A comprehensive study of soil biogeochemical processes relevant to food production, soil remediation and restoration. Water and soil solution chemistry; soil carbon/organic matter, soil minerals, precipitation/dissolution, adsorption reactions and models, redox chemistry, soil acidity. Restoration topics include human and ecological contaminant exposure in soil-water systems; fertilizer and water quality; remediation of severely degraded land from acidity, salinity, toxins; soil impact from subsurface shale fracturing; remediation of contaminated soil; restoration of urban soils. Laboratory component focuses on hands-on soil investigation /problem solving used for soil chemical investigations including USEPA and USGS geochemical speciation models.