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)