

## **COURSE SYLLABUS FORM**

**American University of Beirut  
Faculty of Arts and Sciences  
Department Geology**

### **Geol 330P: Selected Topics in Advanced Geology: Hydrogeologic Systems**

#### **1. Course Learning Outcomes**

This course provides an understanding of the physical and chemical characterization of groundwater flow systems and their interactions with other natural systems. The course introduces the student to groundwater monitoring techniques and the design of water wells.

#### **2. Resources Available to Students**

Required Text: Fetter, C.W. 2001. Applied Hydrogeology, 4<sup>th</sup> ed. Prentice Hall, New Jersey.

Reading Assignments: I.E. Amin and Edmond G. Carlton. "Calculation of induced groundwater recharge from the slopes of time-drawdown data" in Gambling with groundwater – physical, chemical, and biological aspects of aquifer-stream relations Brahana et al., (eds.) pp. 675-679

Isam E. Amin. "Quantification of groundwater recharge received by aquifers during pumping periods" Environmental and engineering geoscience vol. III, No. 2, Summer 1997, pp. 305-307.

I.E. Amin and Michael E. Campana. "A general lumped parameter model for the interpretation of tracer data and transit calculation in hydrologic systems." Journal of Hydrology 179 (1996) 1-21.

#### **3. Grading Criteria**

Term Paper = 20%  
First Exam = 20%  
Second Exam = 20%  
Final Exam = 40%

#### 4. Schedule

Week	Topic	Assignments
1	Introduction Hydrogeologic Units Hydraulic properties Introduction to pumping tests	
2	Interactions of Surface and Groundwater Systems Quantification of induced groundwater recharge: method of aquifer properties method of time-drawdown	Homework 1
3	Delineation of Regional Groundwater Flow systems Topography Hydraulic head distribution Hydrochemical trends Environmental isotopes Soil and land surface features	
4	Geochemical Characterization of Groundwater Flow Systems Use of Cl to quantify groundwater recharge	
5	Use of stable and radioactive isotopes to characterize groundwater systems	
6	Midterm I	
7	Well Screens & Sediment Size Analysis Continuous-slot screens Other types of screens Sediment size analysis	Homework II
8	Water Well Design Casing diameter Well depth Well screen length Well screen slot openings Well screen diameter Open area and entrance velocity	
9	Characterization of Groundwater systems by Flow Nets Determination of transmissivity Determination of storativity	Homework III
10	Field & Laboratory Determination of Hydrologic Parameters Hydraulic conductivity laboratory methods grain size distribution methods	Homework IV
11	Hydraulic head, suction head, porosity, compressibility of porous media	

Week	Topic	Assignments
12	Groundwater Monitoring Techniques Estimation of groundwater volume in storage Impacts of droughts on groundwater supply and use Delineating contaminant plumes Monitoring contaminant movement (transport) Locating monitoring wells Design of monitoring wells	
13	Midterm II	
14	Planning Groundwater Investigations and Presentation of Results Planning Data collection and fieldwork Data analysis Report preparation	

**5. Course Policy (if any)**