GEOL 4320 Hydrogeology T,Th 12:00-2:40 Winter 2013 **Syllabus**

# Text (required): Applied Hydrogeology by C.W. Fetter

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Office: SCN 216 Office hours: T, Th 11:00-12:00, Th 3:00-4:00

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| --- | --- | --- | --- | --- |
| Date | Lecture Topic | Lab Practical Topic | Book chapter | Assessment, Presentations |
| Tue. Jan 8 | Introduction, hydrologic cycle, properties of the water molecule |  | 1, 2 |  |
| Thur. Jan 10 | Runoff, rivers, hydrographs, gaining & losing streams | Lab 1: Units, conversions, water budget Mono Lake | 2 |  |
|  |  |  |  |  |
| Tue. Jan 15 | water budgets | Water budget Mono Lake |  |  |
| Thur. Jan 17 |  | Lab 2: Field trip to local stream, stream gauging | 2, 3, 6 |  |
|  |  |  |  |  |
| Tue. Jan 22 | the vadose zone, factors controlling infiltration, groundwater recharge |  | 3, 8 |  |
| Thur. Jan 24 | Hydrogeologic properties of rocks and sediments, materials, porosity, aquifers, confining layers | Lab 3: Infiltration, Porosity |  |  |
|  |  |  |  |  |
| Tue. Jan 29 | Darcy’s law, heads and gradients; Mathematical principles of groundwater flow, dispersion | Practice problems – Darcy’s Law | 4 | Student 1 |
| Thur. Jan 31 |  | Lab 4: Darcy’s Law; permeameters and hydraulic conductivity | 4 |  |
|  |  |  |  |  |
| Tue. Feb 5 |  |  |  | Test 1 |
| Thur. Feb 7 | Flow in confined and unconfined aquifers | Lab 5: Drawing potentiometric maps, flownets | 5 | Student 2 Student 3 |
|  |  |  |  |  |
| Tue. Feb 12 | Transmissivity, storage coefficient, Jacob method |  | 5 | Student 4 |
| Thur. Feb 14 | Wells, well design, well drilling methods | Practice problems – well tests | 5 | Student 5  Student 6 |
|  |  |  |  |  |
| Tue. Feb 19 | aquifer tests, drawdown, slug tests |  |  | Student 7 |
| Thur. Feb 21 | Well fields, well interference, supply issues, specific capacity | Lab 6: Cooper-Jacob method Theis curves | 7+ Bb files | Student 8 |
|  |  |  |  |  |
| Tue. Feb 26 |  |  |  | Test 2 |
| Thur. Feb 28 |  | Lab 7: CA groundwater basin – groundwater occurrence, use, and recharge | 8 | Student 9 Student 10 |
|  |  |  |  |  |
| Tue. Mar 5 |  | Lab 8: Field trip to ACWD recharge facilities | 7 |  |
| Thur. Mar 7 | Regional groundwater flow, CA groundwater basins | Lab 9: Using water quality data |  | Student 11 |
|  |  |  |  |  |
| Tue. Mar 12 | Water-rock interaction, water chemistry, seawater intrusion, common contaminants |  | 9, 10 | Student 13 –  Student 14 |
| Thur. Mar 14 | CA water and climate change; groundwater remediation, groundwater banking, artificial recharge |  | 10+ |  |
|  |  |  |  |  |
| Thur Mar 21, noon to 1:50 pm |  |  | Cumulative | Final Exam |

Dates and topics subject to change

This course covers physical and chemical hydrogeology. The focus is on groundwater, but surface water and surface water–groundwater interaction are also briefly covered. Practical, laboratory exercises are quantitative, requiring use of spreadsheet programs and carrying out calculations. Participation during two field trips is important. Course topics include: Characteristics of aquifers, aquitards, and the vadose zone. Flow and transport in porous media and principals of advection-dispersion. Groundwater occurrence and use in California and the Western U.S. Water-rock interaction, groundwater contamination, and cleanup methods. Groundwater management and artificial recharge. Collection of hydrogeological data in the field at wells.

**Grading:**

Presentation: 30 points

Exams (2): 45 points each

Lab exercises (7 + 2 field trips): 20 points each; lowest score dropped

Final Exam: 100 points

Total points: 400

# No test makeups, late labs deducted 10% for each day late, no extra credit

Field trip 1 (tentative date) Thursday Jan 17 @ 12:00, complete worksheet/lab

Field trip 2 (tentative date) Tuesday Mar 5 @ 12:00: Alameda County Water District, complete worksheet

**See these Movies (optional):**

A Civil Action (1998)

Erin Brockovich (2000)

Chinatown (1974)

**Read these Books (optional):**

A Civil Action – Jonathan Harr

Cadillac Desert – Marc Reisner

Water Follies – Robert Glennon

Answers to odd-numbered problems in the text are worked out at: <http://www.appliedhydrogeology.info/>

**Learning Objectives for this course:**

1. Students will gain an appreciation for the role that groundwater plays in water budgets for individual basins, for California, for the U.S., and in the global water cycle.
2. Students will gain an understanding of the hydraulic properties of different geologic materials.
3. Students will be able to describe the fundamental differences between unconfined and confined aquifer systems, qualitatively and quantitatively.
4. Students will be able to apply Darcy’s Law to determine the rate of groundwater flow in different geologic media.
5. Students will be able to manipulate data from a pump test or slug test to determine drawdown or transmissivity.
6. Students will gain an understanding of the hydrologic and geologic factors that govern regional groundwater transport.
7. Students will gain and understanding of the source of the most abundant ions in groundwater.
8. Students will become familiar with common groundwater contaminants and the problems associated with their occurrence in drinking water and with remediation.

By enrolling in this class the student agrees to uphold the standards of academic integrity

described in the catalog at

<http://www.csueastbay.edu/ecat/current/i-120grading.html#section12>

If you have a documented disability and wish to discuss academic accommodations, or if

you would need assistance in the event of an emergency evacuation, please contact me as

soon as possible. Students with disabilities needing accommodation should speak with Accessibility Services.

Information on what to do in an emergency situation (earthquake, electrical outage, fire,

extreme heat, severe storm, hazardous materials, terrorist attack) may be found at:

http://www.aba.csueastbay.edu/EHS/emergency\_mgnt.htm.

Please be familiar with these procedures. Information on this page is updated as required.

Please review the information on a regular basis.