

(2.5 credits)

001-2-0004

General Course Description: Combines theoretical and experimental elements of vadose zone physical properties and processes and practical experience in the measurement and analysis of soil physical processes related to agricultural, hydrological and environmental problems.

1. **Introduction:** What is the VZ? Why it is important (the critical zone)? Difference between VZ and saturated media; Historical perspective.
2. **Soil Water Energy:** Properties of water; Water energy' Characteristic curve; Hysteresis' Capillarity; Hydrophobicity and soil-water interactions.
3. **Physics of the solid "skeleton":** Basic soil properties; Soil structure; Soil strength; Soil vs. rock; Preferential flow pathways and fractures.
4. **Dynamics of soil-air-water movement in unsaturated media:** Saturated transport; Flow vs. transport; Heterogeneity; Layered soils.
5. **Transport of solutes and colloids in porous media:** Dispersion and diffusion; Sorption and retardation; Impact of heterogeneity and hydrophobicity on transport; Colloidal transport; vapor transport; modeling transport phenomena.
6. **Infiltration:** Principles; governing equations; assumptions needed and problems; estimation methods.
7. **Evaporation and salinization:** The different stages of evaporation; evaporation from free water vs. soils; evaporation and salt redistribution.
8. **Student presentations:** Topics vary each year.

Lecturer: Noam Weisbrod