Introduction to flow and transport processes in streams מבוא לזרימה והסעת מומסים בנחלים
206-2-6011

Instructor: Dr. Shai Arnon

Credit hours: 3 hours

Course prerequisites:
Introduction to geochemistry & Introduction to hydrology.

Course purpose and objectives:
The course provides the detailed theoretical knowledge required for environmentalists and engineers to understand and protect surface water quality.
On successful completion of this course students will be able to:

1. Understand and quantify fundamental hydrological, chemical and biological processes that control flow and transport of solutes in streams.
2. Understand and quantitatively analyze the connections and relative importance of hydrological, chemical and biological processes in streams.
3. Understand the importance of surface-subsurface interactions between water bodies.
4. Develop an interdisciplinary perspective when evaluating and managing surface water systems.

Reference books:

- Streams and Ground Waters (Jeremy B. Jones and Patrick J. Mulholland)
- Freshwater Ecology: Concepts and Environmental Applications (Walter K. Dodds)
- Stream Hydrology: An Introduction for Ecologists (Nancy D. Gordon, Thomas A. McMahon, Brian L. Finlayson , Christopher J. Gippel and Rory J. Nathan)
- Stream Ecology: Structure and Function of Running Waters (J.D. Allan)
- Aquatic Chemistry- Chemical equilibria and rates in natural waters (W. Stumm and J. J. Morgan)
- Methods in Stream Ecology (F. Richard Hauer and Gary A. Lamberti)
- Treatment Wetlands (Robert H. Kadlec and Scott Wallace)
- Stream Corridor Restoration: Principles, Processes, and Practices (Federal Interagency Stream Restoration Working Group (FISRWG))
- Geomorphology and River Management (Gary J. Brierly and Kristie A. Fryiers)
- Environmental Transport Processes (Bruce E. Logan)
- Hydroecology and Ecohydrology: Past, Present and Future. (Paul J. Wood, David M. Hannah, Jonathan P. Sadler)
- Open-channel Flow (M. Hanif Chaudhry)

Homework
Homework will generally be assigned along with the topics on a weekly basis and due in a week. Homework will be sent to the student by email or via Moodle.

Grading Policy
Grading for classroom students will be based on homework assignments, and final exam, with the following distribution:

Homework Assignments	(20%)
Final Exam	(80%)

Course contents:

1) **Introduction to the topic of streams & water quality. Global and local aspects** *(1 meeting).*
2) **The generic 'treatment' system:** *physical characteristics of streams and stream corridors. Hydrology and geomorphology (2-3 meetings).*
3) **Concepts in aquatic chemistry.**
   Why and how reactions occur. The central role played by oxygen and carbon. Redox potentials and their effects on the N, P, C, and S cycles (1-2 meetings).
4) **Concepts in aquatic ecology.**
   Definition of a stream ecosystem. Definition of nutrient saturation. Definition of a healthy versus unhealthy ecosystem. Models of stream ecosystem dynamics (1 meeting).
5) **Transport mechanisms**
   Diffusion, advection, Taylor's diffusion, nutrient spiraling, boundary layer (2-3 meetings).
6) **Stream metabolism.**
   Factors influencing metabolism and measurement techniques (1 meeting).
6) **Stream restoration** *(1-2 meetings).*