C. Catena
Apr 12: W13	D. Soil Classification
Apr 17: W14	E. Soil Taxonomy
Apr 19: W14	F. Paleosol, Paleoclimate
Apr 24: W15	G. Stresses on local soil sustainability
Apr 26: W15	H. Pedogenic carbonate
May 1: W16	Exam Review, Evaluation
May 3: W16	<b>Exam IV</b>

This schedule is subject to changes as semester moves along.