

Course Name	Code\No.	Number of Credits			
		Theo.	Lab.	Train.	Credit
Applied Groundwater Hydrology	HWR 432	3	-	-	3
Pre-Requests	HWR231				

**Course objectives:**

This course aims to teach students the hydraulics of groundwater wells, design wells and calculate the hydraulic properties of water bearing layers, pumping tests and chemical components of groundwater, which include the quality and classification of groundwater in terms of suitability for use as well as provide principles on groundwater pollutants and their movement.

**Course content:**

1. Hydraulics of wells
2. Well design
3. Calculation of hydraulic properties of water bearing layers and pumping tests.
4. Chemical groundwater components: The important chemical elements in the groundwater quality and definition of each element, groundwater minerals, concentrations and units, chemical rock components, common chemical reaction between rocks and groundwater.
5. Movement of pollutants in groundwater: terms and definitions, mass transfer of pollutants, important terms for pollutants, types of pollution, pollution equations, analytical methods for calculating pollutant movement.

**Course outcomes:**

The student is expected to learn and understand the following concepts:

- Hydraulic calculations of groundwater movement to wells.
- Well design
- Calculating the hydraulic properties of the load bearing layers.
- Chemical groundwater components.
- How pollutants travel in underground reservoirs.
- Description of the sources and characteristics of basic organic and inorganic pollutants.
- Knowing the fate of pollutants and how to treat them.

**Evaluation Method:**

Students are evaluated through periodical, midterm and final exams in addition to assignments and interactions activities during class.

**Reference:**

- **Fetter, C.W.** (2008) Contaminant hydrogeology, Waveland Pr Inc; 2nd edition.
- Deutsch, W. J. (1997) Groundwater geochemistry, Lewis Publishers.
- **Domenico, P. A. and Schwartz, F. W.** (1997) Physical and chemical hydrogeology, John Wiley Wiley; 2 edition, 528p.
- Palmer, C. M. (1996) Principles of contaminant hydrogeology, CRC-Press; 2nd edition.