Hydrometeorology 3 credit points
Dr. Nurit Agam Course # 00125030

During this course students will be exposed to the physical processes governing the micrometeorology and microclimate of ecosystems, through the gain of understanding the surface water and energy balances. The energy cycle, its role, and feedback processes via the water cycle, will be addressed. Atmospheric boundary layer dynamics and turbulent transfer, which play a primary role in feedbacks in the exchange of water and energy between land and near surface atmosphere, will be discussed.

Student evaluation:

- Presentation – 25%
- Exercises (5) – 35%
- Final assignment – 40%

Specific subjects:

1. What is hydrometeorology and why is it important?

2. Solar radiation as a driver of physical and biological processes
   2.1. Introduction
   2.2. Black body radiation laws
   2.3. Radiation exchange for 'gray' surfaces
   2.4. Solar radiation at the top of atmosphere
   2.5. Atmospheric attenuation of solar radiation

3. Radiation balance
   3.1. Actual solar radiation at the ground
   3.2. Longwave radiation
   3.3. Net radiation at the surface
   3.4. Measuring radiation – methods and instrumentation

4. Soil temperature and heat flux
   4.1. Introduction
   4.2. Soil surface temperature
   4.3. Subsurface soil temperatures
   4.4. Thermal properties of soil (specific heat, heat capacity, thermal conductivity, Thermal diffusivity)
   4.5. Computation of soil heat flux
   4.6. Measurement of soil heat flux

5. Turbulent fluxes
   5.1. Turbulent transport in the atmosphere
   5.2. Sensible heat flux
   5.3. Latent heat flux

5.4. Evaporative fraction and Bowen ratio
5.5. Penman's equation for measuring evaporation
5.6. Measurement methods

6. Spatial scale of flux assessments – from point to regional
   6.1. The relationship between soil surface temperature and evaporation
   6.2. Mapping the energy balance components

References:

- Brutseart, W., 1982. Evaporation into the atmosphere. D. Reidel Publishing Company, Dordrecht, Holland.
- Shuttleworth, W.J., 2012. Terrestrial Hydrometeorology. Wiley-Blackwell, Chichester, West Sussex, UK.
- Hillel, D., 1998. Environmental Soil Physics: Fundamentals, Applications, and Environmental Considerations. Academic Press, San Diego.