

Introductory Soil Science (SOCR240)

Course Outline

Introduction- Scope of course and learning objectives. For an excellent overview to supplement the first lecture, read Chapter 1 in Brady and Weil (B&W)

Unit 1- Factors of Soil Formation and Soil Classification

- I. Factors of Soil Formation (Reading: B&W, Chapter 2)
 - A. Soil forming factors
 - B. The soil profile and what it tells us
- II. Soil Classification/Taxonomy (Reading: B&W, Chapter 3)
 - A. Soil Orders- Organization of soil types
 - B. Suborders, Great groups, and Families- what this tells us

Exam 1 (Approximate date: End of week 3)

Unit 2- Soil Physics

- I. Properties of solid phase (Reading: B&W, Chapter 4)
 - A. Particle size, structure, color
 - B. Density and porosity
- II. Soil water (Reading: B&W, Chapter 5)
 - A. Soil water content and soil water potential
 - B. Plant available water
- III. Soil Temperature and thermal properties (Reading: B&W, Chapter 7)
 - A. Thermal conductivity and heat capacity
 - B. Daily and seasonal temperature changes in the soil
- IV. Soil gases- Aeration and transformations (Reading: B&W, Chapter 7)
- V. Basics of movement of water, gases, and energy in soil
- VI. Soil Erosion (Reading: B&W, Chapter 17)
 - A. Types of erosion
 - B. Predicting erosion
 - C. Conservation practices

Exam 2 (Approximate date: End of week 7)

Unit 3- Soil Chemistry

- I. Important clay minerals and reactivity (Reading: Chapter 8, B&W)
 - A. Phyllosilicates
 - B. Cation exchange
 - C. Expansive soils
- II. Soil organic matter and reactivity (Reading: Chapter 12, B&W)
 - A. Types of soil organic matter

- B. Adsorption of pesticides and other reactivity
- III. Salt affected soils and reclamation (Reading: Chapter 10, B&W)
 - A. SAR and EC
 - B. Gypsum requirement
 - C. Leaching requirement
- IV. Acidic Soils (Reading: Chapter 9, B&W)
 - A. Characteristics, impact and occurrence
 - B. Liming requirement
- V. Heavy Metals in Soils
 - A. Sources and fate
 - B. Health concerns
 - C. Phytoremediation

Exam 3 (Approximate date: End of week 11)

Unit 4- Soil Microbiology (Reading: Chapter 11 in B&W)

- I. Types and abundance of soil microorganisms
 - A. Bacteria and Fungi
 - B. Actinomycetes and others
- II. Nutritional needs, environmental adaptation and microbial functions
 - A. Heterotrophs and autotrophs
 - B. Anaerobic and aerobic bacteria
- III. Some key chemical reactions mediated by soil microorganism
 - a. Nitrification
 - b. Degradation of pesticides

Exam 4 (Approximate date: End of week 13)

Unit 5- Soil Fertility

- I. The big three- N,P,K (Reading: Chapter 13 and 14, B&W)
 - A. Sources and cycles
 - B. Deficiency symptoms
 - C. Organic and inorganic fertilizers
- II. Micronutrients (Reading: Chapter 15, B&W)
 - A. Key micronutrients
 - B. Deficiency symptoms and remedies
- III. Organic soil amendments (Reading: Chapter 12, B&W)
 - A. Nutrient benefits of compost and biosolids
 - B. Broader benefit of organic amendments on soil health

Exam 5 (Week 16, Final Exam)