

Southeast Missouri State University

Departments: Environmental Science Program **Course Number:** EV 365/GO 365
Geosciences

Course Title: Environmental Soil Science **New:** Spring 2000

I. Catalog Description and Credit Hours of Course: An investigation of the physical, chemical, mineralogical and microbiological features of soils and an analysis of best land use. Three lectures, one two-hour laboratory and one field trip. (4)

II. Prerequisites: MA 134 and CH 186.

III. Purposes or Objectives of the Course: To provide an understanding of:

- A. the physical, chemical, and microbiological aspects of soils.
- B. clay mineralogy and its role in controlling soil reactivity.
- C. the role that soil organic matter has in controlling soil reactivity.
- D. soil classification and its role in interpreting soil genesis and soil behavior.
- E. soil erosion and its management for sustainability.
- F. soil interactions with heavy metals, pesticides, hydrocarbons and radionuclides.
- G. nutrient cycling in ecosystems.

IV. Expectations of Students:

- A. Students are responsible for text material and assigned problems.
- B. Students will use software to design engineered structures suitable for erosion abatement and to solve soil classification and water relations problems.
- C. Students will successfully complete two exams and one final exam.
- D. Students will successfully complete all laboratory projects, including the writing project reports.
- E. Students will attend at least one of two field trips*.
- F. Students will attend and prepare for class.

G. The course will adhere to the policies of academic honesty as described in the student handbook.

* Out-of-class field trips for soil collection will be to two sites with different soils types; the alluvial basin soils of the Bootheel and the limestone-residual soils of the Missouri Ozarks.

V. Course Content or Outline: (lecture hours)

A. Lecture Outline

1. Introduction to soil science (1)
2. Formation of soils from parent materials (2)
3. Soil architecture and physical properties (1)
4. Soil water and hydrology (3)
5. Soil air and soil temperature (2)
6. Soil colloids: their nature and significance (4)
7. Soil acidity and alkalinity (2)
8. Alkaline and salt-affected soils and their management (1)
9. Examination I (1)
10. Organisms and soil ecology (2)
11. Soil organic matter (2)
12. Soil classification and best land use management (5)
13. Soils and geographic information (1)
14. Nutrient cycling: C, N, P, K, S, Fe (4)
15. Examination II (1)
16. The impact of heavy metals in soils (2)
17. The impact of pesticides and organic pollutants (2)
18. The impact of radionuclides in soils (1)
19. Water erosion and its management (5)
20. Wind erosion and its management (2)
21. Soils and the world's food supply (1)

B. Laboratory outline (each one laboratory)

1. Common minerals in soil science
2. Common rocks in soil science
3. Acidity and pH
4. Alkalinity, sodicity and pH
5. Exchangeable cations (Ca, Mg, K, Na)
6. Organic carbon and organic matter
7. Clay content and texture
8. The soil profile
9. Soil water
10. Soil temperature
11. Clay mineralogy

12. Aggregate analysis
13. Soil erosion
14. Nitrates and lake eutrophication
15. Heavy metals and oxides of Mn and Fe

VI. Textbook:

- A. *The Nature and Properties of Soils*, Nyle C. Brady and Ray R. Weil. 1999. Prentice-Hall. Upper Saddle River, NJ (ISBN 0-02-313371-6).
- B. References:
 1. Soil Science Society America Journal
 2. Soil Science
 3. Geoderma
 4. Journal Environmental Quality
 5. Internet
 6. Cooperative National Soil Surveys
 7. Journal Soil and Water Conservation
 8. Selected Manuals from USDA-NRCS.

VII. Student Evaluation:

- A. Examinations (2) - 30%
- B. Final Examination - 20%
- C. Problem Solving Exercises - 20%
- D. Laboratory Projects - 20%
- E. Manuscript - 10%