Spring 2-1-2004

GEOL 572.01: Advanced Hydrogeology

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Instructor: William Woessner

Text: Groundwater and Wells (Driscoll)
Contaminant Transport (Fetter)
Outside readings as assigned (list attached)

Class Meeting: T, TH 8:00-9:30 A.M.

Dr. Woessner's travel and meeting schedule will require some movement of class meeting times. A weeks notice will be given for rescheduling. A few two hour evening classes may need to be scheduled.

Course Objectives:

Develop advanced theoretical and applied hydrogeologic skills, specifically in solute transport processes, interpretation of water level change, production well design and aquifer test analyses.

Course Assessment:

Completion of all assignments in a professional manner
Active class participation
Grading of assignments

Course Design:

Readings and lectures, problems sets, research paper, midterm and final exam

Course Requirements:

Complete readings
Actively participate in class discussions
Complete all assignments in a professional manner
10 page term paper on a research topic
Grading: Problem Sets 55%, Individual Report: Oral 5%, Written 15%, Final 25%.

Final Exam: Monday, May 10, 8:00-10:00 A.M.

All Assignments will be due on dates specified in class.
<table>
<thead>
<tr>
<th>DATE</th>
<th>TOPIC</th>
<th>READING</th>
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<tbody>
<tr>
<td>January 26</td>
<td>Intro</td>
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<tr>
<td>February 29</td>
<td>Water Level Changes</td>
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<td>February 3</td>
<td>Water Level Changes</td>
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<td>February 6</td>
<td>No Class - MT American Fisheries, Whitefish</td>
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<td>February 10</td>
<td>Water Level Changes</td>
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<td>February 12</td>
<td>Well Drilling Techniques</td>
<td>Driscoll</td>
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<td>February 13</td>
<td>LAST DAY TO ADD/DROP BY CYBERBEAR</td>
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<td>February 17</td>
<td>Production Well</td>
<td>Driscoll</td>
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<td>February 19</td>
<td>Production Well</td>
<td>Driscoll</td>
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<tr>
<td>February 24</td>
<td>Production Well</td>
<td>Driscoll</td>
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<tr>
<td>February 26</td>
<td>Production Well</td>
<td>Driscoll</td>
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<tr>
<td>March 2</td>
<td>Aquifer Test</td>
<td>Lohman</td>
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<td>March 4</td>
<td>Aquifer Test</td>
<td>Lohman</td>
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<tr>
<td>March 9</td>
<td>DROP/ADDS (NO $$$ BACK)</td>
<td>Lohman</td>
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<td>March 9</td>
<td>Aquifer Test</td>
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<td>March 11</td>
<td>Aquifer Test</td>
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<td>March 16</td>
<td>Aquifer Test</td>
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<td>March 18</td>
<td>Aquifer Test</td>
<td>Lohman</td>
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<td>March 23</td>
<td>Solute Transport</td>
<td>Fetter</td>
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<td>March 25</td>
<td>Solute Transport</td>
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<td>Mar. 29 - Ap. 2</td>
<td>SPRING BREAK</td>
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<td>April 6</td>
<td>Solute Transport</td>
<td>Fetter</td>
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<td>April 8</td>
<td>Solute Transport</td>
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<td>April 13</td>
<td>Solute Transport</td>
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<td>April 15</td>
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<td>April 20</td>
<td>Solute Transport</td>
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<td>April 22</td>
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<td>April 27</td>
<td>Paper Presentations</td>
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<td>May 4</td>
<td>Review</td>
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<td>May 6</td>
<td>Finish Up</td>
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GEOLOGY 572 - ADVANCED HYDROGEOLOGY
SUGGESTED OUTSIDE READING

WELL DESIGN AND EVALUATION
Williams, 1981, Fundamental Concepts of Well Design
Clark and Turner, 1983, Experiments to Assess the Hydraulic Efficiency of Well Screens
Williams, 1981, The Well/Aquifer Model
Schafer, 1978, Casing Storage Can Affect Pumping Test Data
Harrill, 1970, Determining Transmissivity from Water-level Recovery of a Step-drawdown Test
Nahm, 1980, Estimating Transmissivity and Well Loss Constant Using Multi-rate Test Data from a Pumped Well
Turcan, 1962, Estimating the Specific Capacity of a Well

AQUIFER TESTING
Reed, 1980, Type curves for Selected Problems of Flow to Wells in Confined Aquifers
Neuman, and Witherspoon, 1969, Applicability of Current Theories of Flow in Leaky Aquifers
Jacob and Lohman, 1952, Non-steady Flow to a Well of Constant Drawdown in an Extensive Aquifer.
Theis, 1935, The Relation Between the Lowering of the Piezometric Surface and the Rate and Duration of Discharge of a Well Using Ground-water Storage.
Jacob, 1940, On the flow of Water in an Elastic Artesian Aquifer.
Papadopulos and Cooper, 1967, Drawdown in a Well of Large diameter.

WATER LEVEL FLUCTUATIONS
Turk, 1975, Diurnal Fluctuations of Water-tables Induced by Atmospheric Pressure Changes.
Freeze, 1969, The Mechanism of Natural Ground-water Recharge and Discharge.

SOLUTE TRANSPORT

Garabedian et al, 1991, Large Scale Natural Gradient Tracer Test in Sand and Gravel, Cape Cod, Massachusetts.


Gelhar, 1986, Stochastic Subsurface Hydrology from Theory to Applications

Anderson, Movement of Contaminants in Groundwater.


Cherry et al, Contaminants in Groundwater Chemical Processes.

Cherry et al, Contaminant Hydrogeology Part 1, Physical Processes.

Domenico and Robbins, 1984, A Dispersion Scale Effect in Model Calibrations and Field Tracer Experiments.


Lehr, 1988, An Irreverent View of Contaminant Dispersion.

Sudicky, 1986, A Natural Gradient Experiment on Solute Transport in a Sand Aquifer.


**POSSIBLE RESEARCH PAPER TOPICS**

1. Fractal approaches to solute transport modeling
2. Scale dependent representation of dispersivity
3. DNAPL behavior in the saturated zone
4. The use and interpretation of ground penetrating radar and seismic reflection in groundwater studies
5. Depositional environments of high hydraulic conductivity aquifers
6. Transport of colloids in groundwater