

Instructor: Colin R. Robins
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office: KSC 238

Office Hours: Mon 11-12, 2:30-3:30, 4:15-5:15; Tues 10-11; & Fri 9-9:50. You can also email me to make an appointment for a more convenient time.

Time & Room: MW 1:15 to 2:30 pm in KS 127; LAB: *every other* Thursday 1:15-4:15 pm

Required Textbook: Brady, N.C., & Weil, R.R., 2007. The Nature and Properties of Soils (14th Edition, revised). Prentice Hall. 980 pages.

Additional readings will be assigned to you throughout the semester, typically posted on Sakai.

Laboratory exercises will be provided to you; there is no manual to purchase for this class.

Course Overview:

This course, with laboratory, is an intensive introduction to the properties and genesis of soils, and to the expression of soils across landscapes past and present. We'll cover topics including soil morphology, soil physical and chemical properties, clay mineralogy, a survey of soil biology & ecology, effects of soil acidity and alkalinity, and the biogeochemical cycles of C, N, and other elements. We'll also address a few crucial applications of soils to environmental science, ecology, geology, agriculture, and/or archaeology, depending on your interests! Indoor laboratory activities will entail physical, chemical and instrumental study of soil properties, while field sessions will train you in the description, sampling, and mapping of soils for a variety of research needs. Lab meets *every other* week. Prerequisite: CHEM 14L & 15L, and BIOL 43L & 44L.

Learning Objectives:

Students who successfully complete this course will be able to:

- Conduct a complete soil profile description using professional terminology
- Demonstrate basic understanding of USDA NRCS soil orders
- Learn where to find and how to apply existing soil science data resources & research to real-world scientific challenges or land management issues
- Explain the implications of specific soil properties for local Earth history, land use, or other purposes
- Discuss, in detail, key global issues relevant to modern soil science (including carbon sequestration, paleoclimate analysis, soil salinization, soil erosion, and sustainable food production) and suggest avenues of targeted research that could improve our understanding of these topics.

Semester Grade Components:

Exam 1	20%
Exam 2 (not cumulative)	20%
Final Exam (cumulative)	20%
Laboratory	20%
Project	10%
Activities & Assignments	10%

Grading Scale: My letter grades are based on the following scale (note: no “D-” at SC, HMC):

0	60	64	66	70	74	76	80	84	87	91	95
NC/F	D-	D	D+	C-	C	C+	B-	B	B+	A-	A

Activities & assignments include graded reading responses, problem sets, in-class activities/discussions, or low-weight quizzes throughout the semester.

Your final project will entail (1) a thorough review of a scientific problem or challenge in soil science, or (2) a short scientific study in which you apply soil science to your (interdisciplinary) interests (more info later). You’ll present this topic to your peers during the last week of the course.

WEEK	DATE (M & W)	TOPIC	READING
1	Sep 4	Introduction to Soil Science & Soil Genesis	CH 1 & 2
2	Sep 9 & 11	Soil Morphology & Taxonomy	CH 3
3	Sep 16 & 18	Soil Physical Properties	CH 4
4	Sep 23 & 25	Soil Water & The Hydrologic Cycle	CH 5 & 6
5	Sep 30 & Oct 2	Soil Air, Redox, & Intro to Soil Mineralogy	CH 7
Exam I is tentatively scheduled for Thursday, Oct 3			
6	Oct 7 & 9	Clay mineralogy & chemistry	CH 8
7	Oct 14 & 16	Sol Acidification & Forest Resources	CH 9
8	Oct 21 & 23	Our future? Alkalinity, Salinization, & Desertification	CH 10, 17
9	Oct 28 & 30	Soil Biodiversity & Ecology	CH 11
10	Nov 4 & 6	Nutrient Cycles & Biomes (<i>CRR at SSSA Meetings</i>)	CH 14-16 partial
11	Nov 11 & 13	Soil C & N	CH 12 & 13 partial,
Exam II is tentatively scheduled for Thursday, Nov 7			(Readings TBA)
12	Nov 18 & 21	C Sequestration & Geochronology	CH 19 & 17
13	Nov 25 & 29	Applications: Paleosols & Environmental Change	(Readings TBA)
14	Dec 2 & 4	Sustainable Applications: Urban Soils & Agroecology	(Readings TBA)
15	Dec 9 & 11	Student Topics & Presentations	(Readings TBA)
16	Dec 21	Final Exam	

Reflections, readings, or problem sets may be assigned throughout the semester. Exams may cover material from lecture, lab, *and* assigned readings; however, they will focus on topics addressed in class. I don’t release Final Exams, but you can of course look them over.

Laboratory Schedule (Again, check Sakai each week to confirm activities/topics). Note that two labs have been reserved for our two one-hour midterm exams.

WEEK	DATE (Thurs)	TOPIC/ACTIVITY	LOCATION
1	9/3	NO LAB	---
2	9/12	Soil Properties, Horizons, & Survey Data	KS II 402
3	9/19		
4	9/26	Soil Profile Description (BFS)	FIELD
5	10/3	-----Exam II-----	
6	10/10	Soil Profile Description (CHWP/PO Farm TBA)	FIELD
7	10/17		
8	10/24	Soil Micromorphology	KS II 402/TBA
9	10/31		
10	11/7	-----Exam II-----	
11	11/14	SDEF Field Trip (TBD)	FIELD
12	11/21	Soil Analysis I: PSD, BD, pH, EC, C, N, S, Pb	KS II 402/TBA
13	11/28	NO LAB – Thanksgiving Break	---
14	12/5	Soil Analysis II: PSD, BD, pH, EC, C, N, S, Pb	KS II 402/TBA
15	12/12	NO LAB – Study Week	---

Supplemental References:

These may prove helpful or of interest to students working in soil-related or soils-based research disciplines down the road.

Birkeland, P.W., 1999. Soils and Geomorphology. 3rd Edition. New York: Oxford University Press. 430 pages.

Schoeneberger, P.J., et al., eds., 2013. Field book for describing and sampling soils, Version 3. Lincoln: USDA Natural Resources Conservation Service, National Soil Survey Center. ([freely available online – will be used in lab.](#))

Soil Survey Staff, 2010. The Keys to Soil Taxonomy, 11th Edition. USDA Natural Resources Conservation Service. ([freely available online – will be used in lab.](#))

Burt R., ed., 2004. Soil Survey Laboratory Methods Manual. USDA Natural Resources Conservation Service. ([freely available online](#))