

Students are responsible to inform themselves about those standards before performing any academic work.

LECTURES

Section I: Introduction

- Overview
- Historical perspectives

Section II: Soil as a habitat for microbes

- Soil Texture, Soil Pores, Soil Density, Soil pH, Soil Water, Soil Aeration, Soil Temperature, and Other Soil Factors

Section II: Microbial Growth and Metabolism

- Microbial growth requirements: Macro- and micro-nutrients, growth factors, optimal growth environment
- Growing microorganism in the lab
- Phases of bacterial growth
- Mathematical expression of microbial growth
- Chemical foundations of metabolism
- Metabolic strategies

Section III: The Soil Microbial Community

- Soil microbes: Bacteria and Archaea, Fungi and Algae
- Larger soil fauna (meso- and macrofauna): Earthworms, Protozoa and Nematodes, Arthropods and Molluscs
- Soil viruses

Section IV: Methods for Studying Soil Microbes

- Sample collection
- Microscopy – cell counting
- Chemical analyses of signal molecules (cytoplasmic constituents, ATP, etc)
- Nucleic acid analyses (DNA and RNA analyses for soils, PCR, etc)
- Physiological analyses (culture studies, isolation and characterization, respiration)
- Enzyme assay

Section IV: Microbial mediated processes in soils

- Carbon, Nitrogen and Sulfur transformations and transformation of other elements

Section V: Soil Microbes and Environmental Quality

- Bioremediation of contaminated soils
- Biological control of soil pathogens
- Composting wastes
- Global gases

LABORATORY EXERCISES

All lab classes will be held in room 255 at the Redding building

- 1) Bacteria and Fungi enumeration: **Jan 23** (requires observation on Jan 30)
- 2) Winogradsky Column: **Feb 6** (requires weekly check over a month)
- 3) Soil Enzymes: Phosphatase assay: **Feb 20**
 Feb 27 (open for data exchange + a tutorial)
- 4) Soil Respiration and Nitrification **March 6** (set-up)
 March 20 (sample analysis)
 March 27 (tutorial and data exchange)
- 5) Water Quality (Coliforms and *E. coli*): **April 3**
- 6) Field Trip (On-site Septic Systems): **April 10**